INFORMATION SHEET

PRESIDING: Commissioner Duffley; Chair Mitchell and Commissioners Brown-Bland, Gray, Clodfelter, Hughes and McKissick
PLACE: Via WebEx Videoconference
DATE: Wednesday, June 17, 2020
TIME: 1:35 p.m. – 5:31 p.m.
DOCKET NO.: E-2, Sub 1220
COMPANY: Williams Solar
DESCRIPTION: Williams Solar, LLC, Complainant, versus Duke Energy Progress, LLC, Respondent
VOLUME: 2

APPEARANCES

FOR WILLIAMS SOLAR, LLC:
Marcus Trathen, Esq.
Eric David, Esq.
Matthew Tynan, Esq.

FOR DUKE ENERGY PROGRESS, LLC:
Jack E. Jirak, Esq.
Brett Breitschwerdt, Esq.

WITNESSES

Jonathan Burke
Charles E. Bolyard
Prefiled Testimony of Jack McNeill
Panel of Kenneth Jennings, Steven Holmes, and Scott Jennings

EXHIBITS

Exhibits CEB-1 through CEB-20	I/A
Confidential Exhibit CEB-21	I/A
K. Jennings/Holmes Exhibits 1, 3 – 6	I/A
Confidential K. Jennings/Holmes Exhibits 2 and 7	I/A
Williams Solar Cross Exhibits 1 and 2	I/

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BEFORE: Commissioner Kimberly W. Duffley, Presiding
Chair Charlotte A. Mitchell
Commissioner ToNola D. Brown-Bland
Commissioner Lyons Gray
Commissioner Daniel G. Clodfelter
Commissioner Jeffrey A. Hughes
Commissioner Floyd B. McKissick, Jr.

IN THE MATTER OF:

Williams Solar, LLC,
Complainant
versus
Duke Energy Progress, LLC,
Respondent

VOLUME 2

A P P E A R A N C E S:

FOR WILLIAMS SOLAR, LLC:

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Raleigh, North Carolina 27601

T A B L E O F C O N T E N T S

E X H I B I T S

Exhibits List

CEB-1	Bolyard CV
CEB-2	List of Documents Reviewed
CEB-3	Initial Estimate (E-mail from Lee P. Winter, Duke Energy, to Williams Solar dated Jan. 29, 2019, transmitting System Impact Study Report, Facilities Study Agreement, and Request for Information)
CEB-4	System Impact Study Report (dated December 20, 2018)
CEB-5	Internal DEP e-mail dated December 19, 2018, transmitting the System Impact Study Report
CEB-6	Respondent Duke Energy Progress, LLC's Responses to Complainant's First Set of Interrogatories and Requests for Production of Documents
CEB-7	Duke Energy Progress, LLC, Supplemental Responses to Complainant's First Set of Interrogatories and Requests for Production of Document
CEB-8	Williams Solar Estimation Tool SIS.xlsx
CEB-9	SIS Estimation Tool Rev1.xlsm
CEB-10	Revised Estimate (E-mail from Lee P. Winter to Williams Solar dated July 30, 2019)
CEB-11	E-mail correspondence "Re: Facility Study Report, Williams Solar, LLC CHKLIST," between July 30, 2019, and August 16, 2019
CEB-12	Overview of Revised Estimating Tool – Williams Solar (Produced in Response to Data Request No. 1-3)
CEB-13	Copy of Time and Expense Template.xlsx
CEB-14	Cost Estimation Tool Presentation
CEB-15	July 30, 2019 e-mail re: Cost Estimation Training
CEB-16	August 1, 2019 e-mail re: Cost Estimation Tool Presentation.pptx
CEB-17	August 1, 2019 e-mail re: Conference Line for Cost Estimation Training

CEB-18	August 8, 2019 e-mail re: Cost Estimation Tool Start Date and Consistency Issues
CEB-19	June 10, 2019 DEP internal e-mail
CEB-20	June 6, 2019 internal DEP e-mail chain “RE: DEP and DEC Exposure”
CEB-21	CONFIDENTIAL DR No. 1-17 Williams Solar

Docket No. E-2, Sub 1220

Exhibit CEB-1

Bolyard CV

PROFESSIONAL BACKGROUND

Name:	Charles E. Bolyard, Jr.
Address:	McDonough Bolyard Peck, Inc. (MBP) 3040 Williams Drive, Suite 300 Fairfax, Virginia 22031
Occupation:	Construction Engineering Consultant
Where Employed:	McDonough Bolyard Peck, Inc. (MBP)
Position:	Chairman of the Board of Directors
Education:	Bachelor of Science Civil Engineering 1974 West Virginia Institute of Technology (now West Virginia University Institute of Technology) Montgomery, West Virginia
	Estimating, Bidding, and Cost Control Catholic University of America, Washington, DC Graduate Study 1976-1977
Certifications:	Certified Construction Manager (CCM), CMAA, 2014
	Planning and Scheduling Professional (PSP), AACEI, 2004
	Certified Forensic Claims Consultant (CFCC), AACEI, 2007
Membership in Professional Associations:	Member and Fellow, AACE International (AACE) Chairman – Certification Associate Board
	Life Member, American Society of Civil Engineers (ASCE)
	Member, Chief Executive Network (CEN)
	Member and Fellow, Construction Management Association of America (CMAA)
	Member, Dispute Resolution Board Foundation (DRBF)

Work
Experience:

June 1974 to June 1978: Bechtel Associates Professional Corporation – Senior Field Engineer/Owners representative on WMATA subway construction in the Washington D.C. area. Projects included mined tunnels, cut and cover tunnels/station, station in retained cut and aerial structures. Duties included field inspection, shop drawing review, quantity take-offs and cost estimating, CPM scheduling review and updates, constructability review, delay analysis, preparation of project documentation in support of pending change orders and contract modifications, negotiation of contract modifications, analysis of claims and project closeout. Projects included Pentagon City Station and Line; Grosvenor Station and Line; Silver Spring, Takoma, Fort Totten and Brookland Stations; and King Street Station and Line.

June 1978 to December 1979: Expressway Constructors – Design/Estimating Engineer and Chief Field Engineer. Designed excavation support and utility support systems and concrete formwork for subway and urban heavy highway projects; prepared detailed quantity take-offs, crew analyses and bid estimates for hard money transit and heavy construction projects; prepared, monitored and updated CPM schedules; administered subcontracts; and managed field survey crews, and geotechnical instrumentation installation and monitoring; drilling and blasting, utility relocations; installation of excavation support and street decking systems, and project closeout. Representative projects included two sections of Interstate I-66, Arlington, VA; VA Route 7, Hamilton, VA; Grosvenor Station and Line, MD; Penn North Station, Baltimore, MD; transit projects in Atlanta, GA; Four Mile Run Flood Control Project, Arlington, VA; and Savage River Project, Bloomington, MD.

December 1979 to January 1990: Alpha Corporation – Projects Engineer and Vice President. For contractors and owners provided construction engineering services including cost estimating, bidding, CPM scheduling, on-site project management, design of excavation and utility support systems, slope stability analysis, dewatering system design, project management oversight, claim analysis, litigation support and expert testimony. Representative projects included Interstate I-66 utilities construction, Rosslyn, VA; Cross Town Water Main, Washington, D.C.; East and West Approaches Fort McHenry Tunnel, Baltimore, MD; Anacostia River Sunken Tube Tunnel option, Washington, D.C.; Hannibal Lock and Dam Power Station, WV; Raystown Dam Power Plant Intake Structure, PA; Hartsville and Phipps Bend nuclear power plants, TVA, TN; Gallatin fossil fuel power plant, TVA, TN; Lake Chicot Pumping Station, LA; transit projects in Washington, D.C., Baltimore, MD, Atlanta, GA, Philadelphia PA, and Pittsburgh, PA, Consolidated Space Operations Center, CO; Water and wastewater treatment plants; various Coast Guard pier and wharf projects; and twenty-two federal building projects.

January 1990 to Present: MBP – Executive Vice President, President, CEO, and Chairman. Responsible for cost estimating, CPM scheduling, construction management and claims analysis and litigation support projects involving heavy construction, process plant, power plant, industrial, transportation, and building projects. Provided factual and expert testimony on topics related to construction means and methods, trade coordination, estimated and actual construction costs, CPM scheduling and delay analysis and impacts, inefficiency, and damages analysis. Venues for testimony include AAA Arbitrations, Corps of Engineers Board of Contract Appeals, Federal Bankruptcy Court, Department of Veterans' Affairs Board of Contract Appeals, Corps of Engineers and Pennsylvania Department of Transportation minitrials; Pennsylvania Board of Claims, State District Courts, Court of Federal Claims, Federal Circuit Court and Civilian Board of Contract Appeals. Developed and presented instructional training seminars on topics including records management, cost management, estimating, bidding, CPM scheduling, delay analysis techniques and damages computations which are presented to numerous public and private entities.

Charles E. Bolyard, Jr., CCM, PSP, CFCC

Chairman

Education

BS, Civil Engineering, West Virginia Institute of Technology, 1974

Professional Certifications/Registrations

Certified Construction Manager (CCM)

Planning & Scheduling Professional (PSP)

Certified Forensic Claims Consultant (CFCC)

OSHA 10-Hour Course Construction Safety & Health

Professional Associations

Member and Fellow, Chairman – Certification Associate Board, AACE International (AACE)

Life Member, American Society of Civil Engineers (ASCE)

Member, Chief Executive Network (CEN)

Member and Fellow, Construction Management Association of America (CMAA)

Member, Dispute Resolution Board Foundation (DRBF)

Background

Mr. Bolyard has more than 46 years of program and construction management experience for owners and contractors. He has served as inspector, estimator, scheduler, senior field engineer, project engineer, and project manager. His project experience includes mined tunnel, cut-and-cover tunnel, at-grade and aerial mass transit; drainage, utilities, grading, paving, bridge and highways; water and wastewater treatment plants; process plants; hydro, fossil fuel and nuclear power plants; manufacturing facilities; detention facilities; and commercial, high rise, educational, hospital, healthcare and special use buildings. Heavy civil engineering applications include electrical/mechanical/instrumentation systems in buildings, plants, and facilities. Extensive experience for owners and contractors in CPM scheduling, cost estimating, management, constructibility review, delay analysis, damages analysis and construction claims analysis, and has provided expert testimony, litigation support services, and has served as mediator and a third-party neutral in the resolution of construction disputes. Mr. Bolyard is an active member and Fellow of AACE International. He serves on AACE's Board of Directors as Past President and has previously served in the capacities of President, President-Elect, Vice President of Certification, Co-chairperson of AACE's Certification Board, and within the Certification Board, as Chairman of the Certified Forensic Claims Consultant (CFCC) Committee. In 2011, he was inducted into the College of Fellows for the Construction Management Association of America (CMAA). As MBP's Chairman, Mr. Bolyard is actively involved in MBP's strategic initiatives and planning for continuing growth.

Relevant Experience

AES Coal Fired Power Plant, Guayama, PR: As Principal-in-Charge, prepared an expert report determining the responsibility for compensable delays and an accompanying expert report for damages analysis and cost impacts. The plant was the first coal-fired power project constructed in Puerto Rico and consisted of two coal fired boilers with circulating dry scrubbers/precipitators, two turbine generators, and related plant equipment. The plant also incorporated, for the first time ever, the use of a scrubber for the clean-up of the flue gasses from the boiler. The combination of these technologies made this plant one of the cleanest coal burning plants in the world. The total construction value was $500 million.

Automatic Train Control for the Outer F Route Extension, WMATA, Prince George's County, MD: As Principal-in-Charge, evaluated contractor delay claim and participated in negotiated settlement. The project involved design, fabrication, installation, and testing of an automatic train control system, spanning over seven train stations and track. The total construction value was $17 million.

Back River Wastewater Treatment Plant, Baltimore City, MD: As Senior Consultant, conducted independent delay analysis and review of project records. Rehabilitation of 50 existing rotary distributor type trickling filter mechanisms, cleaning of filter bed stone and drains, and construction of new trickling filter pumping station while maintaining operation of trickling filters to meet treatment demands. Contractor claimed critical delays due to late delivery and failure of owner-supplied parts for repair of existing rotary distributors. Contractor also claimed City directed work to be performed out of sequence and after the original contract completion date.

Bay Area Rapid Transit (BART) Silicon Valley Berryessa Extension Project, Warm Springs to Berryessa, C700 Line, Track, Stations and Systems: As Senior Consultant, conducted a detailed review of the Design-Build Contractor's claim, followed by independent computation of its validity. The project involves a 10-mile extension of the existing BART rail system with Valley Transportation Authority (VTA) as the owner of the right-away and facilities. BART has the responsibility of the train/systems integration and operations, as well as maintenance. The project consists of two rail stations, Milpitas (in retained cut) and Berryessa (aerial), 7.5 miles of wayside at grade and on aerial structures, and 2.5 miles of wayside in a retained trench structure, with 800 feet of double box cut and cover structure. The project was constructed in right-of-way traversing a combination of industrial and residential neighborhoods. The total construction value was $777.2 million.

Belleville Power Plant, Belleville, WV: As Principal-in-Charge and on behalf of surety and estate of the contractor, provided an independent analysis of schedule and cost in response to EPC contractor's request for time extension and additional compensation. Provided testimony at deposition. The project consisted of the construction of a hydroelectric power generating station on the Ohio River at the West Virginia (East) end of the existing U.S. Army Corps of Engineers Dam. The project involved building a two-unit, low head, horizontally positioned, bulb type turbine power generating plant. The structure is a submersed reinforced concrete powerhouse and gravity dam designed to abut the existing concrete dam on the Ohio River. The total construction value was $135 million.

Boiler/Chiller Plant, Reagan National Airport, Washington, DC: As Project Manager, reviewed project documentation and analyzed delays. Presented findings at mediation. The project involved the construction of a new boiler/chiller plant to provide high temperature hot water and chilled water for HVAC systems in the new terminal and the existing terminal. Key features included one mile of underground concrete tunnel with hot and cold water piping, boiler/chiller building housing three hot water generators, three chillers, cooling towers, water circulating pumps, water treatment, electrical power systems, digital distributed control system, chilled water storage tank, alternative fuel tanks, connections to and enhancement of existing mechanical systems in remote buildings, and appurtenant sitework. The total construction value was $25 million.

Capitol Visitor Center, Washington, DC: As Principal-in-Charge, provided independent analysis of costs to complete construction, independent CPM schedule oversight and periodic updating of the schedule for the second phase of construction, and provided independent risk management program implementation and monitoring. Required interface with multiple contractors, Architect of the Capital project staff and the US Government Accountability Office. The project involved the $400 million construction of a new Capitol Visitor Center. The total construction value was $600 million.

Clark County Advanced Wastewater Treatment Plant, Las Vegas, NV: As Project Engineer, prepared delay claim against general contractor; conducted detailed research; and inspected civil work delays, change orders, coordination errors and equipment substitution problems. Project involved complete range of claims analysis services on complicated project involving substitute equipment, segmental staging, and computerized interface between clients electrical and instrumentation work with the mechanical equipment. Specifications called for general contractor to redesign plant if required to accommodate the substitute equipment. Contractor claimed that owner was responsible for redesign, because the substitute equipment was approved in a formal pre-bid submittal. The total construction value was $7.5 million.

Climatic Testing Laboratory, Eglin Air Force Base, FL: As Principal-in-Charge, provided delay analysis services. The project included the renovation of two climatic test chambers, renovation and additions to administrative work areas and mechanical/electrical equipment areas, and a modification of the firewater pump house interior. It also involved a new 500-pound-mass per second air make-up unit (AMU) including methylene chloride (R30) and calcium chloride (CaC12) brine storage tanks, new brine regeneration heat exchangers/pumps, new package steam boiler, and a new 200,000-gallon fire water tank. It included a new aqueous film forming foam (AFFF) retention pond and oil water separator, as well as new 115-kilowatt and 480-volt distribution and substations. The project involved the relocation of the armaments tow-away, miscellaneous building relocations, new cooling towers, and new building additions. The total construction value was $50 million.

Colver Power Plant, Colver, PA: As Principal, performed an independent evaluation of the time impact for failure and repairs associated with the project. The plant is a base load 110 MW single unit power station fueled by coal refuse and utilizing combined fluidized bed boiler technology and steam turbine generator. The total construction value was $12.9 million.

Conoco Pipeline, The Cardinal State's Gathering Line, Grundy, VA: As Principal-in-Charge, performed delay and issue analysis, researched project records, performed detailed as-built schedule analysis, and review contractor's claim. Project involved the construction of 260,000 feet (50 miles) of 16-inch pipeline to collect coalbed methane gas through steep slopes and along mountain ridges throughout Virginia, West Virginia, and Kentucky. Work included clearing of right-of-way, rock blasting, excavating, welding of pipe, backfill, and testing. Contractor defaulted for non-performance. The total construction value was $18 million.

Consolidated Space Operations Center, Colorado Springs, CO: As Project Manager, provided detailed research, analysis, discovery, and expert testimony at mini-trial. Project involved the Consolidated Space Operations Center (CSOC) for use by the Air Force Strategic Defense Initiative. The seven-building complex included RF shielding security and independent water, fuel storage, power generation, and sewage treatment systems. Contractor filed a claim for delay, acceleration, and disruption due to the cumulative effect of change orders. The total construction value was $84 million.

Cross County MetroLink Extension, Segment I, St. Louis, MO: As Principal-in-Charge on behalf of joint venture design and construction management consultant, performed detailed schedule delay and damages analysis and expert report and provided expert testimony during the jury trial. The project consisted of the design and construction of a seven-mile-long extension of the St. Louis light-rail transit system. It included construction of underground, elevated, and at-grade rail through urban areas; construction of ten new stations; reconfiguration of an existing station; real estate acquisition; coordination with existing municipalities, utilities, and other stakeholders; and systems integration. The total construction value was $550.3 million.

Dulles Corridor Metrorail Project, Phase 2, Herndon, VA: The project consisted of the design and construction of Phase 2 of the Dulles Corridor Metrorail Project (DCMP Phase 2). This included six new heavy rail stations, trackwork, roadway improvements, surface and garage parking facilities, relocation of existing utilities, stormwater management, traction power sub stations, station platforms, kiss and ride stations, pedestrian bridges, at grade and elevated guideways, and support infrastructure. The project also included a service and inspection rail yard. The total construction value was $3.5 billion.

Deer Island Wastewater Treatment Plant, Boston, MA: As Principal-in-Charge, prepared contractor's bid cost estimate. The project included deep foundation excavations, earth surcharge, pile driving, site utilities, structural slurry wall, concrete structures including process gallery, sludge thickening tanks, thickened sludge building, digester gas collection, residuals gallery, operations/odor control; eight egg-shaped sludge digesters and two egg-shaped gas storage tanks; and process equipment, mechanical systems, electrical and instrumentation/controls. The total construction value was $189 million.

Integrated Gasification Combined Cycle Power Station, USA: As Project Executive on behalf of EPCM constructor and process equipment manufacturer, analyzed claims from owner regarding cost estimating standard of care, change management standard of care, re-estimates and reforecasts of costs of construction, and provided testimony at arbitration conducted through International Institute for Conflict Prevention and Resolution. EPC design and construction of a 629 MW IGCC Power Station. The total construction value was $3.5 billion.

Port Arthur Refinery Crude Expansion, Port Arthur, TX: As Senior Testifying Expert, reviewed project documentation, evaluated the performance of the parties, prepared expert report and provided testimony at deposition and at hearing under the auspices of the International Institute for Conflict Preventions and Resolution. Issues for which testimony was provided included cost estimating standard of care, cost management standard of care during design and construction performance, and reasonableness of cost estimates and cost forecasts during management and reporting of actual cost to budget, changes, and trending. The project involved the expansion of existing crude oil refinery to increase capacity by 325,000 BPD. The total construction value was $10 billion.

Gallatin Power Station/Hartsville and Phipps Bend Nuclear Power Plants, TN: As Senior Consultant on the Hartsville and Phipps Bend Nuclear Power Plants, evaluated delays and costs associated with fabrication of steel embedments for wet well and dry well of nuclear reactors. On the Gallatin Power Station, evaluated delays and costs associated with construction of electrostatic precipitators at this coal-fueled power plant. The project involved claims for constructive acceleration to complete work for plant upgrades to meet EPA emission standards. Delays claimed due to change in subsurface conditions and late approval of shop drawings. Included additional costs of night shift and cold weather inefficiencies. The total construction value was $6 million.

Gramercy Works Digester Rebuild, Gramercy, LA: As Principal-in-Charge, provided on-site review of construction status, schedule, cost accounting, change management, claims analysis, and expert testimony both in court and at mediation. Project involved the reconstruction of the digester area, which included foundation piling, structural concrete, steel framed structural supports and pipe racks, installation of fabricated pressure vessels, installation of specialty alloy high pressure piping, electrical power substation, process instrumentation and controls, testing, and startup. The project involved an industrial plant complex that is mid-way between Baton Rouge and New Orleans along the Mississippi River. The main components of the facility are the off-loading and storage system that conveys bauxite ore mined in Jamaica from ocean-going ore ships to the plant ore preparation area; the power plant provides electrical power and high pressure steam exclusively for plant use, and the refinery that processes the raw bauxite ore into alumina powder. The alumina powder is then used in the smelting of aluminum metal and in the production of aluminum paints and coatings. The plant is a complex system of high pressure alloy piping, pressure vessels, clarifiers, and settling tanks used in the process of refining the alumina powder. The total construction value was $458 million.

Hardy Storage Compressor Station, Mathias, WV: As Principal-in-Charge on behalf of design engineer, provided delay and damages analysis. The project involved the design and construction of natural gas compressor station for storage and recovery of natural gas. The total construction value was $70 million.

Iowa Fertilizer Plant OEC-MEI Federal Case (Downstream), Wever, IA: As Senior Consultant, provided quality control review of schedule delay and costs/damages analysis expert report. The Project involved the Iowa Fertilizer Plant, located in Wever, Iowa, in the southeastern part of the state. The Plant is a major ammonium nitrate plant being constructed at a cost in excess of $1.5 billion. The major process components of the Plant consist of an ammonia production facility, converting natural gas in ammonia, and the fertilizer production areas (referred to as the “downstream plant”) that include the production of urea, granulated urea, nitric acid, ammonium nitrate solutions including UAN and diesel exhaust fluid (DEF). The total construction value was $2 billion.

Jeffrey Energy Center, St. Marys, KS: As Principal-in-Charge, performed labor loss of efficiency analysis and delay analysis. The project involved selective catalytic reduction process, additions and alterations to the existing Jeffrey

Energy Center coal-fired electrical power plant. The total construction value was $24 million.

Lee Power Station, Anderson County, SC: As senior claims analyst performed schedule delay and impact analysis and labor loss of efficiency analysis. Construction of a new 750 MW combustion turbine combined cycle electrical power generating facility. Two gas fired combustion turbine generators, two HRSGS, and one steam turbine generator. Project also included associated power block and balance of plant equipment to include steam condenser and cooling tower among other features. Distributed Control System (DCS) for overall plant operations and monitoring performance.

Mayo Power Plant, Roxboro, NC: As Senior Claims Analyst, reviewed project documentation and performed analysis of expert and rebuttal reports. The power plant project involved the fabrication of a zero liquid discharge (ZLD) process for Progress Energy. The engineering and design services were estimated at $640,530 and the steel fabrication estimated at $704,000 with fabrication set to have an approximate six month duration. The total construction value was $75 million.

Modular Nuclear Plants, Lake Charles, LA: As Senior Claims Analyst and Expert, provided consulting on measured mile analysis, direct and indirect cost build-up, and productivity factors used in the development of a Request for Equitable Adjustment. The project involved the fabrication and assembly of structural, piping, and equipment modules for two new nuclear power plants. The total construction value was $5 billion.

Munitions Maintenance Facility, Hurlburt Field, FL: As Principal, performed investigation and technical analysis of contractor's claim, including delay damages and direct cost analysis. Provided expert testimony and litigation support at trial. Project included masonry construction of a four-bay shop facility and office, along with a separate 20-bay munitions storage building. The total construction value was $2 million.

NIPSCO Schafer Station Unit 15, Wheatfield, IN: As Principal-in-Charge, prepared labor loss of efficiency analysis during power plant outage. NIPSCO's R M. Schafer Generating Station Unit 15 is an existing fossil fuel (coal) fired power station. Project involved four existing electrical generating units at Schafer including Unit 15. NIPSCO undertook the rebuild of the electrostatic precipitator for Unit 15 to convert from hot-side to cold-side operation in order to accommodate use of Powder River Basin (PRB) coal. The total construction value was $25 million.

Hyper-pure Polysilicon Production Facility, Charleston, TN: As Executive Expert, reviewed project documentation and affirmative expert reports of claimant, and provided analysis and opinions in response to claimed monetary damages theoretical estimating methodology and quantification. The total construction value was $2.5 billion.

Rock Crusher Facility, Morehead City, NC: As Principal-in-Charge, responsible for investigation and technical analysis of disputed issues on behalf of PCS Phosphate. Reviewed project documents, analyzed delay and entitlement, disputed costs, direct and indirect costs and prepared an expert report in preparation for trial. The project was intended for the processing of imported phosphate pebbles with potential processing of rejects from the phosphate washer process. This would enable the Aurora plant to supplement production at the plant and increase available phosphate concentrate inventory. The project consisted of a two stage grinding system to process phosphate materials, with the capability to produce product, at a rate of 50 to 80 tons per hour, at a maximum dimension of 2 ½ inches in diameter. The total construction value was $1.5 million.

Ship Self Defense Engineering Facility, Wallops Island, VA: As Principal-in-Charge, prepared detailed as-built schedule and delay analysis and labor loss of productivity analysis. The project consisted of a 32,000-square-foot two-story concrete and steel frame research and development laboratory on pile foundations. Work included pre-finished metal exterior wall panels, two ply bituminous roofing, masonry and metal stud interior partitions, raised access flooring, elevator, plumbing, HVAC, compressed air system, fire sprinkler and de-mineralized water system. Electrical systems included main switchgear, individual room transformers and distribution panels, as well as electronic signal grounding and tempest shielding. Also included was a 215-foot-tall steel and fiberglass antenna mast on pile foundation.

Tennessee Valley Authority/Jones-Hailey Joint Venture: As Senior Consultant, performed schedule and cost analysis services. Reconstruction of five-mile long Ocoee Reservoir wooden flume water intake for hydroelectric power plant in the mountains of Cherokee National Forest. Contractor claimed delays due to owner's alleged denial of access, design errors, erroneous interpretation of the specifications, extra work, and underpayment for work performed.

Tennessee Valley Authority/McKinney Drilling Company: As Senior Consultant, performed claims analysis services. The project involved caisson construction for electrostatic precipitator foundations for Cumberland power plant. It included 30-48-inch reinforced concrete caissons drilled in soil and rock using earth augers and down-the-hole rock drills. Contractor claimed delay and disruption due to differing geotechnical site conditions, interferences, and out-of-sequence and inefficient work. The total construction value was $600,000.

Union Camp Pulp and Paper Mill Plant, Franklin, VA: As Principal-in-Charge, performed a detailed analysis of the claim and prepared independent report of findings. Project involved construction of a new steam/electricity cogeneration power plant to serve a pulp and paper mill. As a consortium member, Westinghouse Electric Corporation's primary responsibility was the power island consisting of the turbine, generator, and auxiliaries. The consortium members claimed against Westinghouse for extended overhead, construction acceleration, loss of early completion bonus, additional insurance costs, cost of additional carbon monoxide catalyst, and miscellaneous engineering and construction back charges. The total construction value was $43.8 million.

Wildcat Point Generation Facility, Conowingo, MD: As Senior Testifying Expert on behalf of electrical power utility, owner reviewed project documentation, reviewed and evaluated contractor's expert reports on schedule delay and loss of productivity, and prepared rebuttal analysis and filed report in response to claimed schedule delay and loss of productivity. Natural gas fired combined cycle 2x1 configuration with combustion turbine generators, HRSGs, steam turbine generator, step-up transformers, cooling tower, and site infrastructure. The total construction value was $331 million.

Williamsburg Wastewater Treatment Plant, Hampton Roads, VA: As Senior Consultant, reviewed claims documents and project records and assisted in research and analysis of claimed design issues associated with the performance of sludge filtration systems, sludge handling, and incinerator were elevated. The project involved plant expansion to increase capacity from 10 million gallons per day (MGD) to 22.5 MGD. The total construction value was $30 million.

Wolf Hollow Electric Power Generating Station, Granbury, TX: As Project Manager, performed claims analysis validating estimate to complete services on behalf of replacement EPC contractor completing a power generating station. The project consisted of a 730-megawatt gas-fired, combined cycle electric power generating station consisting of two combustion turbine generators, two HRSGS and a steam turbine generator, and the balance of plant facilities. Procured through the EPC delivery method. The total construction value was $100 million.

Charles E. Bolyard, Jr. Presentations, Courses, and Panels 2020-1997

- "State of the Association", AACEI Western Winter Workshop, Indian Wells, California, 2018
- Keynote "Importance of Professional Level Certifications and Licensure" and "AACE International Certification Program", Construction CPM Conference, New Orleans, Louisiana, 2018
- "Lean Approaches to Project Design and Delivery", AACEI Edmonton Meeting, Edmonton, Canada, 2017
- "State of the Association", AACEI Region 5 Symposium, Houston, Texas, 2017
- "Cost Benchmark Panel", 2017 Regional Building Construction Conference, Silver Spring, Maryland, 2017
- "Quality Control Programs – Best Practices", Chief Executive Network Meeting, Chicago, Illinois, 2017
- "Construction Cost Estimating", Eisner Amper Training, Philadelphia, Pennsylvania, 2017
- "The Importance of Being Active in a Professional Association", MBP Lunch-n-Learn, Fairfax, Virginia, 2016
- "The Battlefield Boulevard Reconstruction Project", 35th Annual Construction and Public Contracts Law, Charlottesville, Virginia, 2014
- "Project Management", The 15th Annual Reed Smith Construction Law Seminar, Falls Church, Virginia, 2014
- "Earned Value Analysis and CPM Schedule Review in Construction", AACEI Annual Meeting, Washington D.C., 2013
- "Introduction of the AACEI to DAU", Defense Acquisition University (DAU) Meeting, Ft. Belvoir, Virginia, 2011
- "Applying Risk Management to Project Performance Presentation", AACEI NCS Meeting, Fairfax, Virginia, 2011
- "AACEI NCS Introduction to Students", Virginia Tech Meeting, Blacksburg, Virginia, 2010
- "Hands-on Application of Qualitative Risk Management to Project Performance", Construction Management Association of America National Conference, San Diego, California, 2010
- "Fundamentals of Construction Scheduling and Claims Avoidance", NAVFAC Washington OICC, Bethesda, Maryland, 2009
- "Tricks, Traps and Ploys Used in Construction Scheduling", Lorman Education Services, Fairfax, Arlington, Loudoun County, Virginia, 2009, 2008, 2007, and 2006
- "Society of American Military Engineers (SAME), Private Sector Organization Structure", Transition Workshop and Job Fair, Atlanta, Georgia, 2008
- "Project Documentation Records Management Delay Analysis Overview", West Virginia University College of Law, Morgantown, West Virginia, 2007, 2006, and 2005
- "Collaborative Construction Scheduling Eight Steps to Success", Construction Superconference, San Francisco, California, 2007
- "Managing Construction Project Costs Optimizing Construction Value – Is a Cost Effective Project a Myth?", Client Seminar, Atlanta, Georgia, 2006
- "Construction Delay Claims", Lorman Education Services, Leesburg and Fairfax, Virginia, 2006
- "Successfully Managing Construction Project Risks and Now Exactly How Confident Are You That Your Design is Within Your Budget", Atlanta, Georgia, 2005
- "Claims Management Services: The CM's Role and Responsibilities", Construction Management Association of America Conference and Leadership Forum, Denver, Colorado, 2005

- "New Approaches to Successfully Managing Your Construction Program", Construction Cost Confidence - MBP In-house Training, Fairfax, Virginia, 2004
- "Fundamentals of CPM Scheduling", Client Seminar, 2004
- "Blasting in Construction", MBP In-house Training, Fairfax, Virginia, 2003
- "Project Documentation Records Management", West Virginia University College of Law, Morgantown, West Virginia, 2002
- "How to Keep Clients Happy by Keeping Them Out of Court", Construction Management Association of America National Conference, Chicago, Illinois, 2002
- "Keeping Owners Happy by Keeping Them Out of Court: 8 Strategies for Avoiding Litigation", Construction Management Association of America National Conference, New Orleans, Louisiana, 2001
- "Construction Delay – Do's and Don'ts of Management, Analysis and Proof", Client Seminar, Research Triangle Park, North Carolina, 2001
- "Do's and Don'ts of Management, Analysis and Proof – Construction Delay", West Virginia University College of Law, Morgantown, West Virginia, 2004
- "A Construction Manager's Point of View – The Commonwealth of Virginia: General Conditions of the Construction Contract (CO-7)", Virginia Polytechnic Institute and State University, Blacksburg, Virginia
- "Project Records Management", J&L Enterprises, 1997
- "CPM Scheduling in Construction and the Analysis of Delays", Arlington County, Virginia, 1997

Charles E. Bolyard, Jr. Published Materials

- Co-Author, *Earned Value Analysis and CPM Schedule Review in Construction*, Cost Engineering, 2014
- Co-Author, *Retro-Commissioning: The Key to Sustainability in Existing Facilities, American Public Works Association*, 2013
- Co-Author, *Retro-Commissioning: The Key to Sustainability in Existing Federal Facilities*, Society for American Military Engineers, 2011

INDIVIDUALS	FOR	VERSUS	PROJECT	ISSUES	FORUM	ANALYSIS/TESTIMONY
C. Bolyard	Old Dominion Electric Cooperative	White Oak Power Constructors	Wildcat Point Generation Facility, MD	Delay, Disruption	United States District Court Eastern District of Virginia	Schedule delay, Loss of efficiency; Report filed; Settled
C. Bolyard	Redstone International, Inc., PA	J.F. Allen Company, WV	Mobley V Pile Wall, WV	Delay, Disruption, Damages	Circuit Court of Wetzel County, WV, Deposition Testimony	Delay, Disruption, Damages
C. Bolyard	Designer of Record	Owner/Developer	Polysilicon Manufacturing Facility, TN	Direct and Delay Damages Estimated Costs of Performance	American Arbitration Association Arbitration	Report filed; Settled
C. Bolyard	Bovis Lend Lease, Inc.	Evangelical Retirement Homes of Greater Chicago, IL	Bridgewater Place - Friendship Village, Schaumburg, IL	Construction Means and Methods and Costs of Repairs	American Arbitration Association, Deposition Testimony, Settled	• Means and Methods • Costs of Construction
C. Bolyard	John and Leslie Sayres	Fuog/Interbuild, Inc., VA	Sayres Utility Building, Loudoun County, VA	Construction Means and Methods, Costs of Construction, Schedule Delays	Circuit Court of Loudoun County, VA, Deposition Testimony, Settled mid-Trial	• Means and Methods • Costs of Construction • Schedule Delays
C. Bolyard	Design Collective, Inc., MD	Whiting-Turner Contracting Company, MD	Pike & Rose Mid-Pike Plaza, Rockville, MD	Costs of Remedial Repairs to Brick Façade; Costs of Remedial Repairs to Interior GWB; Quality Control and Trade Coordination	Circuit Court for Montgomery County, MD; Deposition Testimony, Settled	• Costs of Remedial Repairs to Brick Façade and Interior GWB • Quality Control • Trade Coordination
C. Bolyard	Atlanta Mansonry, Inc., MD	Whiting-Turner Contracting Company, MD	Dundalk Readiness Center, Dundalk, MD	Costs of Repairs to and Completion of Masonry Work	Circuit Court of Baltimore County, MD, Mediation, Deposition and Trial Testimony	• Reasonable Cost of Repairs and Completion
C. Bolyard	EPC Joint Venture Contractor	Refinery Owner	Port Arthur Refinery Crude Expansion Project, TX	Cost Estimates, Forecasts, and Changes Management	International Institute for Conflict Prevention and Resolution-Deposition; Hearing Testimony	• Estimating Standard of Care • Reasonableness of Cost Estimates • Reasonableness of Cost Forecasts
C. Bolyard	CDM Smith, MA	Carbro, NJ	Somerset Raritan Valley Relocated Plant Outfall, NJ	Cost of Tunnel Work Scope Deletion	AAA Arbitration Single Arbitrator Settled in mid-Arbitration	• Costs of Deletion of Tunnel and Dewatering
C. Bolyard	West Virginia Campus Housing, WV	Turner Construction Company, PA	University Place Student Housing, Morgantown, WV	Negative Allowances Reconciliation; Costs of Construction	American Arbitration Association, Arbitration Testimony	• Construction Management • Cost Estimating • Cost Management
C. Bolyard	PSA Dewberry, Inc. & Professional Liability Insurer	Hamaker Court, LLC, VA	Hamaker Court Medical Office Building, Fairfax, VA	CM Standard of Care; Changes Standard of Care; Costs of the Work	Circuit Court of Fairfax County, VA; Bench Hearing, Settled mid-Hearing	• Cost Estimating • Changes Management Standard of Care • CM Standard of Care
C. Bolyard	EPC Contractor and Process Equipment Manufacturer	Electric Power Utility Owner	IGCC Powerstation, IN	Project Estimate and Changes Management	International Institute for Conflict Prevention and Resolution-Deposition; Hearing Testimony	• Estimating Standard of Care • Changes Management Standard of Care
C. Bolyard	M.C. Industrial, MO	Westar	Jeffrey Energy Center Outage Duct Replacement Operating Power Station, St. Mary's, KS	Estimate Validation, Cost of Construction, Delay, Impacts, and Acceleration	AAA Arbitration, Mediation	• Estimate Validation • Costs/Damages • Labor Loss of Efficiency • Delays
C. Bolyard	Flintco, LLC, f/k/a Flintco, Inc.	Buzzi Unicem Ready Mix, LLC, d/b/a Memphis Ready Mix	Memphis International Airport Parking Garage Expansion and Improvements Projects, aka Consolidated Ground Transportation Center	Delays and Impacts	U.S. District Court, Western District of Tennessee, Western Division, Memphis, Tennessee; Deposition Testimony	• Construction Performance • Delays • Impacts
C. Bolyard	Heery-Mitchell, J.V., GA	DeKalb County School District, GA	SPLOST I & II Construction Program Management	Opposing Expert Damages Methodology	Circuit Court for DeKalb County, GA, Daubert Hearing	• Opposing Expert Damages Methodology • CM Standard of Care
C. Bolyard	Canam Steel Corporation	Tully Construction Company/A.J. Pegno Construction Company, J.V.	Whitestone Expressway Rehabilitation Queens, New York	Delay, Damages	AAA Arbitration, Arbitration Testimony	• Delay • Damages

INDIVIDUALS	FOR	VERSUS	PROJECT	ISSUES	FORUM	ANALYSIS/TESTIMONY
C. Bolyard	Heery-Mitchell, J.V.	DeKalb County School District, GA	SPLOST I & II Construction Program Management	Damages Rebuttal	Circuit Court for DeKalb County, GA, Deposition Testimony	• Damages Rebuttal
C. Bolyard	Fluor Intercontinental, Inc., SC	U.S. Department of State, OBO, Washington, DC	U.S. Embassy Port Au Prince, Haiti	Delay and Acceleration	United States Civilian Board of Contract Appeals; Deposition, Trial Testimony	• Schedule • Delay • Acceleration
C. Bolyard	The Fidelity and Deposit Company of MD	First Baptist Church of Guilford, MD	First Baptist Church of Guilford	Estimated Cost to Complete construction	Circuit Court for Howard County, MD, Deposition, Trial Testimony	• Estimated Cost to Complete Construction
C. Bolyard	Fluor Intercontinental, Inc., SC	U.S. Department of State, OBO, Washington, DC	U.S. Embassy Astana, Kazakhstan	Delay, Acceleration, Costs of Acceleration	United States Civilian Board of Contract Appeals; Deposition, Trial Testimony	• Schedule • Delay • Acceleration • Discrete Damages
C. Bolyard	Wellsboro Area School District, PA	G.M. McCrossin, Inc., PA	Wellsboro High School, PA	Delay, Labor Inefficiency, Liquated Damages	Commonwealth of Pennsylvania, County of Tioga, Court of Common Pleas, Jury Trial Testimony	• Schedule Delays • Liquidated Damages
C. Bolyard	Tompkins Builders Inc.	USACOE & USAF	Langley AFB Hospital Expansion & Renovation, VA	Work Scope Disputes, Costs of Changed Work, Schedule Impacts and Delays	Negotiated Resolution	• Third Party Neutral
C. Bolyard	DMJM, VA	Baltimore County, MD	Baltimore County Detention Center Expansion, MD	Schedule Delay	Circuit Court for Baltimore County, MD, Deposition, Jury Trial Testimony	• Schedule Delay
C. Bolyard	Fluor Intercontinental, Inc., SC	U.S. Department of State, OBO, Washington, DC	U.S. Embassy Kingston, Jamaica	Delay, Acceleration, Costs of Performance	United States Civilian Board of Contract Appeals; Deposition Testimony	• Delay • Discrete Damages
C. Bolyard	Cross County Collaborative Joint Venture, MO	Bi-County Development Agency (Metro), St. Louis, MO	St. Louis Light Rail Cross County Extension, MO	Schedule Delay, Damages	Circuit Court of the County of St. Louis, State of Missouri, Deposition, Jury Trial Testimony	• Schedule Delay • Damages
C. Bolyard	Turner Construction	Bryant Durham Electric Company, Inc., NC	VA. Beach Convention Center, VA	Schedule Delay, Disruption Damages	Mediation	• Schedule Delay • Impacts • Damages
C. Bolyard	Goochland County, VA	Bryant Durham Electric Company, Inc., NC	Goochland/Henrico Force Main, VA	Schedule Delay, Damages	United States District Court, Eastern District, Richmond Division, Deposition Testimony	• Schedule Delay • Damages
C. Bolyard	Metropolitan Washington Airports Authority (MWAA)	San Jose Construction Group and ACSTAR Insurance Company	Dulles International Airport, East T-Gates Phase I (Z-Gates), VA	Cost of Completion and Liquidated Damages	American Arbitration Association, Hearing Testimony	• Cost of completion • Liquidated Damages
C. Bolyard	Brookside Development, VA	Fauquier County Water and Sanitation Authority, VA	Vint Hill Farms Wastewater Treatment Plant Upgrade and Expansion, VA	Schedule Delay, Costs of Construction	Circuit Court of Fauquier County, VA, Expert Report	• Schedule delays and costs; settled
C. Bolyard	Perkins-Eastman Architects	Hebrew Home of Greater Washington	Landow House Assisted Living, Washington, DC	Delay	American Arbitration Association, Hearing Testimony	• CPM Schedule Delay Analysis
C. Bolyard	Walton Companies and Tompkins-Grunley, JV	Tompkins Builders	1150 K Street Building, Washington, DC	Design, Schedule Delay, Quality, Damages	Mediation	• Mediator
C. Bolyard	Stone & Webster, Inc.	AES Wolf Hollow, TX and Parsons Energy and Chemical Group, Inc.	Wolf Hollow Power Station, Granbury, TX	Reasonableness of the Cost Estimate	District Court Hood County, TX 355th Judicial District, Deposition Testimony	• Reasonableness of Cost Estimate, Settled
C. Bolyard	Noell, Inc. and Fru-Con Corporation	U.S. Army Corps of Engineers	R.C. Byrd Dam, WV	Reasonableness of Expert Fees	Armed Services Board of Contract Appeals, Alexandria, VA, Hearing Testimony	• Reasonableness of Expert Fees

INDIVIDUALS	FOR	VERSUS	PROJECT	ISSUES	FORUM	ANALYSIS/TESTIMONY
C. Bolyard	AF Construction Company	Clark County, Nevada	Clark County Detention Center Expansion, NV	Project Administration	AAA Arbitration, Deposition	• General Contractor Project Administration
C. Bolyard	Duke-Fluor Daniel, JV	AES, Puerto Rico	Guayama Coal Fired Power Station, Puerto Rico	Delays, Targets, Impacts, and Equipment Design/Delay	AAA Arbitration, Mediation	• Estimate Validation • Analysis of Targets/Actual Performance • Labor Loss of Efficiency • Costs of performance
C. Bolyard	Department of General Services, PA	Lighthouse Electric, Kirby Electric, McGregor Industries	Forest State Correctional Institution, PA	Schedule Delay, Construction Management	Pennsylvania Board of Claims, Trial Testimony	• CM Standard of Care • CPM Schedule Delay Analysis
C. Bolyard	Blake/Poole & Kent, J.V.	Upper Occoquan Sewage Authority, VA	Contract 54 Plant Expansion Centreville, VA	Construction Value	Fairfax County Circuit Court, Virginia, Deposition, Trial Testimony	• Construction Value
C. Bolyard	U.S. Army Corps of Engineers	Sunshine Construction and Engineering	Education Center and Library, MacDill AFB, FL	Schedule Delay, Costs, Damages	United States Court of Federal Claims, Tampa, Florida, Deposition, Trial Testimony	• Schedule Delay • Costs • Damages
C. Bolyard	RCD, Inc.	HRGM Corporation	Sully District Police Station, Fairfax County, Virginia	Delay, Costs, Damages	Fairfax County Circuit Court, Virginia, Deposition Testimony	• Delay • Costs • Damages
C. Bolyard	COXCOM, Inc.	North Central Service, Inc.	Cable TV Network System Rebuild and Upgrade, Washington County, NC	Schedule Delay, Damages	American Arbitration Association, Deposition, Arbitration Testimony	• Schedule Delay • Damages
C. Bolyard	Hamel Commercial, Inc.	Groveton 340 Associates	Groveton Apartments Renovation, VA	Delay, Coordination, Labor Inefficiency, Cost	U.S. District Court for the Eastern District of VA, Alexandria Division, Deposition Testimony	• Labor Inefficiency • Cost
C. Bolyard	Rand Construction Corporation	Fish & Richardson, Washington, DC	1425 K Street, NW, Washington, DC	Delay, Coordination, Impact and Cost	American Arbitration Association, Deposition Testimony, Settled	• Delay • Construction Coordination • Impact • Cost
C. Bolyard	Park Center III, LTD, VA	Pennsylvania Manufacturers Association Insurance Company	Park Center III Apartments, Alexandria, VA	Damage and Delay from Hurricane	U.S. District Court, Eastern District, Alexandria, VA Rocket Docket Deposition and Trial Testimony	• Cost Evaluation • Delay Evaluation
C. Bolyard	Kaiser Aluminum and Chemical Corporation, LA	Thomas & Betts Corporation; Power Control Systems, Inc. etal	Gramercy Plant Digester Rebuild, Louisiana	Cost of Rebuild - Estimated and Actual	Twenty Third Judicial District, Parish of St. James, State of Louisiana, Deposition and Jury Trial Testimony	• Estimated and Actual Construction Cost Analysis • Cost of Completion • Cost of Owner Enhancements
C. Bolyard	CNA Insurance, Hazen & Sawyer and City of Greensboro, NC	MCI Constructors, VA	T.Z. Osborne WWTP, Greensboro, NC	Costs, Standard of Care, Termination	United States District Court, Middle District of North Carolina, Greensboro Division, Deposition Testimony	• Standard of Care • Termination • Costs • Project Administration
C. Bolyard	U.S. Department of Veteran's Affairs, FL	David Boland, Inc., NY	James A. Haley Veteran's Hospital Center Expansion, Tampa, FL	Default Termination	Veteran's Affairs Board of Contract Appeals, Deposition, Trial Testimony	• Delay Impacts • Termination Default
C. Bolyard	Morganti National, Inc.	Federal Bureau of Prisons	Federal Metropolitan Detention Center, Brooklyn, NY	Design Changes and Defects, Trade Coordination, Default Termination	U.S. Court of Federal Claims, Washington, DC Deposition, Trial Testimony	• Delays • Impacts/Inefficiencies • Trade Coordination
C. Bolyard	G.F. Atkinson	Omega JV5	Belleville Hydroelectric Power Plant, WV	Delays, Acceleration, Impacts, Labor Inefficiency	U.S. Court, Eastern District, Huntington, WV, Deposition Testimony	• Delay Analysis • Cost Analysis • Acceleration

INDIVIDUALS	FOR	VERSUS	PROJECT	ISSUES	FORUM	ANALYSIS/TESTIMONY
C. Bolyard	Moses H. Cone Memorial Hospital, Greensboro, N.C.	Centex-Simpson Construction Co., Inc.	East Wing Addition and Renovation	Delays and Damages	AAA Arbitration Greensboro, NC, Hearing Testimony	• CPM Scheduling • Damages Analysis
C. Bolyard	W. G. Tomko & Sons, PA	Jefferson County, OH; The V Companies; and Mascaro, Inc.	Jefferson County Justice Facility, Steubenville, OH	Delay and Impacts	United States District Court, Southern District of Ohio, Eastern Division Deposition, Jury Trial Testimony	• CPM Schedule Delay • Impacts
C. Bolyard	Durham Hospital Corporation, N.C.	Nello L. Teer and Bryant-Durham Electric	Durham Regional Hospital Additions and Renovations	Delays and Damages	American Arbitration Association - Hearing Testimony, Durham, NC	• Delays • Damages Analysis
C. Bolyard	Durham County Hospital Corporation, NC	Colonial Mechanical Corporation	Durham Regional Hospital, Durham, NC	Changes, Inefficiency, Delay	American Arbitration Association - Hearing Testimony, Durham, NC	• CPM Scheduling • Loss of Efficiency • Damages Analysis
C. Bolyard	Washington Suburban Sanitary Commission, MD	Humphrey & Son, Inc., MD	Jacked Pipe Tunnel	Delay & Impact, Defective Design	Mediation	• Mediator
C. Bolyard	O'Brien/Atkins Associates, P.A. and Thai Associates, Research Triangle Park, N.C.	RPR Construction	G. Watts Hill Alumni Center, Chapel Hill, NC	Delays and Damages	Federal District Court Middle District, Winston-Salem, NC Deposition Testimony	• CPM Scheduling • Delays
C. Bolyard	Washington Metropolitan Area Transit Authority (WMATA)	Green International, Inc./Seaboard Surety	Prince George's. Plaza Station & Line, MD	Delays and Impacts	Corps of Engineers Board of Contract Appeals, Deposition, Trial Testimony	• Claims Analysis • CPM Scheduling • Cost Analysis
C. Bolyard	Slattery Associates	Morrison Knudsen Company	Schuykill Expressway Section 400 Philadelphia, PA	Delays Impacts Differing Site Conditions	U.S. District Court Brooklyn, NY, Deposition, Trial Testimony	• Claims Analysis • CPM Scheduling • Costs Productivity
C. Bolyard	Hazen & Sawyer and City of Raleigh, N.C.	Trico Electric and Danis Industries, NC	Neuse River Waste Water Treatment Plant Phase III, Raleigh, NC	Delay, Impacts and Inefficiencies	District Court Wake County, NC, Deposition Testimony	• CPM Scheduling • Damages Analysis • Loss of Efficiency
C. Bolyard	CONOCO, TX	LA Pipeline, OH	Cardinal States Gathering Line, WV, KY, VA	Design, Delay, Impacts	U.S. District Court Charleston, WV, Deposition Testimony	• Costs Analysis • CPM Scheduling • Delays
C. Bolyard	City of Memphis Housing Authority, Tennessee	Construction Technologies, Inc.	Dixie Homes Rehabilitation, TN	Design, Delay	District Court for Tennessee, Shelby County, Deposition, Trial Testimony	• Schedule • Bid and Cost Analysis
C. Bolyard	Virginia Department of Transportation	W. C. English, Inc.	I-95 Widening, Caroline County, VA	Delay & Impact	Deposition Testimony	• CPM Scheduling • Construction Performance • Delays • Bid & Cost Analysis
C. Bolyard	Washington Suburban Sanitary Commission, MD	W. M. Schlosser Co., Inc.	Western Branch Wastewater Treatment Plant, MD	Construction Methodology and Performance	American Arbitration Association (AAA), Hearing Testimony	• Construction Methodology • Cost Analysis • Construction Performance
C. Bolyard	Anjo Construction	Allegheny County, PA	Greater Pittsburgh International Airport Midfield Terminal	Design, Delays, Impact	Mediation	• Claims Analysis • CPM Scheduling • Defective Design
C. Bolyard	Brinderson Corp., CA & City of Newport News, VA	3rd Party Evaluation & Mediation	Harwood's Mill Water Treatment Plant, Newport News, VA	Changes, Delays, Differing site conditions	Mediation	• Claim Analysis • Delays • CPM Scheduling • Impacts & Changes
C. Bolyard	Pennsylvania Department of Transportation, Harrisburg, PA	MK-Slattery, Joint Venture	Schuylkill Expressway, Section 400, Philadelphia, PA	Delay, Impacts, Multiplicity of Changes	Mini-Trial	• Claim Analysis • CPM Schedule • Delays • Impact of Changes • Bid & Cost Analysis

INDIVIDUALS	FOR	VERSUS	PROJECT	ISSUES	FORUM	ANALYSIS/TESTIMONY
C. Bolyard	U.S. Army Corps of Engineers-Omaha District	Bechtel National, Inc.	CSOC Complex, Colorado Springs, CO	Delay, Impact & Inefficiency	USACE Mini-Trial	• CPM Scheduling • Construction Performance • Delays • Bid & Cost Analysis
C. Bolyard	Fruin-Colnon Contracting	RAM Construction	Wood St. Station and Line, Pittsburgh, PA	Breach of Contract	Federal Bankruptcy Court, Pittsburgh, PA Trial Testimony as fact witness	• Construction Performance • Delays • Bid & Cost Analysis
C. Bolyard	Washington Metropolitan Area Transit Authority, Washington, DC	Square-Laferra, JV, NJ	Pentagon City Station and Line, VA	Wrongful Termination for Default	Corps of Engineers Board of Contract Appeals, Washington, DC, Trial Testimony as fact witness	• Non-conforming work • Schedule delays • Costs of reprocurement contract modifications • Costs of rework and completion

Docket No. E-2, Sub 1220

Exhibit CEB-2

List of Documents Reviewed

Exhibit CEB-2

DOCUMENTS REVIEWED BY MBP

- Williams Solar – NCUC Complaint
- Duke Answer and Motion to Dismiss
- Williams Solar Reply to Answer and Motion to Dismiss
- DEP Supplemental Responses to Williams Solar First Requests
- CONFIDENTIAL DEP Final Accounting Report Tracker Q3 2018
- CONFIDENTIAL DR No. 1-17 Williams Solar
- CONFIDENTIAL Project 15007 System Impact Study Calculations - Project A and B 2017 (002)
- CONFIDENTIAL Project 15007 System Impact Study Calculations with A
- CONFIDENTIAL_DEP_Protection_V2.4.2
- DEP Response to Williams Solar Data Request 1
- DR No. 1-3 Revised Estimating Tool Description - Williams Solar
- Reconductoring Work Order Example
- SIS Estimation Tool Rev0
- SIS Estimation Tool Rev1
- System Impact Study SOP
- Williams Solar Estimation Tool SIS
- Williams System Impact Study Report with A
- SIS Estimation Tool Rev0.1
- BLANK IPP MFC Request 4.0 with Admin Costs Formulas
- Copy of Time and Expense Estimate Template
- DET Time and Expense Estimate Tool - v2
- DET Time and Expense Estimate Tool - v3
- DET Time and Expense Estimate Tool - v4
- Time and Expense Estimate Template
- Time and Expense Estimate - CONFIDENTIAL SOLAR FACILITY
- DET Time and Expense Estimate Tool

- CONFIDENTIAL Amendment to Alliance Agreement and 2020 Scope Mastec signed
- CONFIDENTIAL Amendment to Alliance Agreement and 2020 Scope Pike signed
- CONFIDENTIAL Amendment to Alliance Agreement and 2020 Scope Sumter signed
- CONFIDENTIAL Amendment to Alliance Agreement and 2020 Scope ULCS signed.
- CONFIDENTIAL Att C MSA 7004 Amendment No.1 ULCS.
- CONFIDENTIAL Att C MSA 7017 Sumter
- CONFIDENTIAL Att C MSA 7095 Amendment No.1 Mastec
- CONFIDENTIAL Att D MSA 7000 Amendment No.2 Pike
- CONFIDENTIAL Att E MSA 7000 Pike
- Cost Estimation Tool - Revised – Copy
- Cost Estimation Tool Presentation
- FW REDACTED (Part 2 of 3)
- RE_ DEP and DEC exposure
- RE_ slider solar onsite and offsite work order CUE
- DEP Supplemental Response to Williams RFPD No. 10
- DEP Supplemental Responses to Williams Solar First Requests
- DR No. 1-22 and 1-23 Maximo Labor Rates_Historical
- Williams Solar Estimation Tool SIS
- 15007 Williams Solar, LLC_Solar-Revised SLD
- Facility Study Report Williams Solar LLC CHKLIST
- Interconnection Request Williams Solar LLC CHKLIST 15007
- 181113-2309_2250-024_SLD sized resistor_Stamped 2
- DEP Official Release System Impact Study NC2016 02927 Williams Solar LLC
- 181113-2309_2250-024_SLD sized resistor_Stamped 2
- True up labor calculation

- AACE International Recommended Practice 96R-18 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Power Transmission Line Infrastructure Industries
- Re: Facility Study Report Williams Solar LLC CHKLIST.msg e-mail string July 30, 2019 through August 16, 2019
- Re: Tier 3 Projects e-mail string July 19, 2019 through July 26, 2019
- FW: Cost Estimating Training e-mail string July 30, 2019 through February 14, 2020
- Cost Estimation Tool Start Date and Consistency Issues e-mail string July 31, 2019 through August 8, 2019
- Conference Line for Cost Estimating Training e-mail dated August 1, 2019
- Interconnection Procedures

Docket No. E-2, Sub 1220

Exhibit CEB-3

Initial Estimate (E-mail from DEP to Williams Solar dated January 28, 2019, transmitting System Impact Study Report)

To: Flagstad, Frederik -greengoenergy[frederik@greengoenergy.com]; Carl Siebing (cs@greengoenergy.com)[cs@greengoenergy.com]; Interconnection US (interconnection@greengoenergy.com)[interconnection@greengoenergy.com]
Cc: DERContracts[DERContracts@duke-energy.com]
From: Winter, Lee P
Sent: Mon 1/28/2019 11:07:13 AM (UTC-05:00)
Subject: Interconnection Request Williams Solar, LLC CHKLIST 15007
Williams System Impact Study Report with A.pdf
Facility Study Agreement.pdf
Request for Information.docx

The results of the System Impact Study Report for the interconnection costs which do not account for the terrain that DEP personnel will encounter to connect your renewable generation project to the DEP grid. Please be advised that these preliminary costs are based on a grid program, that is used to evaluate the connection to the grid. To that end, these are the baseline costs to connect the facility to the grid based on the proposed route by DEP that should be most cost effective and more easily to secure right-of-way for the project. Please note the project owner will have the option to choose the route of the infrastructure and point-of-delivery (POD) knowing that costs can potentially increase. The purpose of this email is for a decision to be made whether or not to continue moving forward with the project for the final costs or to withdraw.
If you desire to move forward with the project please complete ALL fields of the attached document(s) and return to me. You must complete and return the form(s) to be received within sixty (60) calendar days from the date of this email or your project will be deemed withdrawn.
At this current stage your options are:
o Continue with the interconnection process by completing and returning the attached documents to be received within sixty (60) calendar days from the date of this email – March 29, 2019; or you can
o Withdraw by replying to this email

SYSTEM UPGRADES Assuming NC2016-02927 – Williams Solar, LLC Commits to Installing (Budgetary One Time System Upgrade estimate of $774,000)

As a result of a completed feeder study, the following work scope must be designed and cost-estimated (on its own work order) separately:

1. Reconductoring as follows:
   a. Replace existing 1 - # 2 ACSR circuit with 3-477 AAC circuit from DIS# 2M843 to DIS# 2M845 (approximately 0.0775 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
   b. Replace existing 1 - #4 BC circuit with 3-477 AAC circuit from DIS# 2M803 to DIS# 2M843 (approximately 1.342 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
   c. Replace existing 3 - #2 ACSR circuit with 3-477 AAC circuit from DIS# 2L653 to DIS# 2M803 (approximately 1.114 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
2. Sectionalizing/protection changes as follows:
   a. Remove 25 A Fuse at DIS# 2M803.
   b. Install 3 x 50 A Fuses at DIS# 2M803.
   c. Relocate the Hydraulic Recloser at DIS# 2KU54 to 2M725.
   d. Install a G&W recloser at DIS# 2M725.
   e. Install 1 x 25 A Fuses at DIS# 2M845.
   f. Install 3 x 25 A Fuses at DIS# 2M840.
   g. Install 1 x 25 A Fuses at DIS# 2M827.
   h. Install 1 x 25 A Fuses at DIS# 2M819.
   i. Install 1 x 25 A Fuses at DIS# 2M813.
   j. Install 71 high fault tamer fuses.

1Ø - 2KJ54	1Ø - 2KW94	1Ø - 2KU91	1Ø - 2M885	1Ø - 2M830	1Ø - 2M813	1Ø - 6BY83
1Ø - 2KJ50	1Ø - 2KW93	1Ø - 2KU89	1Ø - 2M823	1Ø - 9NJ16	1Ø - 2M808	1Ø - 7HA89
1Ø - 2KJ49	1Ø - 2NA05	1Ø - 2KU86	1Ø - 2M822	1Ø - 2M827	1Ø - 2M790	1Ø - 7EQ45
1Ø - 2KJ43	1Ø - 2NA02	1Ø - 15LF06	1Ø - 149A06	1Ø - 6LT98	1Ø - 10AJ02	1Ø - 2L823
1Ø - 2KJ47	1Ø - 2KW98	1Ø - 2KU83	1Ø - 2M841	1Ø - 2M824	1Ø - 2M788	1Ø - 2L759
1Ø - 2KJ42	1Ø - 2KW96	1Ø - 2M903	1Ø - 8NJ03	1Ø - 2M819	1Ø - 2Q991	1Ø -14DR68

1Ø - 2KG19	1Ø - 2NA16	1Ø - 2M901	1Ø - 8NJ04	1Ø - 2M816	1Ø - 2M793	1Ø - 104E58
1Ø - 2KG24	1Ø - 2NA13	1Ø - 2M898	1Ø - 2M837	1Ø - 6QA58	1Ø - 2M791	1Ø - 2N380
1Ø - 2L971	1Ø - 2KU98	1Ø - 2M897	1Ø - 2M835	1Ø -15D739	1Ø - 2M782	1Ø - 2L755
1Ø - 2L968	1Ø - 2KU94	1Ø - 2M890	1Ø - 2M831	1Ø - 6QA55	1Ø - 2M780	1Ø - 2L753
1Ø - 2KJ58						

3. Other changes as follows:
   a. Verify that the substation regulator is set to either Ignore Mode or Co-Generation Mode (based on the control type).

There could be as much as 9.292 MW shipped back into the substation during low load periods from the Newton Grove 23 kV feeder.

Interconnection Facilities (Budgetary Interconnection Facilities estimate $60,000)

Interconnection Pole will be 2M845. (35.278505, -78.367579)

Install a maximum of 2 spans of 3 - #477 AAC primary and #1/0 AAAC neutral tap from Pole 2M845 to POD. Deviation from this recommendation requires the approval of the local PQR&I representative or the local Distribution Capacity Planner.

POD per Figure 71B (overhead).

Install G&W recloser one pole to Duke Energy Progress side of POD.

Install Power Quality (PQ) Meter per Figure 71B

"NOTE: The generating facility is to be operated such that unity power factor is continuously maintained at the Point of Delivery (where utility-owned metering is located)."

Please direct other technical questions to DEPCustomerOwnedGeneration@duke-energy.com.

Lee Winter

Wholesale Renewable Manager

Distributed Energy Technology

DUKE ENERGY.

919-546-2207

919-219-7445 (mobile)

Docket No. E-2, Sub 1220

Exhibit CEB-4

System Impact Study Report dated December 20, 2018

Williams Solar, LLC

NC2016-02927

Proposed Generating Facility

System Impact Study Report

Duke Energy Progress (DEP)

December 20, 2018

Table of Contents

Preface

The System Impact Study is designed to identify and detail the electric system impacts associated with interconnecting the proposed Generation Facility and to identify System Upgrades and Interconnections Facilities needed to interconnect the facility and correct any system problems identified in the study. The study is based on the point of interconnection proposed by the Interconnection Customer and on technical information provided in the Interconnection Request. In addition to detailing the required Interconnection Facilities and System Upgrades, the study provides a preliminary, non-binding estimate of the cost and length of time necessary to provide the facilities and upgrades.

Interconnection Data

Interconnection Customer: Williams Solar, LLC

Queue Number: NC2016-02927

Maximum Physical Export Capability Requested: 4,992 kW

Generating Facility Equipment:

- PV Panels: First Solar FS-4120A-3 – Quantity 56,160
  - 120 Watt Panels
- Inverters: Fronius Symo 24.0-3 480 – Quantity 208
  - UL1741 Compliant
  - Rated Output Power of 24 kW
  - Nominal Apparent Power of 24 kVA
  - Operating Voltage: 480 V
- Transformers: 1,700 kVA – Quantity 3
  - Manufacturer: Not provided
  - Primary (Utility) Winding: 22.86 kV Wye-grounded
  - Secondary (Inverter) Winding: 480 V Wye-grounded
  - 5.75% Impedance

Circuit Information

Substation Name: Newton Grove 230 kV

Feeder Number: Newton Grove 23 kV

Point of Interconnection (POI): 35.278505, -78.367579

Nominal Voltage: 22.86 kV

Existing/Proposed Generating Facilities Ahead On Feeder:

Queue Number	Size of Generating Facility (kW)
IC13-138	1,980
NC2016-02911	5,000

Existing/Proposed Generating Facilities Ahead On Substation:

Queue Number	Size of Generating Facility (kW)
IC13-017	4,872
IC13-138	1,980
NC2016-02911	5,000

Figure 1 - Point Of Interconnection

Distributed Energy Resource Planning & Interconnection Guidelines

The Generating Facility was reviewed in conjunction with the DEC & DEP: Distributed Energy Resource (DER) Method Of Service Guidelines for DER No Larger Than 20 MW ("Guidelines") to determine the applicable path for interconnection. A link to the Guidelines is provided below.

https://www.duke-energy.com/business/products/renewables/generate-your-own

As determined by the design of the Generating Facility and the Maximum Physical Export Capability Requested on the Interconnection Request, the Interconnection Customer will interconnect to the DEP system as Method "D", as defined in Section 2.2 of the Guidelines.

The Interconnection Customer's POI is within the first regulated zone of the DEP distribution system. As such, no new line extensions were required in order to accommodate the Interconnection Customer. As such, the POI for this installation will be at the end of the interconnection facilities. The interconnection facilities will be located on the Interconnection Customer's property.

The short circuit capability at the POI is 98.4 MVA. The short circuit capability at the substation bus is 152.1 MVA. Generating Facilities currently exist ahead of the Interconnection Customer in the queue, totaling 11.852 MW. This equates to the Interconnection Customer having a Stiffness Factor of 19.7 and 9.0 at the POI and substation bus, respectively. The Interconnection Customer fails the POI Stiffness Factor and the Substation Stiffness Factor, as defined in Section 3.4 of the Guidelines.

The Generating Facility consists of a large amount of transformer capacity that needs to be energized by the DEP distribution system. In order to address the potential impacts to system safety, reliability and power quality, a study to determine the transient impacts of transformer energization was required. This analysis addressed the potential risk of excessive harmonics and rapid voltage change seen on the distribution system caused by energizing the Generating Facility's transformers. The results of which are detailed in a later section.

Transformer Inrush Study

A study was performed to investigate transient impacts of transformer energization. To remediate issues identified within the study, the Generating Facility will utilize a 150 Ohm pre-insertion resistor. There were no further changes required to the Generating Facility's design.

Circuit Breaker Short Circuit Capability Limits

The POI is electrically downstream of non-electronic protective devices (i.e. fuses, or hydraulic reclosers). The protective scheme of the circuit needed to be altered such that only electronic devices exist upstream of the Interconnection Customer's POI while maintaining the reliability for DEP retail customers. These alterations include, but are not limited to, replacing devices with electronic reclosers and installing/relocating devices. A detailed listing of the System Upgrades that satisfied these requirements can be found in the Results Section below The Interconnection Customer will be responsible for these System Upgrades.

The addition of the Generating Facility causes service transformers to be added to the high fault area. Service transformers within this area are retrofitted with current limiting fuses to minimize the chance of tank ruptures. In order to remediate these issues, the Interconnection Customer will be responsible for retrofitting the following transformers to incorporate current limiting fuses, also known as High Fault Tamers.

Transformer ID	Phase	LLL (A)	LLG (A)	LL (A)	LG (A)
2KJ58	1∅	0	0	0	1904
2KJ54	1∅	0	0	0	1949
2KJ43	1∅	0	0	0	2029
2KJ47	1∅	0	0	0	1970
2KG19	1∅	0	0	0	1965
2KG28	1∅	0	0	0	1901
2KG24	1∅	0	0	0	1993
2L972	1∅	0	0	0	1907
2L971	1∅	0	0	0	1929
2L968	1∅	0	0	0	1971
2KW94	1∅	0	0	0	2023
2NA08	1∅	0	0	0	1915
2NA05	1∅	0	0	0	1949
2NA02	1∅	0	0	0	1977
2KW98	1∅	0	0	0	2016
2NA16	1∅	0	0	0	1986
2NA13	1∅	0	0	0	2007
2KU98	1∅	0	0	0	1930
2KU94	1∅	0	0	0	1951
2KU91	1∅	0	0	0	1974
2KU89	1∅	0	0	0	1993
2KU86	1∅	0	0	0	2018
15LF06	1∅	0	0	0	2091
2KU83	1∅	0	0	0	2114
2M903	1∅	0	0	0	1927
2M901	1∅	0	0	0	1955

2M898	1Ø	0	0	0	1998
2M897	1Ø	0	0	0	1994
2M890	1Ø	0	0	0	2202
2M823	1Ø	0	0	0	2103
2M822	1Ø	0	0	0	2132
2M843	1Ø	0	0	0	1917
149A06	1Ø	0	0	0	1935
2M841	1Ø	0	0	0	1944
8NJ03	1Ø	0	0	0	1942
8NJ04	1Ø	0	0	0	1926
2M837	1Ø	0	0	0	1990
2M835	1Ø	0	0	0	2017
2M831	1Ø	0	0	0	2046
2M830	1Ø	0	0	0	2067
9NJ16	1Ø	0	0	0	2059
2M827	1Ø	0	0	0	2089
6LT98	1Ø	0	0	0	2100
2M824	1Ø	0	0	0	2138
2M819	1Ø	0	0	0	2171
2M816	1Ø	0	0	0	2237
6QA58	1Ø	0	0	0	2179
15D739	1Ø	0	0	0	2187
6QA55	1Ø	0	0	0	2241
2M813	1Ø	0	0	0	2283
2M808	1Ø	0	0	0	2331
2M790	1Ø	0	0	0	2077
10AJ02	1Ø	0	0	0	2097
2M788	1Ø	0	0	0	2124
2Q991	1Ø	0	0	0	1931
2M793	1Ø	0	0	0	1989
2M791	1Ø	0	0	0	2072
2M782	1Ø	0	0	0	2174
2M780	1Ø	0	0	0	2237
7EQ13	1Ø	0	0	0	1920
7HA89	1Ø	0	0	0	1963
7EQ45	1Ø	0	0	0	1993
2L823	1Ø	0	0	0	2028
2L772	1Ø	0	0	0	1917
2L761	1Ø	0	0	0	1917
2L759	1Ø	0	0	0	1930
14DR68	1Ø	0	0	0	1948
104E58	1Ø	0	0	0	1930
2N380	1Ø	0	0	0	1951
2L755	1Ø	0	0	0	1970
2L753	1Ø	0	0	0	2030

Table 1 – High Fault Area Violations

A detailed listing of these System Upgrades can be found in the Results section below.

Thermal Overload Or Voltage Limit Violations

The Interconnection Customer's POI is on a single phase line. The Interconnection Customer will be responsible for rebuilding 1.4195 miles of line from single phase to three phase in order to accommodate the Generating Facility. A detailed listing of these System Upgrades can be found in the Results section below.

The interconnection of a Generating Facility shall not cause the service voltage to exceed DEP's distribution voltage standards. Additionally, the interconnection of a Generating Facility shall not cause the voltage change to exceed the limits defined in the document entitled RVC (Rapid Voltage Change) and Flicker Study Criteria ("Flicker"), attached in the Appendix at the end of this report. After evaluating the addition of the Generating Facility at the requested size of 4,992 kW, it was determined that there are no service voltage and Flicker violations.

The results of the evaluations are detailed in the Tables below. The "Retail Customer" refers to the location of a DEP retail customer who has the potential to experience the greatest effect with the addition of the Generating Facility. The Retail Customer may not refer to the same location between peak and valley circuit loading conditions. The "Substation" location refers to the regulated side of the substation. The voltages are presented on a 120V base and represent the medium voltage (primary) level.

Location	V_A	V_B	V_C	RVC Criteria "A"	RVC Criteria "B"
Retail Customer	123.9 – Pass	124.2 – Pass	124.4 – Pass	1.01% - Pass	1.66% - Pass
Retail Customer	124.6 – Pass	124.1 – Pass	124.8 – Pass	0.32% - Pass	0.98% - Pass
POI	123.9 – Pass	124.2 – Pass	124.4 – Pass	1.01% - Pass	1.66% - Pass
Substation	123.2 – Pass	124.1 – Pass	124.1 – Pass	0.32% - Pass	0.98% - Pass

Table 2 - Voltage Limit Results – Peak Circuit Loading with Existing Infrastructure

Location	V_A	V_B	V_C	RVC Criteria “A”	RVC Criteria “B”
Retail Customer	-	-	124.1 – Pass	0.60% – Pass	0.77% – Pass
Retail Customer	123.9 – Pass	124.2 – Pass	124.0 – Pass	0.07% – Pass	0.11% – Pass
POI	124.3 – Pass	124.4 – Pass	124.1 – Pass	0.60% – Pass	0.77% – Pass
Substation	123.5 – Pass	123.9 – Pass	123.4 – Pass	0.07% – Pass	0.11% – Pass

Table 3 - Voltage Limit Results – Valley Circuit Loading with Existing Infrastructure

The addition of the Generating Facility creates annealing violations for conductors on the existing DEP distribution system. Annealing is a change in the molecular structure of a metal conductor, thereby changing the conductor’s physical and electrical properties; i.e. a decrease in tensile strength, thereby affecting sagging. In order to remediate the violations caused by the addition of the Generating Facility, the Interconnection Customer will be responsible for upgrades to correct these affected conductors. A detailed list of these System Upgrades can be found in the Results section below.

The existing 20 MVA substation transformer can adequately support the Interconnection Customer and the 11,852 kW aggregate Generating Facilities queued ahead of this project.

Grounding Requirements And Electric System Protection

The Generating Facility will supply transformers connected in the Wye-grounded (utility) / Wye-grounded (inverter) configuration. This configuration is acceptable for interconnection to the DEP system.

The interconnection facilities for the Generating Facility will be as per Figure 71B of the Requirements for Electric Service and Meter Installations manual, link provided below.

https://www.duke-energy.com/_/media/pdfs/partner-with-us/service-requirements-manual.pdf

The requirements for the Generating Facility are as follows, as per Figure 75C:

a) Interconnection protection will be owned and operated by DEP and is to include a recloser, relaying (control), and remote communications for monitoring and operations.
    i. Protection will utilize over current, under/over voltage, and under/over frequency relaying.
b) DEP shall provide a manual load-break rated disconnect switch to serve as a clear visible indication of switch position between the utility and the Interconnection Customer. The switch must be readily accessible to DEP personnel.
c) Interconnection Customer's inverters have to be tested and listed for compliance with the latest published edition of Underwriter Laboratories Inc., UL 1741 for utility interactive inverters.
d) Interconnection Customer shall comply with the latest edition of IEEE 1547 and applicable series standards.

These requirements and the interconnection Figure are subject to change at any time.

A power quality (PQ) meter will also be installed with the interconnection facilities to continuously monitor the power quality impacts of the generating facility to the DEP system.

The Generating Facility is to be operated such that unity power factor is continuously maintained at the Point of Interconnection (where utility-owned metering is located).

Results

As a result of the interconnection of the Generating Facility, the System Upgrades detailed above will be required at the responsibility of the Interconnection Customer. A more in depth listing of these System Upgrades is detailed below.

1. Transmission Upgrades:
    a. None.
2. Substation Upgrades:
    a. None.
3. New Line Construction/Reconductoring:
    a. Replace existing 1 - # 2 ACSR circuit with 3-477 AAC circuit from DIS# 2M845 to DIS# 2M843 (approximately 0.0775 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
    b. Replace existing 1 - #4 BC circuit with 3-477 AAC circuit from DIS# 2M843 to DIS# 2M803 (approximately 1.342 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
    c. Replace existing 3 - #2 ACSR circuit with 3-477 AAC circuit from DIS# 2M803 to DIS# 2L653 (approximately 1.114 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
4. Protection Upgrades/Sectionalization:
    a. Remove 25 A Fuse at DIS# 2M803.
    b. Install 3 x 50 A Fuses at DIS# 2M803.
    c. Relocate the Hydraulic Recloser at DIS# 2KU54 to 2M725.
    d. Install a G&W recloser at DIS# 2M725.
    e. Install 1 x 25 A Fuses at DIS# 2M845.
    f. Install 3 x 25 A Fuses at DIS# 2M840.
    g. Install 1 x 25 A Fuses at DIS# 2M827.
    h. Install 1 x 25 A Fuses at DIS# 2M819.
    i. Install 1 x 25 A Fuses at DIS# 2M813.
    j. Install 71 high fault tamer fuses.

1Ø - 2KJ54	1Ø - 2KW94	1Ø - 2KU91	1Ø - 2M885	1Ø - 2M830	1Ø - 2M813	1Ø - 6BY83
1Ø - 2KJ50	1Ø - 2KW93	1Ø - 2KU89	1Ø - 2M823	1Ø - 9NJ16	1Ø - 2M808	1Ø - 7HA89
1Ø - 2KJ49	1Ø - 2NA05	1Ø - 2KU86	1Ø - 2M822	1Ø - 2M827	1Ø - 2M790	1Ø - 7EQ45
1Ø - 2KJ43	1Ø - 2NA02	1Ø - 15LF06	1Ø - 149A06	1Ø - 6LT98	1Ø - 10AJ02	1Ø - 2L823
1Ø - 2KJ47	1Ø - 2KW98	1Ø - 2KU83	1Ø - 2M841	1Ø - 2M824	1Ø - 2M788	1Ø - 2L759
1Ø - 2KJ42	1Ø - 2KW96	1Ø - 2M903	1Ø - 8NJ03	1Ø - 2M819	1Ø - 2Q991	1Ø -14DR68
1Ø - 2KG19	1Ø - 2NA16	1Ø - 2M901	1Ø - 8NJ04	1Ø - 2M816	1Ø - 2M793	1Ø - 104E58
1Ø - 2KG24	1Ø - 2NA13	1Ø - 2M898	1Ø - 2M837	1Ø - 6QA58	1Ø - 2M791	1Ø - 2N380
1Ø - 2L971	1Ø - 2KU98	1Ø - 2M897	1Ø - 2M835	1Ø -15D739	1Ø - 2M782	1Ø - 2L755
1Ø - 2L968	1Ø - 2KU94	1Ø - 2M890	1Ø - 2M831	1Ø - 6QA55	1Ø - 2M780	1Ø - 2L753
1Ø - 2KJ58						

5. Other:
    a. None.
6. Interconnection Facilities:

a. Standard Interconnection Package connected as per Figure 71B.

The budgetary Interconnection Facilities estimate is $60,000. The budgetary One-Time estimate for the required System Upgrades is $774,000. These estimates are non-binding and are detailed in the Table below. Additionally, these estimates are only for the work required on the utility side of the POI.

	Cost
Transmission Upgrades	$0
Substation Upgrades	$0
New Line Construction/Reconductoring	$705,000
Protection Upgrades/Sectionalization	$69,000
Other	$0
Total Upfront Charges	$774,000

Table 4 - One-Time System Upgrades estimate

Appendix

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1 RVC (rapid voltage change) and flicker study criteria

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ThǷVC & fl ƺ eΩƺΩ⁺eΩ ⁺eΩ e" #$ḱC & $ḱ%ǷVC & fl ƺ eΩveΩ on &' (

1.1 RVC criteria "A": 3% Δ V check for single DER shutdown

The⁺u"˘) ll ev lu ⁺e ⁺he effeƺ⁺ of n*le $ḱǷhu⁺"o) n,) ⁺h ⁺he vol⁺ *e ƺh n*e +e n* ev lu ⁺e" ň) heœ on ⁺he ƺ œƺu ⁺ ⁺o uœ ƺh n*e of no *œ ⁺eΩ⁺h n &, (

1.2 RVC criteria "B": 4% Δ V check for aggregate DER shutdown on circuit

The⁺u"˘) ll ev lu ⁺e ⁺he effeƺ⁺ of hu⁺"o) n of ll $ḱǷon ƺ œƺu ⁺- ⁺h . ơ lľ ! ul ⁺e ⁺he ! . ƺ⁺ of ƺ œƺu ⁺ ⁺Ω. n" œƺlo e even⁺ n" ⁺he œ ul⁺ n* vol⁺ *e ƺh n*e ƺœ ⁺he ƺ œƺu ⁺, ƺo! . Ωn* . œ/f ul⁺ & ⁺Ω. vol⁺ *e) ⁺h vol⁺ *e f⁺eΩƺ œƺu ⁺ œ ⁺oΩ ⁺ on 0 n" ll $ḱǷon ƺ œƺu ⁺ offl ne1(The vol⁺ *e ƺh n*e) ll +e ev lu ⁺e" ň) heœ on ⁺he ƺ œƺu ⁺ ⁺o uœ ƺh n*e of no *œ ⁺eΩ⁺h n 4, (

1.3 RVC criteria "C": 1.5% Δ V check at voltage regulators, for single DER output drop of 75%

The⁺u"˘) ll ev lu ⁺e ⁺he effeƺ⁺ of 23, "œ. n $ḱǷou⁺. u⁺ ⁺o uœ ⁺h ⁺ vol⁺ *e "oe no⁺ ƺh n*e ! oœ ⁺h n 1(3, ⁺ ň vol⁺ *e œ*ul ⁺oΩloƺ ⁺ on(4oΩe e of ev lu ⁺ on, 1ي, "œ.) ll +e ev lu ⁺e" * ŋ⁺ 2, ƺh n*e ⁺ ň vol⁺ *e œ*ul ⁺oΩloƺ ⁺ on 0 u! e" ⁺o +e ! ⁺he! ⁺ ƺ lľ e5u v len⁺ ⁺o ⁺he 23, 61(3, ƺΩ⁺eΩ 1(

1.4 RVC criteria "D": 3% Δ V check for transformer energization voltage sag

7 hen u n* . . œ. Ω ⁺e ! o"el n* ⁺eƺhn 5ue Œ(*(%8C9$1, ⁺he⁺u"˘) ll ev lu ⁺e ⁺he effeƺ⁺ of ⁺Ω ŋ foΩ eΩ! *ne⁺ : ⁺ on,) ⁺h ⁺he vol⁺ *e ƺh n*e +e n* ev lu ⁺e" ň) heœ on ⁺he ƺ œƺu ⁺ ⁺o uœ ƺh n*e of no *œ ⁺eΩ⁺h n &, (Ƿ*h⁺ no) ⁺h œƺo! ! en"e" foΩ ll f ƺ l ⁺ e 1 ; 7 n" l Ω*eΩ(

1.5 Flicker criteria

No . eƺ f ƺ ev lu ⁺ on) ll +e . eΩfoΩ e", ⁺ $u e< e⁺ ! ⁺ on ⁺h ⁺ ⁺he ǷVC œ5u œ! en⁺ houl" uff ƺe ⁺ ⁺h ⁺ ! e(The $ḱǷo. eΩ ⁺oΩ) ll +e l +le foΩƺoœeƺ⁺ n* ň œ⁺ l ƺu ⁺o! eΩ. o) eΩ5u l ⁺ . œ+le! ⁺⁺Ω+u⁺e" ⁺o n⁺eΩ ⁺⁺en⁺ ou⁺. u⁺(9 %= ! e⁺eΩ +eƺo! e ! oœ . œv len⁺, $u e) ll ƺoΩ "eΩ ⁺he u e of ꝁḱḱ 1342/2ي 18 n" ꝁḱḱ 143&, ⁺hœu*h ! on ⁺oΩn* % ⁺ n" %ľ⁺ v lue(

2 Revision history

Revision	Date	Comments
1.0	9/13/2017	Initial release
1.1	9/19/2017	Effective date changed
1.2	1/8/2018	Addition of Maximum allowable step voltage changes criteria

Docket No. E-2, Sub 1220

Exhibit CEB-5

Internal DEP e-mail dated December 19, 2018, transmitting the System Impact Study Report

To: DERContracts[DERContracts@duke-energy.com]
Cc: DEP Customer Owned Generation[DEPCustomerOwnedGeneration@duke-energy.com]; Whitaker, Jessica L.[Jessica.Whitaker@duke-energy.com]; Johnson, Ashleyanna[Ashleyanna.Johnson@duke-energy.com]; Liu, Juhua[Juhua.Liu@duke-energy.com]; Sanchez, Eugene[Eugene.Sanchez@duke-energy.com]; Bruton, Lee[Lee.Bruton@duke-energy.com]; Kirby III, John M[John.Kirby@duke-energy.com]; Medlin, Larry E[Larry.Medlin@duke-energy.com]; Hamilton, Donald Wayne[Donald.Hamilton@duke-energy.com]; McIntire, Kristy[Kristy.McIntire@duke-energy.com]; Archer, Kaitlyn E[Kaitlyn.Archer@duke-energy.com]; Sindhu, Goutami[Goutami.Sindhu@duke-energy.com]
From: DEP Customer Owned Generation
Sent: Wed 12/19/2018 10:40:40 AM (UTC-05:00)
Subject: DEP Official Release –System Impact Study – NC2016-02927 – Williams Solar, LLC
181113-2309_2250-024_SLD sized resistor_Stamped 2.pdf
Williams System Impact Study Report with A.pdf

IPP study release for cost estimating:

Substation: Newton Grove 230 kV
Feeder: Newton Grove 23 kV
Size: 4.992 MW
Region: Eastern

Interconnection request files and customer technical information for this proposed IPP can be found at:
\\nt000070\shares70\PEC Interconnected Generation\FILED IC Requests - 2016

The subject project can be found in this folder by finding the folder name that matches the subject line.

SYSTEM UPGRADES Assuming NC2016-02927 – Williams Solar, LLC Commits to Installing (Budgetary One Time System Upgrade estimate of $774,000)

As a result of a completed feeder study, the following work scope must be designed and cost-estimated (on its own work order) separately:

1. Reconductoring as follows:
   a) Replace existing 1 - # 2 ACSR circuit with 3-477 AAC circuit from DIS# 2M843 to DIS# 2M845 (approximately 0.0775 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
   b) Replace existing 1 - #4 BC circuit with 3-477 AAC circuit from DIS# 2M803 to DIS# 2M843 (approximately 1.342 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
   c) Replace existing 3 - #2 ACSR circuit with 3-477 AAC circuit from DIS# 2L653 to DIS# 2M803 (approximately 1.114 miles). The existing neutral should be replaced with a 1/0 AAAC neutral.
2. Sectionalizing/protection changes as follows:
   a) Remove 25 A Fuse at DIS# 2M803.
   b) Install 3 x 50 A Fuses at DIS# 2M803.
   c) Relocate the Hydraulic Recloser at DIS# 2KU54 to 2M725.
   d) Install a G&W recloser at DIS# 2M725.
   e) Install 1 x 25 A Fuses at DIS# 2M845.
   f) Install 3 x 25 A Fuses at DIS# 2M840.
   g) Install 1 x 25 A Fuses at DIS# 2M827.
   h) Install 1 x 25 A Fuses at DIS# 2M819.
   i) Install 1 x 25 A Fuses at DIS# 2M813.
   j) Install 71 high fault tamer fuses.

1Ø - 2KJ54	1Ø - 2KW94	1Ø - 2KU91	1Ø - 2M885	1Ø - 2M830	1Ø - 2M813	1Ø - 6BY83
1Ø - 2KJ50	1Ø - 2KW93	1Ø - 2KU89	1Ø - 2M823	1Ø - 9NJ16	1Ø - 2M808	1Ø - 7HA89
1Ø - 2KJ49	1Ø - 2NA05	1Ø - 2KU86	1Ø - 2M822	1Ø - 2M827	1Ø - 2M790	1Ø - 7EQ45
1Ø - 2KJ43	1Ø - 2NA02	1Ø - 15LF06	1Ø - 149A06	1Ø - 6LT98	1Ø - 10AJ02	1Ø - 2L823
1Ø - 2KJ47	1Ø - 2KW98	1Ø - 2KU83	1Ø - 2M841	1Ø - 2M824	1Ø - 2M788	1Ø - 2L759

1Ø - 2KJ42	1Ø - 2KW96	1Ø - 2M903	1Ø - 8NJ03	1Ø - 2M819	1Ø - 2Q991	1Ø -14DR68
1Ø - 2KG19	1Ø - 2NA16	1Ø - 2M901	1Ø - 8NJ04	1Ø - 2M816	1Ø - 2M793	1Ø - 104E58
1Ø - 2KG24	1Ø - 2NA13	1Ø - 2M898	1Ø - 2M837	1Ø - 6QA58	1Ø - 2M791	1Ø - 2N380
1Ø - 2L971	1Ø - 2KU98	1Ø - 2M897	1Ø - 2M835	1Ø -15D739	1Ø - 2M782	1Ø - 2L755
1Ø - 2L968	1Ø - 2KU94	1Ø - 2M890	1Ø - 2M831	1Ø - 6QA55	1Ø - 2M780	1Ø - 2L753
1Ø - 2KJ58						

3. Other changes as follows:

    a) Verify that the substation regulator is set to either Ignore Mode or Co-Generation Mode (based on the control type).

There could be as much as 9.292 MW shipped back into the substation during low load periods from the Newton Grove 23 kV feeder.

Interconnection Facilities (Budgetary Interconnection Facilities estimate $60,000)
Interconnection Pole will be 2M845. (35.278505, -78.367579)
Install a maximum of 2 spans of 3 - #477 AAC primary and #1/0 AAAC neutral tap from Pole 2M845 to POD. Deviation from this recommendation requires the approval of the local PQR&I representative or the local Distribution Capacity Planner.
POD per Figure 71B (overhead).
Install G&W recloser one pole to Duke Energy Progress side of POD.
Install Power Quality (PQ) Meter per Figure 71B
"NOTE: The generating facility is to be operated such that unity power factor is continuously maintained at the Point of Delivery (where utility-owned metering is located)."

Please direct other technical questions to DEPCustomerOwnedGeneration@duke-energy.com.

Notes:

1. Attached is a copy of the customer's approved one-line. Any changes to the attached one-line must be submitted to Duke Energy Progress for approval.
2. Duke Estimated Construction Hours – 5,157
3. System Upgrade Estimated Mileage – 2.5335 miles
4. Project Charging Information:
    a. OU: AJ9D
    b. Activity: IMP
    c. Project #: DCS015007

Thank you,

DPAC&DG

PUBLIC VERSION

Docket No. E-2, Sub 1220

Exhibit CEB-6

Respondent Duke Energy Progress, LLC's Responses to Complainant's First Set of Interrogatories and Requests for Production of Documents

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1220

In the Matter of Williams Solar, LLC, Complainant v. Duke Energy Progress, LLC, Respondent	)))))))))))	**RESPONDENT DUKE ENERGY PROGRESS, LLC'S RESPONSES TO COMPLAINANT'S FIRST SET OF INTERROGATORIES AND REQUESTS FOR PRODUCTION OF DOCUMENTS**

Pursuant to Rules 26, 33, and 34 of the North Carolina Rules of Civil Procedure and the Rules of Practice and Procedure of the North Carolina Utilities Commission ("Commission"), Duke Energy Progress, LLC's ("DEP", or "the Company" or "Duke") hereby submits this response to Complainant Williams Solar, LLC's ("Williams Solar" or "Complainant") First Set of Requests for Production of Documents and Interrogatories ("Requests").

OBJECTIONS TO INSTRUCTIONS

1. Duke objects to Williams Solar's instruction No. 4 to the extent it directs Duke to identify "the name of the witness in this proceeding who will sponsor the answer and can vouch for its accuracy." At this time, Duke has not identified the Company personnel who will testify in this proceeding. Moreover, the Company's trial preparation materials, including but not limited to the case strategy of Duke's attorneys and the draft pre-filed testimony of Duke's prospective witnesses are protected as attorney work product and not subject to discovery. Nevertheless, Duke's answers to Complainants' Requests identify the employee sponsor(s) for each Response, which reflects the personnel who participated in preparing that Response.

GENERAL OBJECTIONS

Each of the specific responses below is made subject to and without waiving these General Objections:

1. The information contained herein is provided in accordance with the provisions and intent of the North Carolina Rules of Civil Procedure and the North Carolina Utilities Commission's Rules and Regulations, which call for the disclosure of non-privileged information and materials within the responding party's possession, custody, or control that may be relevant or lead to the discovery of admissible evidence. These responses are made without waiving any rights or objections, or admitting the authenticity, relevancy, materiality, or

admissibility into evidence of the subject matter or facts in any Request or any response thereto. Furthermore, Duke specifically reserves the right to object to the uses of any response, or the subject matter thereof, on any grounds in any further proceeding in this action.

2. Duke objects to the Requests (including the instructions and definitions accompanying the Requests) to the extent that they impose requirements beyond those set forth in the North Carolina Rules of Civil Procedure and/or the North Carolina Utilities Commission's Rules and Regulations.

3. Duke objects to the Requests to the extent that they seek information unrelated to issues raised in this action. Any production of information not related to the issues raised by this action shall not waive this objection and shall not be deemed to consent to the admissibility of such information.

4. Duke objects to the Requests to the extent they call for production of mental impressions of counsel or information that was prepared in anticipation of litigation and/or that is otherwise protected by the attorney-client privilege, the work product doctrine, or other applicable privileges.

5. Duke objects to each Request to the extent it is overbroad, unduly burdensome, not reasonably calculated to lead to the discovery of admissible evidence, or is not proportional to the scope of this case. In particular, Duke objects to each Request to the extent it calls for the production of "all documents and data" related to identified topics, as a complete, unfiltered search of the Company's voluminous electronic data would be unduly burdensome and not proportional to the scope of this case. Where such requests for "all documents and data" are made, Duke undertook reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to each Request, and such personnel

identified as a "Sponsor" of each Response have produced responsive information and documents.

6. Duke objects to each Request to the extent it seeks information or Documents that precedes the time period during which Williams Solar has been an Interconnection Customer of DEP (October 2016 to present), as such Requests are unduly burdensome, not relevant to the Company's processing of Williams Solar's Interconnection Request or reasonably calculated to lead to the discovery of admissible evidence, and are not proportional to the scope of this case.

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Williams Solar Data Request No. 1
Item No. 1-1
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

1. Provide the entire basis for DEP's initial estimate of $774,000, including, without limitation, an itemization of all costs included in that estimate and any overhead amounts assumed in that estimate. As part of your response, identify all documents evidencing or relating to the estimate.

Response:

Each generator interconnection project's preliminary estimated upgrade cost projections developed by DEP in the System Impact Study are calculated based on a standardized template cost estimation tool, SIS Estimate Tool Rev1, as further discussed in the Company's response to Williams Solar's Request Nos. 1-7 and 1-8. The SIS Estimate Rev1 is the most updated version of the SIS Estimate Tool Rev0. Further explanation of the process DEP uses to estimate costs is provided in DEP's response to Data Request No. 1-3.

The System Modifications project file used to generate preliminary estimated upgrade costs for Williams Solar is being produced in response to Request for Production No. 1-2, and is labeled "Williams Solar Estimation Tool SIS.xls." Labor, materials, and overhead are included in the $774,000 estimate based on work management data available as of the issuance date of the System Impact Study report for Williams Solar.

Sponsor: Neil Bhagat, Manager, Asset Management/Distributed Generation, Duke Energy

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Williams Solar Data Request No. 1
Item No. 1-2
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

2. Provide the entire basis DEP's estimated installed cost of $1,388,374.26, including, without limitation, an itemization of all costs included in that estimate and any overhead amounts assumed in that estimate. As part of your response, identify all documents evidencing or relating to the estimate.

Response:

The $1,388,374.26 refers to the Estimated System Upgrades plus Sales Tax of 7%

Estimated System Upgrade:	$1,297,546.03
NC Sales Tax – 7%:	$ 90,828.22
Total:	$1,388,374.25

The System Upgrades are comprised of:
- Labor Costs
- Labor Overheads
- Vehicle and Equipment Costs
- Vehicle and Equipment Costs Overheads
- Material Costs
- Material Overheads
- Contingency – 20%

Estimated Labor Costs Total (LC)	**$**	**725,040.00**
Estimated Vehicle / Equipment Total (VC)	**$**	**290,016.00**
Estimated Total Material Costs (EMC)	**$**	**282,490.03**
Estimate	**$**	**1,297,546.03**

Total Labor Costs (LC) for Project

LC	$3,180 X 1 crew x 4 people per crew times 38 weeks	= $483,360
Contingency	$483,360 X 0.20	= $ 96,672
Overheads	$580,032 X 0.25	= $145,008
Total Labor Costs (LC)		**= $725,040**

Vehicle Costs (VC)

Cost per Man Week = ($30 x 5 x 8) x 1.06			= $ 1,272
VC	$ 1,272 X 1 crew x 4 people per 38 weeks		= $193,344
Contingency	$193,344 X 0.20	= $ 36,689	
Overheads	$232,013 X 0.25	= $ 58,003	
Total VC (with Inflation and Overheads)			**= $290,016**

Estimated Material Costs (EMC)

$143,328 X 1.06 inflation assumption for 2 years			= $151,927
Material Overheads $151,927 X 0.4875			= $ 74,065
Sub Total $151,927 + $74,065			= $225,992
Contingency	$225,992 X 0.20	= $ 45,198	
Overheads	$45,198 X 0.25		= $ 11,300
Total EMC (with Inflation and Overheads)			**= $282,490**

Sponsor: Beckton James, Senior Business and Technical Consultant, Duke Energy

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Williams Solar Data Request No. 1
Item No. 1-3
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

3. With respect to the cost data relied upon by DEP in generating cost estimates for interconnection customers, state (a) how the cost data were estimated, (b) who performed the estimation, and (c) whether they reflect competitive bidding prices for parts, equipment, and labor.

Response:

Generator Interconnection cost estimates are generated in two phases corresponding to the System Impact Study and Facilities Study processes:

First, the System Impact Study estimated cost are based on reviewing the upgrades identified in the System Impact Study Report with the existing conditions and any current proposed non-DER upgrades in the DEP Graphical Information System (GIS) and a per mile cost estimation sheet. The SIS Estimation Tool Rev0 (which is being produced in DEP's response to Request for Production of Documents No. 5), has typical system upgrade project cost estimates on a per mile basis. These estimated cost data inputs to the cost estimate sheet were developed by the Capacity Planning Department based on overhead distribution line construction completed in DEP on a per mile cost basis. This cost estimation sheet is utilized to estimate costs for both internal overhead distribution line construction projects, as well as System Impact Study estimates for generator interconnections. The Capacity Planning Department also more recently developed the SIS Estimation Tool Rev0 based on completed projects. The cost data relied upon by DEP in generating cost estimates in the cost estimate tool is based upon the following categories of procured costs:

a. Overhead Contractors (Labor/Equipment) – The contractors completing those projects were selected on a competitive basis and were required to satisfy DEP's qualifications including safety, construction quality, presence in our region, ability to scale, cost and other factors.
b. Material/Parts – Duke obtains competitive pricing for material purchases and performs a technical and commercial evaluation to determine the best overall evaluated pricing to select an approved supplier or in many cases multiple suppliers. Duke periodically reviews market conditions to assess indices relative to raw material cost and perform cost modeling for approved price adjustments.
c. Engineering Labor - Pike Engineering is an engineering contractor for both Duke Energy Progress and Duke Energy Carolinas. Their rates for engineering labor were competitively bid.

Second, the detailed cost estimate provided in the Facilities Study is developed by Duke's Major Projects design organization, either by a Duke Energy Engineering Technologist, or by an offsite contract engineering partner such as Pike Engineering, with final review by a Duke Energy Engineering Technologist. This design process is completed in Maximo, which is used in conjunction with a MicroStation based graphical design tool, Bentley Open Utilities Designer (BOUD), for the development of schedulable tasks, bills of material, and cost estimates. This process is used for all types of Distribution construction work, including Customer Additions, Capital Maintenance, System Improvements, as well as generator interconnections. Compatible units are used as the basis for the design process, specifically for purposes of developing an estimate of the materials and labor hours required to perform the scope of work for a given design.

DEP began using the Maximo and BOUD tools for work order design and estimation in November 2017. Prior to this date, DEP used a similar system called Work Management Information System (WMIS), developed by CGI, for the same purposes. WMIS also utilized a compatible unit process in order to develop estimates of material and labor hours.

In both systems, the process of using compatible units to develop the design and cost estimate involves selection of compatible units, which represent the scope of work being performed. The compatible unit library used in both systems contained a combination of material only compatible units, labor only compatible units, and combination material/labor compatible units. The selection process for compatible units is based on the currently published Distribution Standards manual, which specifies the materials and equipment used for approved styles of installations.

Most compatible units on a design are associated with primary material items used, such as poles, conductor, switches, etc. Each of these compatible units captures what material item numbers and how many labor hours are required to perform the work associated with the compatible unit. Material only compatible units are less common, and associated with minor items such as hardware and connectors in which the labor hours are associated with a higher-level compatible unit. Finally, labor only compatible units are added to a design to capture anticipated labor time that is not reflected in a material only compatible units. Examples of labor-only compatible units are hand digging for poles or anchors, transferring conductor, and laying wire out for reconductors.

In addition to the material and labor compatible units noted above, designers have an opportunity to include "cost adder" compatible units to account for unique costs not associated with standard construction. Examples of when cost adder compatible units might be used are environmental permitting, controls and/or remediation, or other civil work such as asphalt/concrete removal or remediation.

Once a designer has tabulated the list of compatible units associated with a design for the given scope of work, they perform a step called "estimation" which calculates the total material and labor costs for the design. The design cost estimate is based on the following components: direct material costs, material overheads, direct labor costs, and labor overheads. Labor costs are described in more detail in the Company's responses to Request Nos. 1-4 and 1-10. Material costs are estimated based on near real-time system average costs. Duke obtains competitive pricing for material purchases and performs both a technical and commercial evaluation to determine the best overall evaluated pricing to select an approved supplier or in many cases multiple suppliers before executing contracts. Periodically, a review of market conditions is performed to assess indices relative to raw material cost and perform cost modeling for approved price adjustments.

Following development of the Maximo cost estimate, generator interconnection projects are then run through a secondary cost estimation tool, the Revised Estimating Tool ("RET"), which was developed to help provide more accurate cost to customers based on actual construction costs. A detailed explanation of this revised cost estimating tool, labeled "DR No. 1-3 Revised Estimating Tool Description – Williams Solar.doc," is being produced in Request for Production of Documents No. 1.

The RET updates the existing cost produced in Maximo to more accurately reflect total project costs Duke will likely incur from completion of Facilities Study through completion of interconnection-related project construction. The primary adjustments made by the RET are accounting for increased future costs by projecting inflation-impacted labor, material and equipment costs, modeling more likely resourcing and equipment requirements and adding a contingency factor for unforeseen events that have historically increased costs for generator interconnection projects.

Sponsors: Brian Dale, Engineer III, Asset Management Distributed Generation; Genevieve Bestercy, Sourcing Specialist, Transmission and Generation Grid Solutions Labor and EPC; Beckton James, Senior Business and Technical Consultant, Duke Energy; Scott Jennings, Director, Customer Delivery Area Operations; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

DUKE ENERGY PROGRESS, LLC

Request:

4. Describe how contracts for construction of interconnection facilities and system upgrades are awarded, including, without limitation, whether such contracts are the result of competitive bidding or are sole-source contracts.

Response:

In 2017, DEP undertook a targeted competitive request for proposal and negotiation process to obtain construction contractor services for overhead/underground distribution line construction services, including construction of interconnection facilities and system upgrades, in the Carolinas region. Many rounds of negotiations and evaluations resulted in the award of four contracts for construction contractor services for designated geographic regions of DEP's system. The negotiated contracts are for a term of five years, extending through 2022. The Company is producing the single source justification forms documenting the award of these contracts in response this request. These files are labeled as follows and being produced in response to Request for Production No. 1-10:

- "CONFIDENTIAL DR No. 1-4 2017 SSJ Form Mastec.pdf"
- "CONFIDENTIAL DR No. 1-4 2017 SSJ Form Pike.pdf"
- "CONFIDENTIAL DR No. 1-4 2017 SSJ FormSumter.pdf"
- "CONFIDENTIAL DR No. 1-4 2017 SSJ Form ULCS.pdf"

DEP will produce the foregoing documents information subject to a mutually-agreeable confidentiality agreement between DEP and Williams Solar. DEP has redacted all Interconnection Customer-identifiable information as confidential and/or proprietary and not subject to disclosure under the North Carolina Interconnection Procedures.

Sponsor: Genevieve Bestercy, Sourcing Specialist, Transmission and Generation Grid Solutions Labor and EPC

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Williams Solar Data Request No. 1
Item No. 1-5
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

5. Describe in detail the process used to create the Preliminary Estimated Upgrade Charge provided to Williams Solar. As part of your response, identify (a) all individuals who participated or otherwise assisted in creating the Preliminary Estimated Upgrade Charge provided to Williams Solar, LLC and the role of and actions taken by such person; and (b) all documents or data reflecting or evidencing the estimate.

Response:

A study engineer is responsible for creating the Preliminary Estimated Upgrade Charge for the System Impact Study Report. The study engineer reviewed the project under the DEP's System Impact Study evaluation process, which is described in a file labeled "System Impact Study SOP.pdf" being produced in DEP's response to Request for Production of Documents No. 5. Based upon this review, the study engineer then identified necessary upgrades required to safely and reliably interconnect the Williams Solar facility. The identified upgrades were then itemized and entered into the System Impact Study cost estimation spreadsheet by the study engineer, as further described in DEP's response to Data Request No. 1-3. Within the cost estimation spreadsheet, each upgrade was assigned a cost. The total upgrades cost was then calculated.

For Williams Solar, the study engineer responsible for developing the Preliminary Estimated Upgrade Charge included in the System Impact Study Report was a Pike Engineering Employee. Duke Energy Engineers review portions of the System Impact Study and provide approval for their department. Capacity Planner Alex Winslow reviewed the voltage and RVC study. Distribution Protection and Control engineer Andrew Kurczek (Pike Engineering) reviewed the protection study. The system upgrades necessary to safely and reliably interconnection the facility are identified through the voltage, RVC, and Protection studies. The two engineers mentioned above reviewed the accuracy of the study and confirmed the preliminarily-identified upgrades are needed, but do not estimate the cost for the identified system upgrades. The standardized cost estimation tool used to generate preliminary estimated upgrade costs for Williams Solar is further described in response to Request Nos. 1-1 and 1-3, and is being produced in response to Request for Production of Documents No. 5.

Sponsor: Neil Bhagat, Manager, Asset Management/Distributed Generation/ Dmitri Moundous, Senior Engineer, Asset Management/Distributed Generation

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Williams Solar Data Request No. 1
Item No. 1-6
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

6. Identify by line item type the "historic cost data for similar projects," if any, used by DEP in developing the Preliminary Estimated Upgrade Charge. As part of your response, identify the project(s) for which such data was acquired and the period during which the upgrades for such project(s) were constructed.

Response:

The creation of the "SIS Estimation Tool Rev0" tool originated in work order designs created in the late 1990's or early 2000's for general distribution work. Sometime between 2000 and 2005, the work orders were converted to the Work Management Information System (WMIS) and the format of the "SIS Estimation Tool Rev0" tool was developed. Work orders were created in WMIS on various types of construction needed to complete System Improvement projects. The work orders were based upon generic work orders historically and were initially refreshed annually through a labor intensive manual process. Each year, if a new type of System Upgrade was needed, a new work order would be created to cover the need. These work orders correspond to "historic cost data for similar projects" referenced in DEP's Answer.

In recent years, an adjustment factor was added to the SIS Estimation Tool Rev0 to increase labor costs based experienced changes in labor expense. As more time passed between the latest revision of the estimates used to feed the tool and the application of the tool, a decision was made to increase the base labor factor to keep up with rising labor charges.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Neil Bhagat, Manager, Asset Management/Distributed Generation; Jack McNeil, Director, Asset Management Dmitri Moundous, Senior Engineer, Asset Management/Distributed Generation

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Williams Solar Data Request No. 1
Item No. 1-7
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

7. Describe in detail DEP's efforts, if any, during the period from January 1, 2015, to the present, to update the cost data per line item type used to generate Preliminary Estimated Upgrade Charges. As part of your response, identify all documents evidencing or relating to such efforts.

Response:

DEP objects to the temporal scope of this request "from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "efforts…to update the cost data per line item type" prior to the date that Williams Solar submitted an Interconnection Request is not relevant to the issues raised in the Complaint, as such "efforts" do not impact the Preliminary Estimate Upgrade Charge for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

The cost data per line item values were not updated during the period January 1, 2015 through June 2019 for the SIS Estimation Tool Rev0. The updated System Impact Study cost estimation tool, "SIS Estimation Tool Rev1, was created in June 2019 as discussed in the Company's response to Data Request No. 1-8. Also in June 2019, however, after a number of generator interconnection Final Accounting Report ("FAR") true ups were completed, DEP determined that the SIS Estimation Tool Rev 1 needed to have an additional contingency factor of 2.0 added to more accurately reflect the estimate of interconnection facilities and system upgrade costs.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Neil Bhagat, Manager, Asset Management/Distributed Generation; Jack McNeil, Director, Asset Management

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Williams Solar Data Request No. 1
Item No. 1-8
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

8. Describe, and provide the reason for, any change during the period January 1, 2015, to the present, to the procedure by which DEP generates estimates of the cost of system upgrades or interconnection facilities to be provided with system impact studies, including changes to any tool used to generate such estimates and changes to any assumptions made in generating those estimates. As part of your response, identify all documents evidencing any change identified in response to this interrogatory.

Response:

DEP objects to the temporal scope of this request "during the period January 1, 2015, to the present" as overbroad, unduly burdensome, and because any "change…to the procedure by which DEP generates estimates of the cost of system upgrades or interconnection facilities" made prior to the date that Williams Solar submitted an Interconnection Request to DEP is not relevant to the procedures employed by DEP to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

As explained in the Company's response to Request Nos. 1-3 and 1-7, DEP first updated the Facility Study cost estimation process and afterwards updated the System Impact Study cost estimation process in June of 2019, creating the SIS Estimation Tool Rev1. DEP did not modify the procedure or tools used for estimating System Impact Study costs during the period 2015 throughout June 2019. Over the last few years, DEP has adjusted labor, equipment and material values to account for increasing costs. However, there has been no changes in the procedure by which DEP generated estimates of the cost of system upgrades or interconnection facilities to be provided with system impact studies. The provided documents labeled "SIS Estimation Tool Rev0" and "SIS Estimation Tool Rev1" reflect the adjustment in costs and are provided in response to Document Request No. 5. SIS Estimation Tool Rev0 was the original tool used by DEP engineers to estimate internal work. The SIS Estimation Tool Rev1 was created from Rev0 in June 2019 for interconnection projects.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Neil Bhagat, Manager, Asset Management/Distributed Generation; Jack McNeil, Director, Asset Management Dmitri Moundous, Senior Engineer, Asset Management/Distributed Generation

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Williams Solar Data Request No. 1
Item No. 1-9
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

9. For the period 2015 to the present, describe any difference between DEP's process for estimating costs of constructing upgrades necessary for interconnection of independent generation (i.e., PURPA qualified facilities) and DEP's process for estimating DEP's own construction costs (i.e., for system modifications including for interconnection of DEP's own generation facilities or other system modifications undertaken by DEP), including, without limitation, (a) identifying any difference in the estimation of the cost of parts, labor, and overheads; and (b) identifying any difference in the actual cost of parts, labor, overheads, and labor rates for such projects.

Response:

DEP objects to the temporal scope of this request "for the period January 1, 2015 to the present" as overbroad, unduly burdensome and because "any difference between DEP's process for estimating costs of constructing upgrades necessary for interconnection of independent generation (i.e., PURPA qualified facilities) and DEP's process for estimating DEP's own construction costs (i.e., for system modifications including for interconnection of DEP's own generation facilities or other system modifications undertaken by DEP)," having occurred prior to the date that Williams Solar submitted its Interconnection Request to DEP is not relevant and outside the scope of this proceeding, as such differences have no effect on the procedures employed by DEP to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

DEP utilizes the same design and cost estimating process (use of Maximo and common design standards) for all Distribution construction projects that is used for estimating costs of construction upgrades necessary for interconnection of independent generation (i.e. PURPA qualifying facilities) and DEP's own construction costs (i.e., for system modifications including for interconnection of DEP's own generation facilities or for customer addition, reliability improvement or other system modifications undertaken by DEP). Specifically, DEP utilizes Maximo for both independent generation and DEP-owned projects, as further described in the Company's response to Data Request No. 1-3. However, as described in DEP's response to Request No. 1-3, DEP has also integrated a generator interconnection-specific Revised

Estimating Tool as part of the Facilities Study process. A similar mechanism is utilized for NCDOT requested relocations, in which a Maximo design estimate is run through a secondary estimating tool that was developed based on actual costs experienced for NCDOT requested projects.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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Williams Solar Data Request No. 1
Item No. 1-10
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

10. Describe DEP's efforts, if any, during the period from January 1, 2015, to the present, to update the cost data used to generate internal estimates of the costs of DEP's own upgrades of or modifications to the distribution system or transmission system. As part of your response, identify all documents evidencing or relating to such efforts.

Response:

DEP objects to the temporal scope of this request "during the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "efforts [to] update the cost data" prior to the date that Williams Solar submitted its Interconnection Request to DEP is not relevant and outside the scope of this proceeding, as such efforts did not impact the procedures DEP employed to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

As noted in the Company's response to Data Request No. 1-3, Duke's cost estimates to perform overhead distribution system construction work, including generator interconnection-related work, are based on the following: direct material costs, material overheads, direct labor costs, and labor overheads. Note there is no difference in the cost data used for DEP's internal estimates of its own upgrades as compared to the cost data used for generator interconnection upgrades.

Since the implementation of Maximo in November 2017, material costs are tracked internally and shared within the different applications of Maximo on a near real-time basis. Material costs for design estimates are based on system average cost for each item number, based on purchase and transaction history for each item, at the time when the estimate is performed. In addition to these direct material costs, the system then adds an overhead percentage, which is calculated on an annual basis by Duke's Finance department to represent the stores and handling costs associated with internal Supply Chain processes.

Labor cost is calculated based on a summation of all the labor hours associated with the compatible units included on the design, the type(s) of construction resource (overhead, underground, etc.) required to perform the work, and the system average hourly labor rate associated with the type(s) of construction resources required. As with material costs, there is also a labor overhead percentage that is applied to the labor cost and represents the engineering, administrative and management costs associated with support of the direct construction work. Both the hourly labor rates and the labor overhead percentages are calculated on an annual basis by Duke's Finance department.

When reviewing the recent history (3-5 years) of cost estimates produced by the systems as described above, material costs have been reasonably accurate (when comparing estimated to actual costs) and consistent in terms of year over year changes. However, when comparing Duke's historical experience for labor costs, actual labor costs have exceeded estimated labor costs. In response, Duke took the following steps in Fall 2019 to develop more accuracy in labor cost estimating within Maximo:

- Detailed analysis of the labor hours included in commonly used compatible units
- Detailed analysis of how weighted hourly labor cost is calculated.

Based on the analysis of labor hours associated with compatible units in DEP, it was determined that the number of manhours associated with common tasks such as installing poles, transformers and line hardware were too low. This determination was based on comparison of these tasks against both Construction SME input and unit-based contract rates. Increases are attributed to new safety work practices that have been implemented over the past several years. As a result, labor manhours were increased on the compatible units such that it represented an approximately 20% increase to the time necessary to perform typical overhead distribution construction work.

In addition to the labor hours associated with tasks, the calculation of hourly labor rates used for cost estimating in Maximo was also reviewed. Historically, cost estimates had been produced based on an internal (Duke Energy employee) labor assumption. Over time, labor costs for contracted labor have increased to the point that they are higher than Duke internal rates, but this input had not previously been considered within Maximo. A new formula was developed to create a weighted average manhour rate for use in Maximo that reflected the balance of internal and external labor used in each jurisdiction. This update resulted in a ~15% increase to the hourly manhour rate used and is reflected in the graph in response to Request No. 21.

The data updates described above became effective for cost estimates developed in Maximo starting in Q4 2019. These would not have had an impact on the development of cost estimates associated with cost estimates provided to Williams Solar.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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Williams Solar Data Request No. 1
Item No. 1-11
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

11. Describe in detail the process used to create the estimate of system upgrade charges provided to Williams Solar in connection with the Facility Study Report. As part of your response, identify (a) all individuals who participated or otherwise assisted in creating the estimate of system upgrade charges provided to Williams Solar in connection with the Facility Study Report and the role of and actions taken by such person; and (b) all documents or data reflecting or evidencing the estimate.

Response:

Please see DEP's responses to Data Request Nos. 1-3 and 1-9.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

Docket No. E-2, Sub 1220
Williams Solar Data Request No. 1
Item No. 1-12
Page 1 of 1

DUKE ENERGY PROGRESS, LLC

Request:

12. Describe DEP's efforts, if any, during the period from January 1, 2015, to the present, to update the cost data used to generate estimates of the cost of system upgrades or interconnection facilities to be provided with facilities study reports. As part of your response, identify all documents evidencing or relating to such efforts.

Response:

DEP objects to the temporal scope of this request "during the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "efforts . . . update the cost data used to generate estimates of the cost of system upgrades or interconnection facilities to be provided with facilities study reports" prior to the date that Williams Solar submitted its Interconnection Request to DEP is not relevant and outside the scope of this proceeding, as such efforts did not impact the procedures DEP employed to generate the cost of system upgrades or interconnection facilities provided for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Please see DEP's responses to Request Nos. 1-3 and 1-10.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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DUKE ENERGY PROGRESS, LLC

Request:

13. Describe any change during the period January 1, 2015, to the present, to the procedure by which DEP generates estimates of the cost of system upgrades or interconnection facilities to be provided with facilities study reports, including, without limitation, changes to any tool used to generate such estimates and changes to any assumptions made in generating those estimates. As part of your response, identify all documents evidencing any change identified in response to this interrogatory.

Response:

DEP objects to the temporal scope of this request "during the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "changes . . . to the procedure by which DEP generates estimates of the cost of system upgrades or interconnection facilities to be provided with facilities study reports" prior to the date that Williams Solar submitted its Interconnection Request to DEP is not relevant and outside the scope of this proceeding, as such efforts did not impact the procedures DEP employed to generate the cost of system upgrades or interconnection facilities provided for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Please see DEP's responses to Data Request Nos. 1-3 and 1-10.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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DUKE ENERGY PROGRESS, LLC

Request:

14. Describe in detail the investigation referred to at pages 4 and 5 of DEP's Answer and Motion to Dismiss and its conclusions, including, without limitation, identifying the date DEP determined an investigation was needed, the date the investigation began, the date the investigation concluded, all individuals who participated in the investigation and the role of and actions taken by each such person. As part of your response, identify all documents evidencing changes to the estimation process that were considered, proposed, recommended, or adopted by DEP as a result of the investigation, and all documents evidencing the conclusions DEP reached as a result of the investigation.

Response:

Please see DEP's response to Data Request No. 1-15.

Individuals who participated in the investigation and the role of and actions taken by such person:

(1) Gary Freeman

- *Department*: Interconnection Queue Management (DET Management)
- *Company Role:* General Manager, DET Renewable Integration and Operations (Retired from Duke Energy in Q1 2019)
- *Investigation Role:* In Q1 2018, Freeman directed DET Process, Governance, and Reporting Department employees (Donna Massengill and Beckton James) to further investigate observed discrepancies between estimated construction costs and actual construction costs for distribution interconnection projects coming online during Q4 2017.

(2) Ken Jennings

- *Department:* Interconnection Queue Management (DET Management)
- *Company Role:* General Manager, DET Renewable Integration and Operations (Assumed role after Freeman's retirement during Q1 2019)
- *Investigation Role:* In Q2 2019, Jennings reviewed and approved the updated cost estimate tool developed by James, Bhagat, and Andreasen for DEP and DEC distribution interconnection project facility studies. In Q3 2019, Jennings directed DET Management and DET Account Management to work with Distribution Planning and Distributed Generation to apply the updated cost estimate tool to DEP and DEC distribution interconnection projects in construction and subsequently provide updated cost estimate notices to these Interconnection Customers.

(3) Donna Massengill

- *Department:* DET Process, Governance, and Reporting (DET Governance & Process)
- *Company Role:* Manager, Renewable Energy Contracts & Process Governance
- *Investigation Role:* In Q1 2018, Massengill acted on direction received from Freeman to further investigate discrepancies between estimated construction costs and actual construction costs for distribution interconnection projects.

(4) Beckton James

- *Department*: DET Process, Governance, and Reporting (DET Governance & Process)
- *Company Role*: Senior Business and Technical Consultant
- *Investigation Role:* In Q1 2018, James assisted Massengill by compiling generation interconnection cost data to investigate discrepancies between estimated construction costs and actual construction costs for distribution interconnection projects. Also during this time, James began development on an initial version of an updated distribution system upgrade cost estimating tool based on cost data collected by James and Flowers during the final accounting process. The updated cost estimating tool was developed for potential use during distribution interconnection project facility studies conducted in DEP and DEC. In Q1 2019, James further developed and shared an early version of the updated cost estimate tool with the other departments referenced in this response. In Q2 2019, James worked with McNeil, Bhagat, and Andreasen to further develop, conduct final testing, and receive final approvals from the other departments for use of updated cost estimate tool for distribution interconnection project facility studies. In Q3 2019, James trained Distribution Planners on how to apply the updated cost estimate tool to provide distribution interconnection project costs for future facility study reports.

(5) Scott Jennings

- *Department:* Zone Operations CARs Coastal (Distribution Planning)
- *Company Role*: Director, CD Area Operations
- *Investigation Role:* In Q2 2019, Jennings directed Distribution Planners to use the updated cost estimate tool developed by James, McNeil, Bhagat and Andreasen for all DEP and DEC distribution interconnection project facility studies going forward. In Q3 2019, Jennings directed Distribution Planners to work with Distributed Generation and DET Account Management to apply the updated cost estimate tool to DEP and DEC distribution interconnection projects in construction.

(6) Jeff Riggins

- *Department:* Interconnection Queue Management (DET Management)
- *Company Role:* Director, Standard PPAs & Interconnects
- *Investigation Role:* In Q2 2019, Riggins reviewed and approved the updated cost estimate tool developed by James, Bhagat, and Andreasen for distribution interconnection project facility studies in DEP and DEC. In Q3 2019, Riggins directed DET Account Management to work with Distribution Planning and Distributed Generation to apply the updated cost estimate tool to DEP and DEC distribution interconnection projects in construction and subsequently provide updated cost estimate notices to this subset of projects.

(7) Scott Reynolds
- *Department*: Interconnection DEP (DET Account Management)
- *Company Role:* Manager, Interconnection PPA and Account Management
- *Investigation Role*: In Q2 2019, Reynolds reviewed and approved the updated cost estimate tool developed by James, Bhagat, and Andreasen for distribution interconnection project facility studies in DEP. In Q3 2019, Reynolds directed DEP Account Management to work with Distribution Planning and Distributed Generation to apply the updated cost estimate tool to DEP distribution interconnection projects in construction and subsequently provide updated cost estimate notices to this subset of projects

(8) George Flowers
- *Department:* Interconnection DEP (DET Account Management)
- *Company Role:* Renewable Contract Analyst
- Investigation Role: In Q3 2019, Flowers acted on direction received from Reynolds to work with Distribution Planning and Distributed Generation to apply the updated cost estimate tool to DEP distribution interconnection projects in construction. In Q4 2019, Flowers acted on direction received from Reynolds to provide updated cost estimate notices to this subset of projects

(9) Jack McNeil
- *Department:* Major Projects CARs (Distribution Management)
- *Company Role:* Director, Asset Management
- *Investigation Role*: In Q1 2019, McNeil reviewed an early version of James' updated cost estimate tool based on cost data collected by James and Flowers from previously prepared and delivered final accounting reports. In Q2 2019, McNeil directed Bhagat to assist James with development and subsequent adoption of the updated cost estimate tool for distribution interconnection project facility studies in DEP and DEC. Later in Q2 2019, McNeil reviewed and approved the updated cost estimate tool developed by James, Bhagat, and Andreasen for distribution interconnection project facility studies in DEP and DEC. In Q3 2019, McNeil directed Distributed Generation to work with Distribution Planning, DET Management, and DET Account Management to apply the updated cost estimate tool to DEP and DEC distribution interconnection projects in construction.

(10) Neil Bhagat
- *Department:* Asset Management CARs East (Distributed Generation)
- *Company Role:* Manager, Asset Management
- *Investigation Role:* In Q1 2019, Bhagat reviewed an early version of James' updated cost estimate tool based on cost data collected by James and Flowers from previously prepared and delivered final accounting reports. In Q2 2019, Bhagat acted on direction received from McNeil to assist James with development and subsequent adoption of the updated cost estimate tool for distribution interconnection project facility studies in DEP and DEC. At this same time, Bhagat directed Andreasen to also assist James with development and subsequent adoption of the updated cost estimate tool for distribution interconnection project facility studies in DEP and DEC. In Q3 2019, Bhagat acted on direction received from McNeil to work with Andreasen, Distribution Planning, DET

Management, and DET Account Management to apply the updated cost estimate tool to DEP and DEC distribution interconnection projects in construction.

(11) Jack Andreasen

- *Department:* Reliability Eng Car DG (Distributed Generation)
- *Company Role:* Engineering Design Associate
- *Investigation Role:* In Q2 2019, Andreasen acted on direction received from Bhagat to assist James with development and subsequent adoption of the updated cost estimate tool for distribution interconnection project facility studies in DEP and DEC. In Q3 2019, Andreasen trained Distribution Planners on how to apply the updated cost estimate tool to distribution interconnection project facility study results. In Q3 2019, Andresen acted on direction received from McNeil and worked with Bhagat, Distribution Planning, DET Management, and DET Account Management to apply the updated cost estimate tool to DEP and DEC distribution interconnection projects in construction.

Sponsor: George Flowers, Renewable Contract Analyst, Interconnection DEP; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

DUKE ENERGY PROGRESS, LLC

Request:

15. Identify all actions taken by DEP during the period January 1, 2015, to the present, which support DEP's contention that "it has proactively sought to update its cost estimating methodology to better reflect actual costs." Include in this response identification of any events or meetings with third parties you participated in relating to your efforts to update your cost estimating methodology.

Response:

DEP objects to the temporal scope of this request for "all actions taken by DEP during the period January 1, 2015, to the present" as overbroad, unduly burdensome and because actions taken by DEP prior to the date that Williams Solar submitted its Interconnection Request are not relevant and outside the scope of this proceeding, to address the cost estimating methodology and procedures employed by DEP to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Q1 2018

In Q1 2018, DET Management directed DET Process to further investigate observed discrepancies between estimated construction costs and actual construction costs for distribution interconnection projects coming online during Q4 2017.

Q2 – Q3 2018

DET Management, DET Governance & Process, DET Account Management held meetings to review additional evidenced differences between estimated construction costs listed in project IAs and actual construction costs.

Q4 2018

DET Governance & Process began to explore improvements to existing estimate tools utilized for estimates provided prior to construction.

<u>Q1 2019</u>

DET Governance & Process review potential updates to the cost estimate tool with Distribution Management and Distributed Generation. The tool was developed for use during the facility study phase of the interconnection study process for DEP and DEC distribution projects going forward. The updated cost estimate tool applied a multivariate analysis to accounting data documenting cost differences between estimates and actuals for 100+ vintage 2015-2018 commercially operating distribution interconnection projects in DEP and DEC.

<u>Q2 2019</u>

DET Governance & Process and Distributed Generation performed final tests and began receiving necessary internal approvals to utilize the updated cost estimate tool for distribution project facility studies in DEP and DEC.

<u>Q3 2019</u>

DET Governance & Process and Distributed Generation received final approvals and instruction from Distribution Management to ensure that the updated cost estimate tool was utilized for all interconnection facility studies conducted in DEP and DEC for distribution projects going forward. After DET Governance & Process and Distributed Generation trained Distribution planners on how to use the updated cost estimate tool, the planners began to use the updated cost estimate tool for all distribution project facility studies in DEP (starting July 30, 2019) and DEC (starting August 2, 2019).

Shortly after the updated cost estimate tool was approved for use during the facility study phase of the interconnection process for DEP and DEC distribution projects, DET Governance & Process, DET Management, Distribution Management, and Distributed Generation collected pertinent study and cost data for DEP and DEC distribution projects in construction and applied the updated cost estimate tool to those projects.

<u>Q4 2019</u>

After applying the updated cost estimate tool to pertinent study and cost data for DEP and DEC distribution projects in construction, DET Governance & Process, DET Management, DET Account Management, Distribution Management, Distribution Planning, and Distributed Generation coordinated efforts to deliver updated cost estimate notices to those projects.

<u>Q1 2020</u>

DET continues to actively monitor and assess estimated and actual costs for scopes of work involved in constructing distribution generator interconnection projects.

<u>Sponsor:</u> George Flowers, Renewable Contract Analyst, Interconnection DEP, Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

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DUKE ENERGY PROGRESS, LLC

Request:

16. Identify in detail the specific source(s) of the increase in the estimate of Williams Solar's System Upgrade costs from the system impact study to the facilities study. As part of your response, identify all documents evidencing or relating to the specific increases in the estimate of Williams Solar's System Upgrade costs from the system impact study to the facilities study.

Response:

Please see DEP's response to Request Nos. 1-1 and 1-2.

Sponsor: Neil Bhagat, Manager, Asset Management/Distributed Generation, Duke Energy/ Beckton James, Senior Business and Technical Consultant, Duke Energy

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DUKE ENERGY PROGRESS, LLC

Request:

17. For each interconnection request for which DEP has provided a revised estimate of system upgrade and/or interconnection facilities costs since January 1, 2019, please identify (a) the date of the initial estimate; (b) the amount of such costs initially estimated; (c) the date of the revised estimate; (d) the amount of the revised estimate; (e) the date of the system impact study for such project; (f) the date of the facilities study for such project; and (g) the date DEP offered an interconnection agreement for such project.

Response:

Please see the file labeled "CONFIDENTIAL DR No. 1-17 Williams Solar.xls," provided in response to Request for Production No. 1-1.

DEP will produce this information subject to a mutually-agreeable confidentiality agreement between DEP and Williams Solar. DEP has redacted all Interconnection Customer-identifiable information as confidential and/or proprietary and not subject to disclosure under the North Carolina Interconnection Procedures.

Sponsor: George Flowers, Contract Analyst, Interconnection DEP, Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Beckton James, Senior Business and Technical Consultant, Duke Energy; Scott Jennings, Director, Customer Delivery Area Operations; Brian Dale, Engineer III, Asset Management Distributed Generation

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DUKE ENERGY PROGRESS, LLC

Request:

18. State whether DEP generated any estimate of the costs of the system upgrades or interconnection facilities for Williams Solar's interconnection request that was not provided to Williams Solar (including, without limitation, any DEP-internal estimate), and, if so, identify the date of the estimate and the amount of the estimate. As part of your response, identify all documents evidencing or relating to such estimate.

Response:

During the Facilities Study process, DEP developed multiple preliminary iterations of cost estimates prior to a final estimate being provided to Williams Solar. These iterations were based on design review feedback and clarification on protective device design requirements and were immaterial (~1% change) to the final cost estimate provided to Williams Solar in Facilities Study. There were not any scope changes of material significance identified at any time during the Facilities Study design process.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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DUKE ENERGY PROGRESS, LLC

Request:

19. For the Williams Solar System Impact Study and for every document produced in response to Document Request 8, describe in detail the meaning, derivation, and purpose of the phrase “ihateyou” as it relates to that document. As part of this response, identify the person who created the document and their position with the company.

Response:

This phrase was generated by an external contractor at Pike Engineering, who at the time was conducting the Williams Solar DER interconnection study for Duke Energy. Duke Energy has communicated the inappropriate and unprofessional nature of the filename to management at Pike Engineering, who is investigating the incident. Pike Engineering has advised that the individual responsible for the file name is no longer working on projects related to DEP distributed generation interconnection studies.

Sponsor: Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP, Neil Bhagat, Manager, Asset Management/Distributed Generation

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DUKE ENERGY PROGRESS, LLC

Request:

20. For the period from January 1, 2015 to the present, provide a trend comparison of line-item cost assumptions by quarter for each type listed in the Williams Solar system upgrades and interconnection facilities estimates.

Response:

DEP objects to this request on the grounds that it requires DEP to perform original work and requests information not readily attainable as DEP does not generate in the ordinary course "a trend comparison of line-item cost assumptions by quarter for each type listed in the Williams Solar system upgrades and interconnection facilities estimates."

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Trending of material related costs are not available, as these are updated in real time throughout the year based on system average costs driven by purchases and other supply chain transactions. Trending of labor rates and labor overheads is supplied in response to Data Request Nos. 21 and 22.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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DUKE ENERGY PROGRESS, LLC

Request:

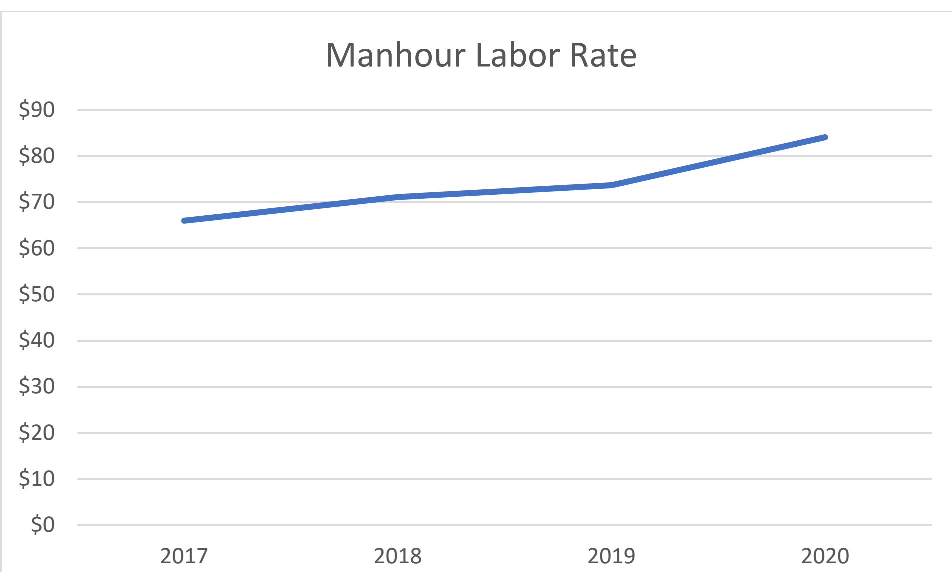
21. For the period from January 1, 2015 to the present, provide a trend comparison of labor cost assumptions for each type of cost listed in the Williams Solar system upgrades and interconnection facilities estimates.

Response:

DEP objects to the temporal scope of this request for information "from January 1, 2015 to the present" and further objects on the grounds that it requires DEP to perform original work and requests information not readily attainable as DEP does not generate in the ordinary course "a trend comparison of cost assumptions for each type of cost listed in the Williams Solar system upgrades and interconnection facilities estimates."

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Due to change in work management systems, data is only available for 2017 forward. Labor cost is estimated using a standard rate in Maximo which reflects a weighted average manhour cost for labor and equipment to perform overhead construction work.



Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

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DUKE ENERGY PROGRESS, LLC

Request:

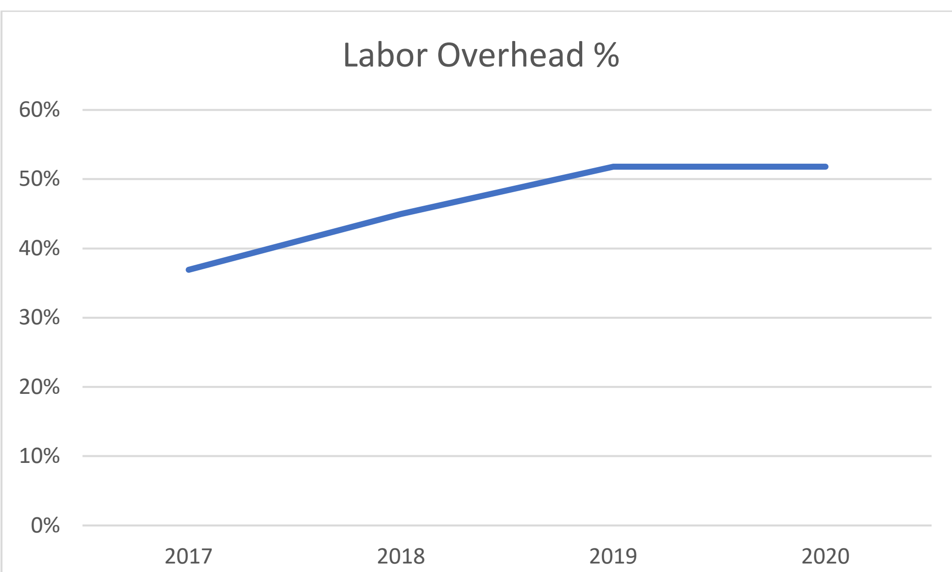
22. For the period from January 1, 2015 to the present, provide a trend comparison of overhead allocation cost assumptions per quarter.

Response:

DEP objects to the temporal scope of this request for information "from January 1, 2015 to the present" and further objects on the grounds that it requires DEP to perform original work and requests information not readily attainable as DEP does not generate, or have any obligation to generate, "a trend comparison of overhead cost assumptions per quarter."

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Due to change in work management systems, data is only available for 2017 forward. Labor overheads are estimated as a fixed percentage associated to the manhour labor rate, and are calculated by the Duke Finance organization on an annual basis. The source file associated with the below graph as well as the graph provided in response to Data Request No. 1-21 is provided in response to Request for Production No. 1-1, labeled "DR No. 1-22 and 1-23 MaximoLaborRates_Historical.xls"



<u>Sponsor</u>: Scott Jennings, Director, Customer Delivery Area Operations

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DUKE ENERGY PROGRESS, LLC

Request:

23. For the period from January 1, 2015 to the present, provide an organization chart and any changes over time for the department(s) responsible for estimating costs for standard offer projects interconnected in distribution system.

Response:

DEP objects to the temporal scope of this request for information "the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "organization chart and any changes over time for the department(s) responsible for estimating costs for standard offer projects interconnected in distribution system" prior to the date that Williams Solar submitted its Interconnection Request to DEP is not relevant and outside the scope of this proceeding, as such efforts did not impact the procedures DEP employed to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

Please see the documents labeled "DR No. 1-23 DET Org 2015 to 2020.xlsx" and "DR No. 1-23 Org 1-1-2020" provided in response to Request for Production No. 1-1.

Sponsor: Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

1. Produce all documents and data identified in response to the foregoing interrogatories.

Response:

Duke objects to Complainant's request for the production of "all documents and data" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of this Response are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-1" on the FTP site in response to this request.

Sponsor: See interrogatories.

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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

2. Produce all documents and data generated in the process of creating the Preliminary Estimated Upgrade Charge for Williams Solar.

Response:

Duke objects to Complainant's request for the production of "all documents and data" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify Company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-2" on the FTP site in response to this request.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Neil Bhagat, Manager, Asset Management/Distributed Generation

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

3. Produce all documents and data generated in the process of creating the System Upgrades and Interconnection Facilities costs for Williams Solar.

Response:

Duke objects to Complainant's request for the production of "all documents and data" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents provided in response to Request for Production No. 1-2 in response to this request.

Sponsor: Beckton James, Senior Business and Technical Consultant, Duke Energy; Scott Jennings, Director, Customer Delivery Area Operations; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

4. Produce all documents and data (including, without limitation, communications, reports, and presentations) evidencing, reflecting, or discussing the investigation referred to in DEP's Answer and Motion to Dismiss.

Response:

Duke objects to Complainant's request for the production of "all documents and data" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-4" on the FTP site in response to this request.

Sponsor: Beckton James, Senior Business and Technical Consultant, Duke Energy; Neil Bhagat, Manager, Asset Management/Distributed Generation, Duke Energy; George Flowers, Account Manager, Interconnection; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Jeff Riggins, Director, Standard PPAs & Interconnects; Donna Massengill, Manager, Renewable Energy Contracts & Process Governance.

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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

5. Produce all documents evidencing any written policy, guidelines, procedures, or methodologies of DEP in effect during the period January 1, 2015 to the present, relating to the generation of estimated costs for system upgrades or interconnection facilities in connection with system impact studies.

Response:

Duke objects to Complainant's request for the production of "all documents" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP further objects to the temporal scope of this request for "all documents evidencing any written policy, guidelines, procedures, or methodologies of DEP in effect during the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "written policy, guidelines, procedures, or methodologies of DEP in effect" prior to the date that Williams Solar submitted its Interconnection Request to DEP are not relevant and outside the scope of this proceeding, as such policies and procedures did not impact the procedures DEP employed to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-5" on the FTP site in response to this request.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Neil Bhagat, Manager, Asset Management/Distributed Generation; Jack McNeil, Director, Asset Management; Dmitri Moundous, Senior Engineer, Asset Management/Distributed Generation

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

6. Produce all documents evidencing any written policy, guidelines, procedures, or methodologies of DEP in effect during the period January 1, 2015 to the present, relating to the generation of estimated costs for system upgrades or interconnection facilities in connection with a facilities study, including, without limitation, any policy, guideline, procedure, or methodology regarding the use of Maximo in producing such estimates.

Response:

Duke objects to Complainant's request for the production of "all documents" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP further objects to the temporal scope of this request for "all documents evidencing any written policy, guidelines, procedures, or methodologies of DEP in effect during the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "written policy, guidelines, procedures, or methodologies of DEP in effect" prior to the date that Williams Solar submitted its Interconnection Request to DEP are not relevant and outside the scope of this proceeding, as such policies and procedures did not impact the procedures DEP employed to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-6" on the FTP site in response to this request.

Sponsors: Scott Jennings, Director, Customer Delivery Area Operations; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Beckton James, Senior Business and Technical Consultant

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

7. Produce all documents evidencing any written policy, guidelines, procedures, or methodologies of DEP in effect during the period January 1, 2015 to the present, relating to the generation of estimated costs for system upgrades or interconnection facilities in connection with interconnection requests other than the estimated costs provided to interconnection customers.

Response:

Duke objects to Complainant's request for the production of "all documents" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP further objects to the temporal scope of this request for "all documents evidencing any written policy, guidelines, procedures, or methodologies of DEP in effect during the period from January 1, 2015, to the present" as overbroad, unduly burdensome and because DEP's "written policy, guidelines, procedures, or methodologies of DEP in effect" prior to the date that Williams Solar submitted its Interconnection Request to DEP are not relevant and outside the scope of this proceeding, as such policies and procedures did not impact the procedures DEP employed to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see documents produced in response to Request for Production No. 1-6.

Sponsors: Scott Jennings, Director, Customer Delivery Area Operations; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Beckton James, Senior Business and Technical Consultant

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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

8. For the period from January 1, 2015 to the present, produce all documents in any format containing the phrase "ihateyou" (without the quotation marks) in the file name or in any other metadata field. For each document produced, include all reasonably accessible metadata including, without limitation, the date sent, date received, author, and recipients.

Response:

Duke objects to Complainant's request for the production of "all documents" for the reasons more fully stated in in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP further objects to the temporal scope of this request for all documents "for the period from January 1, 2015 to the present" as overbroad, unduly burdensome and because this information is not relevant and outside the scope of this proceeding, as any such documents did not impact the procedures DEP employed to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP refers Williams Solar to the Company's Response to Request No. 1-19.

Sponsor: Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Neil Bhagat, Manager, Asset Management/Distributed Generation

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Item No. 1-9
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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

9. For the period from January 1, 2015 to the present, produce all system upgrade and interconnection facility cost estimates for distribution interconnection projects, including, without limitation, all initial cost estimates, final estimates, and final invoices for completed work.

Response:

Duke objects to Complainant's request for the production of "all documents" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP objects to the temporal scope of this request for all documents for "the period from January 1, 2015, to the present" as overbroad, unduly burdensome and further objects because "all system upgrade and interconnection facility cost estimates for distribution interconnection projects, including, without limitation, all initial cost estimates, final estimates, and final invoices for completed work" for other Interconnection Customers are proprietary to such other Interconnection Customers and not relevant to the system upgrades or interconnection facilities cost estimates for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the document labeled "CONFIDENTIAL DEP Final Accounting Report Tracker Q3 2018-Current," in the folder labeled RFP No. 1-9 on the FTP site, which provides a summary of cost estimates and actual costs for those DEP projects that received a FAR.

DEP will produce this information subject to a mutually-agreeable confidentiality agreement between DEP and Williams Solar. DEP has redacted all Interconnection Customer-identifiable information as confidential and/or proprietary and not subject to disclosure under the North Carolina Interconnection Procedures.

Sponsor: George Flowers, Account Manager, Interconnection; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Beckton James, Senior Business and Technical Consultant, Duke Energy; Beckton James, Senior Business and Technical Consultant, Duke Energy; Scott Jennings, Director, Customer Delivery Area Operations

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Williams Solar RFP No. 1
Item No. 1-10
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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

10. Produce all contracts for construction of interconnection facilities and system upgrades for the period January 1, 2015.

Response:

Duke objects to Complainant's request for the production of "all contracts" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP objects to the temporal scope of this request for all documents for "the period from January 1, 2015" as vague, overbroad, unduly burdensome and further objects because "all construction contracts" unduly vague and ambiguous.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

DEP's master construction agreements require notice and consent to produce these Agreements. DEP is in the process of obtaining consent and anticipates supplementing this Response to produce these agreements on or before February 28, 2020. Production of these agreements shall also be subject to execution of a mutually-agreeable confidentiality agreement between DEP and Williams Solar.

Sponsor: Genevieve Bestercy, Sourcing Specialist, Transmission and Generation Grid Solutions Labor and EPC

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Williams Solar RFP No. 1
Item No. 1-11
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DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

11. Produce all Williams Solar comments and communication history within Salesforce (or other data/document collection IT system) used to control data/document records, coordination, email history, etc. generated or received by Duke within the study process.

Response:

Duke objects to Complainant's request for the production of "all Williams Solar comments and communication history" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-11" on the FTP site in response to this request.

Sponsor: George Flowers, Account Manager, Interconnection; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

Dated: February 21, 2020.

/s/E. Brett Breitschwerdt
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Attorneys for Duke Energy Progress, LLC

CERTIFICATE OF SERVICE

There undersigned, of the law firm McGuireWoods LLP, hereby certifies that he has served a copy of the foregoing *Duke Energy Progress, LLC Responses to Williams Solar, LLC's First Data Request* via electronic mail to:

Marcus Trathen
Eric M. David
Brooks, Pierce , McLendon, Humphrey, & Leonard LLP
Suite 1700, Wells Fargo Capitol Center
150 Fayetteville Street
P.O. Box 1800 (zip 27602)
Raleigh NC 27610

This the 21st day of February, 2020.

/s/E. Brett Breitschwerdt
E. Brett Breitschwerdt
McGuireWoods LLP
501 Fayetteville Street, Suite 500
PO Box 27507 (27611)
Raleigh, North Carolina 27601
Telephone: (919) 755-6563
bbreitschwerdt@mcguirewoods.com

Attorney for Duke Energy Progress, LLC

Docket No. E-2, Sub 1220

Exhibit CEB-7

Duke Energy Progress, LLC's, Supplemental Responses to Complainant's First Set of Interrogatories and Requests for Production of Documents

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Williams Solar Data Request No. 1
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DUKE ENERGY PROGRESS, LLC

Request:

1. Provide the entire basis for DEP's initial estimate of $774,000, including, without limitation, an itemization of all costs included in that estimate and any overhead amounts assumed in that estimate. As part of your response, identify all documents evidencing or relating to the estimate.

Response:

Each generator interconnection project's preliminary estimated upgrade cost projections developed by DEP in the System Impact Study are calculated based on a standardized template cost estimation tool, SIS Estimate Tool Rev1, as further discussed in the Company's response to Williams Solar's Request Nos. 1-7 and 1-8. The SIS Estimate Rev1 is the most updated version of the SIS Estimate Tool Rev0. Further explanation of the process DEP uses to estimate costs is provided in DEP's response to Data Request No. 1-3.

The System Modifications project file used to generate preliminary estimated upgrade costs for Williams Solar is being produced in response to Request for Production No. 1-2, and is labeled "Williams Solar Estimation Tool SIS.xls." Labor, materials, and overhead are included in the $774,000 estimate based on work management data available as of the issuance date of the System Impact Study report for Williams Solar.

Sponsor: Neil Bhagat, Manager, Asset Management/Distributed Generation, Duke Energy

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP clarifies its initial Response to confirm that the System Impact Study estimated costs delivered to Williams Solar were generated using SIS Estimation Tool Rev0, more specifically a template called "SIS Estimation Tool Rev0.1." In response to Williams Solar's question regarding the Williams Solar System Impact Study files produced in Request for Production No. 1-2 resembling the Rev1 file and not the Rev0 file, cosmetic changes were made to "SIS Estimation Tool Rev0" by Pike Engineering to make the spreadsheet more user friendly. These can be seen in the spreadsheet template titled "SIS Estimation Tool Rev0.1" now being produced in response to Request for Production No. 1-2

(Supplemental). The adjustment factors and line item costs are unchanged from those represented in “SIS Estimation Tool Rev0.” The “SIS Estimation Tool Rev0.1” file is the template used to create the Williams Solar System Impact Study estimate as well as all other distribution System Impact Study estimates from 2016 to June 2019. DEP is also providing additional explanation of the System Impact Study files produced in a supplemental response to Request for Production No. 1-2.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation

DUKE ENERGY PROGRESS, LLC

Request:

3. With respect to the cost data relied upon by DEP in generating cost estimates for interconnection customers, state (a) how the cost data were estimated, (b) who performed the estimation, and (c) whether they reflect competitive bidding prices for parts, equipment, and labor.

Response:

Generator Interconnection cost estimates are generated in two phases corresponding to the System Impact Study and Facilities Study processes:

First, the System Impact Study estimated cost are based on reviewing the upgrades identified in the System Impact Study Report with the existing conditions and any current proposed non-DER upgrades in the DEP Graphical Information System (GIS) and a per mile cost estimation sheet. The SIS Estimation Tool Rev0 (which is being produced in DEP's response to Request for Production of Documents No. 5), has typical system upgrade project cost estimates on a per mile basis. These estimated cost data inputs to the cost estimate sheet were developed by the Capacity Planning Department based on overhead distribution line construction completed in DEP on a per mile cost basis. This cost estimation sheet is utilized to estimate costs for both internal overhead distribution line construction projects, as well as System Impact Study estimates for generator interconnections. The Capacity Planning Department also more recently developed the SIS Estimation Tool Rev0 based on completed projects. The cost data relied upon by DEP in generating cost estimates in the cost estimate tool is based upon the following categories of procured costs:

a. Overhead Contractors (Labor/Equipment) – The contractors completing those projects were selected on a competitive basis and were required to satisfy DEP's qualifications including safety, construction quality, presence in our region, ability to scale, cost and other factors.
b. Material/Parts – Duke obtains competitive pricing for material purchases and performs a technical and commercial evaluation to determine the best overall evaluated pricing to select an approved supplier or in many cases multiple suppliers. Duke periodically reviews market conditions to assess indices relative to raw material cost and perform cost modeling for approved price adjustments.
c. Engineering Labor - Pike Engineering is an engineering contractor for both Duke Energy Progress and Duke Energy Carolinas. Their rates for engineering labor were competitively bid.

Second, the detailed cost estimate provided in the Facilities Study is developed by Duke's Major Projects design organization, either by a Duke Energy Engineering Technologist, or by an offsite contract engineering partner such as Pike Engineering, with final review by a Duke Energy Engineering Technologist. This design process is completed in Maximo, which is used in conjunction with a MicroStation based graphical design tool, Bentley Open Utilities Designer (BOUD), for the development of schedulable tasks, bills of material, and cost estimates. This process is used for all types of Distribution construction work, including Customer Additions, Capital Maintenance, System Improvements, as well as generator interconnections. Compatible units are used as the basis for the design process, specifically for purposes of developing an estimate of the materials and labor hours required to perform the scope of work for a given design.

DEP began using the Maximo and BOUD tools for work order design and estimation in November 2017. Prior to this date, DEP used a similar system called Work Management Information System (WMIS), developed by CGI, for the same purposes. WMIS also utilized a compatible unit process in order to develop estimates of material and labor hours.

In both systems, the process of using compatible units to develop the design and cost estimate involves selection of compatible units, which represent the scope of work being performed. The compatible unit library used in both systems contained a combination of material only compatible units, labor only compatible units, and combination material/labor compatible units. The selection process for compatible units is based on the currently published Distribution Standards manual, which specifies the materials and equipment used for approved styles of installations.

Most compatible units on a design are associated with primary material items used, such as poles, conductor, switches, etc. Each of these compatible units captures what material item numbers and how many labor hours are required to perform the work associated with the compatible unit. Material only compatible units are less common, and associated with minor items such as hardware and connectors in which the labor hours are associated with a higher-level compatible unit. Finally, labor only compatible units are added to a design to capture anticipated labor time that is not reflected in a material only compatible units. Examples of labor-only compatible units are hand digging for poles or anchors, transferring conductor, and laying wire out for reconductors.

In addition to the material and labor compatible units noted above, designers have an opportunity to include "cost adder" compatible units to account for unique costs not associated with standard construction. Examples of when cost adder compatible units might be used are environmental permitting, controls and/or remediation, or other civil work such as asphalt/concrete removal or remediation.

Once a designer has tabulated the list of compatible units associated with a design for the given scope of work, they perform a step called "estimation" which calculates the total material and labor costs for the design. The design cost estimate is based on the following components: direct material costs, material overheads, direct labor costs, and labor overheads. Labor costs are described in more detail in the Company's responses to Request Nos. 1-4 and 1-10. Material costs are estimated based on near real-time system average costs. Duke obtains competitive pricing for material purchases and performs both a technical and commercial evaluation to determine the best overall evaluated pricing to select an approved supplier or in many cases multiple suppliers before executing contracts. Periodically, a review of market conditions is performed to assess indices relative to raw material cost and perform cost modeling for approved price adjustments.

Following development of the Maximo cost estimate, generator interconnection projects are then run through a secondary cost estimation tool, the Revised Estimating Tool ("RET"), which was developed to help provide more accurate cost to customers based on actual construction costs. A detailed explanation of this revised cost estimating tool, labeled "DR No. 1-3 Revised Estimating Tool Description – Williams Solar.doc," is being produced in Request for Production of Documents No. 1.

The RET updates the existing cost produced in Maximo to more accurately reflect total project costs Duke will likely incur from completion of Facilities Study through completion of interconnection-related project construction. The primary adjustments made by the RET are accounting for increased future costs by projecting inflation-impacted labor, material and equipment costs, modeling more likely resourcing and equipment requirements and adding a contingency factor for unforeseen events that have historically increased costs for generator interconnection projects.

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP clarifies its initial Response to explain that the document labeled "DR No. 1-3 Revised Estimating Tool Description – Williams Solar.doc," was not the actual System Impact Study output file created by Pike Engineering for Williams Solar. The actual System Impact Study output files were initially produced in response to Request for Production No. 1-2 and are further explained in DEP's Supplemental Response to Request for Production No. 1-2.

Further, the difference between the estimated Interconnection Facilities costs identified in "DR No. 1-3 Revised Estimating Tool Description – Williams Solar.doc" ($121,024) and the $196,495 identified in Williams Solar's System Impact Study Report are primarily attributable to metering, commissioning costs, overheads and taxes being separately identified in DR No. 1-3 Revised Estimating Tool Description – Williams Solar.doc but included in the total Interconnection Facilities cost figure of $196,495, as provided below. DEP has also determined that a minor discrepancy in flagging was incorrectly added in the Revised Estimating Tool calculation of Interconnection Facilities costs presented in DR No. 1-3 Revised Estimating Tool

Description – Williams Solar.doc. The Revised Estimating Tool Description should have shown $116,419 as a baseline Interconnection Facilities construction cost estimate.

The table below explains the difference between $116,419 and $196,495.

Item Description	Estimated Installed Cost
1. Estimated Construction cost	$116,419.10
2. Estimated Metering cost	$25,097.51
3. Standard Metering Cost Credit	$(306.21)
4. Subtotal of Estimated Interconnection Facilities	$141,210.40
5. Applicable NC Utility Sales Tax (7%) to Estimated Interconnection Facilities	$9,884.73
6. Overhead costs (processing, technology, oversight, management)	$20,000.00
7. Applicable NC Utility Sales Tax (7%) to Overhead Costs	$1,400.00
8. Subtotal of Taxable costs	$172,495.13
9. Estimated NC Advanced Energy Commissioning Costs (Average = $24,000)	$24,000.00
10. Estimated Total of Interconnection Costs	$196,495.13
11. Estimated Customer MFC (.4% Monthly Facilities Charge under the Contributory Plan) *7% NC Utility Sales Tax to be applied on invoice*	$564.84
12. Estimated Customer MFC (1.0% Monthly Facilities Charge under the Non-Contributory Plan) *7% NC Utility Sales Tax to be applied on invoice*	$1,412.10

Note also that the Revised Estimating Tool was not used to develop the SIS estimate provided to Williams Solar.

Finally, DEP clarifies its response to Request No. 1-3 to confirm that the Capacity Planning Department developed “SIS Estimation Tool Rev0” and provided it to Pike Engineering in 2015. This tool was created using completed distribution work orders completed prior to 2015. In June 2019, the Duke Energy Distributed Generation Team updated the spreadsheet to “SIS Estimation Tool Rev1.” This update was implemented to more accurately estimate system upgrade costs.

Sponsors: Brian Dale, Engineer III, Asset Management Distributed Generation; Beckton James, Senior Business and Technical Consultant, Duke Energy; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

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Williams Solar Data Request No. 1
Item No. 1-5
Page 1 of 2

DUKE ENERGY PROGRESS, LLC

Request:

5. Describe in detail the process used to create the Preliminary Estimated Upgrade Charge provided to Williams Solar. As part of your response, identify (a) all individuals who participated or otherwise assisted in creating the Preliminary Estimated Upgrade Charge provided to Williams Solar, LLC and the role of and actions taken by such person; and (b) all documents or data reflecting or evidencing the estimate.

Response:

A study engineer is responsible for creating the Preliminary Estimated Upgrade Charge for the System Impact Study Report. The study engineer reviewed the project under the DEP's System Impact Study evaluation process, which is described in a file labeled "System Impact Study SOP.pdf" being produced in DEP's response to Request for Production of Documents No. 5. Based upon this review, the study engineer then identified necessary upgrades required to safely and reliably interconnect the Williams Solar facility. The identified upgrades were then itemized and entered into the System Impact Study cost estimation spreadsheet by the study engineer, as further described in DEP's response to Data Request No. 1-3. Within the cost estimation spreadsheet, each upgrade was assigned a cost. The total upgrades cost was then calculated.

For Williams Solar, the study engineer responsible for developing the Preliminary Estimated Upgrade Charge included in the System Impact Study Report was a Pike Engineering Employee. Duke Energy Engineers review portions of the System Impact Study and provide approval for their department. Capacity Planner Alex Winslow reviewed the voltage and RVC study. Distribution Protection and Control engineer Andrew Kurczek (Pike Engineering) reviewed the protection study. The system upgrades necessary to safely and reliably interconnection the facility are identified through the voltage, RVC, and Protection studies. The two engineers mentioned above reviewed the accuracy of the study and confirmed the preliminarily-identified upgrades are needed, but do not estimate the cost for the identified system upgrades. The standardized cost estimation tool used to generate preliminary estimated upgrade costs for Williams Solar is further described in response to Request Nos. 1-1 and 1-3, and is being produced in response to Request for Production of Documents No. 5.

Sponsor: Neil Bhagat, Manager, Asset Management/Distributed Generation; Dmitri Moundous, Senior Engineer, Asset Management/Distributed Generation

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP clarifies its initial Response to identify the "Pike Engineering Employee" responsible for developing the Preliminary Estimated Upgrade Charge included in the System Impact Study Report. To the best of DEP's knowledge, the following Pike engineers worked on the Williams Solar Interconnection Request and contributed approximately 90% of the work to complete the Williams Solar System Impact Study.

Name (Last, First)
Wickstrom, Nikala
Anttila, Konsta
Willin, Wade
Garcia, Eduardo
Witherspoon, Jeffrey

Sponsor: Neil Bhagat, Manager, Asset Management/Distributed Generation, Brian Dale, Engineer III, Asset Management Distributed Generation

DUKE ENERGY PROGRESS, LLC

Request:

6. Identify by line item type the "historic cost data for similar projects," if any, used by DEP in developing the Preliminary Estimated Upgrade Charge. As part of your response, identify the project(s) for which such data was acquired and the period during which the upgrades for such project(s) were constructed.

Response:

The creation of the "SIS Estimation Tool Rev0" tool originated in work order designs created in the late 1990's or early 2000's for general distribution work. Sometime between 2000 and 2005, the work orders were converted to the Work Management Information System (WMIS) and the format of the "SIS Estimation Tool Rev0" tool was developed. Work orders were created in WMIS on various types of construction needed to complete System Improvement projects. The work orders were based upon generic work orders historically and were initially refreshed annually through a labor intensive manual process. Each year, if a new type of System Upgrade was needed, a new work order would be created to cover the need. These work orders correspond to "historic cost data for similar projects" referenced in DEP's Answer.

In recent years, an adjustment factor was added to the SIS Estimation Tool Rev0 to increase labor costs based experienced changes in labor expense. As more time passed between the latest revision of the estimates used to feed the tool and the application of the tool, a decision was made to increase the base labor factor to keep up with rising labor charges.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Neil Bhagat, Manager, Asset Management/Distributed Generation; Jack McNeil, Director, Asset Management Dmitri Moundous, Senior Engineer, Asset Management/Distributed Generation

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP clarifies its initial Response to confirm that adjustment factors were added prior to 2015 and in June 2019. From the time Pike Engineering received the SIS Estimation Tool Rev0 in 2015 through June 2019, no changes were made in the form of adjustment factors, or line item costs. Cosmetic changes were made for the purposes of ease of use as explained in DEP's supplemental response to Request No. 1-1; however, line item costs and adjustment factors remained the same.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation

DUKE ENERGY PROGRESS, LLC

Request:

9. For the period 2015 to the present, describe any difference between DEP's process for estimating costs of constructing upgrades necessary for interconnection of independent generation (i.e., PURPA qualified facilities) and DEP's process for estimating DEP's own construction costs (i.e., for system modifications including for interconnection of DEP's own generation facilities or other system modifications undertaken by DEP), including, without limitation, (a) identifying any difference in the estimation of the cost of parts, labor, and overheads; and (b) identifying any difference in the actual cost of parts, labor, overheads, and labor rates for such projects.

Response:

DEP objects to the temporal scope of this request "for the period January 1, 2015 to the present" as overbroad, unduly burdensome and because "any difference between DEP's process for estimating costs of constructing upgrades necessary for interconnection of independent generation (i.e., PURPA qualified facilities) and DEP's process for estimating DEP's own construction costs (i.e., for system modifications including for interconnection of DEP's own generation facilities or other system modifications undertaken by DEP)," having occurred prior to the date that Williams Solar submitted its Interconnection Request to DEP is not relevant and outside the scope of this proceeding, as such differences have no effect on the procedures employed by DEP to generate estimates of the cost of system upgrades or interconnection facilities for Williams Solar.

Notwithstanding the foregoing objection, DEP provides the following information in response to this request:

DEP utilizes the same design and cost estimating process (use of Maximo and common design standards) for all Distribution construction projects that is used for estimating costs of construction upgrades necessary for interconnection of independent generation (i.e. PURPA qualifying facilities) and DEP's own construction costs (i.e., for system modifications including for interconnection of DEP's own generation facilities or for customer addition, reliability improvement or other system modifications undertaken by DEP). Specifically, DEP utilizes Maximo for both independent generation and DEP-owned projects, as further described in the Company's response to Data Request No. 1-3. However, as described in DEP's response to Request No. 1-3, DEP has also integrated a generator interconnection-specific Revised Estimating Tool as part of the Facilities Study process. A similar mechanism is utilized for NCDOT requested relocations, in which a Maximo design estimate is run through a secondary estimating tool that was developed based on actual costs experienced for NCDOT requested projects.

Sponsor: Scott Jennings, Director, Customer Delivery Area Operations

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP clarifies its initial Response to confirm that DEP has used the same methodology to estimate the cost of parts, labor and overheads for all construction projects (DEP-owned generation subject to the NC Interconnection Procedures, 3rd party generation, as well as retail, commercial, industrial and governmental load customers) since January 1, 2015. Several of the tools have been changed or modified during that timeframe including the change of the work management tool from WMIS to Maximo.

Sponsor: Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP

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Item No. 1-2
Page 1 of 2

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

2. Produce all documents and data generated in the process of creating the Preliminary Estimated Upgrade Charge for Williams Solar.

Response:

Duke objects to Complainant's request for the production of "all documents and data" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify Company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-2" on the FTP site in response to this request.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Neil Bhagat, Manager, Asset Management/Distributed Generation

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP provides the following supplemental explanation of the documents produced in response to Request for Documents No. 1-2:

"CONFIDENTIAL Project 15007 System Impact Study Calculations with A" – This document was provided to show the documentation that goes into each System Impact Study. This spreadsheet is Williams Solar-specific information and is used to determine the "system modifications" (e.g., required upgrades) during the voltage and RVC portion of the System Impact Study.

“CONFIDENTIAL_DEP_Protection_V2.4.2” – This document was provided to show the system, protection-related upgrades and provides the data that leads to those required system upgrades and associated costs identified in the System Impact Study report provided to Williams Solar.

“Williams Solar Estimation Tool SIS” – This spreadsheet is a tab saved as its own individual file taken out of the “CONFIDENTIAL Project 15007 System Impact Study Calculations with A” spreadsheet for the purposes of providing a quick look at the voltage and RVC portion cost estimation.

“CONFIDENTIAL Project 15007 System Impact Study Calculations - Project A and B 2017 (002)” – This spreadsheet was provided to show a preliminary 2017 version of the study calculations initially developed during System Impact Study. This file was superseded by the “CONFIDENTIAL Project 15007 System Impact Study Calculations with A” file used to develop the System Impact Study for Williams Solar.

Sponsor: Brian Dale, Engineer III, Asset Management Distributed Generation

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

4. Produce all documents and data (including, without limitation, communications, reports, and presentations) evidencing, reflecting, or discussing the investigation referred to in DEP's Answer and Motion to Dismiss.

Response:

Duke objects to Complainant's request for the production of "all documents and data" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

Please see the documents in the folder labeled "RFP No. 1-4" on the FTP site in response to this request.

Sponsor: Beckton James, Senior Business and Technical Consultant, Duke Energy; Neil Bhagat, Manager, Asset Management/Distributed Generation, Duke Energy; George Flowers, Account Manager, Interconnection; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Jeff Riggins, Director, Standard PPAs & Interconnects; Donna Massengill, Manager, Renewable Energy Contracts & Process Governance.

Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, the sponsors identified in the initial Response have again reviewed their accessible documents for documents responsive to this Request. DEP has now also included all current employees identified in Response 1-14 as Sponsors in this supplemental response. DEP provides the following supplemental response to this request:

Please see the documents in the folder labeled "RFP No. 1-4 (Supplemental)" on the FTP site.

Sponsor: Beckton James, Senior Business and Technical Consultant, Duke Energy; Neil Bhagat, Manager, Asset Management/Distributed Generation, Duke Energy; George Flowers, Account Manager, Interconnection; Scott Reynolds, Manager of Interconnections and Standard PPAs, DEP; Jeff Riggins, Director, Standard PPAs & Interconnects; Donna Massengill, Manager, Renewable Energy Contracts & Process Governance; Ken Jennings, General Manager, DET Renewable Integration and Operations, Scott, Jennings, Customer Delivery Area Operations, Jack McNeil, Director, Asset Management, Jack Andreasen, Engineering Design Associate

DUKE ENERGY PROGRESS, LLC

DOCUMENT REQUESTS

Request for Production:

10. Produce all contracts for construction of interconnection facilities and system upgrades for the period January 1, 2015.

Response:

Duke objects to Complainant's request for the production of "all contracts" for the reasons more fully stated in DEP's General Objection No. 5. Duke has undertaken reasonable efforts to identify company personnel with knowledge of, or otherwise likely to have custody of documents responsive to this Request and the individual(s) identified as a "sponsor" of DEP's Response to this request are producing responsive documents in their possession.

DEP objects to the temporal scope of this request for all documents for "the period from January 1, 2015" as vague, overbroad, unduly burdensome and further objects because "all construction contracts" unduly vague and ambiguous.

Notwithstanding the foregoing objection, DEP provides the following documents in response to this request:

DEP's master construction agreements require notice and consent to produce these Agreements. DEP is in the process of obtaining consent and anticipates supplementing this Response to produce these agreements on or before February 28, 2020. Production of these agreements shall also be subject to execution of a mutually-agreeable confidentiality agreement between DEP and Williams Solar.

Sponsor: Genevieve Bestercy, Sourcing Specialist, Transmission and Generation Grid Solutions Labor and EPC

Supplemental Response:

Please see DEP's operative master construction agreements and supporting agreements being produced in response to Request for Production No. 1-10. Pursuant to the Confidentiality Agreement dated February 21, 2020 between DEP and Williams Solar, the Company has redacted pricing information that would otherwise be designated as Highly Confidential Information.

Sponsor: Genevieve Bestercy, Sourcing Specialist, Transmission and Generation Grid Solutions Labor and EPC

Second Supplemental Response:

In response to Williams Solar's March 6, 2020 letter, DEP is producing unredacted copies of the Company's operative master construction agreements and supporting agreements as CONFIDENTIAL documents in response to Request for Production No. 1-10, pursuant to the Confidentiality Agreement dated February 21, 2020 between DEP and Williams Solar.

Sponsor: Genevieve Bestercy, Sourcing Specialist, Transmission and Generation Grid Solutions Labor and EPC; Brett Breitschwerdt, McGuireWoods LLP

In providing the foregoing Supplemental Responses, DEP reserves and does not waive the right to further supplement or amend its responses as may be necessary.

Dated: March 20, 2020.

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Attorneys for Duke Energy Progress, LLC

CERTIFICATE OF SERVICE

There undersigned, of the law firm McGuireWoods LLP, hereby certifies that he has served a copy of the foregoing *Duke Energy Progress, LLC's Supplemental Responses to Williams Solar, LLC's First Data Request* via electronic mail to:

Marcus Trathen
Eric M. David
Brooks, Pierce , McLendon, Humphrey, & Leonard LLP
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This the 20th Day of March, 2020.

/s/E. Brett Breitschwerdt
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Attorney for Duke Energy Progress, LLC

Docket No. E-2, Sub 1220

Exhibit CEB-8

Williams Solar Estimation Tool SIS.xlsx

#	Action	From DIS#	To DIS#	Distance (Miles)	Existing # of phases	Existing Conductor	New # of phases	New Conductor	Estimated Cost	Description
1	Reconductor	2M845	2M843	0.0775	1	#2 ACSR	3	477 AAC	$20,970.58	Upgrade 0.0775 miles of existing 1-phase #2 ACSR to 3-phase 477 AAC with 1/0 AAAC neutral from DIS# 2M845 to DIS# 2M843.
2	Reconductor	2M843	2M803	1.342	1	#4 BC	3	477 AAC	$358,173.00	Upgrade 1.342 miles of existing 1-phase #4 BC to 3-phase 477 AAC with 1/0 AAAC neutral from DIS# 2M843 to DIS# 2M803.
3	Reconductor	2M803	2L653	1.114	3	#2 ACSR	3	477 AAC	$325,046.18	Upgrade 1.114 miles of existing 3-phase #2 ACSR to 3-phase 477 AAC with 1/0 AAAC neutral from DIS# 2M803 to DIS# 2L653.
4	None					None		None	$0.00	0
5	None					None		None	$0.00	0
6	None					None		None	$0.00	0
7	None					None		None	$0.00	0
8	None					None		None	$0.00	0
9	None					None		None	$0.00	0
10	None					None		None	$0.00	0
								Total Cost Estimate:	$704,189.76	

3	4	7	Reconductor	#2 ACSR	477 AAC
3	6	7	Reconductor	#4 BC	477 AAC
3	4	7	Reconductor	#2 ACSR	477 AAC
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None

Library

Code	Actions	Conductor Types
1	None	None
2	Build New Line	1/0 ACSR
3	Reconductor	4/0 ACSR
4	Double Circuit	#2 ACSR
5	Triple Circuit	#2 BC
6	Add G&W at Takeoff	#4 BC
7	Verify for High Capacity	477 AAC
8		750 MCM Underground
9		
10		
11		

Neutral Conductor: **1/0 AAAC**

Pricing

Action	Existing # of phases	Existing Conductor	New # of phases	New Conductor	$/mile
Build New Line	0	None	3	477 AAC	$256,036.99
Reconductor	1	1/0 ACSR	3	477 AAC	$247,683.87
Reconductor	1	4/0 ACSR	3	477 AAC	
Reconductor	1	#2 ACSR	3	477 AAC	$270,588.16
Reconductor	1	#2 BC	3	477 AAC	
Reconductor	1	#4 BC	3	477 AAC	$266,894.93
Reconductor	1	477 AAC	3	477 AAC	
Reconductor	2	1/0 ACSR	3	477 AAC	$246,100.45
Reconductor	2	4/0 ACSR	3	477 AAC	
Reconductor	2	#2 ACSR	3	477 AAC	$268,988.30
Reconductor	2	#2 BC	3	477 AAC	
Reconductor	2	#4 BC	3	477 AAC	$272,815.38
Reconductor	2	477 AAC	3	477 AAC	
Reconductor	3	1/0 ACSR	3	477 AAC	$250,342.87
Reconductor	3	4/0 ACSR	3	477 AAC	$250,432.94
Reconductor	3	#2 ACSR	3	477 AAC	$291,782.93
Reconductor	3	#2 BC	3	477 AAC	$291,782.93
Reconductor	3	#4 BC	3	477 AAC	$291,602.78
Double Circuit	1	1/0 ACSR	3	477 AAC	$439,389.13
Double Circuit	1	4/0 ACSR	3	477 AAC	$447,727.68
Double Circuit	1	#2 ACSR	3	477 AAC	$447,727.68
Double Circuit	1	#2 BC	3	477 AAC	$447,727.68
Double Circuit	1	#4 BC	3	477 AAC	$447,727.68
Double Circuit	1	477 AAC	3	477 AAC	$447,727.68
Double Circuit	2	1/0 ACSR	3	477 AAC	$439,389.13
Double Circuit	2	4/0 ACSR	3	477 AAC	$447,727.68
Double Circuit	2	#2 ACSR	3	477 AAC	$447,727.68
Double Circuit	2	#2 BC	3	477 AAC	$447,727.68
Double Circuit	2	#4 BC	3	477 AAC	$447,727.68
Double Circuit	2	477 AAC	3	477 AAC	$447,727.68
Double Circuit	3	1/0 ACSR	3	477 AAC	$439,389.13
Double Circuit	3	4/0 ACSR	3	477 AAC	$447,727.68
Double Circuit	3	#2 ACSR	3	477 AAC	$447,727.68
Double Circuit	3	#2 BC	3	477 AAC	$447,727.68
Double Circuit	3	#4 BC	3	477 AAC	$447,727.68
Double Circuit	3	477 AAC	3	477 AAC	$447,727.68
Triple Circuit	1	1/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	1	4/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	1	#2 ACSR	3	477 AAC	$570,000.00
Triple Circuit	1	#2 BC	3	477 AAC	$570,000.00
Triple Circuit	1	#4 BC	3	477 AAC	$570,000.00

Equipment	$/unit
G&W Electronic Recloser	$39,091.36

PUBLIC VERSION

Triple Circuit	1	477 AAC	3	477 AAC	$570,000.00
Triple Circuit	2	1/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	2	4/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	2	#2 ACSR	3	477 AAC	$570,000.00
Triple Circuit	2	#2 BC	3	477 AAC	$570,000.00
Triple Circuit	2	#4 BC	3	477 AAC	$570,000.00
Triple Circuit	2	477 AAC	3	477 AAC	$570,000.00
Triple Circuit	3	1/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	3	4/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	3	#2 ACSR	3	477 AAC	$570,000.00
Triple Circuit	3	#2 BC	3	477 AAC	$570,000.00
Triple Circuit	3	#4 BC	3	477 AAC	$570,000.00
Triple Circuit	3	477 AAC	3	477 AAC	$570,000.00
Verify for High Capacity	3	477 AAC	0	None	$50,000.00
Double Circuit	0	MCM Undergro	3	) MCM Undergro	$500,323.77
Build New Line	0	None	3	) MCM Undergro	$500,323.77

Count-Pre	22.86 kV	Count-New	2000		Select Nominal Voltage:		22.86 kV	0.95	1
1126	12.47 kV		1126						

Row #	Section ID	Row #	Section ID	Structure	TX DIS#	Phase	Pre-Existin	New LG Fault	New?	71 Transformers Need Retrofit	Transformer ID	Phase	LLL (A)	LLG (A)	LL (A)	LG (A)	Total # of fuses:	71
11	17X814__108209837	11	17X814__108209837	OVERHEAD	17X814	1Ø	3785	3877	-	288 1Ø - 2KJ58	2KJ58	1Ø	0	0	0	1904	Total Cost ($400/fuse):	28400
149	2N317__1710276	149	2N317__1710276	OVERHEAD	2N317	1Ø	1153	1164	-	290 1Ø - 2KJ54	2KJ54	1Ø	0	0	0	1949		
150	2M245__1710267	150	2M245__1710267	OVERHEAD	2M245	1Ø	1160	1171	-	293 1Ø - 2KJ43	2KJ43	1Ø	0	0	0	2029		
159	2M277__1710382	159	2M277__1710382	OVERHEAD	2M277	1Ø	1094	1103	-	294 1Ø - 2KJ47	2KJ47	1Ø	0	0	0	1970		
160	2M276__1710381	160	2M276__1710381	OVERHEAD	2M276	1Ø	1104	1114	-	324 1Ø - 2KG19	2KG19	1Ø	0	0	0	1965		
161	2M275__104711049	161	2M275__104711049	OVERHEAD	2M275	1Ø	1116	1126	-	366 1Ø - 2KG28	2KG28	1Ø	0	0	0	1901		
164	2M279__1710386	164	2M279__1710386	OVERHEAD	2M279	1Ø	1112	1122	-	367 1Ø - 2KG24	2KG24	1Ø	0	0	0	1993		
191	2M325__1710454	191	2M325__1710454	OVERHEAD	2M325	1Ø	952	960	-	387 1Ø - 2L972	2L972	1Ø	0	0	0	1907		
202	2M443__1710484	202	2M443__1710484	OVERHEAD	2M443	1Ø	940	947	-	388 1Ø - 2L971	2L971	1Ø	0	0	0	1929		
205	2M445__1710485	205	2M445__1710485	OVERHEAD	2M445	1Ø	931	938	-	389 1Ø - 2L968	2L968	1Ø	0	0	0	1971		
208	1E7L10__115172660	208	1E7L10__115172660	OVERHEAD	1E7L10	1Ø	928	934	-	434 1Ø - 2KW94	2KW94	1Ø	0	0	0	2023		
241	17Y234__104553642	241	17Y234__104553642	OVERHEAD	17Y234	1Ø	758	763	-	437 1Ø - 2NA08	2NA08	1Ø	0	0	0	1915		
249	2M509__1710531	249	2M509__1710531	OVERHEAD	2M509	1Ø	729	733	-	438 1Ø - 2NA05	2NA05	1Ø	0	0	0	1949		
259	2M527__1710541	259	2M527__1710541	OVERHEAD	2M527	1Ø	690	693	-	439 1Ø - 2NA02	2NA02	1Ø	0	0	0	1977		
261	2M522__1710540	261	2M522__1710540	OVERHEAD	2M522	1Ø	694	698	-	440 1Ø - 2KW98	2KW98	1Ø	0	0	0	2016		
270	1BLR79__111719889	270	1BLR79__111719889	OVERHEAD	1BLR79	1Ø	675	679	-	442 1Ø - 2NA16	2NA16	1Ø	0	0	0	1986		
278	2M548__103658471	278	2M548__103658471	OVERHEAD	2M548	1Ø	647	651	-	443 1Ø - 2NA13	2NA13	1Ø	0	0	0	2007		
284	2M554__1710584	284	2M554__1710584	OVERHEAD	2M554	1Ø	636	639	-	851 1Ø - 2KU98	2KU98	1Ø	0	0	0	1930		
285	2M551__1710581	285	2M551__1710581	OVERHEAD	2M551	1Ø	643	647	-	852 1Ø - 2KU94	2KU94	1Ø	0	0	0	1951		
286	2M549__1710580	286	2M549__1710580	OVERHEAD	2M549	1Ø	647	650	-	853 1Ø - 2KU91	2KU91	1Ø	0	0	0	1974		
287	2M547__1710582	287	2M547__1710582	OVERHEAD	2M547	1Ø	651	654	-	854 1Ø - 2KU89	2KU89	1Ø	0	0	0	1993		
288	2M545__1710579	288	2M545__1710579	OVERHEAD	2M545	1Ø	655	658	-	855 1Ø - 2KU86	2KU86	1Ø	0	0	0	2018		
289	2M542__1710578	289	2M542__1710578	OVERHEAD	2M542	1Ø	659	662	-	856 1Ø - 15LF06	15LF06	1Ø	0	0	0	2091		
290	109H04__1771614	290	109H04__1771614	OVERHEAD	109H04	1Ø	662	665	-	857 1Ø - 2KU83	2KU83	1Ø	0	0	0	2114		
291	2M539__1710577	291	2M539__1710577	OVERHEAD	2M539	1Ø	665	669	-	934 1Ø - 2M903	2M903	1Ø	0	0	0	1927		
292	2M537__1710576	292	2M537__1710576	OVERHEAD	2M537	1Ø	670	674	-	935 1Ø - 2M901	2M901	1Ø	0	0	0	1955		
293	2M536__1710574	293	2M536__1710574	OVERHEAD	2M536	1Ø	676	679	-	936 1Ø - 2M898	2M898	1Ø	0	0	0	1998		
297	2M535__1710575	297	2M535__1710575	OVERHEAD	2M535	1Ø	680	684	-	937 1Ø - 2M897	2M897	1Ø	0	0	0	1994		
301	188L44__108795267	301	188L44__108795267	OVERHEAD	188L44	1Ø	677	680	-	938 1Ø - 2M890	2M890	1Ø	0	0	0	2202		
302	2M532__1710573	302	2M532__1710573	OVERHEAD	2M532	1Ø	688	691	-	941 1Ø - 2M823	2M823	1Ø	0	0	0	2103		
309	17MG83__104347844	309	17MG83__104347844	OVERHEAD	17MG83	1Ø	693	696	-	942 1Ø - 2M822	2M822	1Ø	0	0	0	2132		
310	TLD76__1710535	310	TLD76__1710535	OVERHEAD	TLD76	1Ø	695	699	-	962 1Ø - 2M843	2M843	1Ø	0	0	0	1917		
311	TLD73__1710542	311	TLD73__1710542	OVERHEAD	TLD73	1Ø	707	711	-	972 1Ø - 149A06	149A06	1Ø	0	0	0	1935		
312	2M515__1710534	312	2M515__1710534	OVERHEAD	2M515	1Ø	720	724	-	973 1Ø - 2M841	2M841	1Ø	0	0	0	1944		
315	5KJ12__1710537	315	5KJ12__1710537	OVERHEAD	5KJ12	1Ø	720	724	-	974 1Ø - 8NJ03	8NJ03	1Ø	0	0	0	1942		
316	2M513__1710533	316	2M513__1710533	OVERHEAD	2M513	1Ø	725	729	-	975 1Ø - 8NJ04	8NJ04	1Ø	0	0	0	1926		
317	2M512__1710532	317	2M512__1710532	OVERHEAD	2M512	1Ø	729	733	-	976 1Ø - 2M837	2M837	1Ø	0	0	0	1990		
318	2M508__1710530	318	2M508__1710530	OVERHEAD	2M508	1Ø	734	738	-	977 1Ø - 2M835	2M835	1Ø	0	0	0	2017		
319	2M500__1710539	319	2M500__1710539	OVERHEAD	2M500	1Ø	753	757	-	978 1Ø - 2M831	2M831	1Ø	0	0	0	2046		
320	2M498__1710538	320	2M498__1710538	OVERHEAD	2M498	1Ø	760	764	-	979 1Ø - 2M830	2M830	1Ø	0	0	0	2067		
330	2M486__1710583	330	2M486__1710583	OVERHEAD	2M486	1Ø	761	765	-	980 1Ø - 9NJ16	9NJ16	1Ø	0	0	0	2059		
332	2M479__1710544	332	2M479__1710544	OVERHEAD	2M479	1Ø	794	799	-	981 1Ø - 2M827	2M827	1Ø	0	0	0	2089		
333	2M465__1710507	333	2M465__1710507	OVERHEAD	2M465	1Ø	874	880	-	982 1Ø - 6LT98	6LT98	1Ø	0	0	0	2100		
334	2M464__1710506	334	2M464__1710506	OVERHEAD	2M464	1Ø	881	887	-	983 1Ø - 2M824	2M824	1Ø	0	0	0	2138		
336	56K37__1761806	336	56K37__1761806	OVERHEAD	56K37	1Ø	886	892	-	984 1Ø - 2M819	2M819	1Ø	0	0	0	2171		
337	2M462__1710508	337	2M462__1710508	OVERHEAD	2M462	1Ø	889	895	-	985 1Ø - 2M816	2M816	1Ø	0	0	0	2237		
338	2M460__1710505	338	2M460__1710505	OVERHEAD	2M460	1Ø	895	901	-	986 1Ø - 6QA58	6QA58	1Ø	0	0	0	2179		
339	2M457__1710490	339	2M457__1710490	OVERHEAD	2M457	1Ø	901	907	-	987 1Ø - 15D739	15D739	1Ø	0	0	0	2187		
340	2M455__1710489	340	2M455__1710489	OVERHEAD	2M455	1Ø	907	914	-	988 1Ø - 6QA55	6QA55	1Ø	0	0	0	2241		
341	2M452__1710488	341	2M452__1710488	OVERHEAD	2M452	1Ø	922	929	-	989 1Ø - 2M813	2M813	1Ø	0	0	0	2283		
343	59D99__1760885	343	59D99__1760885	OVERHEAD	59D99	1Ø	926	933	-	990 1Ø - 2M808	2M808	1Ø	0	0	0	2331		
344	2M436__1710487	344	2M436__1710487	OVERHEAD	2M436	1Ø	968	975	-	994 1Ø - 2M790	2M790	1Ø	0	0	0	2077		
345	2M316__1710453	345	2M316__1710453	OVERHEAD	2M316	1Ø	1015	1023	-	995 1Ø - 10AJ02	10AJ02	1Ø	0	0	0	2097		
351	8EY88__1710452	351	8EY88__1710452	OVERHEAD	8EY88	2Ø	999	1007	-	996 1Ø - 2M788	2M788	1Ø	0	0	0	2124		
354	2M305__1777793	354	2M305__1777793	OVERHEAD	2M305	1Ø	995	1003	-	998 1Ø - 2Q991	2Q991	1Ø	0	0	0	1931		
355	2M301__1777792	355	2M301__1777792	OVERHEAD	2M301	2Ø	1011	1019	-	999 1Ø - 2M793	2M793	1Ø	0	0	0	1989		
356	2M294__1710451	356	2M294__1710451	OVERHEAD	2M294	1Ø	1033	1042	-	1000 1Ø - 2M791	2M791	1Ø	0	0	0	2072		
357	2M289__1710450	357	2M289__1710450	OVERHEAD	2M289	1Ø	1053	1062	-	1001 1Ø - 2M782	2M782	1Ø	0	0	0	2174		
358	2M282__1710387	358	2M282__1710387	OVERHEAD	2M282	1Ø	1101	1111	-	1002 1Ø - 2M780	2M780	1Ø	0	0	0	2237		
359	2M278__1782139	359	2M278__1782139	OVERHEAD	2M278	1Ø	1119	1129	-	1050 1Ø - 7EQ13	7EQ13	1Ø	0	0	0	1920		
360	2M272__1710380	360	2M272__1710380	OVERHEAD	2M272	1Ø	1128	1138	-	1054 1Ø - 7HA89	7HA89	1Ø	0	0	0	1963		
361	2M270__1710379	361	2M270__1710379	OVERHEAD	2M270	1Ø	1137	1147	-	1055 1Ø - 7EQ45	7EQ45	1Ø	0	0	0	1993		
362	2M247__1710269	362	2M247__1710269	OVERHEAD	2M247	1Ø	1153	1164	-	1056 1Ø - 2L823	2L823	1Ø	0	0	0	2028		
372	2M256__1710384	372	2M256__1710384	OVERHEAD	2M256	1Ø	1091	1100	-	1059 1Ø - 2L772	2L772	1Ø	0	0	0	1917		
376	2M259__1710280	376	2M259__1710280	OVERHEAD	2M259	1Ø	1061	1070	-	1076 1Ø - 2L761	2L761	1Ø	0	0	0	1917		
382	2Q919__1710284	382	2Q919__1710284	OVERHEAD	2Q919	1Ø	1028	1036	-	1077 1Ø - 2L759	2L759	1Ø	0	0	0	1930		
383	2M263__1710283	383	2M263__1710283	OVERHEAD	2M263	1Ø	1050	1058	-	1078 1Ø - 14DR68	14DR68	1Ø	0	0	0	1948		
384	2M254__1710383	384	2M254__1710383	OVERHEAD	2M254	1Ø	1101	1111	-	1081 1Ø - 104E58	104E58	1Ø	0	0	0	1930		
390	2M268__1710385	390	2M268__1710385	OVERHEAD	2M268	1Ø	1085	1094	-	1082 1Ø - 2N380	2N380	1Ø	0	0	0	1951		
391	2M267__104696111	391	2M267__104696111	OVERHEAD	2M267	1Ø	1089	1099	-	1083 1Ø - 2L755	2L755	1Ø	0	0	0	1970		
392	2M266__1710388	392	2M266__1710388	OVERHEAD	2M266	1Ø	1094	1104	-	1084 1Ø - 2L753	2L753	1Ø	0	0	0	2030		

393 2M264__1775713	393 2M264__1775713	OVERHEAD	2M264	1Ø	1105	1115	-
394 17EX15__104223503	394 17EX15__104223503	OVERHEAD	17EX15	1Ø	1120	1130	-
395 2M252__1776994	395 2M252__1776994	OVERHEAD	2M252	1Ø	1125	1135	-
396 2M249__1710270	396 2M249__1710270	OVERHEAD	2M249	1Ø	1144	1155	-
397 2M246__1710268	397 2M246__1710268	OVERHEAD	2M246	1Ø	1164	1175	-
398 2M243__1710266	398 2M243__1710266	OVERHEAD	2M243	1Ø	1169	1180	-
399 2M241__1710265	399 2M241__1710265	OVERHEAD	2M241	1Ø	1175	1186	-
400 2M239__1710264	400 2M239__1710264	OVERHEAD	2M239	1Ø	1183	1195	-
401 2M236__1710263	401 2M236__1710263	OVERHEAD	2M236	1Ø	1200	1211	-
402 2M234__1710274	402 2M234__1710274	OVERHEAD	2M234	1Ø	1206	1218	-
452 2M690__1710234	452 2M690__1710234	OVERHEAD	2M690	1Ø	914	921	-
455 2N733__1710235	455 2N733__1710235	OVERHEAD	2N733	1Ø	906	912	-
456 2M689__1710233	456 2M689__1710233	OVERHEAD	2M689	1Ø	920	927	-
461 1BTC29__111726490	461 1BTC29__111726490	OVERHEAD	1BTC29	1Ø	912	918	-
462 15NA10__103841825	462 15NA10__103841825	OVERHEAD	15NA10	1Ø	916	923	-
467 2M584__1710243	467 2M584__1710243	OVERHEAD	2M584	1Ø	931	938	-
520 2M309__1710449	520 2M309__1710449	OVERHEAD	2M309	1Ø	635	638	-
523 2M311__1764311	523 2M311__1764311	OVERHEAD	2M311	1Ø	641	644	-
524 2M387__1710448	524 2M387__1710448	OVERHEAD	2M387	1Ø	646	649	-
529 2M396__1710483	529 2M396__1710483	OVERHEAD	2M396	1Ø	638	641	-
530 2M390__1710441	530 2M390__1710441	OVERHEAD	2M390	1Ø	658	661	-
531 2M398__1710482	531 2M398__1710482	OVERHEAD	2M398	1Ø	668	671	-
534 2M428__1764045	534 2M428__1764045	OVERHEAD	2M428	1Ø	685	688	-
535 2M433__1710479	535 2M433__1710479	OVERHEAD	2M433	1Ø	706	710	-
547 136416__1780091	547 136416__1780091	OVERHEAD	136416	1Ø	687	691	-
548 136415__103358361	548 136415__103358361	OVERHEAD	136415	1Ø	691	695	-
549 136412__1783196	549 136412__1783196	OVERHEAD	136412	1Ø	698	702	-
556 2M675__1710503	556 2M675__1710503	OVERHEAD	2M675	1Ø	672	676	-
562 2M681__1710504	562 2M681__1710504	OVERHEAD	2M681	1Ø	654	658	-
564 73C83__1761976	564 73C83__1761976	OVERHEAD	73C83	1Ø	678	681	-
565 2M667__1782271	565 2M667__1782271	OVERHEAD	2M667	1Ø	711	715	-
566 2M665__1710481	566 2M665__1710481	OVERHEAD	2M665	1Ø	716	720	-
567 2M662__1710480	567 2M662__1710480	OVERHEAD	2M662	1Ø	724	728	-
568 2M639__1710363	568 2M639__1710363	OVERHEAD	2M639	1Ø	830	835	-
573 2M638__1710362	573 2M638__1710362	OVERHEAD	2M638	1Ø	819	824	-
574 2M637__1777466	574 2M637__1777466	OVERHEAD	2M637	1Ø	827	832	-
575 2M632__1710353	575 2M632__1710353	OVERHEAD	2M632	1Ø	840	845	-
582 2M630__1710361	582 2M630__1710361	OVERHEAD	2M630	1Ø	828	834	-
583 2M627__1710360	583 2M627__1710360	OVERHEAD	2M627	1Ø	833	839	-
584 2M626__1773219	584 2M626__1773219	OVERHEAD	2M626	1Ø	836	842	-
585 2M624__1710352	585 2M624__1710352	OVERHEAD	2M624	1Ø	841	847	-
586 2M621__1780489	586 2M621__1780489	OVERHEAD	2M621	1Ø	852	858	-
591 2M620__1766450	591 2M620__1766450	OVERHEAD	2M620	1Ø	850	856	-
592 2M615__1710351	592 2M615__1710351	OVERHEAD	2M615	1Ø	853	859	-
593 2M613__1710350	593 2M613__1710350	OVERHEAD	2M613	1Ø	857	863	-
596 2M610__1710349	596 2M610__1710349	OVERHEAD	2M610	1Ø	856	862	-
597 2M609__1778677	597 2M609__1778677	OVERHEAD	2M609	1Ø	863	869	-
598 2M608__1710348	598 2M608__1710348	OVERHEAD	2M608	1Ø	867	873	-
599 2M607__1710358	599 2M607__1710358	OVERHEAD	2M607	1Ø	873	879	-
606 TLD63__1710357	606 TLD63__1710357	OVERHEAD	TLD63	1Ø	853	859	-
607 TLD62__1710359	607 TLD62__1710359	OVERHEAD	TLD62	1Ø	859	864	-
608 TLD61__1710356	608 TLD61__1710356	OVERHEAD	TLD61	1Ø	864	870	-
609 TLD60__1710354	609 TLD60__1710354	OVERHEAD	TLD60	1Ø	869	875	-
610 TLD59__1710355	610 TLD59__1710355	OVERHEAD	TLD59	1Ø	874	880	-
613 2M603__1710245	613 2M603__1710245	OVERHEAD	2M603	1Ø	0	0	-
634 54J48__1710341	634 54J48__1710341	OVERHEAD	54J48	1Ø	0	0	-
638 56W20__1760537	638 56W20__1760537	OVERHEAD	56W20	1Ø	0	0	-
639 2M600__1710345	639 2M600__1710345	OVERHEAD	2M600	1Ø	0	0	-
645 102254__1770703	645 102254__1770703	OVERHEAD	102254	1Ø	0	0	-
646 102253__1780361	646 102253__1780361	OVERHEAD	102253	1Ø	0	0	-
647 93X95__1773042	647 93X95__1773042	OVERHEAD	93X95	1Ø	0	0	-
648 93X94__1775093	648 93X94__1775093	OVERHEAD	93X94	1Ø	0	0	-
649 93X93__1767966	649 93X93__1767966	OVERHEAD	93X93	1Ø	0	0	-
650 2M598__1710344	650 2M598__1710344	OVERHEAD	2M598	1Ø	0	0	-
651 2M597__1710343	651 2M597__1710343	OVERHEAD	2M597	1Ø	0	0	-
655 58K98__1710347	655 58K98__1710347	OVERHEAD	58K98	1Ø	0	0	-
656 58K97__1761561	656 58K97__1761561	OVERHEAD	58K97	1Ø	0	0	-
657 2M595__1710346	657 2M595__1710346	OVERHEAD	2M595	1Ø	0	0	-
658 2N232__1774970	658 2N232__1774970	OVERHEAD	2N232	1Ø	0	0	-
659 2M594__1710342	659 2M594__1710342	OVERHEAD	2M594	1Ø	0	0	-
662 2M589__1710232	662 2M589__1710232	OVERHEAD	2M589	1Ø	0	0	-
663 2M587__1710244	663 2M587__1710244	OVERHEAD	2M587	1Ø	918	925	-
664 2M579__1710242	664 2M579__1710242	OVERHEAD	2M579	1Ø	945	952	-
665 2M576__1710241	665 2M576__1710241	OVERHEAD	2M576	1Ø	959	966	-

666 2M575__1710240	666 2M575__1710240	OVERHEAD	2M575	1Ø	968	975	-
667 2M574__1710239	667 2M574__1710239	OVERHEAD	2M574	1Ø	975	982	-
668 2M572__1710238	668 2M572__1710238	OVERHEAD	2M572	1Ø	980	987	-
676 TLD93__1710112	676 TLD93__1710112	OVERHEAD	TLD93	1Ø	949	956	-
677 TLD72__1710246	677 TLD72__1710246	OVERHEAD	TLD72	1Ø	966	973	-
680 151940__103108636	680 151940__103108636	OVERHEAD	151940	1Ø	972	980	-
684 2M570__1710237	684 2M570__1710237	OVERHEAD	2M570	1Ø	983	990	-
689 2NW67__1761776	689 2NW67__1761776	OVERHEAD	2NW67	1Ø	979	986	-
697 2M562__109512409	697 2M562__109512409	OVERHEAD	2M562	1Ø	926	933	-
700 87X21__1766018	700 87X21__1766018	OVERHEAD	87X21	1Ø	931	938	-
702 8ER66__1767643	702 8ER66__1767643	OVERHEAD	8ER66	1Ø	931	938	-
703 2M560__1764200	703 2M560__1764200	OVERHEAD	2M560	1Ø	940	947	-
704 2M558__1760944	704 2M558__1760944	OVERHEAD	2M558	1Ø	954	961	-
708 2M567__1775235	708 2M567__1775235	OVERHEAD	2M567	1Ø	940	947	-
709 2M565__1710110	709 2M565__1710110	OVERHEAD	2M565	1Ø	948	955	-
710 2M564__1710111	710 2M564__1710111	OVERHEAD	2M564	1Ø	955	962	-
711 2M563__1710114	711 2M563__1710114	OVERHEAD	2M563	1Ø	962	970	-
712 2NW68__1710113	712 2NW68__1710113	OVERHEAD	2NW68	1Ø	970	978	-
716 T8A15__1710247	716 T8A15__1710247	OVERHEAD	T8A15	3Ø	984	992	-
717 2M383__1710248	717 2M383__1710248	OVERHEAD	2M383	1Ø	1001	1009	-
718 2M381__1710236	718 2M381__1710236	OVERHEAD	2M381	1Ø	1007	1015	-
723 2M370__1710251	723 2M370__1710251	OVERHEAD	2M370	2Ø	1012	1021	-
728 2N823__1710258	728 2N823__1710258	OVERHEAD	2N823	2Ø	1003	1011	-
732 9E733__1768990	732 9E733__1768990	OVERHEAD	9E733	3Ø	1001	1009	-
733 2M374__1710256	733 2M374__1710256	OVERHEAD	2M374	1Ø	1004	1012	-
737 15BD92__103353517	737 15BD92__103353517	OVERHEAD	15BD92	1Ø	1004	1012	-
738 2M373__1710252	738 2M373__1710252	OVERHEAD	2M373	1Ø	1008	1016	-
741 2M376__1710253	741 2M376__1710253	OVERHEAD	2M376	1Ø	1005	1013	-
742 2M375__1710255	742 2M375__1710255	OVERHEAD	2M375	2Ø	1009	1017	-
743 2M368__1710250	743 2M368__1710250	OVERHEAD	2M368	2Ø	1015	1023	-
744 2M365__1710249	744 2M365__1710249	OVERHEAD	2M365	3Ø	1022	1031	-
748 17RL37__104608170	748 17RL37__104608170	OVERHEAD	17RL37	3Ø	1031	1040	-
749 2M361__1710257	749 2M361__1710257	OVERHEAD	2M361	1Ø	1041	1050	-
753 98L88__1768366	753 98L88__1768366	OVERHEAD	98L88	3Ø	1044	1053	-
757 17K740__104280136	757 17K740__104280136	OVERHEAD	17K740	1Ø	1061	1070	-
768 5L108__1710260	768 5L108__1710260	OVERHEAD	5L108	1Ø	1032	1040	-
787 17G127__104199417	787 17G127__104199417	OVERHEAD	17G127	1Ø	947	954	-
800 2M403__1710442	800 2M403__1710442	OVERHEAD	2M403	1Ø	862	868	-
807 2M412__1710440	807 2M412__1710440	OVERHEAD	2M412	1Ø	822	827	-
808 2M409__1710439	808 2M409__1710439	OVERHEAD	2M409	1Ø	845	851	-
810 2M414__104319998	810 2M414__104319998	OVERHEAD	2M414	1Ø	858	863	-
811 2M416__1710443	811 2M416__1710443	OVERHEAD	2M416	1Ø	899	905	-
812 2M417__1710446	812 2M417__1710446	OVERHEAD	2M417	1Ø	903	910	-
813 2M419__1710444	813 2M419__1710444	OVERHEAD	2M419	1Ø	908	914	-
814 2M421__1710445	814 2M421__1710445	OVERHEAD	2M421	1Ø	912	918	-
815 5JQ29__1710447	815 5JQ29__1710447	OVERHEAD	5JQ29	1Ø	923	930	-
816 5JQ28__1710378	816 5JQ28__1710378	OVERHEAD	5JQ28	1Ø	932	939	-
817 14Q544__103020362	817 14Q544__103020362	OVERHEAD	14Q544	1Ø	936	942	-
818 5JQ27__1772338	818 5JQ27__1772338	OVERHEAD	5JQ27	1Ø	940	947	-
824 2P985__1710373	824 2P985__1710373	OVERHEAD	2P985	1Ø	925	932	-
826 2N414__1710369	826 2N414__1710369	OVERHEAD	2N414	1Ø	930	937	-
827 2N413__1710374	827 2N413__1710374	OVERHEAD	2N413	1Ø	936	942	-
828 2N412__1710368	828 2N412__1710368	OVERHEAD	2N412	1Ø	941	948	-
829 2N411__1710375	829 2N411__1710375	OVERHEAD	2N411	1Ø	946	953	-
830 2X060__1772369	830 2X060__1772369	OVERHEAD	2X060	1Ø	957	964	-
831 2X059__1710377	831 2X059__1710377	OVERHEAD	2X059	1Ø	959	967	-
832 2X058__1710376	832 2X058__1710376	OVERHEAD	2X058	1Ø	964	972	-
833 2N476__1710371	833 2N476__1710371	OVERHEAD	2N476	1Ø	970	977	-
834 2N332__1710370	834 2N332__1710370	OVERHEAD	2N332	1Ø	975	982	-
835 2N331__1710372	835 2N331__1710372	OVERHEAD	2N331	1Ø	980	988	-
836 2NY93__1710366	836 2NY93__1710366	OVERHEAD	2NY93	1Ø	987	995	-
837 2NX37__1710365	837 2NX37__1710365	OVERHEAD	2NX37	1Ø	995	1003	-
838 1C3W95__113642617	838 1C3W95__113642617	OVERHEAD	1C3W95	1Ø	998	1005	-
839 2NX36__103021048	839 2NX36__103021048	OVERHEAD	2NX36	1Ø	1003	1010	-
840 2NX35__1710367	840 2NX35__1710367	OVERHEAD	2NX35	1Ø	1010	1018	-
841 2NX34__1710259	841 2NX34__1710259	OVERHEAD	2NX34	1Ø	1020	1029	-
842 9AP77__1768545	842 9AP77__1768545	OVERHEAD	9AP77	1Ø	1040	1049	-
850 15W463__103955478	850 15W463__103955478	OVERHEAD	15W463	1Ø	1019	1027	-
851 9MJ65__1772092	851 9MJ65__1772092	OVERHEAD	9MJ65	1Ø	1025	1033	-
852 9MJ63__1769586	852 9MJ63__1769586	OVERHEAD	9MJ63	1Ø	1032	1040	-
853 98435__1768881	853 98435__1768881	OVERHEAD	98435	1Ø	1039	1047	-
855 98436__1768331	855 98436__1768331	OVERHEAD	98436	1Ø	1038	1047	-
856 98434__1775936	856 98434__1775936	OVERHEAD	98434	1Ø	1043	1051	-
857 2NX31__1765493	857 2NX31__1765493	OVERHEAD	2NX31	1Ø	1050	1059	-

858	2NX30__1774859	858 2NX30__1774859	OVERHEAD	2NX30	1Ø	1060	1069 -
859	2NX29__1769033	859 2NX29__1769033	OVERHEAD	2NX29	1Ø	1069	1078 -
860	2NX28__1768414	860 2NX28__1768414	OVERHEAD	2NX28	1Ø	1081	1090 -
861	2M353__1771605	861 2M353__1771605	OVERHEAD	2M353	1Ø	1096	1106 -
866	2M348__1710261	866 2M348__1710261	OVERHEAD	2M348	2Ø	1100	1109 -
867	2M341__1710115	867 2M341__1710115	OVERHEAD	2M341	1Ø	1153	1164 -
868	2M339__1710273	868 2M339__1710273	OVERHEAD	2M339	1Ø	1171	1182 -
869	2M334__1710272	869 2M334__1710272	OVERHEAD	2M334	1Ø	1189	1200 -
870	15W088__103956708	870 15W088__103956708	OVERHEAD	15W088	1Ø	1194	1205 -
871	2M332__1710271	871 2M332__1710271	OVERHEAD	2M332	1Ø	1199	1210 -
872	2M331__1710275	872 2M331__1710275	OVERHEAD	2M331	1Ø	1209	1221 -
873	2M230__1710262	873 2M230__1710262	OVERHEAD	2M230	1Ø	1224	1236 -
874	2M228__1710279	874 2M228__1710279	OVERHEAD	2M228	1Ø	1230	1242 -
875	2M225__1710281	875 2M225__1710281	OVERHEAD	2M225	1Ø	1238	1250 -
876	2M224__1710278	876 2M224__1710278	OVERHEAD	2M224	1Ø	1250	1262 -
877	2M220__1710277	877 2M220__1710277	OVERHEAD	2M220	1Ø	1264	1276 -
878	2M205__1710126	878 2M205__1710126	OVERHEAD	2M205	1Ø	1271	1284 -
887	2Q994__1710134	887 2Q994__1710134	OVERHEAD	2Q994	1Ø	1190	1201 -
888	2M216__1710133	888 2M216__1710133	OVERHEAD	2M216	1Ø	1201	1213 -
889	2M215__1710132	889 2M215__1710132	OVERHEAD	2M215	1Ø	1212	1224 -
891	2Q987__1710282	891 2Q987__1710282	OVERHEAD	2Q987	1Ø	1201	1212 -
892	2M211__1710128	892 2M211__1710128	OVERHEAD	2M211	1Ø	1231	1243 -
893	2M210__1710127	893 2M210__1710127	OVERHEAD	2M210	1Ø	1247	1260 -
895	2M201__1710125	895 2M201__1710125	OVERHEAD	2M201	1Ø	1310	1324 -
896	2M187__1710123	896 2M187__1710123	OVERHEAD	2M187	1Ø	1320	1334 -
904	2M194__1710118	904 2M194__1710118	OVERHEAD	2M194	1Ø	1260	1273 -
911	2M200__1710120	911 2M200__1710120	OVERHEAD	2M200	1Ø	1223	1235 -
916	15PQ27__103889379	916 15PQ27__103889379	OVERHEAD	15PQ27	1Ø	1251	1264 -
919	7RX87__103889372	919 7RX87__103889372	OVERHEAD	7RX87	1Ø	1258	1270 -
920	2M192__1710117	920 2M192__1710117	OVERHEAD	2M192	1Ø	1274	1287 -
925	7Q229__1764635	925 7Q229__1764635	OVERHEAD	7Q229	1Ø	1252	1264 -
926	7AB54__1763056	926 7AB54__1763056	OVERHEAD	7AB54	1Ø	1262	1275 -
927	7AB51__1764903	927 7AB51__1764903	OVERHEAD	7AB51	1Ø	1274	1287 -
928	2M190__1710116	928 2M190__1710116	OVERHEAD	2M190	1Ø	1286	1299 -
929	2M188__1710124	929 2M188__1710124	OVERHEAD	2M188	1Ø	1314	1328 -
930	2M181__1710122	930 2M181__1710122	OVERHEAD	2M181	1Ø	1349	1363 -
933	2M178__1710121	933 2M178__1710121	OVERHEAD	2M178	1Ø	1368	1383 -
937	2NZ33__1710135	937 2NZ33__1710135	OVERHEAD	2NZ33	1Ø	1367	1382 -
938	2M174__1710136	938 2M174__1710136	OVERHEAD	2M174	1Ø	1388	1404 -
941	2M168__1710130	941 2M168__1710130	OVERHEAD	2M168	1Ø	1417	1433 -
942	2M143__1710129	942 2M143__1710129	OVERHEAD	2M143	1Ø	1477	1495 -
952	2M162__1710026	952 2M162__1710026	OVERHEAD	2M162	1Ø	1339	1353 -
961	70C55__1764543	961 70C55__1764543	OVERHEAD	70C55	1Ø	1270	1283 -
962	2M159__1710035	962 2M159__1710035	OVERHEAD	2M159	1Ø	1282	1295 -
963	2M137__1710034	963 2M137__1710034	OVERHEAD	2M137	1Ø	1525	1544 -
964	2M133__1710033	964 2M133__1710033	OVERHEAD	2M133	1Ø	1547	1566 -
968	2M135__1710036	968 2M135__1710036	OVERHEAD	2M135	1Ø	1532	1551 -
969	2M119__1710028	969 2M119__1710028	OVERHEAD	2M119	1Ø	1570	1590 -
975	2M131__1710032	975 2M131__1710032	OVERHEAD	2M131	1Ø	1502	1521 -
976	2M129__1710031	976 2M129__1710031	OVERHEAD	2M129	1Ø	1536	1556 -
977	2M115__1710027	977 2M115__1710027	OVERHEAD	2M115	1Ø	1592	1613 -
983	2M126__1710030	983 2M126__1710030	OVERHEAD	2M126	1Ø	1496	1514 -
984	2M123__1710029	984 2M123__1710029	OVERHEAD	2M123	1Ø	1529	1549 -
985	2M122__1765045	985 2M122__1765045	OVERHEAD	2M122	1Ø	1558	1578 -
989	2M112__1710038	989 2M112__1710038	OVERHEAD	2M112	1Ø	1555	1574 -
990	2M106__1779716	990 2M106__1779716	OVERHEAD	2M106	2Ø	1661	1684 -
994	2KJ91__1710039	994 2KJ91__1710039	OVERHEAD	2KJ91	1Ø	1654	1676 -
998	2KJ99__1710040	998 2KJ99__1710040	OVERHEAD	2KJ99	1Ø	1640	1662 -
1000	2KJ87__1710037	1000 2KJ87__1710037	OVERHEAD	2KJ87	1Ø	1702	1726 -
1001	2KJ85__1710046	1001 2KJ85__1710046	OVERHEAD	2KJ85	1Ø	1739	1764 -
1002	2KJ76__1710045	1002 2KJ76__1710045	OVERHEAD	2KJ76	2Ø	1816	1843 -
1011	2KJ70__1710044	1011 2KJ70__1710044	OVERHEAD	2KJ70	1Ø	1739	1764 -
1012	2KJ64__1710043	1012 2KJ64__1710043	OVERHEAD	2KJ64	1Ø	1790	1816 -
1013	2KJ63__1710048	1013 2KJ63__1710048	OVERHEAD	2KJ63	1Ø	1833	1861 -
1014	2KJ61__1710042	1014 2KJ61__1710042	OVERHEAD	2KJ61	1Ø	1855	1884 -
1015	2KJ58__1710041	1015 2KJ58__1710041	OVERHEAD	2KJ58	1Ø	1875	1904 New
1023	101974__1770625	1023 101974__1770625	OVERHEAD	101974	1Ø	1798	1825 -
1025	2KJ54__1710054	1025 2KJ54__1710054	OVERHEAD	2KJ54	1Ø	1919	1949 New
1026	2KJ50__106750065	1026 2KJ50__106750065	OVERHEAD	2KJ50	1Ø	2001	2034 -
1027	2KJ49__1710053	1027 2KJ49__1710053	OVERHEAD	2KJ49	1Ø	2011	2045 -
1033	2KJ43__1709884	1033 2KJ43__1709884	OVERHEAD	2KJ43	1Ø	1996	2029 New
1037	2KJ47__1709885	1037 2KJ47__1709885	OVERHEAD	2KJ47	1Ø	1939	1970 New
1038	2KJ42__1709883	1038 2KJ42__1709883	OVERHEAD	2KJ42	1Ø	2019	2053 -
1039	2KJ41__1709882	1039 2KJ41__1709882	OVERHEAD	2KJ41	1Ø	2040	2075 -

1040	2KJ36__1709881	1040	2KJ36__1709881	OVERHEAD	2KJ36	1Ø	2128	2166	-
1041	2KJ30__1709893	1041	2KJ30__1709893	OVERHEAD	2KJ30	1Ø	2174	2214	-
1045	2KJ33__1709894	1045	2KJ33__1709894	OVERHEAD	2KJ33	1Ø	2140	2178	-
1050	2KJ29__1709892	1050	2KJ29__1709892	OVERHEAD	2KJ29	1Ø	2154	2193	-
1051	2KJ27__1709891	1051	2KJ27__1709891	OVERHEAD	2KJ27	1Ø	2215	2256	-
1052	2KJ25__1709890	1052	2KJ25__1709890	OVERHEAD	2KJ25	1Ø	2273	2317	-
1053	2KJ23__1709889	1053	2KJ23__1709889	OVERHEAD	2KJ23	1Ø	2313	2358	-
1056	2KJ21__1709888	1056	2KJ21__1709888	OVERHEAD	2KJ21	1Ø	2358	2404	-
1057	2KJ17__1709903	1057	2KJ17__1709903	OVERHEAD	2KJ17	1Ø	2512	2564	-
1063	54T77__1709916	1063	54T77__1709916	OVERHEAD	54T77	1Ø	2504	2557	-
1064	2KJ09__1709914	1064	2KJ09__1709914	OVERHEAD	2KJ09	3Ø	2558	2612	-
1070	2KJ02__1709902	1070	2KJ02__1709902	OVERHEAD	2KJ02	3Ø	2561	2616	-
1074	112829__1773961	1074	112829__1773961	OVERHEAD	112829	3Ø	2569	2625	-
1075	12L580__109775937	1075	12L580__109775937	OVERHEAD	12L580	1Ø	2594	2650	-
1082	2KH88__1709899	1082	2KH88__1709899	OVERHEAD	2KH88	1Ø	2468	2519	-
1086	2KH93__1709917	1086	2KH93__1709917	OVERHEAD	2KH93	1Ø	2416	2464	-
1087	2KH92__103970766	1087	2KH92__103970766	OVERHEAD	2KH92	1Ø	2443	2493	-
1088	2KH90__1709900	1088	2KH90__1709900	OVERHEAD	2KH90	1Ø	2477	2529	-
1089	2KH86__1709913	1089	2KH86__1709913	OVERHEAD	2KH86	1Ø	2521	2574	-
1090	2KH84__1709898	1090	2KH84__1709898	OVERHEAD	2KH84	1Ø	2578	2633	-
1096	17R607__104680921	1096	17R607__104680921	OVERHEAD	17R607	3Ø	2623	2680	-
1102	18HJ61__106172167	1102	18HJ61__106172167	OVERHEAD	18HJ61	3Ø	2636	2694	-
1103	2KH72__1709897	1103	2KH72__1709897	OVERHEAD	2KH72	1Ø	2680	2740	-
1106	2KH71__1709896	1106	2KH71__1709896	OVERHEAD	2KH71	1Ø	2646	2705	-
1107	2KH68__1709920	1107	2KH68__1709920	OVERHEAD	2KH68	1Ø	2698	2759	-
1108	2KH67__108789002	1108	2KH67__108789002	OVERHEAD	2KH67	1Ø	2721	2783	-
1109	2KH63__1709919	1109	2KH63__1709919	OVERHEAD	2KH63	1Ø	2735	2798	-
1137	2KG19__1710149	1137	2KG19__1710149	OVERHEAD	2KG19	1Ø	1934	1965	New
1176	2KH24__1710466	1176	2KH24__1710466	OVERHEAD	2KH24	1Ø	1240	1252	-
1180	128R12__1777404	1180	128R12__1777404	OVERHEAD	128R12	1Ø	1214	1226	-
1187	2KH39__1710494	1187	2KH39__1710494	OVERHEAD	2KH39	1Ø	1144	1155	-
1188	2KH35__1710493	1188	2KH35__1710493	OVERHEAD	2KH35	1Ø	1172	1182	-
1198	2KH60__1710492	1198	2KH60__1710492	OVERHEAD	2KH60	1Ø	1055	1064	-
1205	2KH58__1710509	1205	2KH58__1710509	OVERHEAD	2KH58	1Ø	1045	1054	-
1206	2KH55__1710510	1206	2KH55__1710510	OVERHEAD	2KH55	1Ø	1068	1077	-
1207	2KH47__1710495	1207	2KH47__1710495	OVERHEAD	2KH47	1Ø	1125	1135	-
1208	2KH45__1780119	1208	2KH45__1780119	OVERHEAD	2KH45	1Ø	1134	1144	-
1209	2KH26__1710467	1209	2KH26__1710467	OVERHEAD	2KH26	1Ø	1241	1253	-
1210	2KH20__1710465	1210	2KH20__1710465	OVERHEAD	2KH20	1Ø	1266	1279	-
1215	2KH19__1710464	1215	2KH19__1710464	OVERHEAD	2KH19	1Ø	1245	1257	-
1216	2KH16__1710463	1216	2KH16__1710463	OVERHEAD	2KH16	1Ø	1282	1295	-
1217	2KH13__1710462	1217	2KH13__1710462	OVERHEAD	2KH13	1Ø	1309	1323	-
1230	2KH00__1710455	1230	2KH00__1710455	OVERHEAD	2KH00	1Ø	1144	1154	-
1231	2KG96__1710458	1231	2KG96__1710458	OVERHEAD	2KG96	1Ø	1191	1202	-
1232	2KG94__1710457	1232	2KG94__1710457	OVERHEAD	2KG94	1Ø	1214	1226	-
1233	2KG92__1710456	1233	2KG92__1710456	OVERHEAD	2KG92	1Ø	1236	1249	-
1241	2KH08__1710461	1241	2KH08__1710461	OVERHEAD	2KH08	1Ø	1190	1201	-
1242	2KH07__1783055	1242	2KH07__1783055	OVERHEAD	2KH07	1Ø	1195	1207	-
1246	2KH12__1710491	1246	2KH12__1710491	OVERHEAD	2KH12	1Ø	1104	1114	-
1247	2KH04__1710460	1247	2KH04__1710460	OVERHEAD	2KH04	1Ø	1221	1233	-
1248	2KH03__1772493	1248	2KH03__1772493	OVERHEAD	2KH03	1Ø	1249	1262	-
1249	2KG85__1710459	1249	2KG85__1710459	OVERHEAD	2KG85	1Ø	1306	1320	-
1250	2KG77__1710395	1250	2KG77__1710395	OVERHEAD	2KG77	1Ø	1384	1399	-
1251	2KG73__1710394	1251	2KG73__1710394	OVERHEAD	2KG73	1Ø	1433	1450	-
1252	2KG70__1710393	1252	2KG70__1710393	OVERHEAD	2KG70	1Ø	1462	1479	-
1253	2KG68__1710392	1253	2KG68__1710392	OVERHEAD	2KG68	1Ø	1518	1536	-
1254	2KG66__1710391	1254	2KG66__1710391	OVERHEAD	2KG66	1Ø	1525	1544	-
1263	2KG64__1779562	1263	2KG64__1779562	OVERHEAD	2KG64	1Ø	1392	1408	-
1264	2KG59__1765383	1264	2KG59__1765383	OVERHEAD	2KG59	1Ø	1495	1514	-
1265	2KG58__1710390	1265	2KG58__1710390	OVERHEAD	2KG58	1Ø	1521	1539	-
1266	2KG57__1710389	1266	2KG57__1710389	OVERHEAD	2KG57	1Ø	1542	1561	-
1267	2KG55__1710291	1267	2KG55__1710291	OVERHEAD	2KG55	1Ø	1561	1581	-
1268	2KG51__1710290	1268	2KG51__1710290	OVERHEAD	2KG51	1Ø	1577	1597	-
1269	2KG47__1710289	1269	2KG47__1710289	OVERHEAD	2KG47	1Ø	1661	1684	-
1270	2KG36__1710288	1270	2KG36__1710288	OVERHEAD	2KG36	1Ø	1682	1705	-
1271	2KG35__1710287	1271	2KG35__1710287	OVERHEAD	2KG35	1Ø	1699	1723	-
1272	2X139__1710286	1272	2X139__1710286	OVERHEAD	2X139	1Ø	1772	1798	-
1273	2KG30__1710147	1273	2KG30__1710147	OVERHEAD	2KG30	1Ø	1791	1817	-
1274	2KG29__1710146	1274	2KG29__1710146	OVERHEAD	2KG29	1Ø	1833	1861	-
1275	2KG28__1710148	1275	2KG28__1710148	OVERHEAD	2KG28	1Ø	1872	1901	New
1276	2KG24__1710145	1276	2KG24__1710145	OVERHEAD	2KG24	1Ø	1961	1993	New
1277	2KG15__1710144	1277	2KG15__1710144	OVERHEAD	2KG15	1Ø	2037	2072	-
1289	13QA57__1781399	1289	13QA57__1781399	OVERHEAD	13QA57	1Ø	1786	1812	-
1290	2L975__104386300	1290	2L975__104386300	OVERHEAD	2L975	1Ø	1797	1824	-

1296	2KG04__104383485	1296	2KG04__104383485	OVERHEAD	2KG04	1Ø	1677	1700	-
1302	2KG11__1710052	1302	2KG11__1710052	OVERHEAD	2KG11	1Ø	1622	1644	-
1303	185L78__104751350	1303	185L78__104751350	OVERHEAD	185L78	1Ø	1654	1676	-
1304	2KG06__1710050	1304	2KG06__1710050	OVERHEAD	2KG06	1Ø	1679	1702	-
1305	2KG02__1710049	1305	2KG02__1710049	OVERHEAD	2KG02	1Ø	1700	1724	-
1306	1CDQ96__114161940	1306	1CDQ96__114161940	OVERHEAD	1CDQ96	1Ø	1757	1782	-
1307	2L997__1710060	1307	2L997__1710060	OVERHEAD	2L997	1Ø	1775	1801	-
1319	2L993__1710139	1319	2L993__1710139	OVERHEAD	2L993	1Ø	1554	1573	-
1322	2L996__1710140	1322	2L996__1710140	OVERHEAD	2L996	1Ø	1544	1563	-
1323	2L986__1710138	1323	2L986__1710138	OVERHEAD	2L986	1Ø	1641	1663	-
1324	2L984__1710137	1324	2L984__1710137	OVERHEAD	2L984	1Ø	1666	1689	-
1329	2L982__1710143	1329	2L982__1710143	OVERHEAD	2L982	1Ø	1644	1666	-
1331	2L981__1710142	1331	2L981__1710142	OVERHEAD	2L981	1Ø	1663	1686	-
1332	2L980__1710141	1332	2L980__1710141	OVERHEAD	2L980	1Ø	1684	1707	-
1333	2L978__1710059	1333	2L978__1710059	OVERHEAD	2L978	1Ø	1706	1730	-
1334	2L974__1710058	1334	2L974__1710058	OVERHEAD	2L974	1Ø	1812	1839	-
1335	2L972__1710057	1335	2L972__1710057	OVERHEAD	2L972	1Ø	1878	1907	New
1336	2L971__1710056	1336	2L971__1710056	OVERHEAD	2L971	1Ø	1899	1929	New
1337	2L968__1710067	1337	2L968__1710067	OVERHEAD	2L968	1Ø	1940	1971	New
1338	2L964__1710066	1338	2L964__1710066	OVERHEAD	2L964	1Ø	2039	2074	-
1339	2L962__1710065	1339	2L962__1710065	OVERHEAD	2L962	1Ø	2070	2106	-
1340	2L958__1710068	1340	2L958__1710068	OVERHEAD	2L958	2Ø	2155	2194	-
1350	1B2D80__110598742	1350	1B2D80__110598742	OVERHEAD	1B2D80	1Ø	2266	2309	-
1354	1B2D83__110598735	1354	1B2D83__110598735	OVERHEAD	1B2D83	1Ø	2252	2295	-
1361	7G925__1765709	1361	7G925__1765709	OVERHEAD	7G925	1Ø	2183	2223	-
1367	2L943__1710062	1367	2L943__1710062	OVERHEAD	2L943	1Ø	2285	2329	-
1368	2L933__1710061	1368	2L933__1710061	OVERHEAD	2L933	1Ø	2313	2358	-
1373	2L950__1710063	1373	2L950__1710063	OVERHEAD	2L950	1Ø	2266	2309	-
1374	2L951__1710064	1374	2L951__1710064	OVERHEAD	2L951	1Ø	2288	2331	-
1376	2NY27__1710069	1376	2NY27__1710069	OVERHEAD	2NY27	2Ø	2298	2343	-
1377	2L930__1710076	1377	2L930__1710076	OVERHEAD	2L930	1Ø	2362	2408	-
1378	2L926__1710075	1378	2L926__1710075	OVERHEAD	2L926	1Ø	2441	2491	-
1379	2L922__1710074	1379	2L922__1710074	OVERHEAD	2L922	1Ø	2493	2546	-
1381	2L921__1709953	1381	2L921__1709953	OVERHEAD	2L921	1Ø	2555	2609	-
1385	2L920__1709952	1385	2L920__1709952	OVERHEAD	2L920	2Ø	2543	2597	-
1389	7HW05__109775910	1389	7HW05__109775910	OVERHEAD	7HW05	1Ø	2474	2525	-
1392	7HW06__1764288	1392	7HW06__1764288	OVERHEAD	7HW06	3Ø	2462	2513	-
1393	2L916__1709951	1393	2L916__1709951	OVERHEAD	2L916	1Ø	2650	2709	-
1394	2L913__1709950	1394	2L913__1709950	OVERHEAD	2L913	2Ø	2684	2744	-
1397	2L908__1709949	1397	2L908__1709949	OVERHEAD	2L908	1Ø	2693	2754	-
1398	2L902__1709948	1398	2L902__1709948	OVERHEAD	2L902	2Ø	2743	2806	-
1399	2L893__1709947	1399	2L893__1709947	OVERHEAD	2L893	2Ø	2787	2852	-
1405	2L877__1709945	1405	2L877__1709945	OVERHEAD	2L877	1Ø	2657	2716	-
1413	2L891__1709790	1413	2L891__1709790	OVERHEAD	2L891	1Ø	2480	2531	-
1414	2L889__1709789	1414	2L889__1709789	OVERHEAD	2L889	1Ø	2501	2553	-
1415	2L884__1709911	1415	2L884__1709911	OVERHEAD	2L884	1Ø	2542	2597	-
1416	2L882__1709912	1416	2L882__1709912	OVERHEAD	2L882	1Ø	2571	2627	-
1417	2L878__1709946	1417	2L878__1709946	OVERHEAD	2L878	2Ø	2649	2708	-
1418	2L876__1778704	1418	2L876__1778704	OVERHEAD	2L876	1Ø	2685	2745	-
1419	2L872__1709944	1419	2L872__1709944	OVERHEAD	2L872	1Ø	2731	2794	-
1420	2L871__1709943	1420	2L871__1709943	OVERHEAD	2L871	1Ø	2770	2834	-
1421	2L869__1709942	1421	2L869__1709942	OVERHEAD	2L869	2Ø	2828	2895	-
1432	2KW40__1709927	1432	2KW40__1709927	OVERHEAD	2KW40	1Ø	2649	2708	-
1436	2KW48__1709928	1436	2KW48__1709928	OVERHEAD	2KW48	3Ø	2622	2680	-
1444	2KW70__1709961	1444	2KW70__1709961	OVERHEAD	2KW70	1Ø	2311	2356	-
1447	2KW75__1767273	1447	2KW75__1767273	OVERHEAD	2KW75	1Ø	2276	2319	-
1448	2KW69__1709960	1448	2KW69__1709960	OVERHEAD	2KW69	1Ø	2346	2392	-
1449	2KW66__1709972	1449	2KW66__1709972	OVERHEAD	2KW66	1Ø	2382	2429	-
1450	2KW65__1709971	1450	2KW65__1709971	OVERHEAD	2KW65	1Ø	2426	2475	-
1454	8NN88__1766922	1454	8NN88__1766922	OVERHEAD	8NN88	1Ø	2395	2443	-
1459	8NP06__106288528	1459	8NP06__106288528	OVERHEAD	8NP06	1Ø	2413	2462	-
1463	8NN89__1766921	1463	8NN89__1766921	OVERHEAD	8NN89	1Ø	2389	2437	-
1464	2KW80__1710078	1464	2KW80__1710078	OVERHEAD	2KW80	2Ø	2431	2481	-
1480	2KW94__1710163	1480	2KW94__1710163	OVERHEAD	2KW94	1Ø	1990	2023	New
1481	2KW93__1710162	1481	2KW93__1710162	OVERHEAD	2KW93	1Ø	2016	2050	-
1489	2NA09__1710158	1489	2NA09__1710158	OVERHEAD	2NA09	1Ø	1849	1877	-
1490	2NA08__1710168	1490	2NA08__1710168	OVERHEAD	2NA08	1Ø	1886	1915	New
1491	2NA05__1710167	1491	2NA05__1710167	OVERHEAD	2NA05	1Ø	1919	1949	New
1492	2NA02__1710166	1492	2NA02__1710166	OVERHEAD	2NA02	1Ø	1946	1977	New
1493	2KW98__1710165	1493	2KW98__1710165	OVERHEAD	2KW98	1Ø	1983	2016	New
1494	2KW96__1710164	1494	2KW96__1710164	OVERHEAD	2KW96	1Ø	2011	2045	-
1500	2NA16__1710170	1500	2NA16__1710170	OVERHEAD	2NA16	1Ø	1954	1986	New
1502	2NA13__1710169	1502	2NA13__1710169	OVERHEAD	2NA13	1Ø	1975	2007	New
1503	2KW79__1710077	1503	2KW79__1710077	OVERHEAD	2KW79	1Ø	2463	2514	-

1512 2KW63__1710073	1512 2KW63__1710073	OVERHEAD	2KW63	1Ø	2225	2266	-
1515 13XK01__1781836	1515 13XK01__1781836	OVERHEAD	13XK01	1Ø	2208	2249	-
1516 79A29__1763063	1516 79A29__1763063	OVERHEAD	79A29	1Ø	2235	2276	-
1517 2KW61__1710072	1517 2KW61__1710072	OVERHEAD	2KW61	1Ø	2299	2343	-
1518 12DG65__1777786	1518 12DG65__1777786	OVERHEAD	12DG65	1Ø	2324	2369	-
1519 2KW60__1710071	1519 2KW60__1710071	OVERHEAD	2KW60	1Ø	2357	2404	-
1520 2KW59__1710070	1520 2KW59__1710070	OVERHEAD	2KW59	1Ø	2415	2464	-
1521 2KW58__1710079	1521 2KW58__1710079	OVERHEAD	2KW58	1Ø	2460	2510	-
1522 2KW54__1709930	1522 2KW54__1709930	OVERHEAD	2KW54	1Ø	2550	2604	-
1523 2KW49__1709929	1523 2KW49__1709929	OVERHEAD	2KW49	1Ø	2612	2670	-
1524 2KW38__1709926	1524 2KW38__1709926	OVERHEAD	2KW38	1Ø	2681	2742	-
1525 2KW33__1709925	1525 2KW33__1709925	OVERHEAD	2KW33	1Ø	2781	2846	-
1526 2KW18__112104634	1526 2KW18__112104634	OVERHEAD	2KW18	1Ø	2814	2880	-
1530 2KW21__1709922	1530 2KW21__1709922	OVERHEAD	2KW21	3Ø	2783	2848	-
1542 2M732__1709968	1542 2M732__1709968	OVERHEAD	2M732	1Ø	2567	2622	-
1550 7WL35__1764697	1550 7WL35__1764697	OVERHEAD	7WL35	1Ø	2440	2490	-
1551 2M737__1709969	1551 2M737__1709969	OVERHEAD	2M737	1Ø	2550	2604	-
1552 T6693__1709973	1552 T6693__1709973	OVERHEAD	T6693	2Ø	2629	2687	-
1553 58B30__1709924	1553 58B30__1709924	OVERHEAD	58B30	1Ø	2687	2747	-
1557 2KW29__1709918	1557 2KW29__1709918	OVERHEAD	2KW29	3Ø	2691	2752	-
1561 124P66__1777070	1561 124P66__1777070	OVERHEAD	124P66	3Ø	2673	2733	-
1565 88F00__1766081	1565 88F00__1766081	OVERHEAD	88F00	3Ø	2646	2705	-
1566 2KW23__1709923	1566 2KW23__1709923	OVERHEAD	2KW23	2Ø	2731	2794	-
1567 2KW19__1709921	1567 2KW19__1709921	OVERHEAD	2KW19	1Ø	2795	2860	-
1568 2L866__1709941	1568 2L866__1709941	OVERHEAD	2L866	2Ø	2856	2924	-
1571 2L864__1709940	1571 2L864__1709940	OVERHEAD	2L864	2Ø	2833	2901	-
1572 2L862__1709939	1572 2L862__1709939	OVERHEAD	2L862	2Ø	2877	2946	-
1575 2L859__1709938	1575 2L859__1709938	OVERHEAD	2L859	1Ø	2862	2930	-
1576 2L854__1709937	1576 2L854__1709937	OVERHEAD	2L854	1Ø	2929	3001	-
1582 2L851__1709936	1582 2L851__1709936	OVERHEAD	2L851	1Ø	2839	2907	-
1583 14TE49__103045804	1583 14TE49__103045804	OVERHEAD	14TE49	1Ø	2866	2934	-
1584 2L849__1709935	1584 2L849__1709935	OVERHEAD	2L849	2Ø	2892	2962	-
1585 2L844__1709934	1585 2L844__1709934	OVERHEAD	2L844	1Ø	2977	3051	-
1601 2KU56__1709959	1601 2KU56__1709959	OVERHEAD	2KU56	1Ø	2425	2590	-
1719 2ND49__1710496	1719 2ND49__1710496	OVERHEAD	2ND49	1Ø	767	788	-
1754 111228__1773694	1754 111228__1773694	OVERHEAD	111228	1Ø	626	641	-
1784 58C10__1710648	1784 58C10__1710648	OVERHEAD	58C10	1Ø	535	546	-
1785 58C09__115175733	1785 58C09__115175733	OVERHEAD	58C09	1Ø	537	548	-
1786 2NF53__1710647	1786 2NF53__1710647	OVERHEAD	2NF53	1Ø	540	551	-
1787 2NF50__1710646	1787 2NF50__1710646	OVERHEAD	2NF50	1Ø	544	555	-
1788 2NF47__1710645	1788 2NF47__1710645	OVERHEAD	2NF47	1Ø	545	556	-
1789 2NF43__1710704	1789 2NF43__1710704	OVERHEAD	2NF43	1Ø	548	559	-
1798 2NF60__1710710	1798 2NF60__1710710	OVERHEAD	2NF60	1Ø	537	548	-
1801 2NF62__1710716	1801 2NF62__1710716	OVERHEAD	2NF62	1Ø	532	543	-
1811 2N815__1710764	1811 2N815__1710764	OVERHEAD	2N815	1Ø	510	520	-
1812 2N813__1710720	1812 2N813__1710720	OVERHEAD	2N813	1Ø	514	524	-
1816 7A612__1763109	1816 7A612__1763109	OVERHEAD	7A612	1Ø	515	525	-
1817 2NF81__1710715	1817 2NF81__1710715	OVERHEAD	2NF81	1Ø	526	536	-
1833 2NG99__1879917	1833 2NG99__1879917	OVERHEAD	2NG99	1Ø	484	493	-
1837 2NH02__1811846	1837 2NH02__1811846	OVERHEAD	2NH02	1Ø	483	492	-
1842 2NH07__103705286	1842 2NH07__103705286	OVERHEAD	2NH07	1Ø	476	484	-
1843 2NH04__1880836	1843 2NH04__1880836	OVERHEAD	2NH04	1Ø	482	490	-
1844 2NG91__1710763	1844 2NG91__1710763	OVERHEAD	2NG91	1Ø	507	516	-
1845 2NG88__1710762	1845 2NG88__1710762	OVERHEAD	2NG88	1Ø	510	520	-
1846 2NG86__1781491	1846 2NG86__1781491	OVERHEAD	2NG86	1Ø	517	527	-
1847 18LX79__106171490	1847 18LX79__106171490	OVERHEAD	18LX79	1Ø	522	533	-
1848 2NG82__1710761	1848 2NG82__1710761	OVERHEAD	2NG82	1Ø	524	534	-
1849 2NF64__1710712	1849 2NF64__1710712	OVERHEAD	2NF64	1Ø	531	542	-
1860 2NF79__1710719	1860 2NF79__1710719	OVERHEAD	2NF79	1Ø	508	517	-
1861 2NF74__1710718	1861 2NF74__1710718	OVERHEAD	2NF74	1Ø	515	525	-
1862 2NF71__1710714	1862 2NF71__1710714	OVERHEAD	2NF71	1Ø	523	534	-
1863 2NF68__1710713	1863 2NF68__1710713	OVERHEAD	2NF68	1Ø	527	537	-
1864 2NF61__1710711	1864 2NF61__1710711	OVERHEAD	2NF61	1Ø	535	546	-
1871 2NF90__1710706	1871 2NF90__1710706	OVERHEAD	2NF90	1Ø	530	541	-
1874 2NF93__1710708	1874 2NF93__1710708	OVERHEAD	2NF93	1Ø	528	539	-
1877 2NF92__1710707	1877 2NF92__1710707	OVERHEAD	2NF92	1Ø	528	538	-
1878 2NF85__1710705	1878 2NF85__1710705	OVERHEAD	2NF85	1Ø	544	555	-
1879 2NF54__1710709	1879 2NF54__1710709	OVERHEAD	2NF54	1Ø	550	561	-
1880 2NF39__1710653	1880 2NF39__1710653	OVERHEAD	2NF39	1Ø	556	568	-
1881 2NF14__1710651	1881 2NF14__1710651	OVERHEAD	2NF14	1Ø	570	582	-
1904 2X184__1710616	1904 2X184__1710616	OVERHEAD	2X184	1Ø	518	528	-
1905 2X179__1710660	1905 2X179__1710660	OVERHEAD	2X179	1Ø	527	538	-
1906 2NF29__1710659	1906 2NF29__1710659	OVERHEAD	2NF29	1Ø	538	549	-
1907 2NF24__1710657	1907 2NF24__1710657	OVERHEAD	2NF24	1Ø	552	563	-

1908 2NF21__1710656	1908 2NF21__1710656	OVERHEAD	2NF21	1Ø	558	569	-
1914 10Y783__1775529	1914 10Y783__1775529	OVERHEAD	10Y783	1Ø	551	562	-
1916 13PH77__1781369	1916 13PH77__1781369	OVERHEAD	13PH77	1Ø	552	564	-
1917 10Y784__1773621	1917 10Y784__1773621	OVERHEAD	10Y784	1Ø	554	565	-
1918 2NF32__1710717	1918 2NF32__1710717	OVERHEAD	2NF32	1Ø	556	567	-
1919 2NF31__1710658	1919 2NF31__1710658	OVERHEAD	2NF31	1Ø	557	569	-
1920 2NF18__1710652	1920 2NF18__1710652	OVERHEAD	2NF18	1Ø	564	576	-
1921 2NF10__1710650	1921 2NF10__1710650	OVERHEAD	2NF10	1Ø	579	591	-
1942 17EY96__104154816	1942 17EY96__104154816	OVERHEAD	17EY96	1Ø	535	546	-
1944 2NE91__1710549	1944 2NE91__1710549	OVERHEAD	2NE91	1Ø	534	544	-
1945 2NE90__1780753	1945 2NE90__1780753	OVERHEAD	2NE90	1Ø	537	548	-
1946 2NE87__1710610	1946 2NE87__1710610	OVERHEAD	2NE87	1Ø	538	549	-
1948 2NE93__1710611	1948 2NE93__1710611	OVERHEAD	2NE93	1Ø	540	551	-
1957 2NF03__1710550	1957 2NF03__1710550	OVERHEAD	2NF03	1Ø	521	531	-
1961 2NF06__1710603	1961 2NF06__1710603	OVERHEAD	2NF06	1Ø	529	540	-
1964 2NF08__1710604	1964 2NF08__1710604	OVERHEAD	2NF08	1Ø	526	536	-
1968 2Q986__1710605	1968 2Q986__1710605	OVERHEAD	2Q986	1Ø	527	537	-
1969 2P911__1710612	1969 2P911__1710612	OVERHEAD	2P911	1Ø	538	549	-
1970 2NE84__1710609	1970 2NE84__1710609	OVERHEAD	2NE84	1Ø	548	560	-
1971 2NE73__1710606	1971 2NE73__1710606	OVERHEAD	2NE73	1Ø	557	569	-
1977 2NE80__1710608	1977 2NE80__1710608	OVERHEAD	2NE80	1Ø	549	560	-
1980 8BM50__1766388	1980 8BM50__1766388	OVERHEAD	8BM50	1Ø	548	559	-
1981 2NE76__1710607	1981 2NE76__1710607	OVERHEAD	2NE76	1Ø	554	566	-
1982 148F11__1782471	1982 148F11__1782471	OVERHEAD	148F11	1Ø	555	567	-
1983 9FL05__1768857	1983 9FL05__1768857	OVERHEAD	9FL05	1Ø	558	569	-
1989 9D285__1768654	1989 9D285__1768654	OVERHEAD	9D285	1Ø	559	571	-
1990 9D282__1779300	1990 9D282__1779300	OVERHEAD	9D282	1Ø	561	573	-
1991 2NE66__1710649	1991 2NE66__1710649	OVERHEAD	2NE66	1Ø	578	591	-
1992 2N824__1710655	1992 2N824__1710655	OVERHEAD	2N824	1Ø	581	593	-
1993 2NE62__1710613	1993 2NE62__1710613	OVERHEAD	2NE62	1Ø	591	604	-
1994 2NE60__1710615	1994 2NE60__1710615	OVERHEAD	2NE60	1Ø	600	613	-
1995 2NE57__1710614	1995 2NE57__1710614	OVERHEAD	2NE57	1Ø	610	624	-
1996 110D27__1773695	1996 110D27__1773695	OVERHEAD	110D27	1Ø	629	644	-
1997 2NE49__1710559	1997 2NE49__1710559	OVERHEAD	2NE49	1Ø	634	649	-
1998 2NE48__1710560	1998 2NE48__1710560	OVERHEAD	2NE48	1Ø	641	656	-
2014 2NG12__1710564	2014 2NG12__1710564	OVERHEAD	2NG12	1Ø	603	616	-
2017 2NG14__1710565	2017 2NG14__1710565	OVERHEAD	2NG14	1Ø	597	610	-
2019 2NG15__1710566	2019 2NG15__1710566	OVERHEAD	2NG15	1Ø	597	611	-
2022 8QC74__1767116	2022 8QC74__1767116	OVERHEAD	8QC74	1Ø	594	608	-
2023 2NG06__104019453	2023 2NG06__104019453	OVERHEAD	2NG06	1Ø	615	629	-
2024 2NG03__1710562	2024 2NG03__1710562	OVERHEAD	2NG03	1Ø	623	637	-
2027 15D749__103407729	2027 15D749__103407729	OVERHEAD	15D749	1Ø	624	638	-
2028 2NG02__1710561	2028 2NG02__1710561	OVERHEAD	2NG02	1Ø	627	642	-
2048 2NG43__1710664	2048 2NG43__1710664	OVERHEAD	2NG43	1Ø	576	589	-
2054 2NG48__1710666	2054 2NG48__1710666	OVERHEAD	2NG48	1Ø	575	588	-
2055 2NG47__1710665	2055 2NG47__1710665	OVERHEAD	2NG47	1Ø	578	591	-
2058 2NG50__1710667	2058 2NG50__1710667	OVERHEAD	2NG50	1Ø	576	588	-
2066 2NG62__1710668	2066 2NG62__1710668	OVERHEAD	2NG62	1Ø	558	569	-
2071 2NG66__1710721	2071 2NG66__1710721	OVERHEAD	2NG66	1Ø	557	568	-
2075 2NG71__1710724	2075 2NG71__1710724	OVERHEAD	2NG71	1Ø	554	566	-
2076 2NG70__1710723	2076 2NG70__1710723	OVERHEAD	2NG70	1Ø	556	568	-
2080 2NG76__1710726	2080 2NG76__1710726	OVERHEAD	2NG76	1Ø	548	560	-
2084 2NG79__1710727	2084 2NG79__1710727	OVERHEAD	2NG79	1Ø	545	556	-
2100 2NH41__1710766	2100 2NH41__1710766	OVERHEAD	2NH41	1Ø	505	515	-
2101 2NH40__1710765	2101 2NH40__1710765	OVERHEAD	2NH40	1Ø	509	518	-
2102 2NH38__103127202	2102 2NH38__103127202	OVERHEAD	2NH38	1Ø	515	525	-
2106 2NH47__1710771	2106 2NH47__1710771	OVERHEAD	2NH47	1Ø	519	529	-
2119 2NH70__104397905	2119 2NH70__104397905	OVERHEAD	2NH70	1Ø	489	498	-
2125 2NH76__1811924	2125 2NH76__1811924	OVERHEAD	2NH76	1Ø	480	489	-
2149 2NJ12__1827521	2149 2NJ12__1827521	OVERHEAD	2NJ12	1Ø	435	442	-
2156 2NJ58__1827525	2156 2NJ58__1827525	OVERHEAD	2NJ58	1Ø	426	432	-
2175 2NJ82__1823985	2175 2NJ82__1823985	OVERHEAD	2NJ82	1Ø	404	410	-
2185 2N152__1827529	2185 2N152__1827529	OVERHEAD	2N152	1Ø	395	401	-
2186 2NJ99__1827530	2186 2NJ99__1827530	OVERHEAD	2NJ99	1Ø	396	402	-
2196 17LA07__104356185	2196 17LA07__104356185	OVERHEAD	17LA07	1Ø	387	393	-
2197 6M270__1865108	2197 6M270__1865108	OVERHEAD	6M270	1Ø	391	397	-
2198 2NJ89__1827528	2198 2NJ89__1827528	OVERHEAD	2NJ89	1Ø	400	406	-
2199 2NJ85__1823986	2199 2NJ85__1823986	OVERHEAD	2NJ85	1Ø	404	410	-
2200 2NJ71__1827527	2200 2NJ71__1827527	OVERHEAD	2NJ71	1Ø	413	419	-
2201 2NJ64__1864604	2201 2NJ64__1864604	OVERHEAD	2NJ64	1Ø	423	429	-
2202 2NJ55__1874382	2202 2NJ55__1874382	OVERHEAD	2NJ55	1Ø	431	438	-
2203 2NJ52__1827522	2203 2NJ52__1827522	OVERHEAD	2NJ52	1Ø	434	441	-
2215 2NJ35__1827518	2215 2NJ35__1827518	OVERHEAD	2NJ35	1Ø	410	417	-
2217 2NJ42__1827519	2217 2NJ42__1827519	OVERHEAD	2NJ42	1Ø	409	415	-

2239 10DN01__1873690	2239 10DN01__1873690	OVERHEAD	10DN01	1Ø	400	406	-
2240 18EF74__108925074	2240 18EF74__108925074	OVERHEAD	18EF74	1Ø	405	411	-
2241 2NJ40__1823983	2241 2NJ40__1823983	OVERHEAD	2NJ40	1Ø	408	415	-
2247 2NJ18__1827363	2247 2NJ18__1827363	OVERHEAD	2NJ18	1Ø	428	435	-
2248 2NJ15__1827362	2248 2NJ15__1827362	OVERHEAD	2NJ15	1Ø	432	439	-
2250 2NJ20__1827364	2250 2NJ20__1827364	OVERHEAD	2NJ20	1Ø	431	438	-
2251 2NJ10__1827524	2251 2NJ10__1827524	OVERHEAD	2NJ10	1Ø	436	443	-
2252 2NJ06__1827520	2252 2NJ06__1827520	OVERHEAD	2NJ06	1Ø	438	446	-
2253 2NJ05__1827523	2253 2NJ05__1827523	OVERHEAD	2NJ05	1Ø	440	448	-
2254 2NJ03__1827517	2254 2NJ03__1827517	OVERHEAD	2NJ03	1Ø	443	451	-
2255 2NH98__1827516	2255 2NH98__1827516	OVERHEAD	2NH98	1Ø	447	455	-
2257 2NJ01__1827361	2257 2NJ01__1827361	OVERHEAD	2NJ01	1Ø	447	455	-
2258 2NH78__1878853	2258 2NH78__1878853	OVERHEAD	2NH78	2Ø	481	490	-
2259 2NH71__1811923	2259 2NH71__1811923	OVERHEAD	2NH71	1Ø	487	496	-
2263 2NH68__1811922	2263 2NH68__1811922	OVERHEAD	2NH68	2Ø	489	498	-
2264 2NH63__1811851	2264 2NH63__1811851	OVERHEAD	2NH63	1Ø	497	507	-
2265 2NH61__1811850	2265 2NH61__1811850	OVERHEAD	2NH61	1Ø	499	508	-
2266 2NH58__1811849	2266 2NH58__1811849	OVERHEAD	2NH58	1Ø	504	514	-
2269 2NH56__1811848	2269 2NH56__1811848	OVERHEAD	2NH56	1Ø	504	514	-
2273 2NH52__1811847	2273 2NH52__1811847	OVERHEAD	2NH52	1Ø	503	513	-
2277 149481__1782554	2277 149481__1782554	OVERHEAD	149481	1Ø	517	527	-
2279 2NH45__1710772	2279 2NH45__1710772	OVERHEAD	2NH45	1Ø	515	525	-
2282 2NH33__1710770	2282 2NH33__1710770	OVERHEAD	2NH33	1Ø	522	532	-
2283 2NH30__1710769	2283 2NH30__1710769	OVERHEAD	2NH30	1Ø	529	539	-
2284 2NH28__1710768	2284 2NH28__1710768	OVERHEAD	2NH28	1Ø	530	541	-
2286 2NG81__1710767	2286 2NG81__1710767	OVERHEAD	2NG81	1Ø	541	552	-
2299 2P965__1710733	2299 2P965__1710733	OVERHEAD	2P965	1Ø	512	521	-
2300 2NH15__1710731	2300 2NH15__1710731	OVERHEAD	2NH15	1Ø	523	533	-
2313 1CLB60__114624451	2313 1CLB60__114624451	OVERHEAD	1CLB60	1Ø	506	516	-
2317 1CLB61__114624467	2317 1CLB61__114624467	OVERHEAD	1CLB61	1Ø	502	511	-
2319 2NH21__1710729	2319 2NH21__1710729	OVERHEAD	2NH21	1Ø	517	527	-
2320 2NH19__1710728	2320 2NH19__1710728	OVERHEAD	2NH19	1Ø	520	530	-
2326 2N826__1710732	2326 2N826__1710732	OVERHEAD	2N826	1Ø	512	522	-
2327 2NY86__104659007	2327 2NY86__104659007	OVERHEAD	2NY86	1Ø	521	531	-
2330 2P997__1766050	2330 2P997__1766050	OVERHEAD	2P997	1Ø	524	534	-
2332 2P996__1710730	2332 2P996__1710730	OVERHEAD	2P996	1Ø	526	537	-
2333 2NG74__1710725	2333 2NG74__1710725	OVERHEAD	2NG74	1Ø	552	563	-
2334 2NG69__1710722	2334 2NG69__1710722	OVERHEAD	2NG69	1Ø	558	570	-
2335 2NG38__1710663	2335 2NG38__1710663	OVERHEAD	2NG38	1Ø	588	601	-
2336 2NG35__1710662	2336 2NG35__1710662	OVERHEAD	2NG35	1Ø	592	605	-
2338 8N667__1767003	2338 8N667__1767003	OVERHEAD	8N667	1Ø	595	608	-
2339 2NG32__1710661	2339 2NG32__1710661	OVERHEAD	2NG32	1Ø	597	610	-
2340 2NG31__1710622	2340 2NG31__1710622	OVERHEAD	2NG31	1Ø	601	615	-
2341 2NG30__1710621	2341 2NG30__1710621	OVERHEAD	2NG30	1Ø	603	617	-
2342 2NG28__1710620	2342 2NG28__1710620	OVERHEAD	2NG28	1Ø	608	622	-
2350 15K869__103731249	2350 15K869__103731249	OVERHEAD	15K869	1Ø	602	615	-
2352 5FR05__1710623	2352 5FR05__1710623	OVERHEAD	5FR05	1Ø	608	622	-
2353 2NG26__1771707	2353 2NG26__1771707	OVERHEAD	2NG26	1Ø	616	630	-
2354 2NG23__1710619	2354 2NG23__1710619	OVERHEAD	2NG23	1Ø	620	634	-
2355 2NG21__1710618	2355 2NG21__1710618	OVERHEAD	2NG21	1Ø	625	640	-
2356 2NG20__1710617	2356 2NG20__1710617	OVERHEAD	2NG20	1Ø	629	644	-
2357 2NF98__1710558	2357 2NF98__1710558	OVERHEAD	2NF98	1Ø	642	657	-
2358 2NF95__1710557	2358 2NF95__1710557	OVERHEAD	2NF95	1Ø	651	667	-
2359 2NE43__1710556	2359 2NE43__1710556	OVERHEAD	2NE43	1Ø	655	671	-
2360 2NE40__1710555	2360 2NE40__1710555	OVERHEAD	2NE40	3Ø	658	674	-
2364 10AE82__1771661	2364 10AE82__1771661	OVERHEAD	10AE82	1Ø	655	671	-
2365 2NE39__1710554	2365 2NE39__1710554	OVERHEAD	2NE39	1Ø	661	677	-
2366 2NE34__1710553	2366 2NE34__1710553	OVERHEAD	2NE34	1Ø	666	683	-
2376 2NE26__1710525	2376 2NE26__1710525	OVERHEAD	2NE26	1Ø	669	686	-
2377 2NE24__1710524	2377 2NE24__1710524	OVERHEAD	2NE24	1Ø	674	691	-
2388 2NE23__1710551	2388 2NE23__1710551	OVERHEAD	2NE23	1Ø	627	642	-
2389 2NE19__1783116	2389 2NE19__1783116	OVERHEAD	2NE19	3Ø	649	665	-
2394 15NC73__103841836	2394 15NC73__103841836	OVERHEAD	15NC73	1Ø	671	688	-
2398 186P66__104736871	2398 186P66__104736871	OVERHEAD	186P66	1Ø	665	682	-
2403 7JP51__1763528	2403 7JP51__1763528	OVERHEAD	7JP51	1Ø	658	674	-
2404 7JP50__1764013	2404 7JP50__1764013	OVERHEAD	7JP50	1Ø	661	677	-
2405 2NE11__1710522	2405 2NE11__1710522	OVERHEAD	2NE11	1Ø	674	691	-
2406 2NE09__1710521	2406 2NE09__1710521	OVERHEAD	2NE09	1Ø	676	693	-
2407 2NE06__1710520	2407 2NE06__1710520	OVERHEAD	2NE06	1Ø	686	703	-
2408 2NE04__1710519	2408 2NE04__1710519	OVERHEAD	2NE04	1Ø	692	710	-
2409 2NE02__1710518	2409 2NE02__1710518	OVERHEAD	2NE02	1Ø	695	713	-
2413 2ND81__1710515	2413 2ND81__1710515	OVERHEAD	2ND81	1Ø	694	712	-
2414 2ND80__1710514	2414 2ND80__1710514	OVERHEAD	2ND80	1Ø	696	714	-
2431 2NE01__1710552	2431 2NE01__1710552	OVERHEAD	2NE01	1Ø	634	649	-

2432 2ND93__1772573	2432 2ND93__1772573	OVERHEAD	2ND93	1Ø	672	689 -
2433 2ND91__1710511	2433 2ND91__1710511	OVERHEAD	2ND91	1Ø	677	694 -
2434 2ND88__1710517	2434 2ND88__1710517	OVERHEAD	2ND88	1Ø	684	701 -
2435 2ND83__1710516	2435 2ND83__1710516	OVERHEAD	2ND83	1Ø	693	711 -
2436 2ND77__1710513	2436 2ND77__1710513	OVERHEAD	2ND77	1Ø	708	727 -
2442 2N705__1710527	2442 2N705__1710527	OVERHEAD	2N705	1Ø	700	718 -
2443 2ND75__1710512	2443 2ND75__1710512	OVERHEAD	2ND75	1Ø	715	733 -
2446 2ND74__1710501	2446 2ND74__1710501	OVERHEAD	2ND74	1Ø	718	738 -
2447 2ND70__1710500	2447 2ND70__1710500	OVERHEAD	2ND70	1Ø	742	763 -
2448 2ND67__1710499	2448 2ND67__1710499	OVERHEAD	2ND67	1Ø	756	778 -
2449 2ND53__1710498	2449 2ND53__1710498	OVERHEAD	2ND53	1Ø	762	784 -
2456 2ND60__1773394	2456 2ND60__1773394	OVERHEAD	2ND60	1Ø	737	757 -
2465 2ND66__1710502	2465 2ND66__1710502	OVERHEAD	2ND66	1Ø	726	746 -
2466 6YW46__1764556	2466 6YW46__1764556	OVERHEAD	6YW46	1Ø	735	755 -
2467 2ND51__1710497	2467 2ND51__1710497	OVERHEAD	2ND51	1Ø	769	790 -
2468 2ND45__1710477	2468 2ND45__1710477	OVERHEAD	2ND45	1Ø	775	797 -
2469 2X097__1710478	2469 2X097__1710478	OVERHEAD	2X097	1Ø	780	802 -
2470 2ND35__1710473	2470 2ND35__1710473	OVERHEAD	2ND35	1Ø	808	832 -
2476 2ND03__1710471	2476 2ND03__1710471	OVERHEAD	2ND03	1Ø	800	824 -
2493 17EM15__104222241	2493 17EM15__104222241	OVERHEAD	17EM15	1Ø	753	774 -
2494 2ND19__1710435	2494 2ND19__1710435	OVERHEAD	2ND19	1Ø	758	779 -
2495 2ND14__1710430	2495 2ND14__1710430	OVERHEAD	2ND14	1Ø	797	820 -
2501 2ND27__1710433	2501 2ND27__1710433	OVERHEAD	2ND27	1Ø	772	794 -
2503 2ND24__103108968	2503 2ND24__103108968	OVERHEAD	2ND24	1Ø	786	808 -
2504 2ND22__1710432	2504 2ND22__1710432	OVERHEAD	2ND22	1Ø	791	814 -
2505 2ND20__1710431	2505 2ND20__1710431	OVERHEAD	2ND20	1Ø	799	822 -
2506 2ND09__113424995	2506 2ND09__113424995	OVERHEAD	2ND09	1Ø	817	842 -
2507 2ND08__1710472	2507 2ND08__1710472	OVERHEAD	2ND08	1Ø	821	845 -
2508 2NC95__1710428	2508 2NC95__1710428	OVERHEAD	2NC95	1Ø	850	877 -
2509 2NC93__1710427	2509 2NC93__1710427	OVERHEAD	2NC93	1Ø	859	886 -
2510 2NC88__1710425	2510 2NC88__1710425	OVERHEAD	2NC88	1Ø	875	902 -
2517 2N643__1710429	2517 2N643__1710429	OVERHEAD	2N643	1Ø	861	888 -
2520 2NC50__1710422	2520 2NC50__1710422	OVERHEAD	2NC50	1Ø	859	886 -
2536 2NC65__1710322	2536 2NC65__1710322	OVERHEAD	2NC65	1Ø	793	816 -
2537 2NC63__1710321	2537 2NC63__1710321	OVERHEAD	2NC63	1Ø	802	825 -
2547 11C212__1774814	2547 11C212__1774814	OVERHEAD	11C212	1Ø	779	801 -
2550 11H135__1775355	2550 11H135__1775355	OVERHEAD	11H135	1Ø	776	799 -
2551 11H134__1775354	2551 11H134__1775354	OVERHEAD	11H134	1Ø	779	802 -
2552 10W810__104574825	2552 10W810__104574825	OVERHEAD	10W810	1Ø	784	807 -
2553 191H52__108330284	2553 191H52__108330284	OVERHEAD	191H52	1Ø	786	809 -
2554 10W809__1783769	2554 10W809__1783769	OVERHEAD	10W809	1Ø	790	813 -
2556 13BT27__1780508	2556 13BT27__1780508	OVERHEAD	13BT27	1Ø	791	814 -
2559 13LG34__1781137	2559 13LG34__1781137	OVERHEAD	13LG34	1Ø	787	809 -
2560 13BT28__106405305	2560 13BT28__106405305	OVERHEAD	13BT28	1Ø	791	814 -
2561 10W789__1774633	2561 10W789__1774633	OVERHEAD	10W789	1Ø	796	819 -
2562 10W770__104145701	2562 10W770__104145701	OVERHEAD	10W770	1Ø	804	828 -
2563 9LG81__1769954	2563 9LG81__1769954	OVERHEAD	9LG81	1Ø	821	846 -
2564 9LG82__1710327	2564 9LG82__1710327	OVERHEAD	9LG82	1Ø	824	849 -
2567 2NC57__1710325	2567 2NC57__1710325	OVERHEAD	2NC57	1Ø	827	852 -
2568 2NC54__1710324	2568 2NC54__1710324	OVERHEAD	2NC54	1Ø	830	856 -
2589 6P545__1762548	2589 6P545__1762548	OVERHEAD	6P545	1Ø	731	751 -
2591 86R29__1765829	2591 86R29__1765829	OVERHEAD	86R29	1Ø	738	758 -
2592 2N462__1774776	2592 2N462__1774776	OVERHEAD	2N462	1Ø	743	764 -
2593 T7B54__103704226	2593 T7B54__103704226	OVERHEAD	T7B54	1Ø	749	770 -
2594 T7B53__103704225	2594 T7B53__103704225	OVERHEAD	T7B53	1Ø	756	778 -
2595 2NC80__1710332	2595 2NC80__1710332	OVERHEAD	2NC80	1Ø	765	787 -
2596 2NC79__1710331	2596 2NC79__1710331	OVERHEAD	2NC79	1Ø	771	793 -
2597 2NC77__1710330	2597 2NC77__1710330	OVERHEAD	2NC77	1Ø	776	799 -
2598 2NC75__1710329	2598 2NC75__1710329	OVERHEAD	2NC75	1Ø	782	804 -
2601 2NC83__1710333	2601 2NC83__1710333	OVERHEAD	2NC83	1Ø	775	797 -
2602 2NC68__103704220	2602 2NC68__103704220	OVERHEAD	2NC68	1Ø	816	840 -
2603 2NC66__1710328	2603 2NC66__1710328	OVERHEAD	2NC66	1Ø	821	846 -
2604 17AL98__104017200	2604 17AL98__104017200	OVERHEAD	17AL98	1Ø	843	869 -
2605 2NC46__1710421	2605 2NC46__1710421	OVERHEAD	2NC46	1Ø	872	899 -
2606 2NC39__1710420	2606 2NC39__1710420	OVERHEAD	2NC39	1Ø	909	939 -
2607 2NC35__1710419	2607 2NC35__1710419	OVERHEAD	2NC35	1Ø	930	961 -
2617 2N406__1710469	2617 2N406__1710469	OVERHEAD	2N406	1Ø	876	904 -
2622 50140__1710418	2622 50140__1710418	OVERHEAD	50140	1Ø	959	992 -
2625 72Y66__1765238	2625 72Y66__1765238	OVERHEAD	72Y66	1Ø	954	987 -
2626 2NC26__1710417	2626 2NC26__1710417	OVERHEAD	2NC26	1Ø	988	1023 -
2627 2NC23__1710320	2627 2NC23__1710320	OVERHEAD	2NC23	1Ø	1000	1037 -
2630 1C5A22__113483399	2630 1C5A22__113483399	OVERHEAD	1C5A22	1Ø	999	1035 -
2639 2NC22__1710413	2639 2NC22__1710413	OVERHEAD	2NC22	1Ø	957	990 -
2640 2NC21__1710412	2640 2NC21__1710412	OVERHEAD	2NC21	1Ø	964	997 -

2645	5SZ55__1774795	2645	5SZ55__1774795	OVERHEAD	5SZ55	1Ø	944	976	-
2646	2NC13__104135164	2646	2NC13__104135164	OVERHEAD	2NC13	1Ø	1014	1051	-
2647	2NB83__1710319	2647	2NB83__1710319	OVERHEAD	2NB83	1Ø	1026	1064	-
2659	2NB98__1710409	2659	2NB98__1710409	OVERHEAD	2NB98	1Ø	951	984	-
2662	2X186__1710416	2662	2X186__1710416	OVERHEAD	2X186	1Ø	952	985	-
2663	2NB96__1710414	2663	2NB96__1710414	OVERHEAD	2NB96	1Ø	960	994	-
2670	2NC11__1710408	2670	2NC11__1710408	OVERHEAD	2NC11	1Ø	917	947	-
2671	2NC10__1710407	2671	2NC10__1710407	OVERHEAD	2NC10	1Ø	925	956	-
2672	2NC07__1710406	2672	2NC07__1710406	OVERHEAD	2NC07	1Ø	934	965	-
2675	2NC04__1710411	2675	2NC04__1710411	OVERHEAD	2NC04	1Ø	934	966	-
2676	2NC02__1710410	2676	2NC02__1710410	OVERHEAD	2NC02	1Ø	942	975	-
2677	2Q937__1710415	2677	2Q937__1710415	OVERHEAD	2Q937	1Ø	950	983	-
2678	2NB88__1710318	2678	2NB88__1710318	OVERHEAD	2NB88	1Ø	1008	1045	-
2679	2NB78__1710317	2679	2NB78__1710317	OVERHEAD	2NB78	1Ø	1079	1121	-
2687	2NB77__1710316	2687	2NB77__1710316	OVERHEAD	2NB77	1Ø	1092	1135	-
2688	2NB76__1777261	2688	2NB76__1777261	OVERHEAD	2NB76	1Ø	1105	1148	-
2697	2NB52__1710312	2697	2NB52__1710312	OVERHEAD	2NB52	1Ø	1067	1107	-
2703	2NB59__1710315	2703	2NB59__1710315	OVERHEAD	2NB59	1Ø	1004	1041	-
2704	2NB53__1710314	2704	2NB53__1710314	OVERHEAD	2NB53	1Ø	1058	1099	-
2712	2NB67__1710402	2712	2NB67__1710402	OVERHEAD	2NB67	1Ø	1012	1049	-
2717	2NB72__1710405	2717	2NB72__1710405	OVERHEAD	2NB72	1Ø	1020	1058	-
2718	2NB70__1710404	2718	2NB70__1710404	OVERHEAD	2NB70	1Ø	1028	1066	-
2719	2NB69__1710403	2719	2NB69__1710403	OVERHEAD	2NB69	1Ø	1036	1075	-
2720	2NB63__1710313	2720	2NB63__1710313	OVERHEAD	2NB63	1Ø	1057	1098	-
2721	2Q930__1710311	2721	2Q930__1710311	OVERHEAD	2Q930	1Ø	1107	1151	-
2722	2NA89__1710184	2722	2NA89__1710184	OVERHEAD	2NA89	1Ø	1186	1236	-
2723	2NA88__1710183	2723	2NA88__1710183	OVERHEAD	2NA88	1Ø	1202	1253	-
2730	2NA74__1710181	2730	2NA74__1710181	OVERHEAD	2NA74	1Ø	1133	1179	-
2742	2NA87__1710090	2742	2NA87__1710090	OVERHEAD	2NA87	1Ø	1045	1084	-
2743	2NA86__1768234	2743	2NA86__1768234	OVERHEAD	2NA86	1Ø	1053	1093	-
2747	13PK13__1781406	2747	13PK13__1781406	OVERHEAD	13PK13	1Ø	1056	1096	-
2748	2NA85__104381615	2748	2NA85__104381615	OVERHEAD	2NA85	1Ø	1062	1102	-
2749	2NA81__1710180	2749	2NA81__1710180	OVERHEAD	2NA81	1Ø	1088	1130	-
2750	2NA75__1710182	2750	2NA75__1710182	OVERHEAD	2NA75	1Ø	1136	1182	-
2754	73572__1762647	2754	73572__1762647	OVERHEAD	73572	1Ø	1128	1173	-
2755	73571__1762646	2755	73571__1762646	OVERHEAD	73571	1Ø	1136	1182	-
2756	73570__1762648	2756	73570__1762648	OVERHEAD	73570	1Ø	1145	1191	-
2761	2NA67__1710310	2761	2NA67__1710310	OVERHEAD	2NA67	1Ø	1200	1251	-
2762	2NA66__1710309	2762	2NA66__1710309	OVERHEAD	2NA66	1Ø	1214	1266	-
2763	2NA65__1710308	2763	2NA65__1710308	OVERHEAD	2NA65	1Ø	1227	1280	-
2764	2NA61__1710307	2764	2NA61__1710307	OVERHEAD	2NA61	1Ø	1259	1314	-
2765	2NA59__1710306	2765	2NA59__1710306	OVERHEAD	2NA59	1Ø	1269	1326	-
2766	2NA57__1710305	2766	2NA57__1710305	OVERHEAD	2NA57	1Ø	1280	1337	-
2767	2NA54__1773287	2767	2NA54__1773287	OVERHEAD	2NA54	1Ø	1322	1383	-
2768	2NA52__103045967	2768	2NA52__103045967	OVERHEAD	2NA52	3Ø	1361	1425	-
2769	75A51__1771701	2769	75A51__1771701	OVERHEAD	75A51	3Ø	1369	1434	-
2770	2NA51__104537460	2770	2NA51__104537460	OVERHEAD	2NA51	1Ø	1384	1451	-
2771	2NA50__1767192	2771	2NA50__1767192	OVERHEAD	2NA50	3Ø	1407	1476	-
2775	9EL30__1768818	2775	9EL30__1768818	OVERHEAD	9EL30	3Ø	1407	1475	-
2776	2NB50__1769710	2776	2NB50__1769710	OVERHEAD	2NB50	1Ø	1458	1531	-
2789	2NA40__1710179	2789	2NA40__1710179	OVERHEAD	2NA40	1Ø	1292	1351	-
2795	8YP81__1774185	2795	8YP81__1774185	OVERHEAD	8YP81	1Ø	1284	1341	-
2796	8YP79__1774184	2796	8YP79__1774184	OVERHEAD	8YP79	1Ø	1309	1369	-
2799	2NA36__1710178	2799	2NA36__1710178	OVERHEAD	2NA36	1Ø	1339	1401	-
2800	2NA28__1710177	2800	2NA28__1710177	OVERHEAD	2NA28	1Ø	1428	1498	-
2826	2KW13__1710468	2826	2KW13__1710468	OVERHEAD	2KW13	1Ø	1194	1245	-
2828	2KW07__1774875	2828	2KW07__1774875	OVERHEAD	2KW07	1Ø	1264	1321	-
2830	7RT85__1774770	2830	7RT85__1774770	OVERHEAD	7RT85	3Ø	1282	1340	-
2833	2KV93__1764895	2833	2KV93__1764895	OVERHEAD	2KV93	1Ø	1289	1347	-
2848	2KW00__1710397	2848	2KW00__1710397	OVERHEAD	2KW00	1Ø	1179	1228	-
2849	2KV98__1710396	2849	2KV98__1710396	OVERHEAD	2KV98	1Ø	1187	1237	-
2861	15J373__103649998	2861	15J373__103649998	OVERHEAD	15J373	1Ø	1206	1257	-
2867	7W290__1764640	2867	7W290__1764640	OVERHEAD	7W290	1Ø	1181	1231	-
2868	7RE99__104250005	2868	7RE99__104250005	OVERHEAD	7RE99	1Ø	1204	1255	-
2872	7C005__1763031	2872	7C005__1763031	OVERHEAD	7C005	1Ø	1258	1314	-
2873	79A64__1768358	2873	79A64__1768358	OVERHEAD	79A64	1Ø	1278	1335	-
2876	2KV90__1710400	2876	2KV90__1710400	OVERHEAD	2KV90	1Ø	1320	1381	-
2877	2KV87__1710399	2877	2KV87__1710399	OVERHEAD	2KV87	1Ø	1345	1408	-
2878	2KV85__1710398	2878	2KV85__1710398	OVERHEAD	2KV85	1Ø	1355	1419	-
2883	2N599__1764887	2883	2N599__1764887	OVERHEAD	2N599	1Ø	1333	1396	-
2884	2N347__1764885	2884	2N347__1764885	OVERHEAD	2N347	1Ø	1346	1409	-
2885	2N346__1764883	2885	2N346__1764883	OVERHEAD	2N346	1Ø	1358	1422	-
2892	54640__1710401	2892	54640__1710401	OVERHEAD	54640	1Ø	1288	1346	-
2893	2KV84__1774900	2893	2KV84__1774900	OVERHEAD	2KV84	1Ø	1382	1448	-

2894 2KV83__1774899	2894 2KV83__1774899	OVERHEAD	2KV83	1Ø	1402	1470 -
2895 2KV82__1764878	2895 2KV82__1764878	OVERHEAD	2KV82	1Ø	1424	1494 -
2898 2KV79__1764876	2898 2KV79__1764876	OVERHEAD	2KV79	1Ø	1437	1508 -
2899 2KV78__1710304	2899 2KV78__1710304	OVERHEAD	2KV78	1Ø	1461	1534 -
2900 2KV75__1710303	2900 2KV75__1710303	OVERHEAD	2KV75	1Ø	1509	1587 -
2901 2KV14__1710299	2901 2KV14__1710299	OVERHEAD	2KV14	1Ø	1564	1646 -
2909 2KV24__1710302	2909 2KV24__1710302	OVERHEAD	2KV24	1Ø	1477	1551 -
2922 2KV39__1710297	2922 2KV39__1710297	OVERHEAD	2KV39	1Ø	1325	1386 -
2926 2KV46__1710298	2926 2KV46__1710298	OVERHEAD	2KV46	1Ø	1313	1373 -
2927 2KV43__1764284	2927 2KV43__1764284	OVERHEAD	2KV43	1Ø	1331	1392 -
2928 2KV37__1710296	2928 2KV37__1710296	OVERHEAD	2KV37	1Ø	1341	1403 -
2929 2KV35__1710295	2929 2KV35__1710295	OVERHEAD	2KV35	1Ø	1359	1423 -
2930 2KV33__1710294	2930 2KV33__1710294	OVERHEAD	2KV33	1Ø	1370	1435 -
2931 2KV32__1710293	2931 2KV32__1710293	OVERHEAD	2KV32	1Ø	1379	1444 -
2932 2KV31__1710292	2932 2KV31__1710292	OVERHEAD	2KV31	1Ø	1402	1470 -
2938 2KV54__1710156	2938 2KV54__1710156	OVERHEAD	2KV54	1Ø	1333	1395 -
2944 2KV62__1710152	2944 2KV62__1710152	OVERHEAD	2KV62	1Ø	1291	1349 -
2949 2KV67__1710153	2949 2KV67__1710153	OVERHEAD	2KV67	1Ø	1226	1279 -
2950 2KV64__1783247	2950 2KV64__1783247	OVERHEAD	2KV64	1Ø	1281	1338 -
2951 2KV60__1710151	2951 2KV60__1710151	OVERHEAD	2KV60	1Ø	1299	1358 -
2954 2KV69__1710154	2954 2KV69__1710154	OVERHEAD	2KV69	1Ø	1282	1339 -
2955 2KV68__1777535	2955 2KV68__1777535	OVERHEAD	2KV68	1Ø	1294	1352 -
2956 2KV57__1710150	2956 2KV57__1710150	OVERHEAD	2KV57	1Ø	1316	1377 -
2957 2KV55__1710157	2957 2KV55__1710157	OVERHEAD	2KV55	1Ø	1333	1394 -
2960 5TE89__1710160	2960 5TE89__1710160	OVERHEAD	5TE89	1Ø	1318	1378 -
2961 2KV49__1710155	2961 2KV49__1710155	OVERHEAD	2KV49	1Ø	1361	1425 -
2965 95888__1768172	2965 95888__1768172	OVERHEAD	95888	1Ø	1352	1415 -
2966 57R23__1710161	2966 57R23__1710161	OVERHEAD	57R23	1Ø	1364	1429 -
2967 2N793__1710159	2967 2N793__1710159	OVERHEAD	2N793	1Ø	1380	1446 -
2969 2KV20__1710301	2969 2KV20__1710301	OVERHEAD	2KV20	1Ø	1521	1600 -
2970 2KV17__1710300	2970 2KV17__1710300	OVERHEAD	2KV17	1Ø	1548	1629 -
2974 2KV72__1710176	2974 2KV72__1710176	OVERHEAD	2KV72	1Ø	1477	1551 -
2975 17YW29__104568192	2975 17YW29__104568192	OVERHEAD	17YW29	1Ø	1618	1705 -
2976 2KV06__1710175	2976 2KV06__1710175	OVERHEAD	2KV06	1Ø	1708	1805 -
2980 18EQ18__105929734	2980 18EQ18__105929734	OVERHEAD	18EQ18	1Ø	1752	1853 -
2981 2KV02__1710174	2981 2KV02__1710174	OVERHEAD	2KV02	1Ø	1765	1867 -
2982 2KU98__1710173	2982 2KU98__1710173	OVERHEAD	2KU98	1Ø	1823	1930 New
2983 2KU94__1710172	2983 2KU94__1710172	OVERHEAD	2KU94	1Ø	1842	1951 New
2984 2KU91__1710171	2984 2KU91__1710171	OVERHEAD	2KU91	1Ø	1862	1974 New
2985 2KU89__1710087	2985 2KU89__1710087	OVERHEAD	2KU89	1Ø	1880	1993 New
2986 2KU86__1710085	2986 2KU86__1710085	OVERHEAD	2KU86	1Ø	1903	2018 New
2987 15LF06__103790063	2987 15LF06__103790063	OVERHEAD	15LF06	1Ø	1969	2091 New
2988 2KU83__1710084	2988 2KU83__1710084	OVERHEAD	2KU83	1Ø	1990	2114 New
2989 2KU79__1710083	2989 2KU79__1710083	OVERHEAD	2KU79	1Ø	2062	2193 -
2992 2KU73__1710086	2992 2KU73__1710086	OVERHEAD	2KU73	1Ø	2135	2274 -
2994 2KU69__1710081	2994 2KU69__1710081	OVERHEAD	2KU69	1Ø	2165	2306 -
2995 2KU67__1710080	2995 2KU67__1710080	OVERHEAD	2KU67	1Ø	2217	2363 -
2999 2KU65__1709977	2999 2KU65__1709977	OVERHEAD	2KU65	1Ø	2246	2395 -
3000 2KU63__1709976	3000 2KU63__1709976	OVERHEAD	2KU63	1Ø	2310	2465 -
3001 2KU60__1709975	3001 2KU60__1709975	OVERHEAD	2KU60	1Ø	2413	2578 -
3005 10FP45__1772235	3005 10FP45__1772235	OVERHEAD	10FP45	1Ø	2346	2505 -
3006 2KU58__1709974	3006 2KU58__1709974	OVERHEAD	2KU58	1Ø	2458	2626 -
3007 2KU52__1709958	3007 2KU52__1709958	OVERHEAD	2KU52	1Ø	2549	2725 -
3008 2KU48__1709957	3008 2KU48__1709957	OVERHEAD	2KU48	1Ø	2580	2759 -
3011 2M725__1709967	3011 2M725__1709967	OVERHEAD	2M725	1Ø	2643	2827 -
3017 135299__1779990	3018 135299__1779990	OVERHEAD	135299	1Ø	2475	2703 -
3043 2M906__1710000	3189 2M906__1710000	OVERHEAD	2M906	1Ø	1667	1895 -
3077 15MD96__103827390	3223 15MD96__103827390	OVERHEAD	15MD96	1Ø	1183	1310 -
3081 117X01__1774454	3227 117X01__1774454	OVERHEAD	117X01	1Ø	1213	1345 -
3082 2KU46__1710022	3228 2KU46__1710022	OVERHEAD	2KU46	1Ø	1223	1357 -
3083 2KU44__115164757	3229 2KU44__115164757	OVERHEAD	2KU44	1Ø	1252	1392 -
3086 2KU41__1710020	3232 2KU41__1710020	OVERHEAD	2KU41	1Ø	1273	1418 -
3090 2Q993__1709838	3236 2Q993__1709838	OVERHEAD	2Q993	3Ø	1263	1406 -
3094 89554__1769367	3240 89554__1769367	OVERHEAD	89554	1Ø	1261	1403 -
3098 2KU36__1710018	3244 2KU36__1710018	OVERHEAD	2KU36	1Ø	1284	1431 -
3102 2KU35__1710017	3248 2KU35__1710017	OVERHEAD	2KU35	1Ø	1299	1448 -
3105 7J371__1763523	3251 7J371__1763523	OVERHEAD	7J371	1Ø	1385	1552 -
3106 2KU22__1710008	3252 2KU22__1710008	OVERHEAD	2KU22	1Ø	1419	1594 -
3107 2KU19__1710007	3253 2KU19__1710007	OVERHEAD	2KU19	1Ø	1440	1619 -
3109 2M924__1710009	3255 2M924__1710009	OVERHEAD	2M924	1Ø	1458	1641 -
3115 2M931__1710012	3261 2M931__1710012	OVERHEAD	2M931	1Ø	1394	1565 -
3116 2M928__1710011	3262 2M928__1710011	OVERHEAD	2M928	1Ø	1412	1585 -
3149 2KU16__1710192	3295 2KU16__1710192	OVERHEAD	2KU16	1Ø	1041	1142 -
3151 2KU13__1710191	3297 2KU13__1710191	OVERHEAD	2KU13	1Ø	1052	1155 -

3152	2KU12__1710190	3298	2KU12__1710190	OVERHEAD	2KU12	1Ø	1057	1161	-
3153	2KU08__1710189	3299	2KU08__1710189	OVERHEAD	2KU08	1Ø	1092	1202	-
3154	2KU07__1710188	3300	2KU07__1710188	OVERHEAD	2KU07	1Ø	1096	1206	-
3155	2KU06__1710187	3301	2KU06__1710187	OVERHEAD	2KU06	1Ø	1105	1217	-
3166	2KU01__1710186	3312	2KU01__1710186	OVERHEAD	2KU01	1Ø	1043	1143	-
3167	2KU00__1765000	3313	2KU00__1765000	OVERHEAD	2KU00	1Ø	1050	1152	-
3170	8XE60__1767684	3316	8XE60__1767684	OVERHEAD	8XE60	1Ø	1041	1142	-
3171	2M998__1710198	3317	2M998__1710198	OVERHEAD	2M998	1Ø	1070	1175	-
3172	2M997__1710195	3318	2M997__1710195	OVERHEAD	2M997	1Ø	1076	1183	-
3174	5ZV27__1710197	3320	5ZV27__1710197	OVERHEAD	5ZV27	1Ø	1080	1188	-
3175	2M992__1710194	3321	2M992__1710194	OVERHEAD	2M992	1Ø	1101	1212	-
3176	2M988__1710193	3322	2M988__1710193	OVERHEAD	2M988	1Ø	1114	1228	-
3177	2M987__1710196	3323	2M987__1710196	OVERHEAD	2M987	1Ø	1128	1245	-
3184	101T66__1770709	3330	101T66__1770709	OVERHEAD	101T66	1Ø	1101	1213	-
3185	2M986__1710185	3331	2M986__1710185	OVERHEAD	2M986	1Ø	1140	1259	-
3186	2M983__1710101	3332	2M983__1710101	OVERHEAD	2M983	1Ø	1155	1277	-
3187	2M980__1710100	3333	2M980__1710100	OVERHEAD	2M980	1Ø	1184	1311	-
3188	2M978__1710099	3334	2M978__1710099	OVERHEAD	2M978	1Ø	1201	1331	-
3189	2M977__1710098	3335	2M977__1710098	OVERHEAD	2M977	1Ø	1218	1352	-
3190	2M969__1710096	3336	2M969__1710096	OVERHEAD	2M969	1Ø	1237	1374	-
3198	2M975__1710103	3344	2M975__1710103	OVERHEAD	2M975	1Ø	1077	1190	-
3199	2M971__1710097	3345	2M971__1710097	OVERHEAD	2M971	1Ø	1127	1248	-
3200	2M970__1774491	3346	2M970__1774491	OVERHEAD	2M970	1Ø	1187	1317	-
3201	2M968__1710095	3347	2M968__1710095	OVERHEAD	2M968	1Ø	1244	1383	-
3202	2M954__1710094	3348	2M954__1710094	OVERHEAD	2M954	1Ø	1252	1393	-
3215	2M966__1710102	3361	2M966__1710102	OVERHEAD	2M966	1Ø	1102	1214	-
3216	2M960__1774777	3362	2M960__1774777	OVERHEAD	2M960	1Ø	1168	1293	-
3217	2M952__1710093	3363	2M952__1710093	OVERHEAD	2M952	1Ø	1259	1401	-
3218	2M944__1710092	3364	2M944__1710092	OVERHEAD	2M944	1Ø	1285	1433	-
3227	PAY78__1710019	3373	PAY78__1710019	OVERHEAD	PAY78	1Ø	1151	1275	-
3228	2M949__1710016	3374	2M949__1710016	OVERHEAD	2M949	1Ø	1172	1300	-
3231	2N440__1710021	3377	2N440__1710021	OVERHEAD	2N440	1Ø	1159	1285	-
3232	2N438__108854469	3378	2N438__108854469	OVERHEAD	2N438	1Ø	1181	1311	-
3248	75C56__1762949	3394	75C56__1762949	OVERHEAD	75C56	1Ø	1133	1250	-
3249	2M940__1710015	3395	2M940__1710015	OVERHEAD	2M940	1Ø	1326	1482	-
3251	2M937__1710014	3397	2M937__1710014	OVERHEAD	2M937	1Ø	1388	1557	-
3252	2M934__1710013	3398	2M934__1710013	OVERHEAD	2M934	1Ø	1399	1570	-
3253	2M927__1710010	3399	2M927__1710010	OVERHEAD	2M927	1Ø	1435	1613	-
3257	130188__1779526	3403	130188__1779526	OVERHEAD	130188	1Ø	1417	1591	-
3259	2M921__1782944	3405	2M921__1782944	OVERHEAD	2M921	1Ø	1500	1691	-
3260	2M917__1710006	3406	2M917__1710006	OVERHEAD	2M917	1Ø	1529	1727	-
3261	2M914__1710005	3407	2M914__1710005	OVERHEAD	2M914	1Ø	1567	1773	-
3262	2M912__1710004	3408	2M912__1710004	OVERHEAD	2M912	1Ø	1588	1798	-
3263	2M909__1710001	3409	2M909__1710001	OVERHEAD	2M909	1Ø	1636	1857	-
3264	2N619__1710002	3410	2N619__1710002	OVERHEAD	2N619	1Ø	1645	1868	-
3265	2M903__1709999	3411	2M903__1709999	OVERHEAD	2M903	1Ø	1694	1927	New
3269	2M901__1709998	3415	2M901__1709998	OVERHEAD	2M901	1Ø	1716	1955	New
3270	2M898__1709997	3416	2M898__1709997	OVERHEAD	2M898	1Ø	1752	1998	New
3273	2M897__1709996	3419	2M897__1709996	OVERHEAD	2M897	1Ø	1748	1994	New
3274	2M890__1709995	3420	2M890__1709995	OVERHEAD	2M890	1Ø	1921	2202	New
3275	2M885__1709993	3421	2M885__1709993	OVERHEAD	2M885	1Ø	2026	2327	-
3276	2M803__1709990	3173	2M803__1709990	OVERHEAD	2M803	1Ø	2106	2422	-
3289	2M823__1709821	3158	2M823__1709821	OVERHEAD	2M823	1Ø	1744	2103	New
3290	2M822__1709820	3159	2M822__1709820	OVERHEAD	2M822	1Ø	1768	2132	New
3304	105B17__1771155	3051	105B17__1771155	OVERHEAD	105B17	1Ø	1492	1889	-
3313	2M851__1709749	3064	2M851__1709749	OVERHEAD	2M851	1Ø	1364	1727	-
3314	2M850__1709748	3065	2M850__1709748	OVERHEAD	2M850	1Ø	1386	1757	-
3322	1CKX16__114992519	3073	1CKX16__114992519	OVERHEAD	1CKX16	1Ø	1325	1671	-
3329	53609__1709753	3080	53609__1709753	OVERHEAD	53609	1Ø	1272	1597	-
3330	2M864__1709752	3081	2M864__1709752	OVERHEAD	2M864	1Ø	1284	1614	-
3331	2M863__1782214	3082	2M863__1782214	OVERHEAD	2M863	1Ø	1296	1631	-
3332	2M854__1709751	3083	2M854__1709751	OVERHEAD	2M854	1Ø	1393	1766	-
3333	2M852__1709750	3084	2M852__1709750	OVERHEAD	2M852	1Ø	1415	1794	-
3347	188E08__104860899	3098	188E08__104860899	OVERHEAD	188E08	1Ø	1279	1602	-
3350	5LX60__1709837	3101	5LX60__1709837	OVERHEAD	5LX60	1Ø	1284	1610	-
3351	5LX59__104361181	3102	5LX59__104361181	OVERHEAD	5LX59	1Ø	1297	1629	-
3352	1BXF93__112356001	3103	1BXF93__112356001	OVERHEAD	1BXF93	1Ø	1349	1702	-
3353	5LX55__105929748	3104	5LX55__105929748	OVERHEAD	5LX55	1Ø	1362	1720	-
3354	5LX54__105707814	3105	5LX54__105707814	OVERHEAD	5LX54	1Ø	1381	1747	-
3355	5LX52__109449760	3106	5LX52__109449760	OVERHEAD	5LX52	1Ø	1418	1799	-
3356	5LX51__104758376	3107	5LX51__104758376	OVERHEAD	5LX51	1Ø	1438	1827	-
3357	2M846__1709829	3108	2M846__1709829	OVERHEAD	2M846	1Ø	1465	1864	-
3358	2M845__1778509	3056	2M845__1778509	OVERHEAD	2M845	1Ø	1486	1894	-
3359	2M843__1709828	3109	2M843__1709828	OVERHEAD	2M843	1Ø	1512	1917	New

3366	2M871__1709832	3116	2M871__1709832	OVERHEAD	2M871	1Ø	1417	1788	-
3369	2M876__1709834	3119	2M876__1709834	OVERHEAD	2M876	1Ø	1407	1772	-
3375	2M880__1710003	3125	2M880__1710003	OVERHEAD	2M880	1Ø	1370	1722	-
3376	2M879__1775919	3126	2M879__1775919	OVERHEAD	2M879	1Ø	1382	1738	-
3377	2M877__1709835	3127	2M877__1709835	OVERHEAD	2M877	1Ø	1400	1763	-
3378	2M872__1709833	3128	2M872__1709833	OVERHEAD	2M872	1Ø	1421	1793	-
3379	2M869__1709831	3129	2M869__1709831	OVERHEAD	2M869	1Ø	1446	1827	-
3380	2M866__1709830	3130	2M866__1709830	OVERHEAD	2M866	1Ø	1469	1859	-
3381	2M865__1764574	3131	2M865__1764574	OVERHEAD	2M865	1Ø	1491	1889	-
3382	149A06__1782602	3132	149A06__1782602	OVERHEAD	149A06	1Ø	1532	1935	New
3383	2M841__1709827	3133	2M841__1709827	OVERHEAD	2M841	1Ø	1542	1944	New
3388	8NJ03__1778354	3139	8NJ03__1778354	OVERHEAD	8NJ03	1Ø	1547	1942	New
3392	8NJ04__1778356	3143	8NJ04__1778356	OVERHEAD	8NJ04	1Ø	1533	1926	New
3393	2M837__1709826	3144	2M837__1709826	OVERHEAD	2M837	1Ø	1593	1990	New
3394	2M835__1709825	3145	2M835__1709825	OVERHEAD	2M835	1Ø	1623	2017	New
3395	2M831__1709824	3146	2M831__1709824	OVERHEAD	2M831	1Ø	1657	2046	New
3396	2M830__103783109	3147	2M830__103783109	OVERHEAD	2M830	1Ø	1681	2067	New
3398	9NJ16__1769649	3151	9NJ16__1769649	OVERHEAD	9NJ16	1Ø	1682	2059	New
3399	2M827__1709823	3148	2M827__1709823	OVERHEAD	2M827	1Ø	1705	2089	New
3400	6LT98__1761109	3152	6LT98__1761109	OVERHEAD	6LT98	1Ø	1718	2100	New
3401	2M824__1709822	3153	2M824__1709822	OVERHEAD	2M824	1Ø	1762	2138	New
3402	2M819__1709819	3154	2M819__1709819	OVERHEAD	2M819	1Ø	1801	2171	New
3403	2M816__1709818	3160	2M816__1709818	OVERHEAD	2M816	1Ø	1879	2237	New
3409	6QA58__1761116	3168	6QA58__1761116	OVERHEAD	6QA58	1Ø	1850	2179	New
3410	15D739__103407983	3169	15D739__103407983	OVERHEAD	15D739	1Ø	1857	2187	New
3411	6QA55__103988740	3170	6QA55__103988740	OVERHEAD	6QA55	1Ø	1901	2241	New
3412	2M813__1709817	3161	2M813__1709817	OVERHEAD	2M813	1Ø	1935	2283	New
3413	2M808__1709992	3171	2M808__1709992	OVERHEAD	2M808	1Ø	1993	2331	New
3414	2M805__1709991	3172	2M805__1709991	OVERHEAD	2M805	1Ø	2035	2365	-
3415	2M800__1709989	3422	2M800__1709989	OVERHEAD	2M800	1Ø	2141	2449	-
3416	2M771__1709984	3423	2M771__1709984	OVERHEAD	2M771	1Ø	2200	2495	-
3431	2M790__1710088	3438	2M790__1710088	OVERHEAD	2M790	1Ø	1843	2077	New
3432	10AJ02__1771741	3439	10AJ02__1771741	OVERHEAD	10AJ02	1Ø	1860	2097	New
3433	2M788__103399171	3440	2M788__103399171	OVERHEAD	2M788	1Ø	1883	2124	New
3441	2M798__1710091	3448	2M798__1710091	OVERHEAD	2M798	1Ø	1671	1872	-
3442	2Q991__1710089	3449	2Q991__1710089	OVERHEAD	2Q991	1Ø	1720	1931	New
3443	2M793__1769767	3450	2M793__1769767	OVERHEAD	2M793	1Ø	1769	1989	New
3444	2M791__103936174	3451	2M791__103936174	OVERHEAD	2M791	1Ø	1839	2072	New
3445	2M782__1709994	3452	2M782__1709994	OVERHEAD	2M782	1Ø	1925	2174	New
3446	2M780__1709988	3453	2M780__1709988	OVERHEAD	2M780	1Ø	1978	2237	New
3447	6BY83__1765761	3454	6BY83__1765761	OVERHEAD	6BY83	1Ø	2022	2289	-
3448	2M777__1709987	3455	2M777__1709987	OVERHEAD	2M777	1Ø	2050	2321	-
3449	2M776__1772600	3456	2M776__1772600	OVERHEAD	2M776	1Ø	2079	2355	-
3450	2M775__1709986	3457	2M775__1709986	OVERHEAD	2M775	1Ø	2103	2383	-
3451	2M774__1709985	3458	2M774__1709985	OVERHEAD	2M774	1Ø	2147	2435	-
3458	2M767__1709983	3465	2M767__1709983	OVERHEAD	2M767	1Ø	2111	2356	-
3459	2M765__1709982	3466	2M765__1709982	OVERHEAD	2M765	1Ø	2182	2439	-
3460	2M761__1709981	3467	2M761__1709981	OVERHEAD	2M761	1Ø	2295	2568	-
3461	2M757__1709980	3468	2M757__1709980	OVERHEAD	2M757	1Ø	2342	2603	-
3462	2M756__1709979	3469	2M756__1709979	OVERHEAD	2M756	1Ø	2399	2646	-
3463	2M752__1709978	3470	2M752__1709978	OVERHEAD	2M752	1Ø	2427	2667	-
3467	2M748__1709970	3474	2M748__1709970	OVERHEAD	2M748	3Ø	2588	2782	-
3471	2M724__1709966	3478	2M724__1709966	OVERHEAD	2M724	1Ø	2606	2775	-
3472	2M719__1709964	3479	2M719__1709964	OVERHEAD	2M719	1Ø	2701	2868	-
3473	2M717__1709963	3480	2M717__1709963	OVERHEAD	2M717	1Ø	2769	2918	-
3474	2M716__1709962	3481	2M716__1709962	OVERHEAD	2M716	1Ø	2840	2969	-
3475	2M695__1709954	3482	2M695__1709954	OVERHEAD	2M695	1Ø	2966	3060	-
3487	2M710__1709811	3494	2M710__1709811	OVERHEAD	2M710	1Ø	2603	2679	-
3493	2M714__1709814	3500	2M714__1709814	OVERHEAD	2M714	1Ø	2519	2591	-
3494	2N109__1709816	3501	2N109__1709816	OVERHEAD	2N109	1Ø	2547	2619	-
3495	2M713__1709813	3502	2M713__1709813	OVERHEAD	2M713	1Ø	2575	2649	-
3496	2M712__1709812	3503	2M712__1709812	OVERHEAD	2M712	1Ø	2616	2692	-
3497	2M711__1709815	3504	2M711__1709815	OVERHEAD	2M711	1Ø	2662	2741	-
3498	2M705__1709810	3505	2M705__1709810	OVERHEAD	2M705	1Ø	2712	2793	-
3500	2M702__1709804	3507	2M702__1709804	OVERHEAD	2M702	1Ø	2777	2861	-
3501	2M700__1709806	3508	2M700__1709806	OVERHEAD	2M700	1Ø	2813	2899	-
3502	2M698__1709955	3509	2M698__1709955	OVERHEAD	2M698	1Ø	2891	2981	-
3508	2L660__1709933	3515	2L660__1709933	OVERHEAD	2L660	1Ø	2883	2952	-
3533	2L738__1709778	3540	2L738__1709778	OVERHEAD	2L738	1Ø	2165	2204	-
3540	80504__1766405	3547	80504__1766405	OVERHEAD	80504	1Ø	2098	2135	-
3541	2L743__1709776	3548	2L743__1709776	OVERHEAD	2L743	1Ø	2142	2180	-
3542	2L741__1764857	3549	2L741__1764857	OVERHEAD	2L741	1Ø	2206	2247	-
3545	2L746__1709777	3552	2L746__1709777	OVERHEAD	2L746	1Ø	2145	2183	-
3563	2L831__1709769	3570	2L831__1709769	OVERHEAD	2L831	1Ø	1718	1742	-

3567	2L834__1709765	3574	2L834__1709765	OVERHEAD	2L834	1∅	1643	1665	-
3575	2L840__1709768	3582	2L840__1709768	OVERHEAD	2L840	1∅	1743	1767	-
3579	9DA22__1768772	3586	9DA22__1768772	OVERHEAD	9DA22	1∅	1730	1754	-
3583	9DA23__1768773	3590	9DA23__1768773	OVERHEAD	9DA23	1∅	1722	1746	-
3586	2L843__103133389	3593	2L843__103133389	OVERHEAD	2L843	1∅	1724	1748	-
3587	2L842__1709767	3594	2L842__1709767	OVERHEAD	2L842	1∅	1751	1776	-
3588	2L835__1709766	3595	2L835__1709766	OVERHEAD	2L835	1∅	1820	1847	-
3589	2L826__1764658	3596	2L826__1764658	OVERHEAD	2L826	1∅	1862	1891	-
3597	9HL93__1769007	3604	9HL93__1769007	OVERHEAD	9HL93	1∅	1758	1783	-
3598	9HL92__1771062	3605	9HL92__1771062	OVERHEAD	9HL92	1∅	1775	1801	-
3599	94414__1768089	3606	94414__1768089	OVERHEAD	94414	1∅	1801	1827	-
3600	94413__1769469	3607	94413__1769469	OVERHEAD	94413	1∅	1821	1848	-
3601	94412__1768498	3608	94412__1768498	OVERHEAD	94412	1∅	1845	1873	-
3605	7EQ13__1763937	3612	7EQ13__1763937	OVERHEAD	7EQ13	1∅	1890	1920	New
3609	7F853__1763936	3616	7F853__1763936	OVERHEAD	7F853	1∅	1858	1887	-
3613	7EQ15__1763935	3620	7EQ15__1763935	OVERHEAD	7EQ15	1∅	1827	1854	-
3617	7EQ14__1763934	3624	7EQ14__1763934	OVERHEAD	7EQ14	1∅	1803	1829	-
3618	7HA89__1782604	3625	7HA89__1782604	OVERHEAD	7HA89	1∅	1932	1963	New
3619	7EQ45__1765216	3626	7EQ45__1765216	OVERHEAD	7EQ45	1∅	1962	1993	New
3620	2L823__1764659	3627	2L823__1764659	OVERHEAD	2L823	1∅	1995	2028	New
3621	7HA87__103109942	3628	7HA87__103109942	OVERHEAD	7HA87	1∅	2050	2085	-
3622	2L764__1709770	3629	2L764__1709770	OVERHEAD	2L764	1∅	2117	2154	-
3631	2L772__1709772	3638	2L772__1709772	OVERHEAD	2L772	1∅	1888	1917	New
3643	2L813__1709878	3650	2L813__1709878	OVERHEAD	2L813	1∅	1625	1647	-
3645	2L815__1709879	3652	2L815__1709879	OVERHEAD	2L815	1∅	1628	1649	-
3649	2L819__1710047	3656	2L819__1710047	OVERHEAD	2L819	1∅	1564	1584	-
3650	2L816__1709880	3657	2L816__1709880	OVERHEAD	2L816	1∅	1618	1639	-
3651	2L809__1709877	3658	2L809__1709877	OVERHEAD	2L809	1∅	1688	1711	-
3660	2L789__1709871	3667	2L789__1709871	OVERHEAD	2L789	1∅	1557	1576	-
3669	2L802__1709873	3676	2L802__1709873	OVERHEAD	2L802	1∅	1473	1491	-
3676	154Y57__103179534	3683	154Y57__103179534	OVERHEAD	154Y57	1∅	1436	1452	-
3677	2L807__1709874	3684	2L807__1709874	OVERHEAD	2L807	1∅	1450	1466	-
3679	2L808__1709875	3686	2L808__1709875	OVERHEAD	2L808	1∅	1471	1488	-
3680	13K601__1781110	3687	13K601__1781110	OVERHEAD	13K601	1∅	1583	1603	-
3684	2L794__1709872	3691	2L794__1709872	OVERHEAD	2L794	1∅	1543	1562	-
3685	2L785__1709876	3692	2L785__1709876	OVERHEAD	2L785	1∅	1627	1648	-
3687	2L777__1709886	3694	2L777__1709886	OVERHEAD	2L777	1∅	1830	1857	-
3689	2L766__1709771	3696	2L766__1709771	OVERHEAD	2L766	1∅	2033	2068	-
3692	2L748__1775531	3699	2L748__1775531	OVERHEAD	2L748	1∅	2156	2195	-
3705	2L761__1709740	3712	2L761__1709740	OVERHEAD	2L761	1∅	1887	1917	New
3706	2L759__1709739	3713	2L759__1709739	OVERHEAD	2L759	1∅	1901	1930	New
3707	14DR68__103278465	3714	14DR68__103278465	OVERHEAD	14DR68	1∅	1918	1948	New
3713	104E60__1775920	3720	104E60__1775920	OVERHEAD	104E60	1∅	1844	1872	-
3714	104E59__1773898	3721	104E59__1773898	OVERHEAD	104E59	1∅	1868	1897	-
3715	104E58__1709738	3722	104E58__1709738	OVERHEAD	104E58	1∅	1900	1930	New
3716	2N380__1709741	3723	2N380__1709741	OVERHEAD	2N380	1∅	1921	1951	New
3718	2L755__1709737	3725	2L755__1709737	OVERHEAD	2L755	1∅	1939	1970	New
3719	2L753__1774779	3726	2L753__1774779	OVERHEAD	2L753	1∅	1997	2030	New
3725	57267__1709779	3732	57267__1709779	OVERHEAD	57267	1∅	2040	2074	-
3726	2L730__1709775	3733	2L730__1709775	OVERHEAD	2L730	1∅	2290	2333	-
3727	2L728__1709774	3734	2L728__1709774	OVERHEAD	2L728	1∅	2334	2380	-
3728	2L716__1709788	3735	2L716__1709788	OVERHEAD	2L716	2∅	2543	2597	-
3729	2L714__1709787	3736	2L714__1709787	OVERHEAD	2L714	1∅	2576	2631	-
3734	2L701__1709904	3741	2L701__1709904	OVERHEAD	2L701	1∅	2500	2552	-
3744	8D346__115172693	3751	8D346__115172693	OVERHEAD	8D346	1∅	2254	2296	-
3745	2L712__1709895	3752	2L712__1709895	OVERHEAD	2L712	1∅	2284	2328	-
3746	2L709__1709910	3753	2L709__1709910	OVERHEAD	2L709	1∅	2335	2381	-
3747	2L707__1709909	3754	2L707__1709909	OVERHEAD	2L707	1∅	2365	2412	-
3748	2L706__1709908	3755	2L706__1709908	OVERHEAD	2L706	1∅	2393	2441	-
3750	5ZW78__1709915	3757	5ZW78__1709915	OVERHEAD	5ZW78	1∅	2395	2443	-
3751	2L705__1709907	3758	2L705__1709907	OVERHEAD	2L705	1∅	2421	2470	-
3752	2L704__1709906	3759	2L704__1709906	OVERHEAD	2L704	1∅	2475	2527	-
3753	2L703__1709905	3760	2L703__1709905	OVERHEAD	2L703	1∅	2503	2556	-
3754	2L699__1761111	3761	2L699__1761111	OVERHEAD	2L699	1∅	2574	2629	-
3755	2L696__1709786	3762	2L696__1709786	OVERHEAD	2L696	1∅	2621	2679	-
3763	2L693__1709785	3770	2L693__1709785	OVERHEAD	2L693	1∅	2484	2536	-
3764	2L690__1709784	3771	2L690__1709784	OVERHEAD	2L690	1∅	2545	2600	-
3765	2L684__1709783	3772	2L684__1709783	OVERHEAD	2L684	1∅	2583	2639	-
3766	2L681__1709782	3773	2L681__1709782	OVERHEAD	2L681	1∅	2623	2681	-
3769	2L676__1709781	3776	2L676__1709781	OVERHEAD	2L676	1∅	2647	2706	-
3770	2L672__1709780	3777	2L672__1709780	OVERHEAD	2L672	1∅	2732	2794	-
3771	2L668__1709803	3778	2L668__1709803	OVERHEAD	2L668	1∅	2794	2859	-
3776	2L667__1709802	3783	2L667__1709802	OVERHEAD	2L667	1∅	2722	2785	-
3777	2L665__1709801	3784	2L665__1709801	OVERHEAD	2L665	2∅	2790	2855	-

3778	2L655__1709932	3785 2L655__1709932	OVERHEAD	2L655	1Ø	2970	3044 -
3779	2L654__1709931	3786 2L654__1709931	OVERHEAD	2L654	1Ø	3014	3090 -
3782	2L651__1709800	3789 2L651__1709800	OVERHEAD	2L651	1Ø	3055	3131 -
3783	2L647__1709799	3790 2L647__1709799	OVERHEAD	2L647	1Ø	3111	3189 -
3784	2L645__1709798	3791 2L645__1709798	OVERHEAD	2L645	1Ø	3143	3222 -
3785	2L644__1709797	3792 2L644__1709797	OVERHEAD	2L644	1Ø	3194	3274 -
3786	2L643__1709796	3793 2L643__1709796	OVERHEAD	2L643	1Ø	3246	3327 -
3787	2L639__1709805	3794 2L639__1709805	OVERHEAD	2L639	1Ø	3313	3395 -
3791	2L637__1709795	3798 2L637__1709795	OVERHEAD	2L637	1Ø	3187	3263 -
3792	2L635__1709794	3799 2L635__1709794	OVERHEAD	2L635	1Ø	3280	3360 -
3793	2L631__1709793	3800 2L631__1709793	OVERHEAD	2L631	1Ø	3411	3495 -
3794	2L630__1709807	3801 2L630__1709807	OVERHEAD	2L630	2Ø	3457	3543 -
3795	2L624__1709809	3802 2L624__1709809	OVERHEAD	2L624	1Ø	3566	3655 -
3800	2L628__1709792	3807 2L628__1709792	OVERHEAD	2L628	1Ø	3315	3392 -
3801	2L626__1709791	3808 2L626__1709791	OVERHEAD	2L626	1Ø	3480	3565 -
3804	13XK26__1781843	3811 13XK26__1781843	OVERHEAD	13XK26	3Ø	3548	3635 -
3805	2L621__1709808	3812 2L621__1709808	OVERHEAD	2L621	1Ø	3665	3755 -
3810	1CHY91__114697437	3817 1CHY91__114697437	OVERHEAD	1CHY91	3Ø	1060	1101 -
3811	7G915__1765710	3818 7G915__1765710	OVERHEAD	7G915	3Ø	2208	2249 -

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Exhibit CEB-9

SIS Estimation Tool Rev1.xlsm

PUBLIC VERSION

#	Action	From DIS#	To DIS#	Distance (Miles)	Existing # of phases	Existing Conductor	New # of phases	New Conductor	Estimated Cost	Description
1	None					None		None	$0.00	0
2	None					None		None	$0.00	0
3	None					None		None	$0.00	0
4	None					None		None	$0.00	0
5	None					None		None	$0.00	0
6	None					None		None	$0.00	0
7	None					None		None	$0.00	0
8	None					None		None	$0.00	0
9	None					None		None	$0.00	0
10	None					None		None	$0.00	0
								Total Cost Estimate:	$0.00	

1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None
1	1	1	None	None	None

Library

Code	Actions	Conductor Types
1	None	None
2	Build New Line	1/0 ACSR
3	Reconductor	4/0 ACSR
4	Double Circuit	#2 ACSR
5	Triple Circuit	#2 BC
6	Add G&W at Takeoff	#4 BC
7	Verify for High Capacity	477 AAC
8		750 MCM Underground
9		
10		
11		

Neutral Conductor: **1/0 AAAC**

Pricing

Action	Existing # of phases	Existing Conductor	New # of phases	New Conductor	$/mile
Build New Line	0	None	3	477 AAC	$256,036.99
Reconductor	1	1/0 ACSR	3	477 AAC	$247,683.87
Reconductor	1	4/0 ACSR	3	477 AAC	
Reconductor	1	#2 ACSR	3	477 AAC	$270,588.16
Reconductor	1	#2 BC	3	477 AAC	
Reconductor	1	#4 BC	3	477 AAC	$266,894.93
Reconductor	1	477 AAC	3	477 AAC	
Reconductor	2	1/0 ACSR	3	477 AAC	$246,100.45
Reconductor	2	4/0 ACSR	3	477 AAC	
Reconductor	2	#2 ACSR	3	477 AAC	$268,988.30
Reconductor	2	#2 BC	3	477 AAC	
Reconductor	2	#4 BC	3	477 AAC	$272,815.38
Reconductor	2	477 AAC	3	477 AAC	
Reconductor	3	1/0 ACSR	3	477 AAC	$250,342.87
Reconductor	3	4/0 ACSR	3	477 AAC	$250,432.94
Reconductor	3	#2 ACSR	3	477 AAC	$291,782.93
Reconductor	3	#2 BC	3	477 AAC	$291,782.93
Reconductor	3	#4 BC	3	477 AAC	$291,602.78
Double Circuit	1	1/0 ACSR	3	477 AAC	$439,389.13
Double Circuit	1	4/0 ACSR	3	477 AAC	$447,727.68
Double Circuit	1	#2 ACSR	3	477 AAC	$447,727.68
Double Circuit	1	#2 BC	3	477 AAC	$447,727.68
Double Circuit	1	#4 BC	3	477 AAC	$447,727.68
Double Circuit	1	477 AAC	3	477 AAC	$447,727.68
Double Circuit	2	1/0 ACSR	3	477 AAC	$439,389.13
Double Circuit	2	4/0 ACSR	3	477 AAC	$447,727.68
Double Circuit	2	#2 ACSR	3	477 AAC	$447,727.68
Double Circuit	2	#2 BC	3	477 AAC	$447,727.68
Double Circuit	2	#4 BC	3	477 AAC	$447,727.68
Double Circuit	2	477 AAC	3	477 AAC	$447,727.68
Double Circuit	3	1/0 ACSR	3	477 AAC	$439,389.13
Double Circuit	3	4/0 ACSR	3	477 AAC	$447,727.68
Double Circuit	3	#2 ACSR	3	477 AAC	$447,727.68
Double Circuit	3	#2 BC	3	477 AAC	$447,727.68
Double Circuit	3	#4 BC	3	477 AAC	$447,727.68
Double Circuit	3	477 AAC	3	477 AAC	$447,727.68
Triple Circuit	1	1/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	1	4/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	1	#2 ACSR	3	477 AAC	$570,000.00
Triple Circuit	1	#2 BC	3	477 AAC	$570,000.00
Triple Circuit	1	#4 BC	3	477 AAC	$570,000.00

Equipment	$/unit
G&W Electronic Recloser	$39,091.36

Triple Circuit	1	477 AAC	3	477 AAC	$570,000.00
Triple Circuit	2	1/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	2	4/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	2	#2 ACSR	3	477 AAC	$570,000.00
Triple Circuit	2	#2 BC	3	477 AAC	$570,000.00
Triple Circuit	2	#4 BC	3	477 AAC	$570,000.00
Triple Circuit	2	477 AAC	3	477 AAC	$570,000.00
Triple Circuit	3	1/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	3	4/0 ACSR	3	477 AAC	$570,000.00
Triple Circuit	3	#2 ACSR	3	477 AAC	$570,000.00
Triple Circuit	3	#2 BC	3	477 AAC	$570,000.00
Triple Circuit	3	#4 BC	3	477 AAC	$570,000.00
Triple Circuit	3	477 AAC	3	477 AAC	$570,000.00
Verify for High Capacity	3	477 AAC	0	None	$50,000.00
Double Circuit	0	MCM Undergro	3	) MCM Undergro	$500,323.77
Build New Line	0	None	3	) MCM Undergro	$500,323.77

PUBLIC VERSION

Docket No. E-2, Sub 1220

Exhibit CEB-10

Revised Estimate (E-mail from DEP to Williams Solar dated July 30, 2019)

To: Flagstad, Frederik -greengoenergy[frederik@greengoenergy.com]
Cc: DERContracts[DERContracts@duke-energy.com]
From: Winter, Lee P
Sent: Tue 7/30/2019 1:05:11 PM (UTC-04:00)
Subject: Facility Study Report, Williams Solar, LLC CHKLIST

Dear Williams Solar,
The Interconnection Facilities and System Upgrades (the Facility Study) design and cost estimation for Williams Solar, LLC is complete. Per North Carolina Interconnection Procedures (NCIP) Section 5.1, at this time, you have the option to request a Construction Planning Meeting within 10 business days of receiving this Facility Study Report. If you wish to proceed with this meeting, please submit your request in writing.

The estimated installed cost of the *System Upgrades* is **$1,388,374.26** (amount includes the North Carolina Sales Tax of 7%).

The estimated *Interconnection Facilities* costs for this project are **$196,495.13**. This total is comprised of three costs subject to the North Carolina Sales Tax of 7%, and one cost that is not subject to this tax. The following three costs are subject to the North Carolina Sales Tax of 7%: an estimated construction cost of **$116,419.10**, an estimated metering cost of **$24,791.30**, and an overhead (processing, technology, oversight, and management) cost of **$20,000.00**. With tax included, the total of these three costs amounts to **$151,095.13,** The final cost accounted for in the total estimated Interconnection Facilities costs is an estimated commissioning cost of **$24,000.00**. This cost is not subject to the North Carolina Sales Tax of 7%.

Upon receipt of an Interconnection Agreement (IA) for execution, you must elect to begin paying Interconnection Facilities costs by either a Contributory Plan or a Non-contributory Plan.

- If a Contributory Plan is elected, you will pay DEP a single up-front payment equal to **$196,495.13**. You will also pay to Utility a Monthly Facilities Charge of **$564.84** (0.4% of the estimated installed cost of **$141,210.40** = estimated construction cost + estimated metering cost).
- If a Non-contributory Plan is elected, you must establish financial security arrangements for the initial term of this agreement. Additionally, you agree to maintain an irrevocable letter of credit in the amount of **$151,095.13** for the full term of the initial contract period. You will pay overhead and commissioning costs upfront of **$45,400.00.** You will also pay to Utility a Monthly Facilities Charge of **$1,412.10** (1.0 % of the estimated installed cost of **$141,210.40** = estimated construction cost + estimated metering cost).

All estimated costs are subject to being trued-up to actuals after construction, and the IA amended.

Next Steps:

1. Within 10 business days, please provide your requested in-service date for Duke facilities to be in place and operational. If this request date cannot be accommodated, we will advise you of the earliest possible date.
2. At the same time you send the requested in-service date, please provide a response indicating whether or not you would like to request a Construction Planning Meeting.
    a. If you do not request a Construction Planning Meeting, we will tender an executable IA within 15 business days after receipt of your requested in-service date.
    b. If you do request a Construction Planning Meeting, we will schedule the meeting as soon as a mutually agreeable date is determined. We will not be able to tender an IA until after the occurrence of the Construction Planning Meeting, at such time it would be delivered within 15 business days after the Construction Planning Meeting.

Lee Winter
Wholesale Renewable Manager
Distributed Energy Technology
DUKE ENERGY.
919-546-2207
919-219-7445 (mobile)

Docket No. E-2, Sub 1220

Exhibit CEB-11

E-mail correspondence “Re: Facility Study Report, Williams Solar, LLC CHKLIST,” between July 30, 2019, and August 16, 2019

From: Interconnection [interconnection@greengoenergy.com]
Sent: 8/16/2019 2:10:31 PM
To: Interconnection [interconnection@greengoenergy.com]
CC: Winter, Lee P [/o=DukeEnergy/ou=External (FYDIBOHF25SPDLT)/cn=Recipients/cn=db64aaeb15aa4963b4ea05a8f2778430]; DERContracts [/o=DukeEnergy/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=DERContractsbb5]; Flagstad, Frederik -greengoenergy [/o=DukeEnergy/ou=Exchange Administrative Group (FYDIBOHF23SPDLT)/cn=Recipients/cn=Flagstad, Frederik -greengoenergy61e]
Subject: Re: Facility Study Report, Williams Solar, LLC CHKLIST

Hi Lee,

Can you please provide some availability for a construction planning meeting? We are eager to move forward.

-Chrissy

On Wed, Aug 14, 2019 at 2:36 PM Interconnection <interconnection@greengoenergy.com> wrote:

Hi Lee,

Re: Williams Solar, LLC - NC2016-02927

Just wanted to circle back on the construction planning meeting and see if we could move forward with scheduling that.

-Chrissy

On Wed, Jul 31, 2019 at 4:35 PM Winter, Lee P <Lee.Winter@duke-energy.com> wrote:

Fred,

Receipt confirmed. Please see responses below in RED. We will be in touch shortly to schedule the construction planning meeting.

Lee Winter

Wholesale Renewable Manager

Distributed Energy Technology

DUKE ENERGY.

919-546-2207

919-219-7445 (mobile)

From: Interconnection [mailto:interconnection@greengoenergy.com]
Sent: Tuesday, July 30, 2019 2:52 PM
To: Winter, Lee P <Lee.Winter@duke-energy.com>; DERContracts <DERContracts@duke-energy.com>
Cc: Flagstad, Frederik -greengoenergy <frederik@greengoenergy.com>; Interconnection US <interconnection@greengoenergy.com>
Subject: Re: Facility Study Report, Williams Solar, LLC CHKLIST

*** Exercise caution. This is an EXTERNAL email. DO NOT open attachments or click links from unknown senders or unexpected email. ***

Hi Lee and DERContracts,

Re: Williams Solar, LLC - NC2016-02927

Foremost, thank you for sending through the email noting that the Facility Study process has been completed.

FS - We note that the costs indicated by your email are as follows:

- System Upgrades is $1,388,374.26 (incl. tax)
- Interconnection Facilities costs for this project are $196,495.13 (incl. applicable tax)
- **Total Costs:** $1,584,869.39

SIS - This amount is substantially higher than that of the System Impact Study, which resulted in:

- System Upgrades is $774,000.00 (+ tax)
- Interconnection Facilities costs for this project are $60,000.00 (+ applicable tax)
- **Total Costs:** $834,000.00

This is a **90% ($750,869.34)** increase compared to the very detailed scope and calculation provided at the SIS stage.

Given the extreme departure from the System Impact Study on the part of the Facility Study, we request a detailed overview of the costs associated with this Interconnection Request.

Request 1:

Please provide an updated Table 4 (from SIS) cost estimate for the FS, by filling of the 'Costs FS' section highlighted in yellow below:

Table 4 - Cost Overview	Costs SIS	Costs FS
Transmission Upgrades	$0	
Substation Upgrades	$0	
New Line Construction/Reconductoring	$705,000	$1,181,873.33
Protection Upgrades/Sectionalization	$69,000	$115,672.71
Other	$0	
Total Upfront Charges	$774,000	$1,297,546.04

Further, we ask that you provide a detailed cost break down of every item in the SOW so that we can understand what exactly is driving this substantial increase in costs. We cannot provide this level of detail.

We note that a 'rule of thumb' for many years has been $150-250K per Mile of line upgrade. With the ~2.5 miles of upgrades, this cost should be around $375K to $625K. A cost of ~$1.39m is a very substantial departure from this standard.

Request 2:

Please confirm that the scope provided in the SIS dated December 20th, 2018 has not changed. Confirmed. The scope has not changed.

Request 3:

Please clarify the reasons for the increase in cost. After several true-ups that we have conducted on similar projects, we have found the initial costs that were provided historically (both ballpark costs, and detailed estimates) to be significantly underestimated. Therefore we have applied a new formula to ensure that the upfront costs more closely align with the final true up numbers.

Request 4:

We request that a Construction Planning Meeting be scheduled to review the results. We ask that you provide these requested details in writing prior to scheduling a Construction Planning Meeting for Williams Solar, LLC so that we can have a detailed discussion about costs. We will work on scheduling a construction planning meeting within the time allotted.

Request 5:

Please provide guidance on the earliest possible in-service date for the Duke Interconnection Facilities. We cannot provide estimated in service dates until the IA is executed, upfront costs are paid, and the project is released to construction.

I ask that you please confirm receipt of this email. Further, I ask that you provide the requested information within 5 Business Days or alternatively suspend the deadline provided in your email.

Thank you for your help in clarifying this FS Result.

Regards,

Fred Flagstad

Vice President, GreenGo Energy

Authorized Signatory for Williams Solar, LLC

Frederik Thoring Flagstad | Vice President
GreenGo Energy US, Inc. | 1447 S. Tryon St., Suite 201, Charlotte, NC 28203
Email: interconnection@greengoenergy.com | Mobile: +1 (704) 612 3010

On Tue, Jul 30, 2019 at 1:05 PM Winter, Lee P <Lee.Winter@duke-energy.com> wrote:

Dear Williams Solar,

The Interconnection Facilities and System Upgrades (the Facility Study) design and cost estimation for Williams Solar, LLC is complete. Per North Carolina Interconnection Procedures (NCIP) Section 5.1, at this time, you have the option to request a Construction Planning Meeting within 10 business days of receiving this Facility Study Report. If you wish to proceed with this meeting, please submit your request in writing.

The estimated installed cost of the *System Upgrades* is **$1,388,374.26** (amount includes the North Carolina Sales Tax of 7%).

The estimated *Interconnection Facilities* costs for this project are **$196,495.13**. This total is comprised of three costs subject to the North Carolina Sales Tax of 7%, and one cost that is not subject to this tax. The following three costs are subject to the North Carolina Sales Tax of 7%: an estimated construction cost of **$116,419.10**, an estimated metering cost of **$24,791.30**, and an overhead (processing, technology, oversight, and management) cost of **$20,000.00**. With tax included, the total of these three costs amounts to **$151,095.13,** The final cost accounted for in the total estimated Interconnection Facilities costs is an estimated commissioning cost of **$24,000.00**. This cost is not subject to the North Carolina Sales Tax of 7%.

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- If a Non-contributory Plan is elected, you must establish financial security arrangements for the initial term of this agreement. Additionally, you agree to maintain an irrevocable letter of credit in the amount of **$151,095.13** for the full term of the initial contract period. You will pay overhead and commissioning costs upfront of **$45,400.00.** You will also pay to Utility a Monthly Facilities Charge of **$1,412.10** (1.0 % of the estimated installed cost of **$141,210.40** = estimated construction cost + estimated metering cost).

All estimated costs are subject to being trued-up to actuals after construction, and the IA amended.

Next Steps:

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2. At the same time you send the requested in-service date, please provide a response indicating whether or not you would like to request a Construction Planning Meeting.

    a. If you do not request a Construction Planning Meeting, we will tender an executable IA within 15 business days after receipt of your requested in-service date.
    b. If you do request a Construction Planning Meeting, we will schedule the meeting as soon as a mutually agreeable date is determined. We will not be able to tender an IA until after the occurrence of the Construction Planning Meeting, at such time it would be delivered within 15 business days after the Construction Planning Meeting.

Lee Winter

Wholesale Renewable Manager

Distributed Energy Technology

DUKE ENERGY.

919-546-2207

919-219-7445 (mobile)

Docket No. E-2, Sub 1220

Exhibit CEB-12

Overview of Revised Estimating Tool – Williams Solar (Produced in Response to Data Request No. 1-3)

Overview of Revised Estimating Tool – Williams Solar

In order to give developers a “best estimate cost, including overheads,” the Revised Estimating Tool (RET) was designed based on actual cost analysis of projects built and energized across 2018 and 2019.

RET updates the existing Duke Energy cost models in MAXIMO to more accurately reflect total project costs Duke Energy will likely incur from completion of Facility Study through completion of interconnection-related project construction. RET accounts for increased future costs by projecting inflation-impacted labor, material and equipment costs, modeling more likely resourcing and equipment requirements and adding a contingency factor for unforeseen events that have historically increased costs.

Why were changes needed to existing Duke Energy cost models?

- Interconnected projects are funded by developers and must comply with specific state or FERC regulations, including a requirement for best estimate costs
- Time from Facility Study completion to construction project energization can take several years. Historically, Duke Energy has incurred actual cost increases from the time of Facility Study completions due to multiple reasons, including but not limited to:
  - Inflation on materials, equipment, etc.
  - Contractual changes with internal and external resources
  - Changes to required internal/external resource/equipment usage due to volumes, etc.
  - Unforeseen project facility circumstances such as land constraints
  - Increased regulatory and safety requirements

Summary of RET changes to existing Duke Energy cost models

- Increased labor hours after including productivity constraints– MAXIMO model consistently underestimated labor hours for interconnection projects. MAXIMO has been recently updated to include some productivity constraints, so the RET model has been adjusted accordingly
- Increased contractor hourly rates – MAXIMO model used rate that consistently underestimated the levels of contractor resources and hourly rates used on interconnection projects
- Increased contractor fleet expenses previously underestimated in estimates
- Included inflation rate at 3% per year for labor and equipment x 2 years
- Included contingency of 20% to account for potential changes to operating and safety procedures, unforeseen construction issues caused by weather or ground conditions, etc.
- Increased overhead rates - MAXIMO model consistently underestimated overheads charged to interconnection projects

Detailed RET process

MAXIMO

Duke Energy uses a system called MAXIMO for work order origination and tracking as well as supply chain functions. Labor hour estimates and costs for types of work are pre-programmed in MAXIMO. MAXIMO estimates assume an 8-hour workday, 40 hours per work week for a 4-man crew.

Productivity Rate

To improve accuracy, estimated labor hours must incorporate contractually required reductions for travel, safety meetings, and set-up and take down during an average work day, among other things. The RET tool assumed a productivity rate of 75% for projects estimated prior to December 2019. MAXIMO was updated for productivity starting 12/1/2019, so the RET model has been adjusted to 90% DEP and 79% DEC for projects estimated from December 2019 to current to more closely match what we anticipate for actual charges.

Conversion from Estimated Hours to Estimated Weeks of Work

For a MAXIMO estimate of **4,580** labor hours, RET calculates **6,107** labor hours to complete the work.

- **4,580** MAXIMO hours divided by 75% Productivity Rate = **6,107 RET estimated labor hours**

If a project has 800 labor hours estimated, that project is estimated to take 5 weeks, since Duke Energy estimates a work week as 5, 8-hour days for a team of 4, 160 labor hours. This small partial week was not rounded up to the nearest total week for conservativism in the estimate.

- **6,107** estimated labor hours / (5 x 8 x 4) = **38.17 weeks**

Inflation Rate

The RET tool assumes 3% inflation per year with assumption that interconnection projects span 2 years from completion of Facility Study to completion of interconnection-related construction projects. RET adds 6% Inflation to the following Direct Costs:

- Labor Costs (LC)
- Material Costs (EMC)
- Vehicle Costs (VC)
- Flagging Costs (EFC)
- Additional Costs if applicable

Contingency

RET adds 20% Contingency for unforeseen risks to the following Direct Costs:

- Labor Costs (LC)
- Material Costs (EMC)
- Vehicle Costs (VC)
- Flagging Costs (EFC)
- Additional Costs if applicable

Overheads

RET adds 25% for Overhead Burdens to Direct Costs plus Contingency for LC, VC, EFC.
If there are Additional Costs such as Environmental, Tree Trimming, Right of Way, etc., those Additional Costs also include a 25% Overhead Burden.

For Materials, the Overhead Burden is 48.75%, which includes 33.75% for material allocations and 15% for stores loading.

Conversion to Estimated Cost per Man Week Using Revised Hours and Inflation Rate

RET uses a blended hourly contractor rate of $75 per labor hour. Actual rates will vary dependent on the actual work and assigned crew resources and are charged based on contractual contractor rates negotiated in confidential Master Service Agreements with Duke Energy. Assigned crews can be a mixture of the following resources:

- General Foreman
- Working Foreman
- Class A Lineman
- Class B Lineman
- Class C Lineman
- Groundman
- Equipment Operator
- Truck Driver

Cost per Person per Man Week = ($75 x 5 x 8) x 1.06 inflation assumption for 2 years = $3,180.00

Conversion to Estimated Total Labor Costs (LC) for Project

(Cost per Man Week) x (Number of Crews x Number of people per crew) x (Estimated Weeks of Work)

- $3,180 X 1 crew x 4 people per crew times 38 weeks = $483,360
- $483,360 X 0.20 Contingency = $ 96,672
- $580,032 X 0.25 Overheads = $145,008
- **$725,040 Total LC (with Inflation and Overheads)**

Assumptions are adjusted in RET if the design requires more than the standard resources outlined above.

Vehicle Costs (VC)

Duke Energy subcontractors charge a separate hourly rate for vehicles and equipment required to perform the work. RET uses a blended rate of $30 per hour since the actual rate will vary dependent on the work, assigned equipment, and contractually negotiated terms. Assigned equipment can be a mixture of the example following items:

- 50-60' Material Handler Bucket
- Up to 20,000 lbs. Digger Derrick
- Hourly - Pickup 3/4 Ton (4X4)
- Pickup 1/2 (4X4)
- Material Trailer
- Two Axle Pole Trailer
- Single Axle Pole Trailer
- Material Trailer
- Puller/Tensioner

(Cost per Man Week) x (Number of Crews x Number of people per crew) x (Estimated Weeks of Work)

- Cost per Man Week = ($30 x 5 x 8) x 1.06 inflation assumption for 2 years = $ 1,272
- $ 1,272 X 1 crew x 4 people per crew times 38 weeks = $193,344
- $193,344 X 0.20 Contingency = $ 36,689
- $232,013 X 0.25 Overheads = $ 58,003
- **$290,016 Total VC (with Inflation and Overheads)**

Assumptions are adjusted in RET if the design requires more than the standard resources outlined above.

Estimated Material Costs (EMC)

Material costs are estimated in MAXIMO based on unit estimates. RET increases the MAXIMO estimated costs for inflation across 2 years:

- $143,328 X 1.06 inflation assumption for 2 years = $151,927
- $151,927 X 0.4875 Material Overheads = $ 74,065
- $151,927 + $74,065 = $225,992
- $225,992 X 0.20 Contingency = $ 45,198
- $45,198 X 0.25 Overheads = $ 11,300
- $225,992 + $45,198 + $11,300 = $282,490
- **$282,490 Total EMC (with Inflation and Overheads)**

Estimated Flagging Costs (EFC) – Flagging was minimal

Flagging costs are normally estimated assuming 2 flaggers for half of the estimated length of the project. Flaggers hourly blended rate is $38.38.

Flagging for this project was minimal so it was included as part of Contingency as part of a good faith estimate.

EFC Blended Rate: = ((Rate/Hr x 40 hr + OT Rate/Hr x 5 OT hours) x (Contractor Mark-Up)) / 45 labor Hours / Week

- $38.38 X 5 X 8 X 0 weeks = $0
- $0 X 0.20 Contingency = $0
- $0 X 0.25 Overheads = $0
- **$0 Total EFC (with Inflation and Overheads)**

Additional Costs, such as Environmental, Tree Trimming and Right of Way Costs

There is a section in RET to remind planners to consider the need to add these costs if they are required for the specific project. If these costs are included, they also include 20% Contingency and 25% Overheads.

If estimated MAXIMO cost = $20,000, RET would calculate Total as follows:

- $0 X 0.20 Contingency = $ 0
- $0 X 0.25 Overheads = $ 0
- **$0 Total (with Inflation and Overheads)**

Summary Table Costs

Estimated Labor Costs Total (LC)	**$**	**725,040.00**
Estimated Vehicle / Equipment Total (VC)	**$**	**290,016.00**
Estimated Total Material Costs (EMC)	**$**	**282,490.03**
Estimated Total Flagging Estimate (EFC)	$	-
Estimated Total Adder Amount	$	-
T&E Estimate	**$**	**1,297,546.03**

Revised Estimating Tool Output

Interconnection Agreement Total		
Description	Worksheet Calculation	
Engineering & Design	$	21,369.60
Labor & Equipment - Estimated	$	1,061,083.33
Materials - Estimated	$	331,666.17
Other - Estimated	$	4,451.82
Total Interconnection Agreement Estimate	$	1,418,570.93

Interconnection Facilities		
Description	Worksheet Calculation	
Engineering & Design	$	1,068.48
Labor & Equipment - Estimated	$	55,028.85
Materials - Estimated	$	60,475.74
Other - Estimated	$	4,451.82
Total Interconnection Agreement Estimate	$	121,024.90

System Upgrades		
Description	Worksheet Calculation	
Engineering & Design	$	20,301.12
Labor & Equipment - Estimated	$	1,006,054.48
Materials - Estimated	$	271,190.43
Other - Estimated	$	-
Total Interconnection Agreement Estimate	$	1,297,546.03

System Upgrades			
Description	**REM**	**MAXIMO**	**VARIANCE**
Estimated Productive Manhours	4,580.43		
Estimated Hours to Complete Work	6,107.24	4,580.43	(1,526.81)
Cost per Man Week	3,180.00		
Estimated weeks of work (calculated)	38.00	29.00	(9.00)
Labor Costs	$483,360.00	$336,854.27	(146,505.73)
Vehicle costs	$193,344.00		(193,344.00)
Hotel	$-		-
Per Diem	$-		-
Estimated T&E Labor Costs	$676,704.00	$336,854.27	$(339,849.73)
Material Costs	$151,927.41	$143,327.75	$(8,599.66)
Material O/H (Mat Alloc 33.75% + Stores Loading 15%)	$74,064.61	$24,365.72	$(49,698.90)
Flagging Estimate	$-	$1,451.52	$1,451.52
Tree Trim Estimate	$-	$-	$-
Adder Amount for Additional Estimated Costs	$-		$-
Total Direct Costs	$902,696.02	$505,999.25	$(396,696.77)
Contingency	$180,539.20		$(180,539.20)
Sub-Total before Burdens with Contingency	$1,083,235.23	$505,999.25	$(577,235.98)
Overhead Burdens	$214,310.80	$173,420.06	$(40,890.74)
T&E Estimate	$1,297,546.03	$679,419.31	$(618,126.72)

Interconnection Facilities			
Description	**REM**	**MAXIMO**	**VARIANCE**
Estimated Productive Manhours	213.69		
Estimated Hours to Complete Work	284.92	213.69	(71.23)
Cost per Man Week	3,180.00		
Estimated weeks of work (calculated)	2.00		(2.00)
Labor Costs	$25,440.00	$15,712.13	(9,727.87)
Vehicle costs	$10,176.00		(10,176.00)
Hotel	$-		-
Per Diem	$-		-
Estimated T&E Labor Costs	$35,616.00	$15,712.13	$(19,903.87)
Material Costs	$33,879.97	$31,962.23	$(1,917.73)
Material O/H (Mat Alloc 33.75% + Stores Loading 15%)	$16,516.48	$5,433.58	$(11,082.90)
Flagging Estimate	$3,070.22	$-	$(3,070.22)
Tree Trim Estimate	$-	$-	$-
Adder Amount for Additional Estimated Costs	$-		$-
Total Direct Costs	$89,082.68	$53,107.94	$(35,974.73)
Contingency	$17,816.54		$(17,816.54)
Sub-Total before Burdens with Contingency	$106,899.21	$53,107.94	$(53,791.27)
Overhead Burdens	$14,125.69	$8,138.88	$(5,986.81)
T&E Estimate	$121,024.90	$61,246.82	$(59,778.08)

I/A

Docket No. E-2, Sub 1220

Exhibit CEB-13

Copy of Time and Expense Template.xlsx

Assumptions
Enter Data in Yellow fields only:

Work Order Numbers	Maximo Labor Hours Estimated	Labor Expense Estimated	Labor Overhead Estimated	Material Costs Estimated	Materials Overhead Estimated	Service Cost Estimated	Service Cost O/H Estimated	Veg Mgt Expenses Estimated	Flagging Expenses Estimated	Adder Amount for Additional Estimated Costs	Maximo Total Estimated Expenses	Flagging Yes / No
1	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	Yes
2	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
3	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
4	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
5	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
6	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
7	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
8	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
9	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
10	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
11	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
Total:	-	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	

Notes:

PUBLIC VERSION

Assumptions
Enter Data in Yellow fields only:

Work Order Numbers	Maximo Labor Hours Estimated	Labor Expense Estimated	Labor Overhead Estimated	Material Costs Estimated	Materials Overhead Estimated	Service Cost Estimated	Service Cost O/H Estimated	Veg Mgt Expenses Estimated	Flagging Expenses Estimated	Adder Amount for Additional Estimated Costs	Maximo Total Estimated Expenses	Flagging Yes / No
1	-	$ -	$ -	$ -	$ -	$ -	$ -		$ -	$ -	$0.00	No
2	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
3	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
4	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
5	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
6	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
7	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
8	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
9	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
10	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
11	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
Total:	-	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	

Notes:

Docket No. E-2, Sub 1220

Exhibit CEB-14

Cost Estimation Tool Presentation

Cost Estimation Tool Training

Cost Estimation Tool Training

Goal of Today

- Feel confident in the rationale and logic behind the tool
- Understand how to use the tool

AGENDA

- Reason for new Estimation Tool
- Assumptions in the Estimation Tool
- Review the Tool
- MAXIMO Work Order data
- Exercise to use the Estimation Tool

Context

- Convert Estimates from Unit Price to Time and Expense
- Adjust system estimate for unique circumstances
- Address project risks
- Identify clearly what is and is not included in estimate
- Improve cost estimation

Assumptions

• Hourly Rate	$75 / man hour	Blended Rate
• Fleet Rate	$30 / man hour	Blended Rate
• Flagging	2 man crew - half of total estimated time	
• Contingency	20% of total costs	
• Efficiency factor	75%	

- 6 out of 8 hour work day doing productive work

Example – Robin Solar

- Blank Template

Assumptions Enter Data in Yellow fields only:												
Work Order Numbers	Maximo Labor Hours Estimated	Labor Expense Estimated	Labor Overhead Estimated	Material Costs Estimated	Materials Overhead Estimated	Service Cost Estimated	Service Cost O/H Estimated	Veg Mgt Expenses Estimated	Flagging Expenses Estimated	Environmental Expenses Estimated	Maximo Total Estimated Expenses	Flagging Yes / No
1	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	Yes
2	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
3	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
4	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
5	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
6	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
7	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
8	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
9	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
10	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
11	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
Total:	-	$ -	$ -	$ -	$ -			$ -	$ -	$ -	$ -	

PUBLIC VERSION

Detailed Cost Report-Summary

Service Area: GOLDS **Work Order Number:** 32657525 **Version:** 5-ACCEPTED DESIGN

Service Address: 468 Oberry Rd , DUDLEY , NC 28333 **Work Order Owner:** Coole, Robert

GL Account: CJ6D~E055~69100~NCSLRCA~MX2657[illegible]25~I

Work Order Description: 19_ROBIN SOLAR LLC OFF SITE SYSTEM IMPROVEMENTS_DUDLEY 23KV_WIRE WORK 3 OF 3_RECOND 1.09 MI 2PH #1/0 ACSR / 1PH #4 CHD TO 3PH 477 AAC FROM 1BLQ95 TO DD02AZ_INST TAP FUSE AT DD02AZ

Construction Details:

Task Type / CU Name	Field ID	CU Action	CU Quantity	Process	Project	Activity	Labor	Materials	Service Cost	Total	Labor Hours
OVERHEAD POLE AND EQUIP		I	435.00	NCSLRCA	MX2657525	I	$20,402.52	$9,121.93	$0.00	$29,524.45	277.02
OVERHEAD POLE AND EQUIP		R	235.00	NCSLRCA	MX2657525	I	$6,311.22	$0.00	$0.00	$6,311.22	85.69
OVERHEAD PRIMARY		I	47,054.24	NCSLRCA	MX2657525	I	$74,595.78	$24,632.99	$0.00	$99,228.77	1[illegible]12.84
OVERHEAD PRIMARY		R	29,847.02	NCSLRCA	MX2657525	I	$17,475.38	$0.00	$0.00	$17,475.38	37.28
UNIT INFRASTRUCTURE		R	315.00	NCSLRCA	MX2657525	I	$0.00	$0.00	$0.00	$0.00	0.00
UNIT INFRASTRUCTURE		I	355.00	NCSLRCA	MX2657525	I	$420.00	$373.67	$0.00	$793.67	6.00
DOLLARONLY		I	70,192.40	NCSLRCA	MX2657525	I	$0.00	$0.00	$35,096.20	$35,096.20	0.00
OVERHEAD SECONDARY		I	65.00	NCSLRCA	MX2657525	I	$164.98	$33.33	$0.00	$198.31	2.24
OVERHEAD SECONDARY		R	117.00	NCSLRCA	MX2657525	I	$199.59	$0.00	$0.00	$199.59	2.71
POLE PULL		R	1.00	NCSLRCA	MX2657525	I	$58.80	$0.00	$0.00	$58.80	0.84
POLE REINFORCEMENT		R	3.00	NCSLRCA	MX2657525	I	$371.20	$0.00	$0.00	$371.20	5.04
OVERHEAD SECONDARY		T	10.00	DPRJOMC	MX2657525	X	$796.30	$0.00	$0.00	$796.30	10.81
TREE TRIMMING DUKE		I	1.00	NCSLRCA	MX2657525	I	$88.38	$0.00	$0.00	$88.38	1.20
OVERHEAD PRIMARY		T	11.00	DPRJOMC	MX2657525	X	$991.62	$0.00	$0.00	$991.62	13.46
UNDERGROUND TERMINATIONS		I	14.00	NCSLRCA	MX2657525	I	$613.20	$267.60	$0.00	$880.80	8.76
UNDERGROUND TERMINATIONS		R	14.00	NCSLRCA	MX2657525	I	$464.52	$0.00	$0.00	$464.52	6.64
Grand Total:			148,669.66				$122,953.49	$34,429.52	35,096.20	$192,479.21	1,670.53

Project Details:

Project	Process	Activity	CU	CU Name	Labor	Labor	Material	Material	Service Cost	Service Cost	Total	Labor
MX2657525	DPRJOMC	X	T		$1,787.93	$926.15	$0.00	$0.00	$0.00	$0.00	$2,714.07	1.33%
	NCSLRCA	I	I		$96,284.86	$49,875.56	$34,429.52	$5,853.02	$35,096.20	$18,179.83	$239,718.99	71.36%
			R		$24,880.70	$12,888.20	$0.00	$0.00	$0.00	$0.00	$37,768.90	18.44%
Total					$122,953.49	$63,689.91	$34,429.52	$5,853.02	$35,096.20	$18,179.83	$280,201.96	91.12%

Example – Robin Solar

- Updated with Maximo Work Orders

1 2 3

Assumptions
Enter Data in Yellow fields only:

Work Order Numbers	Maximo Labor Hours Estimated	Labor Expense Estimated	Labor Overhead Estimated	Material Costs Estimated	Materials Overhead Estimated	Service Cost Estimated	Service Cost O/H Estimated	Veg Mgt Expenses Estimated	Flagging Expenses Estimated	Environmental Expenses Estimated	Maximo Total Estimated Expenses	Flagging Yes / No
Work Order Number: 32657525	1,670.53	$122,953.49	$63,689.91	$34,429.52	$5,853.02	$35,096.20	$18,179.83	$ 53,276.03	$ 53,276.03	$ -	$333,478.00	Yes
2	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
3	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
4	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
5	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
6	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
7	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
8	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
9	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
10	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
11	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
Total:	1,670.53	$ 122,953.49	$ 63,689.91	$ 34,429.52	$ 5,853.02			$ 53,276.03	$ 53,276.03	$ -	$ 333,478.00	

Example – Robin Solar

Assumptions
Enter Data in Yellow fields only:

Work Order Numbers	Maximo Labor Hours Estimated	Labor Expense Estimated	Labor Overhead Estimated	Material Costs Estimated	Materials Overhead Estimated	Service Cost Estimated	Service Cost O/H Estimated	Veg Mgt Expenses Estimated	Flagging Expenses Estimated	Environmental Expenses Estimated	Maximo Total Estimated Expenses	Flagging Yes / No
Work Order Number: 32657525	1,670.53	$122,953.49	$63,689.91	$34,429.52	$5,853.02	$35,096.20	$18,179.83		$ 53,276.03	$ -	$280,201.96	Yes
2	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
3	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
4	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
5	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
6	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
7	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
8	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
9	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
10	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
11	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
Total:	1,670.53	$ 122,953.49	$ 63,689.91	$ 34,429.52	$ 5,853.02			$ -	$ 53,276.03	$ -	$ 280,201.96	

Detailed Cost Report-Summary

Service Area: GOLDS **Work Order Number:** 32657525 **Version:** 5-ACCEPTED DESIGN

Service Address: 468 Oberry Rd , DUDLEY , NC 28333 **Work Order Owner:** Coole, Robert

GL Account: CJ6D~E055~69100~NCSLRCA~MX2657525~I

Work Order Description: 19_ROBIN SOLAR LLC OFF-SITE SYSTEM IMPROVEMENTS_DUDLEY 23KV_WIRE WORK 3 OF 3_RECOND 1.09 MI 2PH #1/0 ACSR / 1PH [illegible]

Construction Details:

Task Type / CU Name	Field ID	CU Action	CU Quantity	Process	Project	Activity	Labor	Materials	Service Cost	Total	Labor Hours
OVERHEAD POLE AND EQUIP		I	435.00	NCSLRCA	MX2657525	I	$20,402.52	$9,121.93	$0.00	$29,524.45	277.02
OVERHEAD POLE AND EQUIP		R	235.00	NCSLRCA	MX2657525	I	$6,311.22	$0.00	$0.00	$6,311.22	85.69
OVERHEAD PRIMARY		I	47,054.24	NCSLRCA	MX2657525	I	$74,595.78	$24,632.99	$0.00	$99,228.77	1,012.84
OVERHEAD PRIMARY		R	29,847.02	NCSLRCA	MX2657525	I	$17,475.38	$0.00	$0.00	$17,475.38	237.28
UNIT INFRASTRUCTURE		R	315.00	NCSLRCA	MX2657525	I	$0.00	$0.00	$0.00	$0.00	0.00
UNIT INFRASTRUCTURE		I	355.00	NCSLRCA	MX2657525	I	$420.00	$373.67	$0.00	$793.67	6.00
DOLLARONLY		I	70,192.40	NCSLRCA	MX2657525	I	$0.00	$0.00	$35,096.20	$35,096.20	0.00
OVERHEAD SECONDARY		I	65.00	NCSLRCA	MX2657525	I	$164.98	$33.33	$0.00	$198.31	2.24
OVERHEAD SECONDARY		R	117.00	NCSLRCA	MX2657525	I	$199.59	$0.00	$0.00	$199.59	2.71
POLE PULL		R	1.00	NCSLRCA	MX2657525	I	$58.80	$0.00	$0.00	$58.80	0.84
POLE REINFORCEMENT		R	3.00	NCSLRCA	MX2657525	I	$371.20	$0.00	$0.00	$371.20	5.04
OVERHEAD SECONDARY		T	10.00	DPRJOMC	MX2657525	X	$796.30	$0.00	$0.00	$796.30	10.81
TREE TRIMMING DUKE		I	1.00	NCSLRCA	MX2657525	I	$88.38	$0.00	$0.00	$88.38	1.20
OVERHEAD PRIMARY		T	11.00	DPRJOMC	MX2657525	X	$991.62	$0.00	$0.00	$991.62	13.46
UNDERGROUND TERMINATIONS		I	14.00	NCSLRCA	MX2657525	I	$613.20	$267.60	$0.00	$880.80	8.76
UNDERGROUND TERMINATIONS		R	14.00	NCSLRCA	MX2657525	I	$464.52	$0.00	$0.00	$464.52	6.64
Grand Total:			148,669.66				$122,953.49	$34,429.52	35,096.20	$1[illegible],479.21	1,670.53

Project Details:

Project	Process	Activity	CU	CU Name	Labor	Labor	Material	Material	Service Cost	Service Cost	Total	Labor
MX2657525	DPRJOMC	X	T		$1,787.93	$926.15	$0.00	$0.00	$0.00	$0.00	[illegible]14.07	1.33%
	NCSLRCA	I	I		$96,284.86	$49,875.56	$34,429.52	$5,853.02	$35,096.20	$18,179.83	$239,718.99	71.36%
			R		$24,880.70	$12,888.20	$0.00	$0.00	$0.00	$0.00	$37,768.90	18.44%
Total					$122,953.49	$63,689.91	$34,429.52	$5,853.02	$35,096.20	$18,179.83	$280,201.96	91.12%

Type	Activity	Cost

Example – Robin Solar

- Updated with Maximo Work Orders

Assumptions Enter fields in Yellow only:												
Work Order Numbers	Maximo Labor Hours Estimated	Labor Expense Estimated	Labor Overhead Estimated	Material Costs Estimated	Materials Overhead Estimated	Service Cost Estimated	Service Cost O/H Estimated	Veg Mgt Expenses Estimated	Flagging Expenses Estimated	Environmental Expenses Estimated	Maximo Total Estimated Expenses	Flagging Yes / No
32657525	1,670.53	$122,953.49	$63,689.91	$34,429.52	$5,853.02	$35,096.20	$18,179.83		$ 53,276.03	$ -	$280,201.96	Yes
32657744	75.40	$5,545.94	$2,872.80	$7,689.27	$1,307.18	$0.00	$0.00	$ -	$ -	$ -	$17,415.18	
32657881	12.23	$900.89	$466.66	$4,139.68	$703.75	$0.00	$0.00		$ -	$ -	$6,210.97	
32657409	112.89	$8,052.11	$4,170.99	$19,191.13	$3,262.49	$0.00	$0.00	-	$ -	$ -	$34,676.72	
32656970	1,346.91	$99,171.13	$51,370.65	$30,250.32	$5,142.55	$1,813.05	$939.16	$ 2,752.21		$ -	$188,686.87	
32640550	53.12	$3,897.83	$2,019.08	$27,189.77	$4,622.26	$0.00	$0.00	$ -	$ -	$ -	$37,728.94	
7	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
8	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
9	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
10	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
11	-	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$0.00	
Total:	3,271.08	$ 240,521.39	$ 124,590.08	$ 122,889.69	$ 20,891.25			$ 2,752.21	$ 53,276.03	$ -	$ 564,920.65	

Create Robin Solar Revised Estimate

- Practice Exercise
  - Time and Expense Estimate Template
  - Robin Solar Work Orders
  - Time and Expense Estimate Job Aid

Wrap-up

- Do you feel confident :
  - In the rationale and logic behind the tool
  - To use the tool efficiently
  - How you would use this tool, tailored to your individual needs

- Additional Questions
  - Beckton James beckton.james@duke-energy.com

I/A

Docket No. E-2, Sub 1220

Exhibit CEB-15

July 30, 2019 e-mail re: “Cost Estimation Training”

Subject:	FW: Cost Estimation Training
Location:	Skype Meeting
Start:	Thu 8/1/2019 2:30 PM
End:	Thu 8/1/2019 3:30 PM
Show Time As:	Tentative
Recurrence:	(none)
Meeting Status:	Not yet responded
Organizer:	Andreasen, Jack
Importance:	High

-----Original Appointment-----
From: Andreasen, Jack
Sent: Tuesday, July 30, 2019 4:07 PM
To: Andreasen, Jack; Duke, Kelly B; Judd, Shane Alan; Agee, Matthew; Gill, Mark Anthony; Lewis, Lynn C; Miller, Robert Mull; Sizemore, Patrick W; James, Beckton; Shoaf, David; Mabry, Bob; Ray, Victor A; Vu, Van C; Blanchard, Kenny; Cass, Robert; Hooks, Jimmy Dale; Greene, Kennith R; Walters, Michael L; McRee, Seth R; English, Dylan; Neil Bhagat (Neil.Bhagat@duke-energy.com)
Cc: Sloan, Megan; Emery, Duane D.; Ferrell, Steve B; Waggoner, Mike; Astralla, James John; Deese, Nick; Fields, Billy; Horton, Thomas
Subject: Cost Estimation Training
When: Thursday, August 1, 2019 2:30 PM-3:30 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Skype Meeting
Importance: High

Hello all,

This is the first of two (potentially three, if schedules conflict) trainings regarding the cost estimation tool created by Beckton James. This tool will help identify and rectify the differences between Maximo outputs and the actuals we see come in. Tomorrow afternoon (Wednesday July 31st) I will be sending out the tool itself, the PowerPoint that will direct the training and a test case to check your understanding at the end of the training. The goal of this is to give you a chance to look the presentation and tool beforehand. If you want, give it a try on your own and come with questions. This will make the training run a bit smoother.

If you have any questions or comments about the training or the tool itself please feel free to reach out to myself or Beckton.

If you cannot make this training I will be selecting at least one, potential two dates for next week that will accommodate everyone.

Finally, if you see someone missing from this email please feel free to forward this request, and any requisite materials.

Best,
Jack Andreasen
Engineering Design Associate
Jack.Andreasen@duke-energy.com
Duke Energy 919-546-5305

....

→ Join Skype Meeting

Trouble Joining? Try Skype Web App

Help

....

PUBLIC VERSION

I/A

PUBLIC VERSION

Docket No. E-2, Sub 1220

Exhibit CEB-16

August 1, 2019 e-mail re: “Cost Estimation Tool Presentation.pptx”

From: James, Beckton [/O=EXCHANGELABS/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=A4D3A20F64F64A0480E66F9BCFF404D5-C55923 (337]
Sent: 8/1/2019 11:14:52 AM
To: Andreasen, Jack [Jack.Andreasen@duke-energy.com]; Bhagat, Neil [Neil.Bhagat@duke-energy.com]
Subject: Cost Estimation Tool Presentation.pptx
Attachments: Cost Estimation Tool Presentation.pptx

Neil and Jack,

Here is the presentation for today, please review and give me feedback.

Presentation is intended to be high level and the job aid to follow will be detailed.

Will be sharing my screen so I can also pull in any spreadsheets necessary during presentation and exercise.

Beckton

Docket No. E-2, Sub 1220

Exhibit CEB-17

August 1, 2019 e-mail re: “Conference Line for Cost Estimation Training”

From: Andreasen, Jack
Sent: Thursday, August 1, 2019 11:53 AM
Subject: Conference line for Cost Estimation Training

The following conference line will be used for all 3 cost estimation trainings:
Conference line: 704-382-5555
Participant code: 337699#

The presentation will be sent out shortly along with the tool, and the practice case. Sorry for the delay.

Best,
Jack Andreasen MPA, MSES
Engineering Design Associate
Jack.Andreasen@duke-energy.com
Duke Energy 919-546-5305

Docket No. E-2, Sub 1220

Exhibit CEB-18

August 8, 2019 e-mail re: “Cost Estimation Tool Start Date and Consistency Issues”

From: Andreasen, Jack
Sent: Thursday, August 8, 2019 9:50 AM
Cc: Davis, Wesley; Massengill, Donna B
Subject: Cost Estimation Tool Start Date and Consistency Issues

All,

I understand there has been some confusion over when the new cost estimation tool should be used. This tool is to be used beginning **now**. The tool is operational and should be used on projects going forward from today.

Alongside this, each estimation made needs to have a person (another engineer, technologist, manager etc.) approve it. The place to note this approval can be seen in totals vs estimates tab at the top. To supplement this approval process, after the **first** attempt at using the tool, send the final estimate to either Beckton or myself to ensure the tool was used correctly. This should help with consistency issues and iron out any bugs that may arise in developing a new tool across the entire firm.

Please forward these instructions to whoever you see fit. I appreciate your help in this process and apologize for any confusion that may have resulted.

Best,
Jack Andreasen MPA, MSES
Engineering Design Associate
Jack.Andreasen@duke-energy.com
Duke Energy 919-546-5305

From: James, Beckton
Sent: Wednesday, August 7, 2019 3:10 PM
To: Andreasen, Jack <Jack.Andreasen@duke-energy.com>; Winter, Lee P <Lee.Winter@duke-energy.com>; Walters, Michael L <Michael.Walters2@duke-energy.com>; Duke, Kelly B <Kelly.Duke@duke-energy.com>; Fields, Billy <Billy.Fields@duke-energy.com>; Judd, Shane Alan <Shane.Judd@duke-energy.com>; Astralla, James John <James.Astralla@duke-energy.com>; Agee, Matthew <Matthew.Agee2@duke-energy.com>; Deese, Nick <Nick.Deese@duke-energy.com>; Gill, Mark Anthony <Mark.Gill@duke-energy.com>; Hardwick, Elizabeth E <Elizabeth.Hardwick@duke-energy.com>; Lewis, Lynn C <Lynn.Lewis@duke-energy.com>; Anderson, Zachary B <Zachary.Anderson@duke-energy.com>; Miller, Robert Mull <Robert.Miller@duke-energy.com>; Horton, Thomas <Thomas.Horton3@duke-energy.com>; Sizemore, Patrick W <Patrick.Sizemore@duke-energy.com>; Ray, Mallory C <Mallory.Ray@duke-energy.com>; Shoaf, David <David.Shoaf@duke-energy.com>; Ray, Victor A <Victor.Ray@duke-energy.com>; Vu, Van C <Van.Vu@duke-energy.com>; Blanchard, Kenny <Kenny.Blanchard@duke-energy.com>; Cass, Robert <Robert.Cass@duke-energy.com>; Hooks, Jimmy Dale <Jimmy.Hooks@duke-energy.com>; Greene, Kennith R <Kennith.Greene@duke-energy.com>; McRee, Seth R <Seth.McRee@duke-energy.com>; English, Dylan <Dylan.English@duke-energy.com>; Bhagat, Neil <Neil.Bhagat@duke-energy.com>; Mabry, Bob <Bob.Mabry@duke-energy.com>

Cc: Davis, Wesley <Wesley.Davis@duke-energy.com>; Massengill, Donna B <Donna.Massengill@duke-energy.com>
Subject: RE: Cost Estimation Training Day 2

Attached is the example files for Robin Solar I will be using today.

You can practice entering the Detailed Cost Report Work Orders into the template as I walk through them or on your own.

If you have any questions, please let me know.

Thanks,
Beckton

-----Original Appointment-----
From: Andreasen, Jack
Sent: Wednesday, July 31, 2019 10:57 AM
To: Andreasen, Jack; Winter, Lee P; Walters, Michael L; Duke, Kelly B; Fields, Billy; Judd, Shane Alan; Astralla, James John; Agee, Matthew; Deese, Nick; Gill, Mark Anthony; Hardwick, Elizabeth E; Lewis, Lynn C; Anderson, Zachary B; Miller, Robert Mull; Horton, Thomas; Sizemore, Patrick W; Ray, Mallory C; James, Beckton; Shoaf, David; Ray, Victor A; Vu, Van C; Blanchard, Kenny; Cass, Robert; Hooks, Jimmy Dale; Greene, Kennith R; McRee, Seth R; English, Dylan; Bhagat, Neil; Mabry, Bob
Cc: Davis, Wesley; Massengill, Donna B
Subject: Cost Estimation Training Day 2
When: Wednesday, August 7, 2019 4:00 PM-5:00 PM (UTC-05:00) Eastern Time (US & Canada).
Where: Skype Meeting

Hello all,

If you have already confirmed your attendance for the first training you can disregard this email.

This is the second of three trainings regarding the cost estimation tool created by Beckton James. This tool will help identify and rectify the differences between Maximo outputs and the actuals we see come in. Today (Wednesday July 31st) I will be sending out the tool itself, the PowerPoint that will direct the training and a test case to check your understanding at the end of the training. The goal of this is to give you a chance to look the presentation and tool beforehand. If you want, give it a try on your own and come with questions. This will make the training run a bit smoother.

If you have any questions or comments about the training or the tool itself please feel free to reach out to myself or Beckton.

If you cannot make this training there will be another on Thursday afternoon (8/8). If you cannot make any of these please reach out to Beckton or myself to set something up.

Finally, if you see someone missing from this email please feel free to forward this request, and any requisite materials.

....

→ Join Skype Meeting

Trouble Joining? Try Skype Web App

Help

Docket No. E-2, Sub 1220

Exhibit CEB-19

June 10, 2019 DEP internal e-mail

FW: [redacted] - Message (HTML) (Read-Only)

File | Message | Acrobat | Litera | Tell me what you want to do...

Delete | Reply | Reply All | Forward | Move | Mark Unread | Categorize | Follow Up | Translate | Zoom | Show/Hide EM Toolbar | Save Attachments | Where Filed | Properties

Delete | Respond | Move | Tags | Editing | Zoom | iManage

iManage E-Mail Management

Duke Energy Corp - STATE - SC Generator Interconnection (- | File | Delete | Private | Save Attachments

Mon 6/10/2019 11:30 AM

Bhagat, Neil

FW: [redacted]

To James, Beckton

From: Roberts, Edward
Sent: Monday, June 10, 2019 11:24 AM
To: McNeill, Jack <Jack.McNeill@duke-energy.com>; Bhagat, Neil <Neil.Bhagat@duke-energy.com>; Jones, Roy <Roy.Jones3@duke-energy.com>; Lambert, Douglas <Douglas.Lambert@duke-energy.com>; Dembnicki, Jack <Jack.Dembnicki@duke-energy.com>; Martin, Daniel Joseph <Daniel.Martin4@duke-energy.com>; McRee, Seth R <Seth.McRee@duke-energy.com>
Subject: [redacted]

I did some research on the estimate calculations in Maximo and compared to what is real world. Below is the hourly rate that Maximo uses, roughly based on 4 men and 2 trucks. The hours for each CU are roughly based on WMIS plus 20%. (WMIS being based on a 3 man crew) We currently have a base crew size of 5 men but due to the ramp up efforts in late 2017 and throughout 2018 our crews were generally 6 men including a FM (2 bucket trucks, 1 line truck and 1 PU). The contract allows the vendor to bill us for equipment and total manhours, including the GF. These 2 solar jobs had an average crew size of 6 men plus some time charged by a GF. This would explain the estimates from Maximo being nearly 50% below the actuals. The labor cost is the largest contributing factor in the overrun. This looks to be an opportunity within our Maximo program that needs to be addressed as soon as possible.

Edward Roberts
Manager Contractor Resources
Coastal Zone / Carolinas East
1451 Military Cutoff Road
Wilmington, NC 28403
Cell: 910-619-1340

From: Roberts, Edward
Sent: Monday, June 10, 2019 10:00 AM
To: McNeill, Jack <Jack.McNeill@duke-energy.com>; Bhagat, Neil <Neil.Bhagat@duke-energy.com>; Jones, Roy <Roy.Jones3@duke-energy.com>; Lambert, Douglas <Douglas.Lambert@duke-energy.com>; Dembnicki, Jack <Jack.Dembnicki@duke-energy.com>;

Docket No. E-2, Sub 1220

Exhibit CEB-20

June 6, 2019 internal DEP e-mail chain "RE: DEP and DEC Exposure"

To: Jennings, Kenneth J[Kenneth.Jennings@duke-energy.com]; Massengill, Donna B[Donna.Massengill@duke-energy.com]
From: James, Beckton
Sent: Thur 6/6/2019 8:06:49 AM (UTC-04:00)
Subject: RE: DEP and DEC exposure

Ken,

It includes all of the projects I know of that are currently connected or under construction.

We might be missing some older projects from 2015 and 2016.

Thanks,
Beckton

From: Jennings, Kenneth J
Sent: Thursday, June 6, 2019 8:05 AM
To: James, Beckton <Beckton.James@duke-energy.com>; Massengill, Donna B <Donna.Massengill@duke-energy.com>
Subject: RE: DEP and DEC exposure

Thanks Beckton. So about $30 million.

Would this include everything that is currently connected or under construction?

From: James, Beckton
Sent: Thursday, June 6, 2019 8:03 AM
To: Jennings, Kenneth J <Kenneth.Jennings@duke-energy.com>; Massengill, Donna B <Donna.Massengill@duke-energy.com>
Subject: DEP and DEC exposure

Ken,

I built out the DEC exposure for Jack McNeill as well.
Below is what I sent to Jack and Neil Bhagat 2 weeks ago.

The DEC exposure was my first iteration and I had not broken out the potential exposure in the same format as I did for DEP.
Will send a revised breakout to you later today so you have apples to apples and a clear high level summary.

DEC:

Current Exposure	**$**	**1,854,762.10**
Potential Exposure	**$**	**7,168,127.95**
Total Exposure:	**$**	**9,022,890.05**

Dist. or Transm.	(All)
OPCO	DEC
Operational Status	(Multiple Items)

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Count
2016	$1,651,332.30		$5,828,569.67		

2017	$1,063,399.58	$1,583,412.22	$816,875.80	$1,687,572.59	
2018	$321,370.47	$471,688.82	$302,030.34	$615,764.66	
2019	$448,664.08		$1,747,430.26		
2020	$1,220,095.38		$3,411,174.73		
Grand Total	**$4,704,861.81**	**$2,055,101.04**	**$12,106,080.80**	**$2,303,337.25**	

Dist. or Transm.	(All)
OPCO	DEC
Operational Status	(Multiple Items)

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Count
2017	$1,063,399.58	$1,583,412.22	$816,875.80	$1,687,572.59	
2018	$321,370.47	$471,688.82	$302,030.34	$615,764.66	
Grand Total	**$1,384,770.05**	**$2,055,101.04**	**$1,118,906.14**	**$2,303,337.25**	

Total:	**$ 2,503,676.19**	**$ 4,358,438.29**	**$ 1,854,**
		Overrun Percentage	
		Current Exposure	$

Dist. or Transm.	(All)
OPCO	DEC
Operational Status	(Multiple Items)

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Count
2016	$1,651,332.30		$5,828,569.67		
2019	$448,664.08		$1,747,430.26		
Grand Total	**$2,099,996.38**		**$7,575,999.93**		

Total:	**$ 9,675,996.31**	**74.08%**	**$**
		Current Exposure	**$**

Dist. or Transm.	(All)
OPCO	DEC
Operational Status	(Multiple Items)

Potential Exposure	**$**
Total Exposure:	**$**

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Count
2020	$1,220,095.38		$3,411,174.73		
Grand Total	**$1,220,095.38**		**$3,411,174.73**		

Total:	**$ 4,631,270.11**

Thanks,
Beckton

From: Jennings, Kenneth J
Sent: Thursday, June 6, 2019 7:55 AM
To: James, Beckton <Beckton.James@duke-energy.com>; Massengill, Donna B <Donna.Massengill@duke-energy.com>
Subject: RE: DEP Exposure

This is perfect. Great Work!! Thank you so much.

Is it possible to get this for DEC? I think that Elissa is working on it, but it seems like it is more difficult or something. Here is the email that Megan sent me?

Ken

From: James, Beckton
Sent: Friday, May 31, 2019 1:36 PM
To: Massengill, Donna B <Donna.Massengill@duke-energy.com>
Subject: FW: DEP Exposure

Here is what I have supplied to Jack McNeill for the DEP exposure cost.

I have updated the file with the estimated costs for the projects currently under construction.

Thanks,
Beckton

From: James, Beckton
Sent: Friday, May 31, 2019 1:17 PM
To: McNeill, Jack <Jack.McNeill@duke-energy.com>
Cc: Flowers Jr., George Ginn <George.Flowers2@duke-energy.com>
Subject: DEP Exposure

Jack,

Here is what I calculate on the DEP exposure.
I have included the estimated costs from the IA's for all of the projects currently under construction.
These are only the DEP Distribution projects, Transmission projects are not included.

Current Exposure		**$**	**11,379,454.66**	Projects have been trued u
Potential Exposure		**$**	**3,950,087.08**	Projects with PTO dates in 2
Projects under Constr.		**$**	**6,020,659.12**	Projects with Operational S
Total Exposure:		**$**	**21,350,200.86**	

Dist. or Transm.	Dist.	**Current Exposure**
OPCO	DEP	**Trued Up Projects**
Operational Status	(Multiple Items)	

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Co
2017	$2,218,756.05	$2,597,015.76	$7,922,433.06	$11,113,619.26	
2018	$1,999,482.15	$2,748,742.75	$4,908,599.15	$11,969,347.30	
Grand Total	**$4,218,238.20**	**$5,345,758.51**	**$12,831,032.21**	**$23,082,966.56**	

Total:	**$ 17,049,270.41**	**$ 28,428,725.07**	**$**
		Overrun Percentage	
		Current Exposure	**$**

Dist. or Transm.	Dist.	**Potential Exposure**
OPCO	DEP	**Not - Trued Up Projects - Interconnected**
Operational Status	(Multiple Items)	

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Co
2016	$796,477.68	$965,756.37	$2,679,459.51	$4,727,657.83	
2019	$1,122,480.82	$965,776.02	$1,319,800.81	$2,697,917.40	

Grand Total	**$1,918,958.50**	**$1,931,532.39**	**$3,999,260.32**	**$7,425,575.23**

Total:	**$** **5,918,218.82**	**66.74%**	**$**
		Overrun Percentage	
		Potential Exposure	**$**

Dist. or Transm.	(All)
OPCO	DEP
Operational Status	(Multiple Items)

Exposure to Current Construction

Projects Under Construction

Row Labels	Sum of IC	Sum of IC Actual Costs	Sum of SI Estimated Costs	Sum of SI Actual Costs	Cou
2019	$70,767.81		$185,633.26		
2020	$2,187,413.59		$6,576,639.16		
Grand Total	**$2,258,181.40**		**$6,762,272.42**		

Total:	**$** **9,020,453.82**	**66.74%**	**$**
		Overrun Percentage	
		Under Construction	**$**

Regards,

Beckton James
DET – Senior Business & Technical Consultant
(980) 373-2896 – office
(919) 740-6597 – mobile
beckton.james@duke-energy.com

DUKE ENERGY.

Docket No. E-2, Sub 1220

Exhibit CEB-21

CONFIDENTIAL DR No. 1-17
Williams Solar

DOCUMENT FILED UNDER SEAL

CONFIDENTIAL DOCUMENT

OMITTED FROM PUBLIC VERSION

AACE INTERNATIONAL RECOMMENDED PRACTICE

96R-18

COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE POWER TRANSMISSION LINE INFRASTRUCTURE INDUSTRIES

AACE INTERNATIONAL

AACE® International Recommended Practice No. 96R-18

COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE POWER TRANSMISSION LINE INFRASTRUCTURE INDUSTRIES

TCM Framework: 7.3 – Cost Estimating and Budgeting

Rev. July 31, 2019

Note: As AACE International Recommended Practices evolve over time, please refer to web.aacei.org for the latest revisions.

Any terms found in AACE Recommended Practice 10S-90, *Cost Engineering Terminology*, supersede terms defined in other AACE work products, including but not limited to, other recommended practices, the *Total Cost Management Framework*, and *Skills & Knowledge of Cost Engineering*.

Contributors:

Disclaimer: The content provided by the contributors to this recommended practice is their own and does not necessarily reflect that of their employers, unless otherwise stated.

July 31, 2019 Revision:

Larry R. Dysert, CCP CEP DRMP FAACE Hon. Life
(Primary Contributor)
John K. Hollmann, PE CCP CEP DRMP FAACE Hon. Life
(Primary Contributor)
Peter R. Bredehoeft, Jr. CEP FAACE

October 5, 2018 Revision:

John K. Hollmann, PE CCP CEP DRMP FAACE Hon. Life
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AACE® International Recommended Practice No. 96R-18

COST ESTIMATE CLASSIFICATION SYSTEM – AS APPLIED IN ENGINEERING, PROCUREMENT, AND CONSTRUCTION FOR THE POWER TRANSMISSION LINE INFRASTRUCTURE INDUSTRIES

TCM Framework: 7.3 – Cost Estimating and Budgeting

July 31, 2019

TABLE OF CONTENTS

PURPOSE

As a recommended practice (RP) of AACE International, the *Cost Estimate Classification System* provides guidelines for applying the general principles of estimate classification to project cost estimates (i.e., cost estimates that are used to evaluate, approve, and/or fund projects). The *Cost Estimate Classification System* maps the phases and stages of project cost estimating together with a generic project scope definition maturity and quality matrix, which can be applied across a wide variety of industries and scope content.

This recommended practice provides guidelines for applying the principles of estimate classification specifically to project estimates for engineering, procurement, and construction (EPC) work for electrical power transmission lines infrastructure facilities. This document supplements the generic cost estimate classification RP (17R-97 [1]) by providing:

- A section that further defines classification concepts as they apply to the power transmission line infrastructure industries.
- A chart that maps the extent and maturity of estimate input information (project definition deliverables) against the class of estimate.

As with the generic RP, the intent of this document is to improve communications among all the stakeholders involved with preparing, evaluating, and using project cost estimates specifically for the power transmission line infrastructure industries.

The overall purpose of this recommended practice is to provide the power transmission line infrastructure industries with a project definition deliverable maturity matrix that is not provided in 17R-97. It also provides an approximate representation of the relationship of specific design input data and design deliverable maturity to the estimate accuracy and methodology used to produce the cost estimate. The estimate accuracy range is driven by many other variables and risks, so the maturity and quality of the scope definition available at the time of the estimate is not the sole determinate of accuracy; risk analysis is required for that purpose.

This document is intended to provide a guideline, not a standard. It is understood that each enterprise may have its own project and estimating processes, terminology, and may classify estimates in other ways. This guideline provides a generic and generally acceptable classification system for the power transmission line infrastructure industries that can be used as a basis to compare against. This recommended practice should allow each user to better assess, define, and communicate their own processes and standards in the light of generally-accepted cost engineering practice.

INTRODUCTION

For the purposes of this document, the term *power transmission line infrastructure industries* is assumed to include greenfield or brownfield sites for overhead, buried and submarine transmission of electrical power in the infrastructure industries. High voltage is typically >100kV but may be less (e.g., 33 or 66kv) if long distance with light electrical loads. This excludes power supply and distribution scope within a process plant, mining facility, building complex or other facility site. It also excludes power generation facilities and substations. The defining deliverables of those excluded project scopes are covered in other RPs (e.g., 18R-97 for process plants [2]).

Power transmission is considered an element of the infrastructure industry. The Construction Industry Institute has provided a good definition of infrastructure in its Project Definition Rating Index for Infrastructure Projects as follows [3]:

"A capital project that provides transportation, transmission, distribution, collection or other capabilities supporting commerce or interaction of goods, services, or people. Infrastructure projects generally impact multiple jurisdictions, stakeholder groups and/or a wide area. They are characterized as projects with a primary purpose that is integral to the effective operation of a system. These collective capabilities provide a service that is made up of nodes and vectors into a grid or system."

Using this definition, power transmission lines are a vector or linear scope element that connects substation or other facility nodes at its terminations. The substation nodes may be part of or associated with a generation, consuming or interconnection facility. As such, transmission projects are often executed as part of a program that also involves node project scope or facility operational changes (or at least considerations for integrated system commissioning and startup). As the definition states, a distinguishing feature of these projects is that they often traverse wide areas, cross country or subsea, which puts an emphasis on the definition of routing, land ownership and conditions, and establishing right-of-way (ROW). Associated scope definition challenges include defining stakeholder, permitting and regulatory requirements. Buried and submarine installations increase the focus on the protection philosophy and strategies affecting cable selection, armoring and joint considerations. While many distinguish power transmission (higher voltage, long distances) from power distribution (short distance, lower voltage connections to retail customers), the principles of estimating these elements are similar; i.e., the RP applies to both.

The main physical power transmission line scope elements are conductors and their support structures if installed overhead. Main installation elements include land clearing if over land (including forestry if applicable), foundation and structure erection and conductor stringing if overhead, or trenching, laying and horizontal boring if subsurface or subsea. Special scope elements are involved with crossings of water, road, rail and so on and at terminations. Because conductor (e.g., aluminum) and structure (e.g., steel) material costs are usually a significant cost element, these project estimates are particularly sensitive to escalation uncertainty. In general, the more developed the route, the more complex the installation will be. In urban areas, visual appeal and concern for safety and health can be major issues. Installation in remote location and/or difficult or environmentally sensitive terrain creates its own challenges. Subsea installation adds the need for bathymetry[1] and metocean[2] studies and specialized installation equipment and vessels. Before any installation work can begin in an area, stakeholder consultation must be advanced (sometimes requiring agreements with local populations with rights), and appropriate land and ROW must be acquired which creates unique scheduling as well as cost challenges.

For the purpose of estimate classification then, the main scope definition deliverables are associated with defining the power requirements (i.e., kV), the conductors and structure, and the routing. Conductors can vary widely in content (copper, aluminum, etc.) and insulation. Overhead structures may be wood, concrete, composite or steel in various configurations with various foundation designs including pilings, concrete and so on. The route's land or subsea characteristics and the nature of developments drive the need for special design features and execution strategies. Operability and maintainability considerations may also affect ROW and access design. Brownfield and revamp projects add their own concerns for interface with existing elements, crowded working conditions, etc. For each scope definition decision, stakeholder requirements need to be considered.

Power substation projects are usually associated with transmission projects. However, substations being equipment-centric and located on a facility site have physical and defining characteristics similar to process plant projects (e.g., reliance on one-line diagrams, plot plans, etc.).

Power transmission is usually a regulated industry if not government owned. As environmental concerns increase, the design and installation becomes more complex (e.g., mitigation and management plans, construction plans with seasonality, etc.) and the regulation of projects becomes more rigorous. In respect to classification, the regulation becomes critical as the stage-gate process is increasingly driven by the regulators and not by owner economic concerns. For example, the regulator or agency with authority may dictate that final engineering cannot proceed until after the routing is finalized and the utility submits a *maximum* and reasonable cost to the agency. In some cases, this gate may require design deliverables be more or less advanced than the Classification Table 3 stages. In these situations, one should assess the governing stage-gate process and decide what class the estimate will be for each gate. For example, one may find the gate is somewhere between the RP's class; say between Class 3 and 2. If so, one would designate the estimate as "Class 2 with Exceptions" and describe which deliverables are not to full class definition at that decision gate. This is also true if the stage gate system is defined by 30/60/90 percent design reviews (or other percentages) where percent design completion may not have much relationship to the status of any particular deliverable (e.g., definition at 30% design review may not be adequate for Class 3 and hence the associated estimate would be Class 3 with Exceptions as noted).

This guideline reflects generally-accepted cost engineering practices. This recommended practice was based upon the practices of multiple major power utility companies as well as published references and standards [4]. Company and public standards were solicited and reviewed, and the practices were found to have significant commonalities. These classifications are also supported by empirical industry research of systemic risks and their correlation with cost growth and schedule slip [5].

This RP applies to a variety of project delivery methods such as traditional design-bid-build (DBB), design-build (DB), construction management for fee (CM-fee), construction management at risk (CM-at risk), and private-public partnerships (PPP) contracting methods.

COST ESTIMATE CLASSIFICATION MATRIX FOR THE POWER TRANSMISSION LINE INFRASTRUCTURE INDUSTRIES

A purpose of cost estimate classification is to align the estimating process with project stage-gate scope development and decision-making processes.

[1] The study of underwater depth of lake or ocean floors.
[2] A combination of meteorology and oceanography.

Table 1 provides a summary of the characteristics of the five estimate classes. The maturity level of project definition is the sole determining (i.e., primary) characteristic of class. In Table 1, the maturity is roughly indicated by a percentage of complete definition; however, it is the maturity of the defining deliverables that is the determinant, not the percent. The specific deliverables, and their maturity or status are provided in Table 3. The other characteristics are secondary and are generally correlated with the maturity level of project definition deliverables, as discussed in the generic RP.[1] The characteristics are typical but may vary depending on the circumstances.

	Primary Characteristic	*Secondary Characteristic*		
ESTIMATE CLASS	**MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES** Expressed as % of complete definition	**END USAGE** Typical purpose of estimate	**METHODOLOGY** Typical estimating method	**EXPECTED ACCURACY RANGE** Typical variation in low and high ranges at an 80% confidence interval
Class 5	0% to 2%	Concept screening	Cost/length factors, parametric models, judgment, or analogy	L: -20% to -50% H: +30% to +100%
Class 4	1% to 15%	Study or feasibility	Cost/length, factored or parametric models	L: -15% to -30% H: +20% to +50%
Class 3	10% to 40%	Budget authorization or control	Semi-detailed unit costs with assembly level line items	L: -10% to -20% H: +10% to +30%
Class 2	30% to 75%	Control or bid/tender	Detailed unit cost with forced detailed take-off	L: -5% to -15% H: +5% to +20%
Class 1	65% to 100%	Check estimate or bid/tender	Detailed unit cost with detailed take-off	L: -3% to -10% H: +3% to +15%

Table 1 – Cost Estimate Classification Matrix for the Power Transmission Line Infrastructure Industries

This matrix and guideline outline an estimate classification system that is specific to electrical power transmission lines in the infrastructure industry. Refer to Recommended Practice 17R-97 [1] for a general matrix that is non-industry specific, or to other cost estimate classification RPs for guidelines that will provide more detailed information for application in other specific industries (e.g., RP 18R-97 for electrical substation facilities [2]). These will provide additional information, particularly the *Estimate Input Checklist and Maturity Matrix* which determines the class in those industries. See Professional Guidance Document 01, *Guide to Cost Estimate Classification.*[6]

Table 1 illustrates typical ranges of accuracy ranges that are associated with the power transmission line infrastructure industries. The +/- value represents typical percentage variation at an 80% confidence interval of actual costs from the cost estimate after application of contingency (typically to achieve a 50% probability of project cost underrun versus overrun) for given scope. Depending on the technical and project deliverables (and other variables) and risks associated with each estimate, the accuracy range for any particular estimate is expected to fall within the ranges identified. However, this does not preclude a specific actual project result from falling outside of the indicated range of ranges identified in Table 1. In fact, research indicates that for weak project systems and complex or otherwise risky projects, the high ranges may be two to three times the high range indicated in Table 1. [7]

In addition to the degree of project definition, estimate accuracy is also driven by other systemic risks such as:

- Level of familiarity with technology.
- Unique/remote nature of project locations and conditions and the availability of reference data for those.

- Complexity of the project and its execution.
- Quality of reference cost estimating data.
- Quality of assumptions used in preparing the estimate.
- Experience and skill level of the estimator.
- Estimating techniques employed.
- Time and level of effort budgeted to prepare the estimate.
- Market and pricing conditions.
- Currency exchange.
- Complexity and condition influence on system/grid power conditions.
- Regulatory, community, landowner, and political risks.

Systemic risks such as these are often the primary driver of accuracy, especially during the early stages of project definition. As project definition progresses, project-specific risks (e.g. risk events and conditions) become more prevalent and also drive the accuracy range.

Another concern in estimates is potential organizational pressure for a predetermined value that may result in a biased estimate. The goal should be to have an unbiased and objective estimate both for the base cost and for contingency. The stated estimate ranges are dependent on this premise and a realistic view of the project. Failure to appropriately address systemic risks (e.g. technical complexity) during the risk analysis process, impacts the resulting probability distribution of the estimated costs, and therefore the interpretation of estimate accuracy.

Figure 1 illustrates the general relationship trend between estimate accuracy and the estimate classes (corresponding with the maturity level of project definition). Depending upon the technical complexity of the project, the availability of appropriate cost reference information, the degree of project definition, and the inclusion of appropriate contingency determination, a typical Class 5 estimate for an electrical transmission substation facilities project may have an accuracy range as broad as -50% to +100%, or as narrow as -20% to +30%. However, note that this is dependent upon the contingency included in the estimate appropriately quantifying the uncertainty and risks associated with the cost estimate. Research for power transmission projects has shown that industry has greatly underestimated risks and contingency for Class 5 and 4 estimates [4]. Environmental and political risk are increasing that becomes a particular concern when regulators require reporting of maximum costs or similar dictates related to accuracy. Refer to Table 1 for the accuracy ranges conceptually illustrated in Figure 1. [8]

Figure 1 also illustrates that the estimating accuracy ranges overlap the estimate classes. There are cases where a Class 5 estimate for a particular project may be as accurate as a Class 3 estimate for a different project. For example, similar accuracy ranges may occur for a Class 5 estimate of one project that is based on a repeat brownfield project with good history in an existing, approved ROW with few stakeholders, and a Class 3 estimate for a project involving new technology in a remote location, or environmentally sensitive region with stringent regulations and many stakeholders. It is for this reason that Table 1 provides ranges of accuracy values. This allows consideration of the specific circumstances inherent in a project, and an industry sector to provide realistic estimate class accuracy range percentages. While a target range may be expected for a particular estimate, the accuracy range should always be determined through risk analysis of the specific project and should never be pre-determined. AACE has recommended practices that address contingency determination and risk analysis methods. [9]

If contingency has been addressed appropriately approximately 80% of projects should fall within the ranges shown in Figure 1. However, this does not preclude a specific actual project result from falling inside or outside of the indicated range of ranges identified in Table 1. As previously mentioned, research indicates that for weak project systems, and/or complex or otherwise risky projects, the high ranges may be two to three times the high range indicated in Table 1.

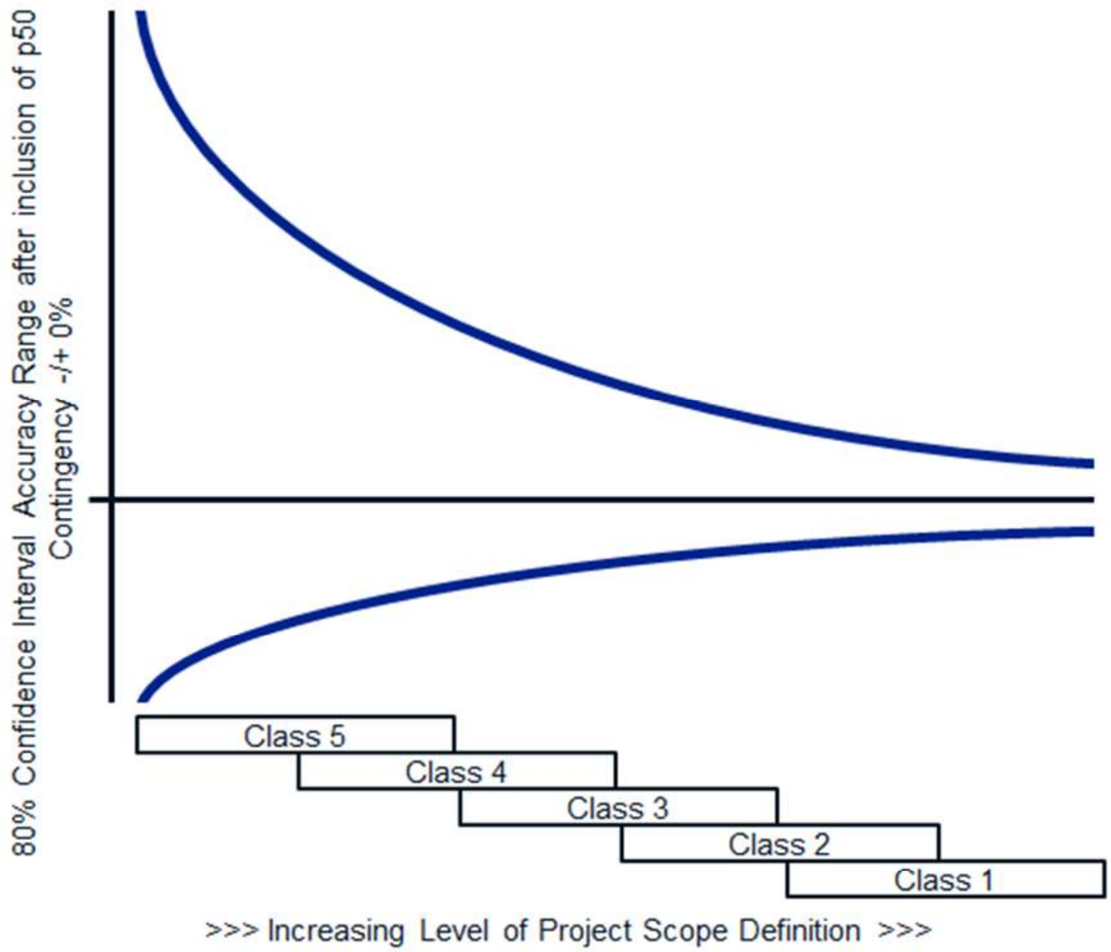

Figure 1 – Illustration of the Variability in Accuracy Ranges for Power Transmission Line Infrastructure Industry Estimates

DETERMINATION OF THE COST ESTIMATE CLASS

For a given project, the determination of the estimate class is based upon the maturity level of project definition based on the status of specific key planning and design deliverables. The percent design completion may be correlated with the status, but the percentage should not be used as the class determinate. While the determination of the status (and hence the estimate class) is somewhat subjective, having standards for the design input data, completeness and quality of the design deliverables will serve to make the determination more objective.

CHARACTERISTICS OF THE ESTIMATE CLASSES

The following tables (2a through 2e) provide detailed descriptions of the five estimate classifications as applied in the power transmission line infrastructure industries. They are presented in the order of least-defined estimates to the most-defined estimates. These descriptions include brief discussions of each of the estimate characteristics that define an estimate class.

For each table, the following information is provided:

- **Description:** A short description of the class of estimate, including a brief listing of the expected estimate inputs based on the maturity level of project definition deliverables.

- **Maturity Level of Project Definition Deliverables (Primary Characteristic):** Describes a particularly key deliverable and a typical target status in stage-gate decision processes, plus an indication of approximate percent of full definition of project and technical deliverables. Typically, but not always, maturity level correlates with the percent of engineering and design complete.

- **End Usage (Secondary Characteristic):** A short discussion of the possible end usage of this class of estimate.

- **Estimating Methodology (Secondary Characteristic):** A listing of the possible estimating methods that may be employed to develop an estimate of this class.

- **Expected Accuracy Range (Secondary Characteristic):** Typical variation in low and high ranges after the application of contingency (determined at a 50% level of confidence). Typically, this represents about 80% confidence that the actual cost will fall within the bounds of the low and high ranges if contingency appropriately forecasts uncertainty and risks.

- **Alternate Estimate Names, Terms, Expressions, Synonyms:** This section provides other commonly used names that an estimate of this class might be known by. These alternate names are not endorsed by this recommended practice. The user is cautioned that an alternative name may not always be correlated with the class of estimate as identified in Tables 2a-2e.

CLASS 5 ESTIMATE	
Description: Class 5 estimates are generally prepared based on very limited information, and subsequently have wide accuracy ranges. As such, some companies and organizations have elected to determine that due to the inherent inaccuracies, such estimates cannot be classified in a conventional and systematic manner. Class 5 estimates, due to the requirements of end use, may be prepared within a very limited amount of time and with little effort expended—sometimes requiring less than an hour to prepare. Often, little more than the proposed nominal kV and length over approximate alternate routes on large scale maps is known at the time of estimate preparation. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: Line capacity (kV), general design concepts and routing alternatives agreed by business stakeholders. 0% to 2% of full project definition. **End Usage:** Class 5 estimates are prepared for any number of strategic business planning purposes, such as but not limited to market studies, assessment of initial viability, evaluation of alternate schemes, project screening, routing studies, evaluation of resource needs and budgeting, long-range capital planning, etc.	**Estimating Methodology:** Class 5 estimates generally use stochastic estimating methods such as gross unit costs (cost/length), factoring and other parametric and modeling techniques. **Expected Accuracy Range:** Typical accuracy ranges for Class 5 estimates are -20% to -50% on the low side, and +30% to +100% on the high side, depending on the technological and route complexity, and appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks including volatile commodity markets and escalation (i.e., because of the proportion of commodity material content such as aluminum and steel). The range values will shift (show bias) to the extent that contingency included in the funding is over or underestimated. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Ballpark, conceptual, gross, blue sky, back of envelope, high level, seat-of-pants, rough order of magnitude (ROM), idea study, indicative, scoping, prospect estimate, guesstimate, rule-of-thumb.

Table 2a – Class 5 Estimate

CLASS 4 ESTIMATE	
Description: Class 4 estimates are generally prepared based on limited information and subsequently have fairly wide accuracy ranges. They are typically used for project screening, determination of feasibility, concept evaluation, and preliminary budget approval. Typically, engineering is from 1% to 15% complete, and would comprise at a minimum the following: line capacity (kV), route topographic mapping with aerial photography, preliminary conductor and structure types with span lengths, and major environmental, community, regulatory and ROW concerns identified. In some cases, stakeholder consultation is in progress. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: Routing corridors defined with optimization underway with assumed conductor and structure types, span lengths and ground or subsea conditions. 1% to 15% of full project definition. **End Usage:** Class 4 estimates are prepared for a number of purposes, such as but not limited to, detailed strategic planning, business development, project screening at more developed stages, alternative scheme analysis, confirmation of economic and/or technical feasibility, and preliminary budget approval or approval to proceed to next stage. Usually there is only one major option carried forward for more detailed Class 3 estimate development.	**Estimating Methodology:** Class 4 estimates generally use stochastic estimating methods such as adjusted gross unit costs (cost/length) with adjustment for specific design elements or approximate unit or assembly costs for conductor, structures and other major elements, factored design and installation costs, and other parametric and modeling techniques. **Expected Accuracy Range:** Typical accuracy ranges for Class 4 estimates are -15% to -30% on the low side, and +20% to +50% on the high side, depending on the technological and route complexity, and appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks including volatile commodity markets and escalation (i.e., because of the proportion of commodity material content such as aluminum and steel). The range values will shift (show bias) to the extent that contingency included in the funding is over or underestimated. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Screening, top-down, feasibility, factored, pre-design, advanced study, basic engineering, planning, preliminary funding, concession license.

Table 2b – Class 4 Estimate

CLASS 3 ESTIMATE	
Description: Class 3 estimates are generally prepared to form the basis for budget authorization, appropriation, and/or funding. As such, they typically form the initial control estimate against which all actual costs and resources will be monitored. Typically, engineering is from 10% to 40% complete, and would comprise at a minimum the following: confirmed optimized route, specific conductor and structure types defined considering specific environment, soils, weather/wind and thermal characteristics, long lead orders ready to be placed. Quantities are identified at a reasonable level of detail. ROW title holders defined and negotiation in progress, and regulatory, permitting and stakeholder concerns addressed. Adequate definition to obtain firm construction bid unit pricing with execution and contracting plans defined. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: Route conditions (including weather/wind) confirmed by survey; structure types and numbers defined; all ROW title holders identified and negotiations in progress, major permit applications submitted, license applications and environmental impact statements (EIS) prepared, and execution plans agreed. 10% to 40% of full project definition. **End Usage:** Class 3 estimates are typically prepared to support full project funding requests, and become the first of the project phase control estimates against which all actual costs and resources will be monitored for variations to the budget. They are used as the project control budget until replaced by more detailed estimates. In many owner organizations, a Class 3 estimate is often the last estimate required and could very well form the only basis for cost/schedule control.	**Estimating Methodology:** Class 3 estimates generally involve more deterministic estimating methods than stochastic methods. They usually involve predominant use of unit cost line items, although these may be at an assembly level of detail rather than individual components. Factoring and other stochastic methods may be used to estimate less-significant areas of the project. **Expected Accuracy Range:** Typical accuracy ranges for Class 3 estimates are -10% to -20% on the low side, and +10% to +30% on the high side, depending on the technological and route complexity, and appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks including volatile commodity markets and escalation (i.e., because of the proportion of commodity material content such as aluminum and steel). However, projects in existing, developed ROW may have tighter ranges. The range values will shift (show bias) to the extent that contingency included in the funding is over or underestimated. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Budget, scope, sanction, semi-detailed, forced detail, authorization, preliminary control, front-end engineering and design (FEED), target estimate, concession license, bid, tender.

Table 2c – Class 3 Estimate

CLASS 2 ESTIMATE	
Description: Class 2 estimates are generally prepared to form a detailed contractor control baseline (and update the owner control baseline) against which all project work is monitored in terms of cost and progress control. For contractors, this class of estimate is often used as the bid estimate to establish contract value. Typically, engineering is from 30% to 75% complete, and would comprise at a minimum the following: final routing, specific structure designs, conductors ordered, most ROW obtained, permits and licenses obtained, contracts in place and construction in progress. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: Specific route conditions surveyed, specific structure designs; most ROW, permits and licenses obtained; and supply and installation contracts issued. 30% to 75% of full project definition. **End Usage:** Class 2 estimates are typically prepared as the detailed contractor control baseline (and update the owner control baseline) against which all actual costs and resources will now be monitored for variations to the budget and form a part of the change management program.	**Estimating Methodology:** Class 2 estimates generally involve a high degree of deterministic estimating methods. Class 2 estimates are prepared in great detail, and often involve tens of thousands of unit cost line items. For those areas of the project still undefined, an assumed level of detail takeoff (forced detail) may be developed to use as line items in the estimate instead of relying on factoring methods. **Expected Accuracy Range:** Typical accuracy ranges for Class 2 estimates are -5% to -15% on the low side, and +5% to +20% on the high side, depending on the technological and route complexity, and appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks. The range values will shift (show bias) to the extent that contingency included in the funding is over or underestimated. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Detailed control, execution phase, master control, engineering, tender, change order estimate.

Table 2d – Class 2 Estimate

CLASS 1 ESTIMATE	
Description: Class 1 estimates are generally prepared for discrete parts or sections of the total project rather than generating this level of detail for the entire project. The parts of the project estimated at this level of detail will typically be used by subcontractors for bids, or by owners for check estimates. The updated estimate is often referred to as the current control estimate and becomes the new baseline for cost/schedule control of the project. Class 1 estimates may be prepared for parts of the project to comprise a fair price estimate or bid check estimate to compare against a contractor's bid estimate, or to evaluate/dispute change orders and claims. Typically, overall engineering is from 65% to 100% complete (some parts or packages may be complete and others not) and would comprise virtually all engineering and design documentation of the project, and complete project execution and commissioning plans. **Maturity Level of Project Definition Deliverables:** Key deliverable and target status: All deliverables in the maturity matrix complete. 65% to 100% of full project definition. **End Usage:** Generally, owners and EPC contractors use Class 1 estimates to support their change management process. They may be used to evaluate bid checking, to support vendor/contractor negotiations, or for claim evaluations and dispute resolution. Construction contractors may prepare Class 1 estimates to support their bidding and to act as their final control baseline against which all actual costs and resources will now be monitored for variations to their bid. During construction, Class 1 estimates may be prepared to support change management.	**Estimating Methodology:** Class 1 estimates generally involve the highest degree of deterministic estimating methods and require the greatest amount of effort. Class 1 estimates are prepared in great detail, and thus are usually performed on only the most important or critical areas of the project. All items in the estimate are usually unit cost line items based on actual design quantities. **Expected Accuracy Range:** Typical accuracy ranges for Class 1 estimates are -3% to -10% on the low side, and +3% to +15% on the high side, depending on the technological and route complexity, and appropriate reference information and other risks (after inclusion of an appropriate contingency determination). Ranges could exceed those shown if there are unusual risks. The range values will shift (show bias) to the extent that contingency included in the funding is over or underestimated. **Alternate Estimate Names, Terms, Expressions, Synonyms:** Full detail, release, fall-out, tender, firm price, bottoms-up, final, detailed control, forced detail, execution phase, master control, fair price, definitive, change order estimate.

Table 2e – Class 1 Estimate

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ESTIMATE INPUT CHECKLIST AND MATURITY MATRIX

Table 3 maps the extent and maturity of estimate input information (deliverables) against the five estimate classification levels. This is a checklist of basic deliverables found in common practice in the power transmission line infrastructure industries. The maturity level is an approximation of the completion status of the deliverable. The degree of completion is indicated by the following descriptors.

General Project Data:

- **Not Required:** May not be required for all estimates of the specified class, but specific project estimates may require at least preliminary development.
- **Preliminary**: Project definition has begun and progressed to at least an intermediate level of completion. Review and approvals for its current status has occurred.
- **Defined**: Project definition is advanced, and reviews have been conducted. Development may be near completion with the exception of final approvals.

Technical and ROW Deliverables:

- **Not Required (NR)**: Deliverable may not be required for all estimates of the specified class, but specific project estimates may require at least preliminary development.
- **Started (S):** Work on the deliverable has begun. Development is typically limited to sketches, rough outlines, or similar levels of early completion.
- **Preliminary (P):** Work on the deliverable is advanced. Interim, cross-functional reviews have usually been conducted. Development may be near completion except for final reviews and approvals.
- **Complete (C):** The deliverable has been reviewed and approved as appropriate.

	ESTIMATE CLASSIFICATION				
	CLASS 5	**CLASS 4**	**CLASS 3**	**CLASS 2**	**CLASS 1**
MATURITY LEVEL OF PROJECT DEFINITION DELIVERABLES	**0% to 2%**	**1% to 15%**	**10% to 40%**	**30% to 75%**	**65% to 100%**
General Project Data:					
Project Scope Description	Preliminary	Preliminary	Defined	Defined	Defined
Voltage (kV) and Circuits	Preliminary	Preliminary	Defined	Defined	Defined
Routing	Preliminary	Preliminary	Defined	Defined	Defined
System/Grid Planning including Substation and Interconnect Locations	Preliminary	Preliminary	Defined	Defined	Defined
Right-of Way (ROW) Strategy	Preliminary	Preliminary	Defined	Defined	Defined
Soils, Hydrology, Meteorology, and Oceanographic Studies	Not Required	Preliminary	Defined	Defined	Defined
Integrated Project Plan	Not Required	Preliminary	Defined	Defined	Defined
Stakeholder Management Plan	Not Required	Preliminary	Defined	Defined	Defined
Stakeholder Consultation/Requirements	Not Required	Preliminary	Defined	Defined	Defined
Project Master Schedule	Not Required	Preliminary	Defined	Defined	Defined
Escalation Strategy	Not Required	Preliminary	Defined	Defined	Defined
Work Breakdown Structure	Not Required	Preliminary	Defined	Defined	Defined
Project Code of Accounts	Not Required	Preliminary	Defined	Defined	Defined
Procurement/Contracting Strategy	Not Required	Preliminary	Defined	Defined	Defined
Technical and ROW Deliverables:					
Route Mapping/Survey/Topography/Bathymetry	S/P	P/C	C	C	C
Tower/Structure Location/Spotting	NR	S/P	P	C	C
Land/ROW Title Negotiation	NR	S/P	P/C	C	C
Conductor, Insulator, Grounding, Joint Design (including protection for buried or subsea)	S	P	C	C	C
Foundation/Structure (Tower) Design	S	P	C	C	C
Foundation/Structure (Tower) Discipline Drawings	NR	S/P	P	C	C
Crossings and Borings Design and Drawings	NR	S/P	P	C	C
Civil/Site Preparation/Access Road Discipline Drawings	NR	S/P	P	C	C
Substation Interface Design	NR	S/P	P	C	C
Specifications and Datasheets	NR	S	P	C	C

Table 3 – Estimate Input Checklist and Maturity Matrix (Primary Classification Determinate)

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BASIS OF ESTIMATE DOCUMENTATION

The basis of estimate (BOE) typically accompanies the cost estimate. The basis of estimate is a document that describes how an estimate is prepared and defines the information used in support of development. A basis document commonly includes, but is not limited to, a description of the scope included, methodologies used, references and defining deliverables used, assumptions and exclusions made, clarifications, adjustments, and some indication of the level of uncertainty.

The BOE is, in some ways, just as important as the estimate since it documents the scope and assumptions; and provides a level of confidence to the estimate. The estimate is incomplete without a well-documented basis of estimate. See AACE Recommended Practice 34R-05 *Basis of Estimate* for more information [10].

PROJECT DEFINITION RATING SYSTEM

An additional step in documenting the maturity level of project definition is to develop a project definition rating system. This is another tool for measuring the completeness of project scope definition. Such a system typically provides a checklist of scope definition elements and a scoring rubric to measure maturity or completeness for each element. A better project definition rating score is typically associated with a better probability of achieving project success.

Such a tool should be used in conjunction with the AACE estimate classification system; it does not replace estimate classification. A key difference is that a project definition rating measures overall maturity across a broad set of project definition elements, but it usually does not ensure completeness of the key project definition deliverables required to meet a specific class of estimate. For example, a good project definition rating may sometimes be achieved by progressing on additional project definition deliverables, but without achieving signoff or completion of a key deliverable.

AACE estimate classification is based on ensuring that key project deliverables have been completed or met the required level of maturity. If a key deliverable that is indicated as needing to be complete for Class 3 (as an example) has not actually been completed, then the estimate cannot be regarded as Class 3 regardless of the maturity or progress on other project definition elements.

An example of a project definition rating system is the *Project Definition Rating Index* developed by the Construction Industry Institute. It has developed several indices for specific industries, such as IR113-2 [12] for the process industry and IR115-2 [11] for the building industry. Similar systems have been developed by the US Department of Energy [13].

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Peter R. Bredehoeft, Jr. CEP FAACE

October 5, 2018 Revision:
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BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1220

In the Matter of

Williams Solar, LLC, Complainant, v. Duke Energy Progress, LLC Respondent.	)))))))	WILLIAMS SOLAR, LLC'S RESPONSES TO DUKE ENERGY PROGRESS, LLC'S FIRST DATA REQUEST TO WILLIAMS SOLAR, LLC

Pursuant to the Rules of Practice and Procedure of the North Carolina Utilities Commission ("Commission"), Williams Solar, LLC ("Williams Solar") hereby submits this response to Respondent Duke Energy Progress, LLC ("DEP", or "the Company" or "Duke") First Data Request to Williams Solar, LLC.

INTERROGATORIES

1-1. Page 1 of Williams Solar's Complaint states that the grounds for the Complaint include ". . . other violations of statutes and Commission Orders . . ." in addition to alleging that the Company has failed to complete the System Impact Study and Facilities Study delivered to Williams Solar in good faith. However, the Complaint does not identify any other violations of statutes or Commission Orders. Please identify and describe in detail the legal and factual basis for any "other violations of statutes and Commission Orders" that Williams Solar alleges has occurred.

Response:

In this proceeding, Williams Solar is seeking Commission review of whether DEP's cost estimates have been made and provided in good faith. Nevertheless, as recited in the Complaint, DEP refused to study Williams Solar in parallel with the relevant project A. In part because of the foregoing, DEP failed to review the Williams Solar interconnection request within the timelines set forth in the N.C. Interconnection Procedures, or within any reasonable extension of those timelines. DEP also introduced a number of technical barriers relating to the interconnection process that have delayed and prevented interconnection to its system, including by attempting to alter the applicable ONAN rating for substations in order to avoid DEP's obligations under HB 589. Williams Solar considers these actions to violate DEP's obligations under state law and PURPA.

1-2. Describe in detail Williams Solar's efforts to develop the planned solar generating facility, including dates of significant milestones in the development process, as well as any contracts entered into by or on behalf of Williams Solar. As part of your response, identify all documents evidencing or relating to such development efforts.

Response:

Date	**Event/Milestone**
8/11/16	Williams Solar, LLC formed with North Carolina Secretary of State ("NCSOS")
8/15/16	CPCN Submitted to NCUC
8/17/16	Pre App submitted to DEP for interconnection information
8/18/16	Lease Agreement fully executed with 2-year development period
8/19/16	Interconnection Request submitted to DEP
8/26/16	Interconnection Request receipt acknowledged by DEP
9/8/16	SISA executed by Williams Solar with no countersignature by DEP
10/25/16	CPCN Order Issued
10/27/16	Notice of Commitment to Sell the Output filed by Williams Solar, LLC
10/28/16	FERC 556 filed with NCUC
03/28/17	Annual registration filed by Williams Solar with NCSOS
03/31/17	Annual certification filed by Williams Solar with NCUC
08/24/17	LEO acknowledgement by DEP of Williams Solar's Notice of Commitment to Sell
1/31/18	Settlement Agreement with Duke executed
04/03/18	Annual registration filed by Williams Solar with NCSOS
04/20/18	Annual certification filed by Williams Solar with NCUC
5/15/18	Mitigations Options "Pass" Notification received from DEP
7/2/18	First lease extension exercised by Williams Solar
1/3/19	Petition for Variance filed with Johnston County by Williams Solar
1/17/19	Memorandum of Lease Recorded with Johnston County
1/28/19	System Impact Study completed by DEP, report received
2/27/19	Johnston County Board of Adjustment Hearing on Local Variance Request resulted in denial decision. Appeal process initiated.
2/27/19	Fully executed FSA received from DEP

03/20/19	Williams Solar, LLC's Petition for *Writ of Certiorari* filed in Johnston County Superior Court
03/22/19	Annual certification filed by Williams Solar with NCUC
04/05/19	Annual registration filed by Williams Solar with NCSOS
6/24/19	Hearing at Johnston County Superior Court for Appeal on Variance
7/1/19	Second lease extension exercised by Williams Solar
7/2/19	Offer to Purchase and Contract with ELA, LLC executed for additional land needed to accommodate Williams Solar and Johnston County Zoning
7/30/19	Facilities Study completed by DEP
7/31/19	Johnston County Superior Court Order on Variance entered (denied)
8/26/19	Construction Planning Meeting with DEP
9/10/19	Notice of Dispute executed by Williams Solar
10/3/19	E911 Address Issued
10/10/19	Interconnection Agreement tendered to Williams Solar
10/24/19	NCUC Complaint filed with Utilities Commission by Williams Solar
12/2/19	First Amendment to extend Offer to Purchase and Contract with ELA, LLC executed
	NCUC denied DEP's motion to dismiss
1/24/20	Amended CPCN Order Issued
04/03/20	Annual registration filed by Williams Solar with NCSOS
04/15/20	Annual certification filed by Williams Solar with NCUC

Williams Solar objects to this request to the extent it seeks identification of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to this request because identification of "all documents evidencing or relating to" these development efforts would be unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence having any relevance to this proceeding. Williams Solar further objects to producing documents already in the possession of DEP. Notwithstanding the foregoing objections, Williams Solar identifies the documents referred to in the foregoing table being produced with these responses.

1-3. Describe in detail each of the "multiple technical barriers to entry to its regulated distribution system" alleged by Williams Solar in Paragraph 9 of the Complaint. As part of your response, identify all documents evidencing or relating to such allegations.

Response:

DEP's circuit stiffness test, flicker limit policy, decreased substation capacity using a unilateral change to ONAN limits for DEP substations after HB589, broad introduction of anti-islanding test/screen, elimination of dedicated circuits as GUP, elimination of double-triple circuits as GUP, elimination of single-phase regulators at/near substations to control voltage as GUP, and introduction of the Method of Service Guidelines (which contain a number of new technical requirements, new planning barriers and assumptions, enhanced engineering discretion of study input assumptions, including requirements relating to new LVR policy, new planning limits introduced on distribution and transmission circuits, etc.) all created additional barriers to interconnection that did not previously exist at the time of Williams Solar, LLC's interconnection submission, nor during the period in which DEP should have processed its interconnection studies according to the NCUC interconnection standard applicable at the time. *See, e.g.,* Elk Solar, LLC, Notice of Dispute dated November 29, 2018 to DEP and Public Staff (with detailed recitation of Technical Barriers). All documents evidencing or relating to such allegations are in the possession of DEP.

1-4. Describe in detail the basis for Williams Solar's allegations in Paragraph 17 of the Complaint that DEP "was aware that Williams Solar (like other solar project developers) would use the cost estimate provided at the System Impact Study stage to determine whether to proceed with project analysis and thereby incur additional costs." As part of your response, identify all documents evidencing or relating to such allegations.

Response:

DEP is well aware that the purpose of the cost estimate provided at the System Impact Stage is to allow the developer to determine whether to proceed with additional project development and analysis, including incurring additional development costs at risk prior to receipt of its interconnection agreement and power purchase agreement from DEP. As DEP stated in the transmittal e-mail for the System Impact Study estimate provided to Williams Solar:

> The purpose of this email is for a decision to be made whether or not to continue moving forward with the project for the final costs or to withdraw.

Any other documents evidencing or relating to DEP's awareness of the purpose of the cost estimate provided at the System Impact Study stage are in the possession of DEP.

1-5. Provide a timeline and describe in detail all material development costs (exceeding $5,000) incurred by or on behalf of Williams Solar in furtherance of development of the proposed generating facility. Williams Solar's response should describe (i) the development cost incurred, (ii) the date of incurrence, (iii) identify the entity that incurred the costs, and (iv) to whom the costs were paid. As part of your response, please identify the total development costs incurred through the date Williams Solar filed the Complaint.

Response:

See response to request 1-2 for a project development timeline. Total costs incurred through 10/24/2019 were $103,995.52. Further responding, Williams Solar incurred the following costs exceeding $5,000:

Cost	Purpose	Date	Payee
$25,000.00	DEP IR Study Deposit	9/8/2016	DEP
$6,248.00	Permitting and zoning	4/4/2019	Fox Rothschild LLP
$13,500.00	Site control	6/27/2019	ELA, LLC
$18,861.11	Permitting and zoning	7/22/2019	Fox Rothschild LLP
$13,250.00	Site control	12/14/2019	ELA LLC
$13,250.00	Site control	1/14/2020	ELA LLC
$7,510.00	Interconnection legal expense	11/15/2019	Brooks Pierce LLP
$7,000.00	Interconnection legal expense	1/20/2020	Brooks Pierce LLP
+$5000 each	Interconnection legal expenses (continuing)	Ongoing	Brooks Pierce LLP

In addition, as explained in response to interrogatory 1-6, in furtherance of this project, Williams Solar entered into an option to acquire real estate which contemplates substantial additional investment and which Williams Solar regards as part of the overall non-ITC tax eligible project costs based on the assumptions of the initial estimate provided by DEP. Finally, there are also certain costs that have not been accounted for in the above summary, including supply, contracting, legal and financing costs that have been shared among multiple projects, a portion of which are attributable to Williams Solar. To the extent Williams Solar determines these costs exceed $5,000, Williams Solar will supplement this response.

1-6. To the extent not clearly provided in response to Interrogatory 1-5, provide a timeline and describe in detail all development costs supporting Williams Solar's allegation in Paragraph 20 of the Complaint that "Williams Solar invested over $100,000 in development costs since receipt of the SIS Report." Williams Solar's response should describe (i) the development cost incurred, (ii) the date of incurrence, (iii) identify the entity that incurred the costs, and (iv) to whom the costs were paid. As part of your response, identify all documents evidencing or relating to such allegations.

Response:

See response to Interrogatory 1-5. Between the issuance of the SIS report and the filing of the Complaint, Williams Solar paid $63,174.36 in costs, as shown in the following table:

Cost	Purpose	Date	Payee
$1,137.50	Site control	2/27/2019	Kirkland Appraisals, LLC
$3,914.00	Permitting and zoning	3/2/2019	Fox Rothschild LLP
$1,137.50	Permitting and zoning	3/4/2019	Chris Sandifer
$46.00	Permitting and zoning	3/4/2019	Chris Sandifer
$6,248.00	Permitting and zoning	4/4/2019	Fox Rothschild LLP
$1,349.27	Permitting and zoning	5/6/2019	Fox Rothschild LLP
$500.00	Permitting and zoning	5/10/2019	ARC Design & Consulting LLC
$297.50	Site control	5/12/2019	Smithson Mills, Inc.
$40.00	Site control	5/30/2019	Hedrick Murray Bryson Kennett & Mauch PLLC

$999.62	Site control	6/3/2019	Smithson Mills, Inc.
$3,018.61	Permitting and zoning	6/12/2019	Fox Rothschild LLP
$13,500.00	Site control	6/27/2019	ELA, LLC
$164.69	Site control	7/1/2019	Smithson Mills, Inc.
$5,000.00	Site control	7/4/2019	Carol W. Williams & Joyce W. Burchette
$18,861.11	Permitting and zoning	7/22/2019	Fox Rothschild LLP
$114.30	Administrative	8/1/2019	CSC
$187.26	Permitting and zoning	8/15/2019	Fox Rothschild LLP
$1,659.00	Interconnection legal expense	10/14/2019	Brooks Pierce
$5,000.00	Site control	10/15/2019	ELA, LLC

In addition, to date Williams Solar has paid $45,000 to acquire and extend an option to purchase an interest in additional real estate necessary to support the solar power plant planned capacity. This interest, which was obtained in July 2019 after receipt of the initial cost estimates, is viewed by Williams Solar as part of the overall project development costs based on the assumptions of the initial estimate provided by DEP and would require an additional investment by Williams Solar of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**. This additional investment was premised on the presumed good faith of the information provided by DEP upon tender of the system impact study results. If Williams Solar had been aware that the actual reasonable interconnection costs would be more than 80% higher than those first estimated by DEP in the SIS, Williams Solar would not have proceeded with this additional investment. In this regard, the allegation in Paragraph 20 of the Complaint regarding the total amount of investment since receipt of the SIS Report was made in anticipation of the total project costs necessary to construct the project, including the costs of acquiring the additional real estate.

Williams Solar objects to this request to the extent it seeks identification of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to this request because identification of "all documents evidencing or relating to" these transactions would be unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence having any relevance to this proceeding. Notwithstanding the foregoing objections, Williams Solar identifies the invoices, contracts, or other billing statements relating to the costs identified in the foregoing table, which are being produced with these responses, along with a table summarizing all expenses.

1-7. Please explain in detail and provide the entire basis for Williams Solar's allegations in Paragraph 34 of the Complaint that "Based on the substantial increase in the estimated system upgrade costs as tendered in the Facilities Study report, the Williams Solar project has now become uneconomical." As part of your response, identify all documents evidencing or relating to such allegations.

Response:

Williams Solar is a project within a portfolio of 2 to 5 MWac projects under development by GreenGo Energy US, Inc., that has qualified for a standard offer contract, protection under House Bill 589 and the Settlement Agreement entered with DEP and filed with the NCUC. GreenGo is responsible for determining whether the projects it develops are commercially viable. In connection with this, GreenGo is charged with evaluating and procuring sites for solar projects, obtaining all necessary governmental authorizations, zoning, engineering, procurement, construction of the facilities, and achieving interconnection with the incumbent electric utility.

GreenGo's decision regarding any specific project are driven by consideration of the economics of the project—which includes the costs incurred to develop the project and to achieve interconnection with the incumbent utility. There is no "one size fits all" financial template that applies to all projects within its portfolio; rather GreenGo is charged with managing its portfolio with a view to maximizing the potential profitability for its investors of the portfolio as a whole.

GreenGo designed its projects based on projected costs in accordance with its and its employees' development experience, along with publicly available information. By its statement that the unexplained and unanticipated substantial increase in project costs has rendered the project "uneconomical," Williams Solar intended to convey that its project assumptions did not contemplate a near doubling of upgrade and interconnection costs (already significantly higher than other DEP projects) and that if it had been aware that the costs would be, in actuality, at least 80% higher than those quoted by DEP, it would not have elected to proceed with the project as originally planned.

In support of this position, as of January 28, 2019, the initial projected interconnection and upgrade cost of the Williams Solar project of $834,000 (upgrade costs of $774,000 and interconnection facility costs of $60,000) was the highest estimated cost GreenGo had received for any project by over $200,000. Additionally, GreenGo updates and tracks its average costs ongoing (upgrade and interconnection facilities) for the DEP portfolio noting its general average per DEP project interconnection cost that reached interconnection agreement stage at $287,878. Despite the unusually high initial cost estimate at the SIS conclusion —which GreenGo assumed to be a good faith estimate— GreenGo determined that it could proceed with the Williams Solar project but that it was a marginal project based on those estimates. However, the Facility Study estimate included upgrade costs of approximately $1.4 million, with total estimated costs of nearly $1.6 million. Based on these increased costs, GreenGo determined that the project was not economically practical. On its face, those revised costs substantially exceeded GreenGo's expected average costs for DEP projects.

Additionally, based on GreenGo's experience and assumptions, federal investment tax credit ("ITC") eligible capital expenses typically run approximately $1 million to $1.5 million per megawatt DC of a proposed solar generation facility in North Carolina assuming variances in prices due to racking, civil and subsurface variations, etc. This translates to approximately $7 million to $10.5 million in ITC eligible costs for a 5 MW_{AC} facility (approximately 7 MW_{DC}). A rule of thumb used by GreenGo in analyzing solar development costs is that if a project's non-eligible expenses exceed 15% of the tax eligible expenses, that is indicia that the project may be uneconomical. Thus, a 5 MW_{AC} project like Williams Solar may be considered economical when non-tax eligible costs—which include interconnection costs, land acquisition costs, ROW costs and network upgrade costs—are less than approximately $1 million, but are generally considered uneconomical when such costs exceed approximately $1.5 million per 5MWac project. Using this rule of thumb, the interconnection and upgrade costs (alone) of nearly $1.6

million estimated for Williams Solar, by themselves, render the Williams Solar project uneconomical.

Williams Solar objects to this request to the extent it seeks identification of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to this request because identification of "all documents evidencing or relating to" the substantial increase in estimated upgrade costs would be unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence having any relevance to this proceeding.

1-8. Please explain in detail and provide the entire basis for Williams Solar's asserted "information and belief" in Paragraph 37 of the Complaint that ". . . given the proximity in time and disparity in amount of the estimates, Respondent's initial estimate of the cost of upgrades and its later estimated installed cost could not both have been made in good faith." As part of your response, identify all documents evidencing or relating to such allegations.

Response:

It is public record that DEP has significant experience providing cost estimates for solar facilities, as it had interconnected over 3,000 MW of solar capacity in its service territory, including over 140 MW of utility-owned solar generation facilities. See Duke Energy Progress 2019 Integrated Resource Plan Update, p. 43, filed in Docket No. E-100, Sub 157 on September 3, 2019. DEP has repeatedly touted this experience, *see, e.g.*, DEP's October 2, 2019 NOD Response, implying that it has special experience and expertise with solar interconnection. Based on this extensive experience, DEP presumably would be in the best position to accurately estimate interconnection costs.

No caveats were provided regarding the bona fides or legitimacy of the initial cost estimates received after the SIS was completed, nor did DEP indicate that it believed its initial cost estimates understated actual costs likely to be required with the facility study results. And those estimates at the SIS conclusion, albeit on the high end, were near the top range of estimated costs anticipated for the upgrades identified. Yet, the estimate for Williams Solar's upgrade costs after facility study completion nearly doubled in just six months. There are no project- or site-specific details that would reasonably cause the facilities study estimate to be substantially higher than the SIS estimate based on engineering considerations and the fact that no additional equipment or scope of work was triggered. Rather, it appeared that the increased estimate was due to either (1) increased costs (labor, materials, etc.) that DEP knew, or should reasonably have known, about in December 2018—suggesting that DEP intentionally understated the interconnection costs at the SIS stage to create a "low-ball" estimate, and/or (2) the increased costs (labor, materials, overheads, contingency, etc.) relied upon in creating the facilities study estimate were intentionally overstated (or both).

Williams Solar objects to this request to the extent it seeks identification of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to this request because identification of "all documents evidencing or relating to" the substantial increase in estimated upgrade costs would be unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence having any relevance to this proceeding. Subject to and without waiver of these objections, Williams Solar identifies all documents produced by DEP in response to Williams Solar's data requests.

1-9. Please explain in detail and provide the entire basis for Williams Solar's allegations on pages 2-3 of Complainant's Reply and Motion to Dismiss that "DEP has a substantial incentive to delay interconnection and to make [interconnection] as expensive as possible for solar developers." As part of your response, identify all documents evidencing or relating to such allegations.

<u>Response:</u>

DEP, as the incumbent monopoly electric utility, is incentivized to (1) increase its rate base to maximize recovery from ratepayers and (2) sell as much electricity from DEP's own generation to maximize revenue. PURPA and North Carolina's implementing laws and rules require DEP to purchase electricity from qualified facilities, which has the effect of (1) decreasing the amount of generation assets DEP can build and deploy (thus decreasing DEP's rate base) and (2) decreasing the amount of electricity produced and sold from DEP's own generation assets. Thus, qualified facilities are a potential threat to DEP's profits, and DEP is incentivized to oppose and delay interconnection of qualified facilities.

In DEP's pending rate case, its witness Robert B. Hevert, spent significant effort describing the "competitive threat" DEP faces from complying with its obligations under PURPA, as identified by credit rating agencies, including "'two specific challenges distributed solar generation creates for utilities: lost sales volume and a "foregone" need for new capacity.'" Corrected Direct Testimony of Robert B. Hevert, pp. 47-50 (quoting Copley, Michael, "Despite distributed generation's buzz, grid power 'here to stay,' Bernstein says," SNL Financial, July 21, 2014), available at https://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=016332b2-e48f-4fc9-b624-61fc91660119. DEP's parent company also recognizes

> Federal and state regulations, laws and other efforts designed to promote and expand the use of . . . distributed generation technologies, such as private solar and battery storage, in Duke Energy service territories could result in customers leaving the electric distribution system, excess generation resources as well as stranded costs[.]

Duke Energy 2019 Annual Report and Form 10-K at p. 27, available at https://www.duke-energy.com/annual-report/_/media/pdfs/our-company/investors/de-annual-reports/2019/2019-duke-energy-annual-report.pdf.

Furthermore, House Bill 589 allows DEP to compete and satisfy up to 30 percent of its CPRE procurement volume through the utility's own development of renewable energy facilities. However, the total amount of CPRE procurement volume can be reduced by the amount of non-CPRE development, resulting in direct competition between DEP and non-CPRE projects for renewable energy development megawatts.

Williams Solar objects to this request to the extent it seeks identification of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to this request because identification of "all documents evidencing or relating to" the allegations would be unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence having any relevance to this proceeding.

DOCUMENT REQUESTS

1-1. Produce all documents and data identified in response to the foregoing Set 1 interrogatories.

Response:

Williams Solar will produce the responsive documents, except to the extent they have been publicly filed with the Utilities Commission or they have been produced by DEP in this proceeding.

1-2. Produce all documents and data (including, without limitation, communications, reports, and presentations) relied upon by Williams Solar evidencing, reflecting, or discussing the allegations referred to in Williams Solar's Complaint.

Response:

Williams Solar objects to this request to the extent it seeks identification or production of documents or data containing privileged attorney-client communications or work product. Without waiving the foregoing objections, Williams Solar will produce responsive, non-privileged documents, except to the extent they have been publicly filed with the Utilities Commission or they have been produced by DEP in this proceeding.

1-3. Produce all documents and data (including, without limitation, communications, reports, and presentations) that Williams Solar intends to reference or rely upon in testimony or at the evidentiary hearing in this proceeding.

Response:

Williams Solar objects to this request to the extent it seeks identification or production of documents or data containing privileged attorney-client communications or work product. Williams Solar also objects to this request as premature. Williams Solar will provide documents and data it intends to use as exhibits prior to the evidentiary hearing.

1-4. For the period October, 2016 to present, please identify and produce all documents developed by or in the possession of Williams Solar or GreenGo concerning projections of, or reporting of, development costs, interconnection costs, margins, profits, rate of return, internal rate of return, or return on equity of relating to development of the proposed generating facility.

Response:

Williams Solar objects to this request to the extent it seeks identification or production of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to the production of documents "concerning projections of, or reporting of, development costs, interconnection costs, margins, profits, rate of return, internal rate of return, or return on equity of relating to development of the proposed generating facility." The information sought is not relevant to any claim or defense presented in this case, and the request therefore is not reasonably calculated to lead to the discovery of admissible evidence. This case is concerned with the estimating methodologies used by DEP and whether the estimates provided to Williams Solar were made in good faith. The particulars of Williams Solar's financial data have no bearing on that question.

1-5. Produce any documents that support Williams Solar's allegations in Paragraph 34 of the Complaint that "Based on the substantial increase in the estimated system upgrade costs as tendered in the Facilities Study report, the Williams Solar project has now become uneconomical."

Response:

Williams Solar objects to this request to the extent it seeks identification or production of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to the extent that DEP seeks documents or data describing the finances of Williams Solar. As discussed in response to request 1-4, the particulars of Williams Solar's financial data is not relevant to any claim or defense presented in this action, nor is Williams Solar's decision-making process using that data.

Dated: April 15, 2020.

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CERTIFICATE OF SERVICE

The undersigned, of the law firm Brooks, Pierce, McLendon, Humphrey & Leonard, L.L.P., hereby certifies that he has served a copy of the foregoing RESPONSES TO DUKE ENERGY PROGRESS, LLC'S FIRST DATA REQUEST TO WILLIAMS SOLAR, LLC via electronic mail to:

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This the 15th day of April, 2020.

Marcus W. Trathen

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

DOCKET NO. E-2, SUB 1220

In the Matter of

Williams Solar, LLC, Complainant, v. Duke Energy Progress, LLC Respondent.	)))))))	WILLIAMS SOLAR, LLC'S SUPPLEMENTAL RESPONSES TO DUKE ENERGY PROGRESS, LLC'S FIRST DATA REQUEST TO WILLIAMS SOLAR, LLC

Pursuant to the Rules of Practice and Procedure of the North Carolina Utilities Commission ("Commission"), Williams Solar, LLC ("Williams Solar") hereby submits this supplemental response to Respondent Duke Energy Progress, LLC ("DEP", or "the Company" or "Duke") First Data Request to Williams Solar, LLC.

INTERROGATORIES

Williams Solar supplements each of its responses to state that Jonathan Burke of GreenGo Energy US, Inc. sponsors each of Williams Solar's responses.

1-6. To the extent not clearly provided in response to Interrogatory 1-5, provide a timeline and describe in detail all development costs supporting Williams Solar's allegation in Paragraph 20 of the Complaint that "Williams Solar invested over $100,000 in development costs since receipt of the SIS Report." Williams Solar's response should describe (i) the development cost incurred, (ii) the date of incurrence, (iii) identify the entity that incurred the costs, and (iv) to whom the costs were paid. As part of your response, identify all documents evidencing or relating to such allegations.

Response:

See response to Interrogatory 1-5. Between the issuance of the SIS report and the filing of the Complaint, Williams Solar paid $63,174.36 in costs, as shown in the following table:

Cost	Purpose	Date	Payee
$1,137.50	Site control	2/27/2019	Kirkland Appraisals, LLC
$3,914.00	Permitting and zoning	3/2/2019	Fox Rothschild LLP
$1,137.50	Permitting and zoning	3/4/2019	Chris Sandifer
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$40.00	Site control	5/30/2019	Hedrick Murray Bryson Kennett & Mauch PLLC
$999.62	Site control	6/3/2019	Smithson Mills, Inc.
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$13,500.00	Site control	6/27/2019	ELA, LLC
$164.69	Site control	7/1/2019	Smithson Mills, Inc.
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$18,861.11	Permitting and zoning	7/22/2019	Fox Rothschild LLP
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$187.26	Permitting and zoning	8/15/2019	Fox Rothschild LLP

$1,659.00	Interconnection legal expense	10/14/2019	Brooks Pierce
$5,000.00	Site control	10/15/2019	ELA, LLC

In addition, to date Williams Solar has paid $45,000 to acquire and extend an option to purchase an interest in additional real estate necessary to support the solar power plant planned capacity. This interest, which was obtained in July 2019 after receipt of the initial cost estimates, is viewed by Williams Solar as part of the overall project development costs based on the assumptions of the initial estimate provided by DEP and would require an additional investment by Williams Solar of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**. This additional investment was premised on the presumed good faith of the information provided by DEP upon tender of the system impact study results. If Williams Solar had been aware that the actual reasonable interconnection costs would be more than 80% higher than those first estimated by DEP in the SIS, Williams Solar would not have proceeded with this additional investment. In this regard, the allegation in Paragraph 20 of the Complaint regarding the total amount of investment since receipt of the SIS Report was made in anticipation of the total project costs necessary to construct the project, including the costs of acquiring the additional real estate.

Williams Solar objects to this request to the extent it seeks identification of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to this request because identification of "all documents evidencing or relating to" these transactions would be unduly burdensome and not reasonably calculated to lead to the discovery of admissible evidence having any relevance to this proceeding. Notwithstanding the foregoing objections, Williams Solar identifies the invoices, contracts, or other billing statements relating to the costs identified in the foregoing table, which are being produced with these responses, along with a table summarizing all expenses.

Supplemental Response:

Williams Solar supplements this response to clarify that to date it has paid a total of $45,000 to ELA, LLC to acquire and extend an option to purchase an interest in additional real estate necessary to support the solar power plant planned capacity. As reflected in its initial response to Interrogatory 1-6, $18,500 of

this total was paid prior to the filing of the Complaint in this matter. As reflected in Williams Solar's initial response to Interrogatory 1-5, an additional $26,500 was paid to extend the option after the filing of the Complaint in this matter.

Williams Solar further supplements this response to clarify that the purchase of the additional real estate will cost <u>[BEGIN CONFIDENTIAL]</u> [redacted] <u>[END CONFIDENTIAL]</u> beyond what Williams Solar has already spent to acquire and extend the option to purchase the additional real estate.

DOCUMENT REQUESTS

1-4. For the period October, 2016 to present, please identify and produce all documents developed by or in the possession of Williams Solar or GreenGo concerning projections of, or reporting of, development costs, interconnection costs, margins, profits, rate of return, internal rate of return, or return on equity of relating to development of the proposed generating facility.

<u>Response:</u>

Williams Solar objects to this request to the extent it seeks identification or production of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to the production of documents "concerning projections of, or reporting of, development costs, interconnection costs, margins, profits, rate of return, internal rate of return, or return on equity of relating to development of the proposed generating facility." The information sought is not relevant to any claim or defense presented in this case, and the request therefore is not reasonably calculated to lead to the discovery of admissible evidence. This case is concerned with the estimating methodologies used by DEP and whether the estimates provided to Williams Solar were made in good faith. The particulars of Williams Solar's financial data have no bearing on that question.

<u>Supplemental Response</u>:

Williams Solar confirms that it has not located any additional responsive documents, other than those it has already produced (see, e.g., WS_96-332 and WS_471-475; Filed Testimony of Jonathan Burke).

1-5. Produce any documents that support Williams Solar's allegations in Paragraph 34 of the Complaint that "Based on the substantial increase in the estimated system upgrade costs as tendered in the Facilities Study report, the Williams Solar project has now become uneconomical."

Response:

Williams Solar objects to this request to the extent it seeks identification or production of documents or data containing privileged attorney-client communications or work product. Williams Solar further objects to the extent that DEP seeks documents or data describing the finances of Williams Solar. As discussed in response to request 1-4, the particulars of Williams Solar's financial data is not relevant to any claim or defense presented in this action, nor is Williams Solar's decision-making process using that data.

Supplemental Response:

Williams Solar confirms that it has not located any additional responsive documents, other than those it has already produced (see, e.g., WS_96-332 and WS_471-475; Filed Testimony of Jonathan Burke).

Dated: May 4, 2020.

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CERTIFICATE OF SERVICE

The undersigned, of the law firm Brooks, Pierce, McLendon, Humphrey & Leonard, L.L.P., hereby certifies that he has served a copy of the foregoing RESPONSES TO DUKE ENERGY PROGRESS, LLC'S FIRST DATA REQUEST TO WILLIAMS SOLAR, LLC via electronic mail to:

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This the 4th day of May, 2020.

Marcus W. Trathen

BEFORE THE NORTH CAROLINA UTILITIES COMMISSION
DOCKET NO. E-2, SUB 1220

In the Matter of

Williams Solar, LLC, Complainant, v. Duke Energy Progress, LLC Respondent.	)))))))	WILLIAMS SOLAR, LLC'S RESPONSES TO DUKE ENERGY PROGRESS, LLC'S SECOND DATA REQUEST TO WILLIAMS SOLAR, LLC

Pursuant to the Rules of Practice and Procedure of the North Carolina Utilities Commission ("Commission"), Williams Solar, LLC ("Williams Solar") hereby submits this response to Respondent Duke Energy Progress, LLC ("DEP", or "the Company" or "Duke") Second Data Request to Williams Solar, LLC:

INITIAL OBJECTIONS

As more specifically detailed below, Williams Solar objects to each Request in this Second Data Request as unduly burdensome and otherwise beyond the scope of discovery in this proceeding.

In its Order Scheduling Hearing issued January 24, 2020, the Commission set this matter for hearing, requiring the pre-filing of direct and rebuttal testimony, but not specifically addressing the conduct of discovery between the parties. The discovery that has been undertaken by the parties to date has been undertaken in a cooperative fashion, generally following the Rules of Civil Procedure.

Prior to Williams Solar filing its initial testimony, the parties neither discussed nor agreed to discovery on witness testimony. In fact, Williams Solar submitted a consent request for modification of the procedural schedule which would have converted this proceeding to a "paper" proceeding, with the simultaneous filing of affidavits, without any provision for discovery on those affidavits. *See* Complainant's Consent Request for Approval of Revised Procedural Schedule, filed April 14, 2020. Williams Solar subsequently submitted a consent alternative request proposing the extension of the then-existing pre-filed testimony deadlines. *See* Alternative Request for Extension of Time, filed April 15, 2020. Neither request contemplated conducting discovery on the submissions of the parties, and the Commission's Order

Granting Request for Extension of Time did not so provide. Furthermore, by e-mail on April 27, 2020, counsel for DEP argued that "DEP should not be unfairly prejudiced by having to file a Motion to Compel close in time to when our testimony is due." By all appearances, DEP was acknowledging the fact that the parties had not discussed or contemplated further discovery relating to testimony and were seeking to avoid discovery issues during the period "close in time" to when the parties' pre-filed testimony was due.

The current procedural schedule, mutually agreed by the parties, provides only seven days between DEP's submission and the deadline for submission of rebuttal testimony—insufficient time for DEP to provide substantive responses to any questions Williams Solar may have or for Williams Solar to review such responses and formulate rebuttal testimony. In this light, DEP is seeking, through self-help, to create an imbalance in discovery rights—arrogating to itself the ability to conduct discovery on Williams Solar's witnesses while not allowing the same rights for William Solar. If DEP had contemplated the need to conduct discovery on witness testimony, it should have discussed this with Williams Solar before the procedural schedule was fixed.

Moreover, Williams Solar objects to each request as unduly burdensome and not designed to discover admissible evidence. The issue in this case concerns the estimates **prepared by DEP** and provided by DEP to Williams Solar. In this regard, DEP is in sole possession of the information that is relevant to resolution of the complaint. While purporting to give Williams Solar just seven days to respond, DEP has served more than twice the number of interrogatories it served in its first set of requests. Adding to the burden, these requests are not remotely aimed at the question presented in this proceeding—whether DEP's Initial and Revised Estimates of system upgrade costs were reasonable and were provided to Williams Solar in good faith. Rather, DEP's new requests appear interested in questioning the reasonableness of Williams Solar's decision to rely on DEP's estimates in deciding to move forward with the Williams Solar project, a matter which is subject to cross-examination at the hearing.

INTERROGATORIES

Questions related to the Direct Testimony of Jonathan Burke

2-1 On page 1, Lines 18-20, Mr. Burke testifies that "In North Carolina, GreenGo is pursuing development of a portfolio of 2 to 5 MWAC projects . . ." Please identify (i) the number of Interconnection Requests and aggregate capacity (MWac) that GreenGo or affiliated entities have submitted to DEP since GreenGo's formation in 2016; and (i) the number of Interconnection Requests and aggregate capacity (MWac) of GreenGo-affiliated Interconnection Customers in DEP that are either still under development and pending interconnection or installed and operating today.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond. Specifically, GreenGo's portfolio was described in substantially the same terms in Williams Solar's April 15, 2020 discovery responses, *see* Response 1-7, but DEP did not seek additional information until April 30, 2020;
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding; and
c) It seeks information that, by definition, is in the possession of DEP.

2-2 On Pg. 7, Lines 12-14, Mr. Burke states that the "reconductoring cost of $705,000 for approximately 2.5 miles of distribution line was higher than expected." Describe in detail any facts and identify any documents on which Mr. Burke relied in forming this opinion. Please identify any cost estimates received by GreenGo from any other utility or any entity (other than DEP or Duke Energy Carolinas, LLC ("DEC")) for the reconductoring or upgrading of any distribution line to facilitate the interconnection of a solar generating facility, including (1) date on which the estimate was provided, (2) the entity providing the estimate, (3) any written documentation concerning such estimate, (4) the location of such distribution line, (5) a description of the nature of the upgrade or reconductoring, (6) the length of the distribution line to be reconductored or upgraded.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond. Specifically, DEP's estimate was described in substantially the same terms in Williams Solar's April 15, 2020 discovery responses, *see* Response 1-7, but DEP did not seek additional information until April 30, 2020; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

Williams Solar further objects to the mischaracterization of Mr. Burke's testimony as an "opinion."

Subject to and without waiver of these objections, Mr. Burke's testimony is based on his personal knowledge of the solar industry in North Carolina and this particular project.

2-3 Identify all operational solar generating facilities with a nameplate capacity greater than 1 MW (AC) located outside of DEP's or DEC's service territory in which GreenGo has been involved in the project's development. For each project identified in this response, please identify the 1) facility name or unique identifier; 2) nameplate capacity (MWac) of the facility; 3) jurisdiction where project is located; and 3) utility to which the solar facility is interconnected

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

2-4 For all of the solar generating facilities identified in response to Request 2-3, identify those that are interconnected to the distribution system (*i.e.,* connected at or below 35 kV voltage).

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

2-5 For all of the solar generating facilities identified in the response to Request 2-4, please identify each facility which required reconductoring or upgrading of any distribution line to facilitate the interconnection of such solar generating facility. For each solar generating facility identified in this response, please also provide (1) a description of the nature of the upgrade or reconductoring, (2) the length of distribution line to be reconductored or upgraded to interconnect the facility, (3) the actual cost of such upgrade or reconductoring, (4) the entity responsible for constructing such required upgrade or reconductoring, and (5) the location of such distribution line (jurisdiction or interconnecting utility).

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

2-6 On page 13, Lines 18-22, Mr. Burke describes a "rule of thumb" GreenGo utilizes for assessing the economics of distribution connected solar projects. Specifically, Mr. Burke explains that "a 5 MWAC project like Williams Solar may be considered economical when non-tax eligible costs—which include interconnection costs, land acquisition costs, ROW costs, system upgrades and network upgrade costs—are less than approximately $1 million, but would generally be considered uneconomical when such costs approach $1.5 million or more." Describe in detail the total non-tax eligible costs incurred or projected to be incurred to place Williams Solar into commercial operation, including but not limited to, the categories identified in Mr. Burke's testimony and identify any documents responsive to this request.

<u>Response:</u>

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond. Specifically, GreenGo's "rule of thumb" was described in substantially the same terms in Williams Solar's April 15, 2020 discovery responses, *see* Response 1-7, but DEP did not seek additional information until April 30, 2020.

Subject to and without waiver of these objections, Williams Solar has already provided a complete response to this Request in its Responses to DEP's First Set of Data Requests (e.g., Responses to Interrogatories 1-5, 1-6, 1-7) and the filed testimony of Jonathan Burke.

2-7 In relation to Mr. Burke's testimony on page 13, Lines 18-22 that "a 5 MWAC project like Williams Solar may be considered economical when non-tax eligible costs—which include interconnection costs, land acquisition costs, ROW costs, system upgrades and network upgrade costs—are less than approximately $1 million, but would generally be considered uneconomical when such costs approach $1.5 million or more", please identify whether any other planned distribution-connected solar projects under development by GreenGo in North Carolina were determined to be uneconomical from January 1, 2019, to present. For each project identified in this response, please specifically 1) identify whether GreenGo made the determination to terminate development and/or withdraw the Interconnection Request due to the level of "non-tax eligible costs" identified through the development process or due to other non-cost factors (or some combination of factors); 2) identify the estimated non-tax eligible costs for each project identified; and 3) where non-cost factors in the development process impacted GreenGo's decision to terminate development and/or withdraw the Interconnection Request, please describe in detail the specific non-cost factors.

Response:

Williams Solar objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond. Specifically, GreenGo's "rule of thumb" was described in substantially the same terms in Williams Solar's April 15, 2020 discovery responses, *see* Response 1-7, but DEP did not seek additional information until April 30, 2020; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

2-8 In relation to Mr. Burke's testimony on page 14, beginning on Line 19, describing the "parcel of land (Property) on which the project would be developed," please provide the following information:
a) The acreage of the Property.
b) Whether GreenGo is currently developing any other 5 MW solar projects in DEP or DEC on acreage less than or equal to the acreage of the Property. If so, please identify the project and the acreage of the other project(s)'s site. If not, please identify the acreage for the two projects currently under development by GreenGo in DEP or DEC that are closest in acreage size to the Property.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

Subject to and without waiver of these objections, the acreage of the Property is approximately 30 acres.

2-9 Please describe in detail the "special design considerations" for developing Williams Solar on the Property as referenced by Mr. Burke on page 14, Line 20, and how GreenGo factored the irregular shape and size of the property into consideration in pursing development of the Williams Solar project.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

2-10 Describe in detail any facts and identify any documents that support Mr. Burke's allegation of "uncontrolled and undocumented allocation of soft costs (overheads and not actuals) by DEP outside of regulatory supervision to improve its profit margin by removing unallocated or "stranded" costs. . ." as stated on page 28, Lines 6-9 of Mr. Burke's testimony. As part of Williams Solar's response to this request, please specifically explain Mr. Burke's use of the terms "profit margin" and "'stranded' costs."

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

Subject to and without waiver of these objections, Williams Solar directs DEP to DEP's discovery responses in this matter. Mr. Burke intended the terms "profit margin" and "stranded costs" to have their customary meaning. To the extent DEP requires a further definition of "stranded costs," *see* https://en.wikipedia.org/wiki/Stranded_costs.

2-11 Describe in detail any facts and identify any documents that support Mr. Burke's allegation of "the possibility" of a "discriminatory set of circumstances—cost controls for DEP, but not for its independent power producing competitors . . ." as stated on page 33, Lines 7-11 of Mr. Burke's testimony.

<u>Response:</u>

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

Subject to and without waiver of these objections, Williams Solar directs DEP to DEP's discovery responses in this matter.

2-12 Describe in detail the work performed by Enerlytic Engineering LLC for Williams Solar as identified in the two expense line items dated September 25, 2018, as set forth in Exhibit JB-5. As part of your response, please identify and produce all correspondence or other documents provided by Enerlytic Engineering LLC to Williams Solar relating to the scope of work paid for by Williams Solar through these invoices.

<u>Response:</u>

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

2-13 Describe in detail the work performed by Chris Sandifer for Williams Solar as identified in the expense line items dated March 14. 2019, as set forth in Exhibit JB-5. As part of your response, please identify and produce all correspondence or other documents provided by Chris Sandifer to Williams Solar relating to the scope of work paid for by Williams Solar through these two invoices.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

2-14 On page. 27, Lines 20 – 22, Mr. Burke states "…it surprises me that a company with as much experience as DEP would need to build in such a large contingency at the detailed design stage which under professional engineering norms should be closer to actual costs." Please identify and describe in detail the "engineering norms" that Mr. Burke is referencing and identify any documents responsive to this request.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

Subject to and without waiver of these objections, Williams Solar directs DEP to the filed testimony of Charles Bolyard and its responses to Interrogatories 2-18 through 2-21 below. This testimony is also based on Mr. Burke's personal knowledge, including his engineering experience and training.

2-15 On page 30, Lines 12-14, Mr. Burke states "…it does concern me in that it suggests that DEP's new estimating process is not grounded in rational risk management nor good utility practice but more akin to DEP profit optimization…" Please identify and describe in detail what is meant by the phrase "rational risk management" as it relates to interconnection cost estimation. Please describe in detail any facts and identify any documents that support Mr. Burke's assertion that "DEP's new estimating process…[is] more akin to DEP profit optimization." Please explain in detail how DEP allegedly maximizes its profit through the interconnection study process.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

Subject to and without waiver of these objections, Williams Solar directs DEP to DEP's discovery responses in this matter. DEP, not Williams Solar, is in the best position to explain to the Commission how and why DEP uses its monopoly control of the interconnection study process, among many others means, to thwart solar developers from interconnecting, or to maximize the costs of interconnecting, and thereby to maximize DEP's profit.

2-16 On page 34, Lines 4 - 5, Mr. Burke states that DEP's cost estimation "does not conform to good utility practice." Please describe in detail any facts and identify any documents that support Mr. Burke's assertion. Please (1) describe in detail the interconnection cost estimation methodology that Mr. Burke believes <u>does</u> constitute good utility practice, (2) identify the particular utilities or other entities that Mr. Burke asserts have implemented interconnection cost estimation methodologies that conform to good utility practice, (3) produce documentation concerning the methodologies identified in subpart (2), and (4) produce interconnection cost estimates received by GreenGo from the utilities or other entities identified in subpart (2).

<u>Response:</u>

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

Subject to and without waiver of these objections, Williams Solar directs DEP to DEP's discovery responses in this matter, to the filed testimony of Charles Bolyard, and to Williams Solar's responses to Interrogatories 2-18 through 2-21 below.

2-17 On page 3 of Exhibit JB-6, Mr. Fred Flagstad refers to a "'rule of thumb'" that the cost for "line upgrades" is "$150-250K per Mile." Please identify in detail the basis for this assertion and provide specific examples where GreenGo has paid for line upgrades to facilitate the interconnection of a solar generating facility and, in each such instance, identify (1) the nature of such line upgrade, (2) the location of such line upgrade, (3) the utility or other entity responsible for such line upgrade, (4) the date when such line upgrade was completed and (4) the actual cost of such line upgrade.

<u>Response:</u>

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond; and
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

Subject to and without waiver of these objections, Williams Solar states that the "basis" for this "rule of thumb" is GreenGo's experience and knowledge of the solar industry in North Carolina.

Questions related to the Direct Testimony of Charles Bolyard

2-18 On page 7, Lines 2-3, Mr. Bolyard states that DEP's "improvements" to the cost estimating process are not consistent with industry practice." In relation to this statement, please (1) describe in detail the interconnection cost estimation methodology that Mr. Bolyard believes constitutes industry practice for conducting generator interconnection studies, (2) identify the particular utilities or other entities that Mr. Bolyard asserts have implemented interconnection cost estimation methodologies that conform with industry practice in conducting generator interconnection studies, and (3) identify and produce documentation concerning the methodologies identified in subpart (2).

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request because it assumes, without basis, that the methodology for estimating costs on a generator interconnection construction project is materially different than the methodology for estimating costs on other construction projects. Williams Solar further objects to this Request because it seeks confidential business information about other generator interconnection studies to which Mr. Bolyard does not, and would not, have access.

Subject to, and without waiver of, the foregoing specific and general objections, Williams Solar responds as follows:

The basic components and methodology for construction cost estimating are consistent across industries. *See, e.g.*, TOTAL COST MANAGEMENT (TCM) FRAMEWORK, Second Edition (published by AACE International); THE SKILLS AND KNOWLEDGE OF COST ENGINEERING, Sixth Edition 2015 (published by AACE International). Of course, each project is different, and the construction estimating process for each project must take account of the specifics of the project and any regulatory requirements that might affect the development of the cost estimate.

In general, however, in order to prepare a cost estimate, a cost estimator will first identify the location of the work and assess the level of definition (design development) available through which to ascertain the scope of work to be constructed. The cost estimator will set up a work breakdown structure that will guide the categorizing of quantities of work to be accomplished and costs associated with various aspects of the project.

If necessary, the cost estimator may choose to visit the site of the work to evaluate access, potential restrictions for mobilization of materials and equipment, special circumstances related to right of entry or right of way or easements, availability of space for marshaling of materials and equipment, features of the site related to safe working conditions, and any circumstances potentially arising from the noise of construction or environmental concerns that could impact the progress of the work and the cost of the project.

The cost estimator will then determine the measurement and counts of materials (materials quantity takeoffs) and work activities to be performed, which form the basis for the estimate of costs for temporary and permanent materials, labor, equipment, and incidentals to accomplish the defined scope of work.

The cost estimator also considers the elements of the scope of work, if any, for which there is little or no definition, but which are needed for overall completion of the project. The estimator will rely on personal experience, the experiences of others and historical costs from similar projects in estimating the costs for the project under consideration. The estimator then applies crew analysis, historical labor production data, or historical unit cost data to determine the effort and costs to install the materials or elements of the scope of work.

Once the costs of performing the defined scope of work are estimated, the estimator will evaluate and estimate overhead expenses in connection with the estimated time duration (schedule) applicable to the project.

The cost estimator will then compile and total the direct and indirect estimated costs and then evaluate the contingency, if any, to be applied for both known and unknown circumstances that have the potential to increase the costs of the project. Lastly the cost estimator will apply consideration for profit or fee, if and as appropriate, and then add up all cost components into the total estimated price for the project.

2-19 On page 6, Lines 19-23, Mr. Bolyard states that "…I find 20% to be an excessive amount of contingency and would expect the contingency applied in the Revised Estimate to be significantly less than the 20% used by DEP." Please identify all information and documents on which Mr. Bolyard relied in forming this opinion, including specifically identifying any knowledge or information that Mr. Bolyard possesses regarding the amount of contingency applied in the generator interconnection process by other utilities at the Facilities Study (or similar) step.

Response:

Williams Solar objects to this Request because it assumes, without basis, that the methodology for estimating costs on a solar interconnection construction project is materially different than the methodology for estimating costs on other construction projects.

Subject to, and without waiver of, the foregoing specific and general objections, Williams Solar responds as follows:

Mr. Bolyard's testimony is based on his experience, education, and training in the field of construction estimating. He also relied on the following:

- AACE International Recommended Practice 96R-18 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Power Transmission Line Infrastructure Industries

2-20 On page 6, Lines 7-8, Mr. Bolyard references his "experience with appropriate methods of cost estimation in the construction industry." Please identify all of Mr. Bolyard's experience in estimating construction costs within the context of the generator interconnection study process, including identifying the specific generator interconnection process and jurisdiction in which Mr. Bolyard has performed such generator interconnection construction cost estimations.

Response:

Williams Solar objects to this Request because it assumes, without basis, that the methodology for estimating costs on a solar interconnection construction project is materially different than the methodology for estimating costs on other construction projects.

Subject to, and without waiver of, the foregoing specific and general objections, Williams Solar responds as follows:

Mr. Bolyard's experience is detailed in his filed testimony.

2-21 On page 28, Lines 17-18, Mr. Bolyard states that "DEP's RET does not produce estimates based on historical experience with similar projects as one would expect." Please identify all documents and information on which Mr. Bolyard relied in forming this opinion.

Response:

Mr. Bolyard relied on the following documents in forming the referenced opinion:

- DEP's Response to Williams Solar Data Request 1
- DEP Supplemental Responses to Williams Solar First Requests
- DEP Answer and Motion to Dismiss
- True up labor calculation
- RE_DEP and DEC Exposure
- CONFIDENTIAL DEP Final Accounting Report Tracker Q3 2018
- FW REDACTED (Part 2 of 3)
- RE_slider solar onsite and offsite work order CUE
- Cost Estimation Tool – Revised – Copy
- Time and Expense Estimate Template
- SIS Estimation Tool Rev0
- SIS Estimation Tool Rev1
- CONFIDENTIAL DR No. 1-17 Williams Solar
- Cost Estimation Tool Presentation
- DET Time and Expense Estimate Tool – v2
- DET Time and Expense Estimate Tool – v3
- DET Time and Expense Estimate Tool – v4
- BLANK IPP MFC Request 4.0 with Admin Cost Formulas
- DET Time and Expense Estimate Tool
- Time and Expense Estimate – CONFIDENTIAL SOLAR FACILITY
- DR No. 1-3 Revised Estimating Tool Description – Williams Solar
- Facility Study Report Williams Solar LLC CHKLIST

- Overview of Revised Estimating Tool – Williams Solar (produced in Response to Data Request No. 1-3)
- E-mail correspondence "Re: Facility Study Report, Williams Solar, LLC CHKLIST, " between July 30, 2019, and August 16, 2019
- Copy of Time and Expense Template.xlsx
- July 30, 2019 email re: Cost Estimation Training
- August 1, 2019 email re: Cost Estimate Tool Presentation.pptx
- August 1, 2019 email re: Conference Line for Cost Estimation Training

DOCUMENT REQUESTS

2-1 Produce all documents and data identified in response to the foregoing Set 2 interrogatories, identifying which data request corresponds to each document produced.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond.

Subject to, and without waiver of, the foregoing specific and general objections, Williams Solar is producing herewith a copy of AACE International Recommended Practice 96R-18 Cost Estimate Classification System – As Applied in Engineering, Procurement, and Construction for the Power Transmission Line Infrastructure Industries.

2-2 Produce any documents created by Williams Solar or GreenGo since November 7, 2019, that discuss, identify, assess or analyze interconnection-related costs to interconnect Williams Solar or other projects included in the "North Carolina portfolio of projects protected under HB 589" under GreenGo's management, as discussed on Page 29, Lines 8-11 of Mr. Burke's testimony. This request includes, but is not limited to, documents providing information similar to Confidential Exhibit JB-14 dated November 7, 2019.

Response:

Williams Solar incorporates by reference its Initial Objections. Williams Solar further objects to this Request as unduly burdensome and not reasonably calculated to lead to the discovery of admissible information because, among other reasons:

a) It purports to require Williams Solar to respond within seven days to a request that DEP failed to make earlier in this proceeding, when Williams Solar might have had reasonable time to respond;
b) It seeks information about legally distinct companies and projects that are not parties to this proceeding.

Dated: May 8, 2020.

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Attorneys for Williams Solar, LLC

CERTIFICATE OF SERVICE

The undersigned, of the law firm Brooks, Pierce, McLendon, Humphrey & Leonard, L.L.P., hereby certifies that he has served a copy of the foregoing RESPONSES TO DUKE ENERGY PROGRESS, LLC'S SECOND DATA REQUEST TO WILLIAMS SOLAR, LLC via electronic mail to:

Jack E. Jirak
Associate General Counsel
Duke Energy Corporation
P.O. Box 1551/NCRH20
Raleigh, North Carolina 27602
Jack.jirak@duke-energy.com

E. Brett Breitschwerdt
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434 Fayetteville Street, Suite 2600
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Raleigh, North Carolina 27601
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This the 8th day of May, 2020.

Marcus W. Trathen

Christine Valcourt <cv@greengoenergy.com>

Interconnection Request Williams Solar, LLC CHKLIST 15007

Carl Siebing <cs@greengoenergy.com> Mon, Jan 28, 2019 at 1:01 PM
To: Jon Burke <jb@greengoenergy.com>, Frederik Flagstad <frederik@greengoenergy.com>

Gents,

We received the System Impact Study Report for 2250-024 - Williams Solar, LLC. This is the most expensive interconnection estimate we have received to date by about $200k.

Total estimated cost: $834,000 ($774,000 + $60,000). The main cost drivers appear to be:

1.) 2.5 miles of reconductoring.
2.) 71 new high-fault tamers are planned (high associated labor costs).

No DTT or new VT's are identified.

Add to this the expected metering costs, overhead costs, etc. not included in the Report. Furthermore, the $834k is a pre-tax estimate. We are likely looking at a near $1MM interconnection here.

There are 11 plus parcels between the POI and the sub. I do not readily see a viable option for reducing these costs. Please advise.

Br.
Carl

Carl Siebing | Development Analyst
GreenGo Energy US, Inc. | 1447 S. Tryon St., Suite 201, Charlotte, NC 28203
Email: cs@greengoenergy.com | Mobile: (312) 919 6249

[Quoted text hidden]

3 attachments

Williams System Impact Study Report with A.pdf
749K

Facility Study Agreement.pdf
107K

Request for Information.docx
17K

Filed in Johnston County
Planning Department
3-27-19 at 3:30 pm
Filed by: Stephanie Richter

NORTH CAROLINA	)	JOHNSTON COUNTY
	)	BOARD OF ADJUSTMENT
JOHNSTON COUNTY	)	CASE NO. 19-01

EXHIBIT 6

ORDER DENYING VARIANCE

This application for variance came before the Board of Adjustment for the County of Johnston (the "BOA) on February 27, 2019, after due notice, for a quasi-judicial hearing to consider Case No. 19-01 (the "Hearing"), submitted by Applicant, Williams Solar, LLC, and Owners, Carolyn W. Williams and Joyce W. Burchette, and identified as Parcel ID: 09J17036, located on Harper House Road, Newton Grove, in the Meadow Township of Johnston County, North Carolina. Based on the testimony of staff and the witnesses, the documentary evidence, the application and related materials, the exhibits, the Staff Report and other evidence and arguments presented at the Hearing, the BOA finds that the variance should be denied, and in support thereof, makes the following FINDINGS OF FACT and CONCLUSIONS OF LAW as required by N.C. Gen. Stat. §160A-388(e2):

FINDINGS OF FACT:

1. The subject property is comprised of approximately 30 acres and is located on Harper House Road, Newton Grove, in the Meadow Township of Johnston County, North Carolina, that property listed as having Tax Parcel Number 09J17036 (the "Property").

2. The Property is currently zoned Agricultural-Residential (AR), is undeveloped and surrounded by similarly zoned property that is used for residential, agricultural and commercial purposes.

3. The owners of the Property are Carolyn W. Williams and Joyce W. Burchette ("Property Owner"). The Applicant for the variance request, on behalf of the Property Owner, is Williams Solar, LLC (the "Applicant"). The Applicant was represented at the Hearing by Colin Tarrant, Esq.

4. The Applicant intends to seek a rezoning of the Property and apply for a special use permit to operate a solar energy facility as a utility facility on the Property. Pursuant to Section 14-123(c)(1) and 14-123(c)(3) of the Johnston County Land Development Code (the "LDC"), solar mounting devices, ground mounted equipment and accessory structures shall be set back at least 150 feet from all property lines.

5. According to the Planning Director, the aforementioned setback requirements have been in the LDC "for a while." The legislative history of LDC Section 14-123 demonstrates that section was adopted on September 6, 2011 and amended on September 1, 2015.

6. The Applicant's variance request seeks a reduction of setbacks for solar mounting

devices and accessory structures on three out of the four sides of the Property. Specifically, the variance requests seeks to: (a) reduce the setback along the western boundary by more than 60%, from 150 feet to 55 feet; and (b) reduce the setback along the eastern and rear boundaries by 70%, from 150 feet to 45 feet (the "Variance Request").

7. On February 27, 2019, the Hearing was held concerning the Variance Request.

8. At the Hearing, the Planning Director testified that a number of solar generation energy facilities have been approved and denied within Johnston County in recent years. To the Planning Director's knowledge, most, if not all, have adhered to the setback requirements in the LDC. The Planning Director was not aware of any variances of this size granted by the BOA from the 150 foot setback requirements for solar generation energy facilities.

9. At the Hearing, the Applicant presented testimony that compliance with the 150 foot setback would reduce the megawatts that could be generated on the Property, resulting in certain economic consequences, including a reduction of the 5 megawatt facility the Applicant hoped to develop on the Property. The Applicant also testified that compliance with the setback requirements would create personal circumstances that may require the Applicant to re-file their application with Duke Energy that was originally submitted in 2016 (after the setback restrictions in the LDC had been in place for since September 1, 2015).

10. The Applicant testified that it has developed smaller solar energy facilities on acreages of smaller size that produce 3 megawatts instead of the 5 megawatts that the Applicant would like to generate on the Property.

11. Much of the Applicant's testimony related to hardships that would result from the personal circumstances of the Applicant.

12. The Applicant did not, however, present substantial, competent and material evidence that any hardship created would be unnecessary or that the hardship results from conditions that are peculiar to the Property.

13. The Applicant's testimony and arguments that the width of the Property (east to west) is a hardship peculiar to this Property is not persuasive. By adopting a 150 feet setback from all property lines for solar mounting devices, ground mounted equipment and accessory structures, the clear legislative intent of the Johnston County Board of Commissioners was to only allow these types of solar energy generation facilities to be located and developed on parcels of land with sufficient size and width to accommodate these enhanced setbacks.

14. The Variance Request is a significant departure from the express terms and the spirit, purpose and intent of LDC Sections 14-123(c)(1) and 14-123(c)(3) in that it seeks to vary the setback requirements on 3 of the 4 sides of the Property for a total setback reduction between 60-70% on each of those sides of the Property.

CONCLUSIONS OF LAW:

Pursuant to the foregoing FINDINGS OF FACT, LDC Section 14-593 and N.C. Gen. Stat. 160A-388(d), the BOA makes the following Conclusions of Law:

1. The Variance Request should be denied because the Applicant/Property Owner has failed to submit competent, material and substantial evidence to establish that an unnecessary hardship would result from the strict application of LDC Sections 14-123(c)(1) and 14-123(c)(3) to the Property;

2. The Variance Request should be denied because the Applicant/Property Owner has failed to submit competent, material and substantial evidence to establish that, even if a unnecessary hardship exists, the hardship results from conditions that are peculiar to the Property and are not hardships resulting from conditions that are common to the neighborhood or the general public;

3. The Variance Request should be denied because the Applicant/Property Owner has failed to submit competent, material and substantial evidence to establish that, even if a unnecessary hardship exists, the hardship does not result from the actions taken by the Applicant, *i.e.*, the Applicant's refusal to consider or evaluate a smaller solar energy generation facility that produces less than 5 megawatts;

4. The Variance Request should be denied because the Applicant/Property Owner has failed to submit competent, material and substantial evidence to establish that the Variance Request is consistent with the spirit, purpose and intent of the LDC in maintaining 150 foot setbacks from all property lines for solar mounting devices, ground mounted equipment and accessory structures; and

5. The Variance Request should be denied because the Variance Request failed to receive a concurring vote of fourth-fifths of the BOA as mandated by N.C. Gen. Stat. § 160A-388(e)(1).

THEREFORE, based upon the foregoing, IT IS ORDERED that the application for a VARIANCE of Section 14-123(c)(1) and 14-123(c)(3) of the Johnston County LDC is DENIED.

Ordered this 27th day of March, 2019.

Craig Jones

CHAIRMAN

Stephanie Richter

SECRETARY

NOTE: If you are dissatisfied with the decision of this Board, an appeal maybe taken to the Superior Court of Johnston County within thirty (30) days after the date this Order is served on you. See the Johnston County Ordinance for further information.

19 CVS 958

STATE OF NORTH CAROLINA IN THE GENERAL COURT OF JUSTICE

JOHNSTON COUNTY SUPERIOR COURT DIVISION

WILLIAMS SOLAR, LLC, CAROLYN WILLIAMS and JOYCE BURCHETTE, *Petitioners,*	)	
v.	)	ORDER
JOHNSTON COUNTY, *Respondent.*	)	

THIS MATTER came on for hearing before the undersigned Senior Resident Superior Court Judge presiding during the June 24, 2019, session of Superior Court, Johnston County, upon Petitioners' Appeal in the Nature of Certiorari from the decision of the Johnston County Board of Adjustment denying Petitioners' request for variance. The Court has considered the written decision of the Board of Adjustment, the record evidence and record of proceedings, Petitioners' Petition for Writ of Certiorari, the Writ of Certiorari, the parties' briefs, and argument of counsel at hearing.

Procedural History

1. The property in question is located at Harper House Road, Newton

Grove, North Carolina (Tax Parcel Number 09J17036). Petitioners consist of the property owners, Carolyn Williams and Joyce Burchette, and the applicant, Williams Solar, LLC.

2. This action was commenced upon Petitioners filing a petition for variance (hereinafter "request for variance") with the Johnston County Planning Department on January 3, 2019. Petitioners requested that the setback requirements for solar mounting devices and accessory structures in the Johnston County Land Development Code be varied from the specific setback requirement of 150 feet from all property lines. Petitioners specifically requested the side and rear setbacks for the property be reduced to anywhere between 45 to 55 feet while maintaining the front setback at 150 feet.

3. On February 27, 2019, a quasi-judicial hearing before the Johnston County Board of Adjustment (hereinafter "the Board") was conducted wherein the Board received and considered Petitioners' presentation of evidence in support of the request for variance, as well as a report and testimony from the Johnston County Planning Department.

4. Following the presentation of evidence, the Board voted 3-2 in favor

of the request for variance; however, the request for variance was not granted because, as provided by N.C.G.S. § 160A-388(e)(1), the concurring vote of four-fifths of the Board was required to approve the variance. On February 28, 2019, the Board notified Petitioners via certified mail that the Board denied the request for variance at the hearing and that "[a] copy of the order and approved minutes will be provided . . . upon approval of said minutes by the Board of Adjustment at its March 27, 2019 meeting."

5. On March 22, 2019, Petitioners filed their Petition for Writ of Certiorari (hereinafter "the Petition") and, on the same date, the Clerk of Superior Court, Johnston County issued the Writ of Certiorari in accordance with N.C.G.S. § 160A-393(f). On March 26, 2019, Petitioners served upon Respondent the Petition and Writ of Certiorari via certified mail, return receipt requested. Service was complete on March 29, 2019.

6. On March 27, 2019, the Board reduced to writing its decision to deny the variance request when the Board entered its written Order Denying Variance (hereinafter "Order") reflecting the Board's determination of contested facts and their application to the applicable standards. The written Order was signed by the Board's Chairman and filed by the Board's Secretary in the Johnston County Planning Department on March 27, 2019. On March

28, 2019, the Board notified Petitioners of the Board's written Order and approved minutes, providing copies of both to Petitioners via certified mail.

7. On April 30, 2019, Respondent filed and certified the Record, consisting of eight exhibits. Petitioners' evidence at the hearing, as reflected in the Record and reviewed by the Court, was comprised of Petitioners' application for the request for variance (Exhibit 1); the Johnston County Planning Staff Report (Exhibit 2); minutes and testimony at the February 27, 2019, hearing (Exhibits 3 and 4); and, an Impact Study prepared by Petitioners' appraiser (Exhibit 8). Also included in the Record reviewed by the Court are the Board's February 28, 2019, notification letter (Exhibit 5); the Board's March 27, 2019, written order and notification letter (Exhibit 6); and, portions of the Johnston County Land Development Code (Exhibit 7).

Discussion

8. Chapter 153A, Article 18 of our General Statutes empowers counties to regulate planning and development throughout the county except as otherwise provided by statute. N.C.G.S. § 153A-320. Along these lines, a county may adopt zoning and development regulation ordinances, N.C.G.S. § 153A-340(a), and, upon doing so, "may provide that a board of adjustment may determine and vary their application," § 153A-340(c). When a county's

board of adjustment has been empowered to hear and decide matters properly before it, including requests for variances, the proceedings must comply with the requirements of Section 160A-388 of our General Statutes. N.C.G.S. § 153A-345.1(a) ("The provisions of G.S. 160A-388 are applicable to counties.").

9. As an initial observation, the Court notes that neither party before it has raised the issue that Petitioners filed the Petition for Writ of Certiorari before the Board's decision became effective pursuant to N.C.G.S. § 160A-388(e2)(1) and Petitioners did not file a subsequent or amended Petition within the thirty day window for appeal provided by N.C.G.S. § 160A-388(e2)(2). *Cf. Mannise v. Harrell*, 249 N.C. App. 322, 325, 791 S.E.2d 653, 656 (2016) (concluding that, because the appellant did not file a subsequent or amended notice of appeal following entry of the order, under such circumstances, "[a]n entered order did not exist when Defendant filed notice of appeal"); *see McCrann v. Vill. of Pinehurst*, 216 N.C. App. 291, 294, 716 S.E.2d 667, 670 (2011) (noting that the Court "see[s] no reason to treat the requirements for timely 'appeal' for judicial review under section 160A-388(e2) differently" than requirements for appeal from a civil judgment); *Hirschman v. Chatham Cnty.*, 250 N.C. App. 349, 356-57, 792 S.E.2d 211, 216 (2016) (observing that compliance with the statutory

requirements for filing the petition, like entry of notice of appeal, is jurisdictional).

10. Turning to the merits of Petitioners' claims on appeal raised by the Petition, when reviewing the decision of a decision-making board, the Court's scope of review is limited to ensuring that the rights of petitioners have not been prejudiced because the board's findings, inferences, conclusions, or decisions were, in relevant part, "[u]nsupported by substantial competent evidence in view of the entire record" or "[a]rbitrary or capricious." N.C.G.S. § 160A-393(k)(1)e.,f..

11. "The standard of review depends on the nature of the error of which the petitioner complains. If the petitioner complains that the Board's decision was based on an error of law, the superior court should conduct a *de novo* review. If the petitioner complains that the decision was not supported by the evidence or was arbitrary and capricious, the superior court should apply the whole record test." *Hopkins v. Nash Cnty.*, 149 N.C. App. 446, 448, 560 S.E.2d 592, 594 (2002) (internal citation omitted).

12. The whole record test "requires the reviewing court to examine the entire record to determine if the [board's] decision was supported by substantial evidence. The trial court may not consider evidence outside of the

record." *Northfield Dev. Co.*, 165 N.C. App. at 888, 599 S.E.2d at 924; *321 News & Video, Inc. v. Zoning Bd. of Adjustment*, 174 N.C. App. 186, 188, 619 S.E.2d 885, 886 (2005) ("[T]he trial court does not review the sufficiency of evidence presented to it, but rather reviews that evidence presented to the Board.").

13. When a county's board of adjustment has been empowered to hear and decide requests for variances, Subsection 160A-388(d) of our General Statutes provides that:

> When unnecessary hardships would result from carrying out the strict letter of a zoning ordinance, the board of adjustment shall vary any of the provisions of the ordinance upon a showing of all of the following:
>
> (1) Unnecessary hardship would result from the strict application of the ordinance. It shall not be necessary to demonstrate that, in the absence of the variance, no reasonable use can be made of the property.
>
> (2) The hardship results from conditions that are peculiar to the property, such as location, size, or topography. Hardships resulting from personal circumstances, as well as hardships resulting from conditions that are common to the neighborhood or the general public, may not be the basis for granting a variance.
>
> (3) The hardship did not result from actions taken by the applicant or the property owner. The act of purchasing property with knowledge that circumstances exist that may justify the granting of a variance shall not be regarded as a self-created hardship.
>
> (4) The requested variance is consistent with the spirit, purpose, and intent of the ordinance, such that public safety is secured, and substantial justice is achieved.

> No change in permitted uses may be authorized by variance. Appropriate conditions may be imposed on any variance, provided that the conditions are reasonably related to the variance. Any other ordinance that regulates land use or development may provide for variances consistent with the provisions of this subsection.

N.C.G.S. § 160A-388(d); *see* Johnston County, North Carolina, Land Development Code § 14-593(a). The petitioner "bear[s] the burden of proving their case and must show what type of variance they need and why the variance is needed." *Robertson v. Zoning Bd. of Adjustment*, 167 N.C. App. 531, 534, 605 S.E.2d 723, 726 (2004).

14. A board of adjustment's quasi-judicial decision to grant or deny a variance request must be "based upon competent, material, and substantial evidence in the record." N.C.G.S. § 160A-388(e2)(1). Competent, material, and substantial evidence "is evidence that is admissible, relevant to the issues in dispute, and sufficient to support the decision of a reasonable fact-finder." *Blair Invs., LLC v. Roanoke Rapids City Council*, 231 N.C. App. 318, 321, 752 S.E.2d 524, 527 (2013).

15. Petitioners' first claim raised by the Petition is that the Board's decision to deny the variance was not supported by competent, material, and substantial evidence in the record. Accordingly, the Court applies the whole

record test, examining all record evidence that both detracts from and supports the Board's decision to deny Petitioners' requested variance.

16. Despite Petitioners' contention that the Board was required to grant the request for variance because no competent, material, and substantial evidence was submitted in opposition to the request for variance, the Board did, in fact, base its decision upon evidence in the record: Petitioners' evidence.

17. In particular, the Board's findings in the written Order based upon Petitioners' evidence and testimony found that Petitioners claimed an unnecessary hardship from the potential economic consequences for Petitioners if a smaller-than-desired solar farm was built, the need for Petitioners to re-file an application with Duke Energy for a smaller solar farm in compliance with the setbacks, and the lack of consideration given by Petitioners to the construction of a smaller solar farm on the property despite it being possible to do so under the required setbacks.

18. As a result of these findings, the Board properly concluded in the written Order that Petitioners had failed to show the claimed hardship was unnecessary, was a result of conditions peculiar to the property rather than

personal circumstances, and was not otherwise the result of its own actions. *See Lee v. Bd. of Adjustment*, 226 N.C. 107, 110, 37 S.E.2d 128, 131 (1946) (explaining it would be "erroneous to base a conclusion that the denial of an application would work an unnecessary hardship because the applicant could earn a better income from the type of building proposed"); *Turik v. Town of Surf City*, 182 N.C. App. 427, 434, 642 S.E.2d 251, 255 (2007) ("In the context of zoning, pecuniary loss alone is not enough to show an 'unnecessary hardship' requiring a grant of a variance." (quoting *Williams v. N.C. Dep't of Env't & Natural Res.*, 144 N.C. App. 479, 486, 548 S.E.2d 793, 798 (2001))).

19. Considering the entirety of the record evidence, the Court concludes that the Board's Findings of Fact in the written Order were supported by competent, material, and substantial evidence, and the Board's findings supported the Board's Conclusions of Law in the written Order wherein the Board concluded that Petitioners failed to show the existence of the conditions in Subsection 160A-388(d) necessary to grant a variance.

20. A board's "decision may be reversed as arbitrary and capricious only where the petitioner establishes that the decision was whimsical, made patently in bad faith, indicates a lack of fair and careful consideration, or fails to indicate any course of reasoning and the exercise of judgment."

Whiteco Outdoor Adver. v. Johnston Cnty. Bd. of Adjustment, 132 N.C. App. 465, 468-69, 513 S.E.2d 70, 73 (1999) (quotation and citation omitted). Furthermore, "[w]hen a Board action is unsupported by competent substantial evidence, such action must be set aside for it is arbitrary." *Stealth Props., LLC v. Town of Pinebluff Bd. of Adjustment*, 183 N.C. App. 461, 465, 645 S.E.2d 144, 147 (2007).

21. Petitioners' second claim raised by the Petition is that the Board's decision was arbitrary and capricious because there was no evidence supporting the Board's decision. As with Petitioners' first claim, the Court applies the whole record test, examining all record evidence that both detracts from and supports the Board's decision to deny Petitioners' requested variance.

22. The Court has already determined that the Board's decision was supported by competent, material, and substantial evidence. Furthermore, Petitioners have not otherwise established that the Board's decision to deny the request for variance was whimsical, made patently in bad faith, indicated a lack of fair and careful consideration, or failed to indicate any course of reasoning and the exercise of judgment. Accordingly, in considering the entirety of the record evidence, the Court concludes that the Board's decision

to deny Petitioners' request for variance was not arbitrary and capricious.

23. The Court notes that in Petitioners' memorandum of law in support of the Petition, Petitioners also allege that the Board's decision was in excess of the statutory authority conferred upon the Board, was inconsistent with applicable procedures specified by statute, and was otherwise affected by error of law. These allegations, though, were not raised by the Petition and largely rely on a contention as to the validity of the variance requirements in the County Land Development Code, which is a separate issue not properly a part of these proceedings. Therefore, the Court declines to address the merits of such allegations. N.C.G.S. § 160A-393(j) ("The court shall hear and *decide all issues raised by the petition*" (emphasis added)); *see Stealth Props., LLC v. Town of Pinebluff Bd. of Adjustment*, 183 N.C. App. 461, 465, 645 S.E.2d 144, 147 (2007) (noting "the construction of the Unified Development Ordinance is not properly before this Court, nor was it properly before the trial court"); *see also Sherrill v. Wrightsville Beach*, 76 N.C. App. 646, 649, 334 S.E.2d 103, 105 (1985) ("The constitutionality of the zoning ordinance is a separate issue not properly a part of these proceedings since the denial of the variance request never addressed the validity of the zoning ordinance.").

Accordingly, the Court, for the reasons stated herein, hereby

AFFIRMS the decision of the Johnston County Board of Adjustment to deny Petitioners' request for variance.

This the 29 day of July, 2019.

Imelda J. Pate

Imelda J. Pate
Superior Court Judge