Fox Rothschild LLP
ATTORNEYS AT LAW

434 Fayetteville Street
Suite 2800
Raleigh, NC 27601
Tel (919) 755-8700 Fax (919) 755-8800
www.foxrothschild.com

KAREN M. KEMERAIT
Direct No: 919.755.8764
Email: kkemerait@foxrothschild.com

November 26, 2019

Ms. Kimberley A. Campbell, Chief Clerk
North Carolina Utilities Commission
430 N. Salisbury Street
Raleigh, NC 27603

RE: Application for Certificate of Public Convenience and Necessity for Friesian Holdings, LLC to construct a 70-MW Solar Facility in Scotland County, North Carolina NCUC Docket No. EMP-105, Sub 0

Dear Ms. Campbell:

On behalf of Friesian Holdings, LLC, we herewith submit the pre-filed Supplemental Direct Testimony and Exhibits of Charles Askey in the above-referenced EMP docket.

Pursuant to Commission Rule R1-28(e), the Company plans to deliver 16 copies of its testimony and exhibits on November 27, 2019.

Should you have any questions concerning this testimony or exhibits attached thereto, please do not hesitate to contact me.

Sincerely,

/s/ Karen M. Kemerait

Karen M. Kemerait

skb

CC: All Parties of Record
Enclosures

BEFORE THE

NORTH CAROLINA UTILITIES COMMISSION

FRIESIAN HOLDINGS, LLC

DOCKET NO. EMP-105, SUB 0

PRE-FILED SUPPLEMENTAL DIRECT TESTIMONY

OF

CHARLES ASKEY

November 26, 2019

I. INTRODUCTION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Charles Askey. I am a Senior Project Manager in the Power Engineering & System Planning Group at Timmons Group. My business address is 610 East Morehead Street, Suite 250, Charlotte, North Carolina 28202.

Q. PLEASE DESCRIBE THE TIMMONS GROUP.

A. Timmons Group is a multi-disciplined engineering and technology firm that has been recognized for over twenty-five years as one of the Engineering New Record's Top 500 Design Firms in the country. Timmons Group provides civil engineering, structural, environmental, electrical, geotechnical, GIS/geospatial technology, landscape architecture, and surveying services to a diverse client base.

Founded in 1953, Timmons Group is a well-established firm with a pioneering spirit. Timmons Group has provided clients with services in the following areas:

- Site/Civil Engineering
- Environmental Services
- Survey & Mapping / ALTA Survey
- Electrical Engineering & Design
- Landscape Architecture
- Stormwater Infrastructure
- Right-of-Way Services
- Generation Interconnection Services
- Unmanned Aircraft Systems (UAS) / Drone Services
- Power System Planning
- Geotechnical Engineering & Testing
- Water & Wastewater Engineering
- Traffic & Transportation
- Structures & Bridges
- Geographic Information Systems (GIS)

- Construction Administration & Inspection
- LEED® & Envision Sustainable Design
- MW Injection / System Impact Studies
- Economic Development

Q. PLEASE DESCRIBE YOUR EDUCATION AND PROFESSIONAL EXPERIENCE.

A. I obtained a Bachelors of Science degree and a Masters of Electrical Engineering with a concentration in Power System Analysis from Clemson University. I am a registered Professional Engineer.

As previously mentioned, I am a Senior Project Manager in the Power Engineering & System Planning Group at Timmons Group. I have over thirty years of experience in Power System Planning and System Operations, and my work experience includes twenty-seven years of utility experience in Power System Planning and Systems Operations either as an employee or as a contractor. My consulting background includes work with Investor Owned Utilities, Electric Membership Cooperatives, Municipal Utilities, Merchant Generation Developers, and EPC Contractors. I have conducted numerous studies and client engagements regarding electrical system studies and NERC compliance. My client work with generation developers includes performing preliminary system impact assessments to identify acceptable Points of Interconnection and the determination of maximum transfer capability from a potential project to the power system. I have performed these generation impact assessments on transmission systems throughout the country, and I have interfaced with most of the Regional Transmission Organizations (RTOs) and NERC regions.

I have also prepared generation interconnection documentation and reviewed Transmission Providers' studies in support of clients' projects. Additionally, I have supported clients in the following areas: power supply contracts, transmission contracts, scheduling, operations, transmission billings, regulatory issues, facility planning and siting, and NERC Audit preparation.

A copy of my resume is attached hereto as Exhibit A.

Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS CASE?

A. I am testifying on behalf of Friesian Holdings, LLC ("Friesian").

Q. HAVE YOU PREVIOUSLY TESTIFIED BEFORE THE NORTH CAROLINA UTILITIES COMMISSION?

A. No.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY IN THIS PROCEEDING?

A. The purpose of my testimony is to demonstrate that the Friesian network upgrades are required for additional solar resources and other generation resources to be added to Duke Energy Progress, LLC's ("DEP") system even if Friesian is not constructed. My testimony also recognizes that Duke Energy's 2018 Integrated Resource Plans ("IRPs") and Duke Energy's 2019 IRP Updates indicate that additional generation is needed to support load growth and resource portfolio improvements from renewable resources or other generation resources in eastern North Carolina.

Q. ARE YOU SPONSORING ANY EXHIBITS WITH YOUR TESTIMONY?

A. Yes. I am sponsoring the following exhibits:

Exhibit Number	Contents
Exhibit A	Resume of Charles Askey
Exhibit B	*DEP Queue Analysis: Review of Transmission System Upgrades and Project Impact*

II. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS

Q. HAVE YOU PERFORMED AN ANALYSIS OF THE TRANSMISSION SYSTEM UPGRADES FOR GENERATION ADDITIONS TO DEP'S SYSTEM EVEN IF FRIESIAN IS NOT CONSTRUCTED?

A. Yes. I performed an analysis of the network upgrades that are required to add new generation to DEP's transmission system even if Friesian is not constructed. My analysis and conclusions are contained in my report, *DEP Queue Analysis: Review of Transmission System Upgrades and Project Impact,* that is attached as Exhibit A.

Q. PLEASE SUMMARIZE YOUR ANALYSIS.

A. Interdependency to the Friesian Project

Initially, I considered information that DEP provided in response to Friesian's data request. DEP provided information that it has completed an assessment for interconnection requests received through September 30, 2017. There are 108 interconnection requests totaling 1,561 megawatts ("MW") that have been identified as interdependent on the network upgrades assigned to Friesian. In addition to the projects specifically identified to date by DEP as interdependent on the Friesian upgrades, DEP stated that there are likely many additional later-queued projects that are also technically interdependent on the Friesian upgrades. DEP also stated that the interconnection study is designed to assess whether upgrades are needed to accommodate a particular generating facility but are not intended to assess whether a particular upgrade will accommodate a particular set of future generating facilities. However, DEP believes that it is undoubtedly the case that the Friesian upgrades will alleviate the interdependency of at least 1,561 MW of additional solar resources and provide a path forward for such projects to interconnect in a safe and reliable manner.

Furthermore, DEP has provided information that as a general matter, substantial network upgrades will be needed to accommodate the addition of a substantial amount of new grid resources (not limited to solar resources). The Friesian upgrades are the type of requisite network upgrades that will help to accommodate the interconnection of a substantial amount of additional renewable and other resources. In fact, in addition to solar resources, Duke Energy's 1235 Combined Cycle Plan in Cumberland County is interdependent on the Friesian upgrades.

Required Transmission System Upgrades

In conjunction with the study of the Friesian project along with several other previously queued projects, DEP has identified multiple system upgrades to be constructed prior to allowing Friesian to interconnect to the system. These transmission line upgrades are listed in the table below:

Transmission Upgrades	Description	Distance (Miles)
Erwin –Fayetteville East 230 kV Line	Reconductor to 6-1590 MCM ACSR Conductor	~23
Fayetteville – Fayetteville Dupont 115 kV Line	Reconductor to 3-1590 MCM ACSR Conductor	~3.2
Cape Fear – West End 230 kV Line	Reconductor to 6-1590 MCM ACSR Conductor	~26
Sanford Deep River Tap – Sanford Horner Blvd. 230 kV Line	Reconductor to 6-1590 MCM ACSR Conductor	~4.4
Erwin - Fayetteville 115 kV Line	Reconductor to 3-1590 MCM ACSR Conductor	~8.7
Rockingham – West End 230 kV Line	Upgrade the line to full conductor rating.	~7.7

DEP System Impact Study Methodology

As part of Duke's FERC-jurisdictional Large Generation Interconnection Procedures ("LGIP"), DEP uses a "Stressed System" model to evaluate impacts to the system caused by generation interconnection facilities. The stated reason for this is to ensure that the DEP-owned transmission system can deliver on firm transmission commitments under the direst of circumstances.

Timmons Group, through its FERC Critical Energy Infrastructure Information (CEII) clearance, has access to the power flow models and maps for the power systems in the mainland United States. The current set of cases has a Southeastern Electric Reliability Council (SERC) 2023 Summer Peak model that Timmons Group used for the analysis. In evaluating DEP's System Impact Studies for Friesian, Timmons Group was able to access and evaluate

Duke Energy's models to perform the requisite generation interconnection studies. Based on those models of the system, certain changes outlined in the report were made to the FERC CEII model.

<u>Analysis</u>

The below Table 1 shows the pre-contingency and post contingency flows, rating, and percentage loading on the five limiting elements based on the most critical contingency studies.

Table 1 - Pre-contingency and Post Continency Loading on the Friesian Related System Operating Limits for the loss of the Most Critical Contingency

Scenario	Post Contingency Flow (MVA)	Rating (MVA)	Voltage Adjusted Post Contingency Loading (%)
Limitation: Erwin - Fayetteville East 230 kV (~23 Miles)			
Contingency: Wake - Cumberland 500 kV			
Queue included up through Q380	492	478	105.51%
Queue included except for Q380	484	478	103.74%
No Queue	449	478	95.69%
Limitation: West End - Cape Fear 230 kV (~26.6 Miles)			
Contingency: Richmond - Cumberland 500 kV			
Queue included up through Q380	529	542	100.47%
Queue included except for Q380	523	542	99.32%
No Queue	499	542	94.34%
Limitation: Rockingham - West End 230 kV (7.7 Miles)			
Contingency: Richmond - Cumberland 500 kV			
Queue included up through Q380	505	542	96.13%
Queue included except for Q380	500	542	94.87%
No Queue	477	542	90.12%
Limitation: Erwin - Fayettevlle 115 kV (~8.7 Miles)			
Contingency: Wake - Cumberland 500 kV			
Queue included up through Q380	114	119	97.99%
Queue included except for Q380	112	119	95.89%
No Queue	105	119	89.65%
Limitation: Fayetteville - Fayetteville Dupont 115 kV			
Contingency: Richmond - Cumberland 500 kV			
Queue included up through Q380	120	119	103.54%
Queue included except for Q380	119	119	102.41%
No Queue	114	119	97.31%

<u>Evaluation of Results</u>

DEP's System Impact Study contains the following statement in regard to power flow results:

> Facilities that may require upgrade within the first three to five years following the in-service date are identified. Based on projected load

> growth on the DEP transmission system, **facilities of concern are those with post-contingency loadings of 95% or greater of their thermal rating** and low voltage of 92% and below, for the requested in-service year or the in-service year of a higher queued request. The identification of these facilities is crucial due to the construction lead times necessary for certain system upgrades. This process will ensure that appropriate focus is given to these problem areas to investigate whether construction of upgrade projects is achievable to accommodate the requested interconnection service. (Emphasis added.)

The results demonstrate that with the interconnection queue loaded up through Friesian (Q380), all the limiting elements are loaded over either 95 percent or 100 percent of their contingency ratings. Obviously, these loading levels are the reason that DEP found that facility loadings need to be addressed prior to granting transmission service to Friesian. However, it is noted the while the loadings are heavy, the loadings without the queue are within five to ten percent of the contingency loading levels without the queued generation listed.

Also note that DEP has two, 1235 MW queued gas projects (Q398 & Q399) which will add significantly to most, if not all these line loadings absent any other upgrades. This projected outcome is consistent with the findings of the Q398 System Impact Study Report that was published in December 2018 and Q399 System Impact Study Report that was published in April 2019. The first report recommends building a new 35 mile, 230 kV line between the Cumberland and Erwin Substations and a similar 230 kV line between the Cumberland and Clinton Substations. While DEP has determined that its first gas project (Q398) is not dependent upon Friesian's upgrades, DEP's second Combined Cycle Plant (Q399) is interdependent upon Friesian's upgrades.

Q. PLEASE SUMMARIZE YOUR PRIMARY CONCLUSIONS.

A. Based on the Friesian System Impact Study and my study results, the Friesian network upgrades are required to allow Friesian to connect and deliver power to the system without violating the DEP LGIP Study Methodology. Further, without the Friesian upgrades, new generation resources (*i.e.*, renewable energy, Duke Energy's Q398 / Q399 projects, and other generation resources) in this area of DEP's system will not be able to be added to the system without requiring substantial upgrades. In other words, no new generation (new renewable resources, DEP's gas plants, and other generation resources) will be able to be added to this area of the state without substantial network upgrades.

Also, there are a number of key benefits that will result from the Friesian network upgrades, including enhanced load serving capabilities, reduced power system losses, and improved flexibility to operate the transmission grid.

Additionally, Duke Energy's integrated resource plan indicates that additional generation is required to support load growth and resource portfolio improvements. Whether that new generation comes from renewable energy or other generation resources in eastern North Carolina, it cannot occur without the Friesian network upgrades or other major improvements to DEP's transmission system.

Q. PLEASE SUMMARIZE YOUR RECOMMENDATION.

A. I recommend that the Commission approve Friesian's CPCN Application for a 70-MW solar facility since the network upgrades are not just important for the Friesian project. The Friesian upgrades are important for DEP's transmission system – those upgrades are necessary to support new generation to DEP's transmission system separate and apart from the Friesian project.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

CHARLES M. ASKEY
6008 Alexa Road Charlotte, North Carolina 28277
(704) 840-7718 (Mobile) / charlieaskey@aol.com

BUSINESS PROFILE

An accomplished and highly successful Professional Manager who is innovative, profit-oriented and performance-driven. Extensive experience in positions of increasing responsibility in transmission planning, resource and project management, developing strong implementation teams and delivering desired results. An action person with a proven record of success. Highly organized with an innate ability to get things done working with, and through, others at all levels in the organization. Strong multi-tasking and problem-solving skills. Adjusts to change easily by creating new and improved methods to reach goals and objectives. Intuitive and effective decision maker.

AREAS OF EXPERTISE

- Project Management
- Resource Management
- Transmission Planning
- Contract Administration
- Problem Solving
- Customer Service
- Team Development
- Relationship Building
- Strategic Planning
- Multi-Tasking
- Consulting
- Systems Operations
- Facility Siting
- Contract Negotiation
- Scheduling/Organizing

ACCOMPLISHMENTS

- Started the Power Engineering & System Planning Group at Timmons Group, Inc. Currently responsible for the staffing and participating in the design work on a 162.15 MW Wind Farm and four utility scale solar projects.
- Launched the System Planning business function at three companies. Perform steady-state assessments of the transmission system's ability to accept injections of power from generation projects. The purpose of these studies is to determine the maximum generator output that can be achieved under all studied conditions before system limitations are observed. These assessments are performed throughout the country and for various types of resources (wind, solar, gas, biomass, etc.). The determination of the Available Transfer Capability (ATC) is performed under a variety of load levels and system dispatch scenarios. Prepare generation interconnection documentation and advise clients regarding system studies. (Timmons Group, Pike/UCS & ERP)
- Managed the division of UC Synergetic (UCS) that specializes in providing system planning studies, siting, site engineering, environmental analysis, project permitting, and landscape services to the electric industry. In addition to performing system assessments and NERC planning studies, the team was responsible for conducting infrastructure facility siting studies by executing a comprehensive siting process. Execution included land use studies; visual impact; hydrology, wildlife and fisheries studies; cultural and historic resource investigations; rare, endangered species investigations; engineering evaluation and construction feasibility analyses of alternate sites/routes; and cost analysis of alternate sites/routes. (UCS/Pike).
- Responsible for business development of the system planning & siting function. Achieved financial & resource utilization goals and objectives. Prepared and submit responses to Request for Proposals. (UCS/Pike)
- Performed a variety of power flow studies and assessed the transmission and distribution substation reliability for two large transmission cooperatives' systems. Recommended capital projects and operating procedures addressing identified deficiencies. (Pike and EnerVision)
- Provided services for the negotiation and implementation of new power supply contracts for five electric distribution cooperatives in North Carolina. Coordinated the successful completion of transmission contracts, and managed implementation, scheduling, operations, billings and regulatory issues. (EnerVision)
- Prepared for and participated in the successful completion of planning compliance audits. (EnerVision)
- Monitored and analyzed market and regulatory activities at the national, regional and state level assessing their relevance. (FPLE)
- Advocated policies and positions influencing the outcome of market designs, regulations and governmental actions to further commercial interests. Worked closely with the Development and Origination Departments to assist with power supply contacts, transmission interconnections and market relations. (FPLE)
- Participated in external venues, including representing company in the FERC RTO Southeast Mediation Process, performing as Sector Representative on the SeTrans Stakeholder Advisory Committee, providing input to the state commissions of NC, VA, GA, SC and LA, and commenting on FERC Orders and NOPRs. (FPLE)
- Managed a team of 8 to 18 developing the requirements, process descriptions, application summaries and job descriptions for the Operations and Planning Organizations of the GridSouth Transco (start-up). (Duke)
- Requested, received and reviewed bid packages from vendors satisfying the requirements of Order 2000 and the GridSouth Filing. Selected the best solution providers and negotiated Letters of Intent for Energy Management System software and computer equipment. (Duke)

- Provided leadership on transmission issues related to the Operational Planning time horizon. (Duke)
- Managed the implementation of the VACAR-South Security Coordinator and participated on the SERC and NERC ATC Working Groups. (Duke)
- Performed power flow studies, special studies and assisted in the development and delivery of training materials to system coordinators. (Duke)
- Directed and supervised successfully all transmission related activities: corporate transmission strategy development including rate modifications, transmission expansion planning, project approval among and with the Georgia Integrated Transmission System (ITS) Participants, participation in regional reliability organizations, release of all capital transmission projects (over $50 million per year) including presentation to the Board, administration of the ITS Agreement and direct management of 12 full-time and 2 part-time positions. (Oglethorpe Power)

PROFESSIONAL EXPERIENCE

2017-Present	**Timmons Group, Inc.** Client Consultation Senior Project Manager		Charlotte, NC
2015-2016	**Energy Renewal Partners, LLC** Client Consultation Director, System Planning		Charlotte, NC
2012-2015	**UC Synergetic, LLC** (f/k/a Pike Energy Solutions**)** Client Consultation Director, System Planning & Siting		Fort Mill, SC
2009-2012	**Pike Energy Solutions, LLC** Client Consultation Director, System Planning		Charlotte, NC
2003-2009	**EnerVision, Inc.** Consulting to distribution / transmission cooperatives Principal Consultant		Atlanta, GA Charlotte, NC
2002-2003	**Independent Consultant** Consulting to distribution / transmission co-ops		Atlanta, GA Charlotte, NC
2001-02	**Florida Power & Light Energy** Merchant generation developer Director, Market Affairs – Southeast Region		Charlotte, NC
1996-01	**Duke Energy** Investor owned utility Team Lead, GridSouth Consulting Engineer	 2000-01 1996-00	Charlotte, NC
1985-96	**Oglethorpe Power Corporation** Generation/transmission cooperative Manager, Transmission Planning Senior Electrical System Planner Transmission Service Engineer System Planning Engineer	 1995-96 1992-95 1991-92 1985-91	Tucker, GA
	Dekalb Technical Institute Adjunct Instructor – Mathematics **Clemson University** Graduate Teaching/Research Assistant **Georgia Power Company** Research and Test Lab Engineer **Westinghouse Transformer Division** Core/Council Designing Engineer – Co-Op Student		

EDUCATION/PROFESSIONAL AFFILIATIONS

Clemson University Clemson, SC
Master of Science – Electrical Engineering
Major – Power System Analysis, Minor – Mathematics
Bachelor of Science – Electrical Engineering

Registered Professional Engineer in the State of Georgia

PUBLICATIONS

C.M. Askey, M.A. Wortman, "A Mathematical Formulation for the Reliability of Power System State Estimators", proceedings 17th Annual Southeastern Symposium on System Theory, March 1985.

Masters Thesis – "A Technique for Evaluating the Reliability of a Power System State Estimator", presented to and accepted by the Graduate School at Clemson University in May 1985.

DEP Queue Analysis

Review of Transmission System Upgrades and Project Impact

Provided by

TIMMONS GROUP
YOUR VISION ACHIEVED THROUGH OURS.

For

BIRDSEYE
RENEWABLE ENERGY

November 26, 2019

Background

Birdseye Renewable Energy is in the process of developing four photovoltaic projects, including Friesian Holdings, LLC ("Friesian"), in Duke Energy Progress, LLC's ("DEP") North Carolina Territory. Friesian is in DEP's FERC Generation Interconnection Queue and has advanced through the study phases outlined in the Large Generation Interconnection Procedures (LGIP). The four projects are listed below:

Name	Queue #	County	MW	POI
Friesian	380	Scotland	70	Laurinburg – Bennettsville 230kV
Homer	381	Hoke	75	Blewett – Tillery 115 kV
Slender Branch	383	Bladen	80	Cumberland – Whiteville 230 kV
Fair Bluff	387	Columbus	75	Marion – Whiteville 230 kV

In response to Friesian's data request, DEP provided information that it has completed an assessment for interconnection requests received through September 30, 2017. There are 108 interconnection requests totaling 1,561 megawatts ("MW") that have been identified as interdependent on the network upgrades assigned to Friesian. In addition to the projects specifically identified to date by DEP as interdependent on the Friesian upgrades, DEP stated that there are likely many additional later-queued projects that are also technically interdependent on the Friesian upgrades. DEP also stated that the interconnection study is designed to assess whether upgrades are needed to accommodate a particular generating facility but are not intended to assess whether a particular upgrade will accommodate a particular set of future generating facilities. However, DEP believes that it is undoubtedly the case that the Friesian upgrades will alleviate the interdependency of at least 1,561 MW of additional solar resources and provide a path forward for such projects to interconnect in a safe and reliable manner. Attached hereto as Exhibit A is Duke's response Friesian's data request that contains a list of projects that are interdependent to Friesian's upgrades.

Furthermore, DEP has provided information that as a general matter, substantial network upgrades will be needed to accommodate the addition of a substantial amount of new grid resources (not limited to solar resources). The Friesian upgrades are the type of requisite network upgrades that will help to accommodate the interconnection of a substantial amount of additional renewable and other resources. In fact, in addition to solar resources, Duke Energy's 1235 Combined Cycle Plan in Cumberland County is interdependent on the Friesian upgrades.

In conjunction with the study of the Friesen Solar Project along with several other previously queued projects, DEP has identified multiple system upgrades to be constructed prior to allowing the Friesian Solar Project to interconnect to the system. These transmission line upgrades are listed in the table below:

Transmission Upgrades	Description	Distance (Miles)
Erwin –Fayetteville East 230 kV Line	Reconductor to 6-1590 MCM ACSR Conductor	~23
Fayetteville – Fayetteville Dupont 115 kV Line	Reconductor to 3-1590 MCM ACSR Conductor	~3.2
Cape Fear – West End 230 kV Line	Reconductor to 6-1590 MCM ACSR Conductor	~26
Sanford Deep River Tap – Sanford Horner Blvd. 230 kV Line	Reconductor to 6-1590 MCM ACSR Conductor	~4.4
Erwin - Fayetteville 115 kV Line	Reconductor to 3-1590 MCM ACSR Conductor	~8.7
Rockingham – West End 230 kV Line	Upgrade the line to full conductor rating.	~7.7

The Appendices for the draft Large Generator Interconnection Agreement ("LGIA") for Friesian (Q380) includes Friesian's cost responsibility for the upgrades and the need for security when executing the LGIA. The LGIA also contains an outline of the reimbursement schedule for the network upgrade costs after construction is complete and the project is placed in service.

Birdseye Renewable Energy has engaged Charles Askey (Timmons Group) to evaluate the potential benefit of the upgrade projects listed above to DEP's system independent of the addition of the Friesian facility. Specifically, Timmons Group is to perform the following tasks:

1. To the extent possible using a recent version of the 2023 Summer Peak SERC (Southeastern Electric Reliability Council) power flow model, replicate the system impact study performed by Duke Energy Progress on the Friesian Solar Project. The focus being the contingency loading on the most critical system limitations associated with the transmission upgrades in the table listed above;
2. Using study criteria that closely mimics the Duke Energy Progress System Impact Study, evaluate the impact of the Friesian Project by itself on the contingency loading on each of the transmission lines;
3. Using study criteria that closely mimics the Duke Energy Progress System Impact Study, evaluate the contingency loading on each of the transmission lines without the queued generation projects in the model;

Timmons Group scope of work is to document the results of the study and comment on the need for the transmission system upgrades as it relates not just to renewable energy development, but also the origination of any generation in the eastern portion of the Duke Energy Progress System.

Power Flow Model

While Timmons Group can perform studies on the Duke Energy Progress system using the FERC issued power flow models, we cannot duplicate the Duke Energy Progress results exactly primarily because the dispatch of the generation will vary to some extent. However, Timmons Group has attended generation interconnection system impact study review meetings with DEP and Developer Clients and is familiar with the study methodology. Timmons Group's goal with this study is to show the approximate contingency loading levels on the critical facilities and also the relative amounts of those loadings associated with each scenario.

Duke Energy Progress System Impact Study Methodology

As part of their Large Generation Interconnection Procedures ("LGIP"), DEP uses a "Stressed" system model to evaluate impacts to the system caused by Generation Interconnection Facilities. The stated reason for this is to ensure that the DEP-owned transmission system can deliver on firm transmission commitments under the direst of circumstances.

Timmons Group, through its FERC Critical Energy Infrastructure Information (CEII) clearance, has access to the power flow models and maps for the power systems in the mainland United States. The current set of cases has a Southeastern Electric Reliability Council (SERC) 2023 Summer Peak model that Timmons Group will use for the analysis. In evaluating DEP's System Impact Studies of the Friesian Project, Timmons Group was able to access and evaluate Duke Energy's models to perform the requisite generation interconnection studies. Based on those models of the system, the following changes are made to the FERC CEII model in order to perform the scope of work outlined in the background section of this report.

Power Flow Study Assumptions

The power flow model modifications are listed below:

- Loss of the Harris Nuclear Unit;
- Maximum Import of the Duke Energy Progress (DEP) Transmission Reserve Margin (TRM). This is the amount that is defined in their Transmission Planning Summary as 1830 MW. DEP has stated that the VACAR reserve sharing complement of the TRM is 1830 MW. The model was modified to import 1400 MW (1830 MW less DEP's approximate share of the reserve).
- The Duke Energy Progress (DEP) generation dispatch in the study "stressed" case differs significantly from the FERC CEII base case. The net effect of the changes in dispatch biases the system from south to north such that additional flows are seen on the Erwin – Fayetteville East 230 kV Line (EFE230). The dispatch changes include the following:
  - ➢ The Fayetteville area generation is turned on and dispatched full in the stressed model.
    - o Weatherspoon 128MW petroleum liquid generator;
    - o Butler-Warner 225MW combined cycle natural gas generator;
    - o The Fayetteville PWC generation is dispatched full in the DEP Case;
  - ➢ The Roxboro / Mayo plants, located in the northern portion of the state, are ramped down from the dispatch in the FERC base case.
  - ➢ The Goldsboro area plants are ramped down. These plants are located north of the constrained EFE230 line and the dispatch down causes more MW to flow from south to north.
  - ➢ The Lee Combined Cycle 910MW combined cycle natural gas generator is dispatched lower in the stressed case than the FERC case.
  - ➢ The Wayne County 863MW combustion turbine natural gas generator is dispatched in the FERC CEII case, but is dispatched at 0 MW in the stressed Case.
  - ➢ Sherwood A Smith (i.e., Richmond County Energy Complex) 1868MW combined cycle + combustion turbine is located west and south of the EFE230 constraint. The stressed case dispatch is the plants maximum output and is higher than in the FERC base case, aggravating the south to north flows.
  - ➢ The Hamlet (339MW) and Anson County (345MW) natural gas combustion turbine units are dispatched at full output.

Timmons Group cannot match the exact dispatch performed by Duke Energy Progress (DEP) because some of the dispatch is based on proprietary generation cost information. However, using the assumptions provided to Timmons Group during the system impact study review, Timmons Group can approach contingency loading levels on the critical limiting element consistent with DEP's System Impact Study.

The critical contingency that causes the System Operating Limit (SOL) violation varies between the limiting transmission elements. The original system impact study showed that Bay Tree Solar (Q377) was the project that caused the majority of the loading issues; however, changes to queued generation (i.e., projects dropping out of the queue) have resulted in Friesian (Q380) becoming the project with the upgrade cost responsibility in the Generation Interconnection Agreement.

Queued Projects Included in the analysis

After creating the 2023 Summer Peak "Stressed" Power Flow Model described above, queued generation was added to the model to simulate the Friesian Solar System Impact study. These projects are consistent with the projects included in the 2018 summer peak power flow model that DEP used to study the Friesian Solar Project during the Facility Study.

- Q331 – 20 MW
- Q353 – 67 MW
- Q356 – 49.3 MW
- Q358 – 48.9 MW
- Q366 – 67 MW
- Q370 – 55 MW
- Q372 – 34 MW
- Q374 – 100 MW
- Q375 – 50.4 MW
- Q376 – 53.8 MW
- Q377 – 75 MW
- Q378 – 50.4 MW
- Q380 – 70 MW (Friesian Solar)

Timmons Group made dispatch assumptions consistent with the "Stressed Case" philosophy while incorporating the additional 740.8 MW of queued generation into the model.

Analysis

The following scenarios were performed on the stressed case model and the results recorded:

- The Loss of the Wake – Cumberland 500 kV Line and separately the loss of the Cumberland – Richmond 500 kV Line with the queued generation listed above in the model including the Friesian Solar Project;
- The Loss of the Wake – Cumberland 500 kV Line and separately the loss of the Cumberland – Richmond 500 kV Line with the queued generation listed above in the model except the Friesian Solar Project;
- The Loss of the Wake – Cumberland 500 kV Line and separately the loss of the Cumberland – Richmond 500 kV Line with none of the queued generation listed above in the model; and

Table 1 below shows the pre-contingency and post contingency flows, rating and percentage loading on the five limiting elements listed in the background section of the report based on the most critical contingency studied.

Table 1 - Pre-contingency and Post Continency Loading on the Friesian Related System Operating Limits for the loss of the Most Critical Contingency

Scenario	Post Contingency Flow (MVA)	Rating (MVA)	Voltage Adjusted Post Contingency Loading (%)
Limitation: Erwin - Fayetteville East 230 kV (~23 Miles)			
Contingency: Wake - Cumberland 500 kV			
Queue included up through Q380	492	478	105.51%
Queue included except for Q380	484	478	103.74%
No Queue	449	478	95.69%
Limitation: West End - Cape Fear 230 kV (~26.6 Miles)			
Contingency: Richmond - Cumberland 500 kV			
Queue included up through Q380	529	542	100.47%
Queue included except for Q380	523	542	99.32%
No Queue	499	542	94.34%
Limitation: Rockingham - West End 230 kV (7.7 Miles)			
Contingency: Richmond - Cumberland 500 kV			
Queue included up through Q380	505	542	96.13%
Queue included except for Q380	500	542	94.87%
No Queue	477	542	90.12%
Limitation: Erwin - Fayettevlle 115 kV (~8.7 Miles)			
Contingency: Wake - Cumberland 500 kV			
Queue included up through Q380	114	119	97.99%
Queue included except for Q380	112	119	95.89%
No Queue	105	119	89.65%
Limitation: Fayetteville - Fayetteville Dupont 115 kV			
Contingency: Richmond - Cumberland 500 kV			
Queue included up through Q380	120	119	103.54%
Queue included except for Q380	119	119	102.41%
No Queue	114	119	97.31%

Evaluation of Results

As stated earlier, Timmons Group cannot match the loadings exactly that DEP determined in the study of the Friesian Solar Project based on the reasons stated above. However, we believe we have determined loadings that approach the level of those in the System Impact Study based on the Stressed Case approach used by DEP.

DEP's System Impact Study contains the following the following statement regarding power flow results:

> "Facilities that may require upgrade within the first three to five years following the in-service date are identified. Based on projected load growth on the DEP transmission system, facilities of concern are those with post-contingency loadings of 95% or greater of their thermal rating and low voltage of 92% and below, for the requested in-service year or the in-service year of a higher queued request. The identification of these facilities is crucial due to the construction lead times necessary for certain system upgrades. This process will ensure that appropriate focus is given to these problem areas to investigate whether construction of upgrade projects is achievable to accommodate the requested interconnection service."

As can be seen from the results, with the queue loaded up through Project Q380, all the limiting elements are loaded over either 95 percent or 100 percent of their contingency ratings. Obviously, these loading levels are why DEP flagged these as facility loadings that need to be address prior to granting transmission service to the Friesian Solar. However, it is noted the while the loadings are heavy, the loadings without the queue are within five to ten percent of the contingency loading levels without the queued generation listed.

Also note that DEP has two, 1235 MW queued gas projects (Q398 & Q399) which will add significantly to most, if not all these line loadings absent any other upgrades. This projected outcome is consistent with the findings of the Q398 System Impact Study Report that was published in December 2018 and Q399 System Impact Study Report that was published in April 2019. The first report recommends building a new 35 mile, 230 kV line between the Cumberland and Erwin Substations and a similar 230 kV line between the Cumberland and Clinton Substations. While DEP has determined that its first gas project (Q398) is not dependent upon Friesian's upgrades, DEP's second Combined Cycle Plant (Q399) is interdependent upon Friesian's upgrades.

Timmons Group Summary and Conclusion

Based on the Friesian Solar System Impact Study and the study results presented herein, the network upgrades included in the Friesian Interconnection Agreement are required to allow the Friesian Solar Project to connect and deliver power to the system without violating the DEP LGIP Study Methodology. Further, without the Friesian upgrades or additional transmission improvements, new generation resources (i.e., renewable energy, Duke Energy's Gas Project(s), among others) in this area of the system will not be able to achieve full interconnection based on the limitations listed herein.

The benefits that result from the transmission system upgrades will include enhanced load serving capabilities, reduced power system losses and improved flexibility to operate the transmission grid. Finally, Duke Energy's integrated resource plan indicates that additional generation is needed to support load growth and resource portfolio improvements. Whether that new generation comes from renewable energy or other generation resources in eastern North Carolina, it cannot occur without the Friesian network upgrades or other major improvements to DEP's transmission system.

Friesian Holdings, LLC
Data Request No. 2
of
Duke Energy Progress, LLC
Docket No. EMP-105, Sub 0
Date Sent: November 8, 2019
Requested Due Date: November 20, 2019

Sent to Duke Energy Progress, LLC in c/o: Jack Jirak
E-mail: Jack.Jirak@duke-energy.com

Contact for Friesian Holdings, LLC
Karen M. Kemerait
E-mail: kkemerait@foxrothschild.com

1. Please list all projects in Duke's queue that are interdependent upon Friesian (Q380), and the total amount of megawatts of those interdependent projects.

Based on the assessment completed by DEP for interconnection requests received through September 30, 2017, there are 108 interconnection requests totaling 1,561 MW that have been identified as being interdependent on the upgrades assigned to Friesian. See Attachment DR 2-1 for a list of such projects. In addition to the projects specifically identified to date by DEP as interdependent on the Friesian upgrades, there are likely many additional later-queued projects that are also technically interdependent on the Friesian upgrades. Note that all such interdependent projects may also require upgrades in addition to the Friesian upgrades.

As a general matter, the interconnection study process is designed to assess whether upgrades are needed to accommodate a particular generating facility but are not intended to assess whether a particular upgrade will accommodate a particular set of future potential generating facilities. However, it is undoubtedly the case that the Friesian upgrades will at least partially facilitate the interconnection of more than 1,000 MW of additional solar generation.

Attachment%20DR
%202-1.xlsx

2. Please provide the Generator Queue Power Flow Study Case models for the following:

The Study Case referenced in subsection (b) has already been provided to Birdseye's consultant, who has executed the necessary FERC confidentiality document. The Study case referenced in subsections (c) and (d) will also be provided to Birdseye's consultant. The Company is not clear what is being requested in subsection (a) but notes that the Birdseye consultant is able to adjust the inputs in the Study Cases provided.

a. Base Case model with no queue generation dispatch.

b. Study Case with all generation dispatch up to Friesian (Q380).

c. Study Case with all generation dispatch up to Fairbluff (Q387).

d. Any contingency files and/or an explanation of studied scenarios beyond single contingency scenarios.

3. For Q380, please describe the benefits that Q380 upgrades would have on reliability, resiliency, and interconnecting additional renewables (transmission and distribution interconnected) and load.

NERC Reliability Standard TPL-001-4 establishes requirements for planning the interconnected bulk electric system such that the network can be operated to supply real and reactive forecasted loads and projected firm transmission services. DEP already complies with all of these requirements, and the Friesian Upgrades will allow DEP to continue to comply with NERC Reliability Standard TPL-001-4 after the addition of the Q380 project. In addition, the Friesian upgrades will not only provide sufficient capacity to allow the Friesian project to interconnect, but will also provide sufficient capacity to allow many other projects to interconnect due the size the next available upgrade. From an operational perspective, the Friesian upgrades will alleviate interdependency for at least 1,561 MW of additional solar resources, providing a path forward for such projects to interconnect in a safe and reliable manner (though some such projects may require additional upgrades at the transmission or distribution level).

4. Given the progress that has been made on planning the Q380 upgrades based on work funded by deposits already made under the Q380 LGIA, please provide any updates on cost estimates for these upgrades.

There are no cost updates at this time.

5. In Section 3.1 of the System Impact Study of Q398, Duke Energy's 1235 MW Combined Cycle Plant in Cumberland County, NC (as available on DEP's OASIS site as "Q398_SIS_Rev_1.pdf"), option 1 is dependent on upgrades of prior-queued projects. Please provide information as to whether option 2 is dependent on upgrades of prior-queued projects, and if not, why option 2 is not dependent on upgrades of prior-queued projects.

As a general matter, the transmission planning process assumes that all earlier queued projects and their associated upgrades are constructed and therefore does not attempt to assess system impacts based on alternative potential scenarios in which particular planned upgrades are not constructed. However, the Company has determined that Q398 is not dependent on the Friesian upgrades, including when studied under Option 1 or Option 2. Q399 which is a second 1235 MW Combined Cycle Plant in Cumberland County is interdependent on the Friesian upgrades. Also, for the sake of clarity, Option 1 and Option 2 are addressed in Section 3.2 of the Q398 System Impact Study Report.

6. Please describe the benefits that Q398 upgrades would have on reliability, resiliency, and interconnecting additional renewable (transmission and distribution interconnected) and load.

See the Company's responses to DR 2-1 and 2-3.

7. In Duke Energy Carolinas, LLC and Duke Energy Progress, LLC's Response to Commission Questions in August 27, 2019 Order Docket No. E-100, Sub 157 on November 4, 2019, Duke states on page 31: "The scenarios presented do not fully account for the real-world challenges that would be faced in adding a significant number of new grid resources in a short amount of time. Issues not addressed, but required to implement this pace of system transformation, include physical and regulatory challenges affecting the time to construct new assets and their associated interconnection and system upgrade requirements." Please state whether the upgrades associated with the Friesian project address one of the physical challenges affecting the interconnection of new renewable energy resources, and if, so the specific challenges that would be addressed.

As a general matter, substantial network upgrades will be needed to accommodate the addition of a substantial amount of new grid resources. While the referenced Company analysis from Docket No. E-100, Sub 157 did not attempt to identify what specific network upgrades will be needed, the Friesian upgrades are representative of the types of network upgrades that may be needed in the future and the Friesian upgrades would, in fact, help to accommodate the interconnection of a substantial amount of additional renewable and other resources.

8. In the same filing described in question 7 above, Duke states: "The Companies are presenting two potential, illustrative scenarios that would move the Companies closer to achieving 70% CO2 reduction target by 2030, utilizing a 2005 baseline. These reductions are achieved by increasing the pace of coal plant retirements while significantly increasing the Companies' mix of renewables (including wind generation), battery storage, energy efficiency, and combustion turbine (CT) generation." Please state how many additional MWs of renewables are called for in each plan respectively.

As stated in DEC's and DEP's response to the Commission's Question 3(b) filed on November 4, 2019 in Docket No. E-100, Sub 157, the Companies have not developed a preferred plan for how they would comply with the greenhouse gas emission reduction goals of the North Carolina Clean Energy Plan. However, see Table 1 on page 32 of the November 4, 2019 filing for the list of resources that comprise the generation mix under the potential illustrative scenarios, including additional MWs of renewables.

As shown in the potential illustrative scenarios comparison listed on Table 1 on Pg. 32, the base case (51% CO_2 reduction) requires 3,000+ MW of additional solar resources over current amounts. The 60% CO_2 reduction by 2030 scenario projects an additional 669 MW increase in the amount of solar resources (as compared with the base case), while the 64% reduction scenario projects an additional 2,100 MW increase in the amount of solar resources (as compared with the base case).

9. The transmission study that Duke conducted in 2017 finds that CPRE will use up the remainder of grid capacity to interconnect solar resources. Due to this finding, please confirm that in order to connect additional solar resources after CPRE, grid upgrades will be required in both DEC and DEP territories.

Duke is not aware of the referenced study.

10. Please explain whether or not it is possible to achieve a 70% reduction in CO2 emissions by 2030 without the upgrades associated with Q380?

The Company's analysis of potential pathways to further substantial reductions in CO2 has not attempted to assess whether the Friesian upgrades are required for such a reduction. Nevertheless, as stated in the Company's response to DR 2-7, substantial network upgrades will be needed to accommodate substantial amounts of new grid resources. The Friesian upgrades are representative of the types of upgrades that will be needed. The Friesian upgrades will, in fact, accommodate the interconnection of a substantial amount of solar resources which will introduce incremental renewable generation to the system that will, all things being equal, contribute to a reduction in CO_2.

11. Please state the total cost of network upgrades that Duke intends to construct over the next ten years in DEP and DEC territories.

[To be provided]

Queue Number	Generation Size (MW)
CHKLIST-8140	5
CHKLIST-8480	4.999
CHKLIST-8581	7
CHKLIST-8586	4.998
CHKLIST-8624	4.999
CHKLIST-8626	4.999
CHKLIST-8773	6.2
CHKLIST-8977	10
CHKLIST-8987	5
CHKLIST-9061	5
CHKLIST-9196	3.92
CHKLIST-9244	6.9
CHKLIST-9806	8.1
CHKLIST-10113	10.56
CHKLIST-10361	4.998
CHKLIST-10520	8.9
CHKLIST-10493	4.998
CHKLIST-10534	5
CHKLIST-10544	2.2
CHKLIST-10585	4.384
SC2015-00007	2
NC2015-00009	1.999
NC2015-00014	5
SC2015-00005	2
SC2015-00009	2
SC2015-00011	2
SC2015-00012	2
SC2015-00051	2
SC2015-00027	2
SC2015-00047	10
SC2015-00048	8.8
SC2015-00052	10
SC2015-00056	10
SC2015-00069	10
SC2015-00118	10
SC2015-00119	10
SC2015-00120	10
SC2015-00123	10
SC2015-00124	10
SC2015-00126	10
SC2015-00127	10
SC2015-00150	8.16
NC2015-00031	4.998
SC2015-00067	6
SC2015-00136	1

SC2015-00151	6.12
NC2015-00043	4
SC2015-00167	2
SC2015-00168	10.88
NC2016-00010	5
SC2016-00037	2
NC2016-00028	4.998
NC2016-00041	5
SC2016-00075	10
SC2016-00076	10
SC2016-00083	10
CHKLIST-9361	9.996
NC2016-02778	5
NC2016-02789	1.998
NC2016-02796	5
NC2016-02798	5
SC2016-00919	20
NC2016-02809	5
NC2016-02810	4.996
NC2016-02811	5
Q381	75
Q383	80
NC2016-02849	5
Q385	100
NC2016-02869	5
NC2016-02870	5
NC2016-02885	4.992
NC2016-02893	5
NC2016-02897	4.992
NC2016-02902	4.992
Q387	75
NC2016-02917	4.992
NC2016-02928	4.992
NC2016-02935	5
SC2016-01038	2
NC2016-02954	5
SC2016-01042	1.92
Q404	71.5
Q405	60.5
sc2017-01087	1.98
sc2017-01088	1.98
Q406	60.5
Q407	80
SC2017-01122	2
SC2017-01123	2
SC2017-01124	2
Q412	20

Q413	20
NC2017-02998	1.98
Q419	100
Q425	50
Q426	74.5
SC2017-01134	1.98
SC2017-01137	1.98
SC2017-01138	1.98
SC2017-01139	1
SC2017-01140	1.98
Q431	60
Q432	75
SC2017-01144	1.98
SC2017-01146	1.98
SC2017-01150	1.98
Q436	63