15RTEP1 Proposal

SUBMITTED BY: ITC MID-ATLANTIC DEVELOPMENT LLC

August 4, 2015

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A. EXECUTIVE SUMMARY

1. Name and Address

ITC Mid-Atlantic Development LLC
27175 Energy Way
Novi, MI 48377

2. Proposal Window and Associated Violations Addressed

ITC Mid-Atlantic Development LLC ("ITC") has proposed five similar alternatives that resolve the NEW-52 violation which is a thermal overload of the Rogers Rd to Carson 500-kV line identified as a Generator Deliverability issue in the 2015 RTEP Proposal Window 1. Each alternative consists of a greenfield 500kV line project, as detailed in the sections below. The projects also resolve various combinations of 230-kV Generation Deliverability issues on flowgates NEW-32, NEW-34, NEW-36 and NEW-37 near Richmond, VA. The projects and resolved flowgates identified in 2015 RTEP Proposal Window 1 are shown in Table A1 below.

Table A1- Flowgate Resolution

Project	NEW-32	NEW-34	NEW-36	NEW-37	NEW-52	Adverse Impact
15RTEP1-1	Y	Y	Y	Y	Y	None
15RTEP1-2a	Y	N	Y	N	Y	NEW-A
15RTEP1-2b	Y	N	Y	N	Y	NEW-A
15RTEP1-3a	Y	N	Y	N	Y	NEW-A
15RTEP1-3b	Y	N	Y	N	Y	NEW-A

3. Violations Caused or Not Addressed by Proposal

The projects were identified primarily as options to resolve the 500-kV Generator Deliverability issue identified south of Richmond for flowgate NEW-52. Further, the projects were found to provide relief to various combinations of the 230-kV Generator Deliverability issues into Richmond as identified in flowgates NEW-32, NEW-34, NEW-36 and NEW-37. With the exception of the Rawlings to Midlothian Project ("15RTEP1-1"), all other project options resolve flowgates NEW-32 and NEW-36 but NEW-34 and NEW-37 are not resolved.

Projects 15RTEP1-2a, 15RTEP1-2b, 15RTEP1-3a and 15RTEP1-3b all cause a marginal increase to the loading on the Chesterfield-Basin 230-kV line (less than 2%) for the loss of the Carson-Midlothian 500-kV line or the newly created Lakeland-Midlothian 500-kV or Steers-Midlothian 500-kV lines, as identified as a part of the Generator Deliverability test for single contingencies. Note that in base model results the loading on this line was already nearly at 100-percent of its rating limit; however, the branch was not identified as a flowgate generation deliverability issue by PJM.

4. Identification of Interregional Project

All proposed project options are wholly contained within the boundaries of PJM's operating territory and, more specifically, within Dominion's existing territory. They do not propose any interconnection with other PJM Transmission Owners (TO) or TOs outside the PJM footprint.

5. Intentions to Construct/Own/Operate/Maintain

ITC Mid-Atlantic Development LLC does intend to be the Designated Entity to construct, own, operate and maintain the project described in this proposed project submittal.

6. Description of Proposed Solution and Resolution

ITC has identified the following projects to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1 (Figure 1, Table A2):

Table A2- Summary of Proposed Solutions

Project	Line	Proposed Solution	Resolution
15RTEP1-1	Rawlings to Midlothian 500-kV Line	41.6-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to Midlothian substation (Dominion)	• Rogers Rd – Carson 500-kV overload • 230kV Richmond Area Issues
15RTEP1-2a	Rawlings to Lakeland 500-kV Line	24.6-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to a new ITC owned 500-kV Lakeland switchyard	• Rogers Rd – Carson 500-kV overload • 230kV Richmond Area Issues
15RTEP1-2b	Rawlings to Steers 500-kV Line	21.0-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to a new ITC owned 500-kV Steers switchyard	• Rogers Rd – Carson 500-kV overload • 230kV Richmond Area Issues
15RTEP1-3a	Brunswick to Carson 500-kV Line	30.6-miles of new 500-kV single-circuit overhead line from Brunswick substation (Dominion) to Carson substation (Dominion)	• Rogers Rd – Carson 500-kV overload • 230kV Richmond Area Issues
15RTEP1-3b	Rawlings to Carson 500-kV Line	23.1-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to Carson substation (Dominion)	• Rogers Rd – Carson 500-kV overload • 230kV Richmond Area Issues

7. Description of How the Project(s) Should be Considered

Each greenfield proposed project described above in Table A2 is an alternative to address the primary target issue on the 500-kV system and ancillary target issues on the nearby 230-kV system. It is not anticipated for PJM to combine or fracture the ITC projects since there is a high degree of overlap on the resolution. However, ITC makes no prohibition on PJM scope additions, combinations, or reductions to these ITC projects. Future identified issues, perhaps in 2015 RTEP Proposal Window 2, may make such revisions to greenfield project elements the most sensible approach.

The upgrade components of the project are not under ITC control but are critical components to the ITC proposal. Scope revisions, additions and subtractions to incumbent upgrades that are immaterial to the ITC resolution should be considered. The owner of these facilities is best capable of understanding the scope of the project and the more cost effective solution. For example an incumbent could identify a rearrangement at a substation that would increase, or decrease, scope and cost to the incumbent upgrades that would increase or decrease the overall cost of the project.

In summary an ITC greenfield solution should be evaluated independently of whether an incumbent or PJM has a better approach than ITC's to addressing the necessary upgrades to properly incorporate the ITC greenfield proposal.

8. High-Level Overview of Cost and Cost Commitment

The capital cost of the proposed projects in 2015 dollars, including the substation work that would be assigned to incumbent transmission owners, are shown in Table A3 below and described in detail in section E.2.

Table A3– Summary of Total Project Costs

Project	Greenfield Cost in 2015 Dollars ($MM)	Incumbent Cost in 2015 Dollars ($MM)	Total Project Cost in 2015 Dollars ($MM)	Total Project Cost in 2020 ISD Dollars ($MM)
15RTEP1-1	153.8	13.4	167.1	184.1
15RTEP1-2a	101.5	17.5	118.9	131.4
15RTEP1-2b	90.7	15.0	105.7	116.8
15RTEP1-3a	123.3	11.9	135.2	149.3
15RTEP1-3b	78.3	15.9	94.2	104.1

Cost Containment/Commitment

ITC Mid-Atlantic Development LLC ("ITC") is proposing a project cost commitment to provide additional clarity on project cost while also allowing flexibility for contingencies that are outside the control of ITC and which any project owner would experience. First, ITC is committing to a project cost cap in this proposal. Second, it specifies circumstances that may alter the cost cap because they are beyond ITC's control and would be experienced by any project owner.

9. Additional Benefits of Proposal

Economic Benefits

The proposed projects offer economic benefits ranging from $39.8-62.9 Million. Section D.5 describes the economic benefits of each project in more detail.

Unique Qualifications

ITC's success story is the proven integration of established systems, organic expansions and non-incumbent developments into a unified independent transmission company. ITC will apply resources and experience with non-incumbent development to integrate this green-field project into an ITC facility.

ITC has successfully expanded from its origins in Southeast Michigan to include planning, construction, operation and maintenance of over 15,000-miles of transmission facilities in seven states covering three NERC regions and two RTO footprints. ITC is expanding into the PJM footprint and is actively engaged in ensuring all PJM requirements will be met when the new Covert to Segreto 345-kV line in Southwest Michigan goes into service on June 1, 2016. This will be ITC's first project energized in PJM.

Since ITC was formed in 2003, contract maintenance services have been used over its entire multistate footprint. These services have been typically performed via a specialized utility maintenance contractor but in some cases have been in partnership with local utilities.

ITC is a utility in eight states (including Wisconsin where we are in pre-construction on an MVP, our first project in that state) and recognizes states have varying requirements. ITC has gone through many state regulatory processes to become a public utility in the states in which it operates and expects to do the same in any PJM states where ITC is successful in securing projects through the PJM competitive process. ITC will dedicate the necessary resources to pursue that state's requirements to secure such status.

Independent Business Model

ITC's independent transmission business model is unique and vital to its corporate identity. ITC does not own generation or distribution assets; ITC employees and directors are prohibited from owning the stock of market participants (generation owners, load-serving entities, marketers, etc.); and there are strict restrictions on market participants owning ITC stock. Unlike some utilities that have created stand-alone transmission subsidiaries, ITC is not owned by utility companies, holding companies of utilities, or entities that buy or sell energy.

Because ITC is fully independent, it does not have and is not distracted by conflicting interests with generators, markets, electricity retailers and other market participants. ITC's attention is focused on the reliable delivery of low cost energy to end users.

The independent transmission model provides numerous substantial benefits:

- **Transparency:** Throughout transmission development and operations, ITC is transparent in its planning processes, design and routing, construction, operations and maintenance
- **Operational Excellence:** Since high-voltage transmission is ITC's sole focus and the core of its business, it is attentive to transmission operations and brings experience, creative and flexible solutions and an exceptional focus on how an excellent transmission system can benefit customers.
- **Reliability:** Without other activities or lines of business that can become distractions, ITC is completely focused on the reliability of transmission systems.
- **Infrastructure Investment:** Since ITC does not have other capital-intensive businesses such as generation or distribution, there are no internal conflicts for capital that can lead to deferring needed transmission investments.
- **High Quality Credit:** ITC's unique business model and long-term record of achievements in financial management, project development, construction and operations have resulted in investment-grade credit ratings, which ITC is committed to retaining. Higher credit quality enables consistent and predictable access to capital, even during challenging economic times, and results in lower borrowing costs.
- **Public Policy Alignment:** ITC's independence does not favor any specific type of generation, but ITC's focus on transmission efficiency and flexibility results in a more robust transmission system that can be a strong facilitator of various public policies.

- **Facilitate Generator Interconnections:** Since ITC does not own generation that may be impacted by new generation or transmission facilities, generators will be treated fairly throughout the interconnection process.

- **Customer Focus:** ITC's independence from all electricity generators, buyers and sellers allows planned improvements to the electric transmission grid for the broadest public benefit including seams and regional projects.

FERC has also recognized the benefits of an independent transmission company. ITC's superior record of investment in reliability and economic infrastructure to facilitate energy markets has been recognized in federal policies aimed at perpetuating and replicating ITC's independent model. Benefits cited by FERC include:

1. Improved asset management, including increased investment;
2. Improved access to capital markets, given a more focused business model than that of vertically-integrated utilities;
3. Development of innovative services; and
4. Additional independence from market participants

In summary, ITC offers the following benefits to PJM:

- **Vast Resources** – Because ITC is the largest independent transmission owner in the country, it has the resources needed to undertake all sizes and complexities of projects;
- **Experience in the PJM Region** – Existing connections and the Covert-Sergreto project means ITC will have a reduced or very minimal learning curve, so we can hit the ground running in PJM earlier than other non-incumbent owners;
- **Experience Operating Infrastructure in Different Regions** – ITC has owned, operated and maintained more than 15,600 miles of transmission lines in seven states, serving a combined peak-load of more than 26,000 MW;
- **Experience participating in Multiple Regional Processes** – ITC is a transmission-owning member in both the Midcontinent Independent System Operator (MISO) and the Southwest Power Pool (SPP) Regional Transmission Organizations (RTO) and actively participates in both the planning and operations process of both RTOs;
- **Scalable Resources** – ITC can match its expertise based on the needs of its customers because of its close working relationships with industry-leading consultants and contracting firms.

B. COMPANY EVALUATION INFORMATION

1. Name and Address of Primary and Secondary Contact

Primary Contact:

Thomas Wrenbeck

Email: twrenbeck@itctransco.com

Phone: 248-946-3464

ITC Mid-Atlantic Development LLC

27175 Energy Way

Novi, MI 48377

Secondary Contact:

Daniel Oginsky

Email: doginsky@itctransco.com

Phone: 248-946-3563

ITC Mid-Atlantic Development LLC

27175 Energy Way

Novi, MI 48377

2. Pre-Qualification Submittal Identification Number

ITC Mid-Atlantic Development LLC (14-02 ITC) affirms that the information included in our pre-qualification application dated March 2014 and posted on the PJM website reflects the company's present qualifications.

3. Technical & Engineering Qualifications

ITC Mid-Atlantic Development LLC (ITC Mid-Atlantic) is a wholly-owned subsidiary of ITC Grid Development, LLC, which is itself a wholly-owned subsidiary of ITC Holdings Corp. (ITC). ITC Mid-Atlantic was formed to develop, construct, own, operate, maintain and finance transmission facilities in PJM. As a wholly-owned subsidiary of ITC Grid Development, LLC, ITC Mid-Atlantic has full access to the resources, capabilities and expertise of ITC Holdings Corp., a Michigan corporation and its affiliates.

ITC is the nation's first, largest and only publicly traded independent transmission company. Since its founding in 2003, ITC has invested over $4.8 billion in the electric transmission grid to improve reliability, expand non-discriminatory access to markets, lower the overall cost of delivered energy and allow new generating resources to interconnect to its transmission systems regardless of ownership. In its first 10 years, ITC successfully acquired and integrated three transmission businesses. In addition, ITC established a new subsidiary company, ITC Great Plains LLC (ITC Great Plains or ITCGP), a new pioneering transmission-only utility that was created from the ground-up. ITC Great Plains has identified and facilitated critical regional transmission infrastructure in the Southwest Power Pool (SPP) footprint, and has constructed a portfolio of actionable transmission development projects by partnering with local utilities and electric cooperatives.

a. Operating Companies

A brief summary of the existing operating companies provides a high-level context of ITC and its capabilities to develop and own transmission projects (approvals, siting, engineering, construction, operations and maintenance).

ITC Companies in MISO and SPP

ITC has four operating companies that own, operate and maintain transmission assets of multiple voltage levels in diverse geographies and conditions: International Transmission Company, d/b/a; ITC*Transmission* (ITCT); Michigan Electric Transmission Company, LLC (METC); ITC Midwest LLC (ITCMW); and ITC Great Plains, LLC (ITCGP) (see Table B1).

ITC*Transmission* (ITCT), the operating company in Southeast Michigan is comprised of approximately 3,000 circuit miles of transmission assets formerly owned by DTE Electric and its parent company DTE Energy. ITCT has invested over $1.4 billion to upgrade and expand this system. ITCT serves the densely populated Detroit metropolitan area and its concentration of automotive and other manufacturing and supplier facilities in the region. ITCT's transmission system includes predominantly 120-kV and 345-kV facilities. ITCT also owns and operates some 230-kV facilities, as well as underground transmission facilities operated at 120-kV and 345-kV. ITCT has existing transmission interconnections with the IESO (HydroOne) and PJM (ATSI).

The METC transmission system serves much of the remainder of Michigan's Lower Peninsula and is made up of the transmission assets formerly owned by Consumers Energy and its parent company CMS Energy. METC's transmission system has approximately 5,600 circuit miles of 138-kV and 345-kV facilities. Over $950 million has been invested in the METC system to strengthen the transmission network. METC also has existing interconnections with PJM (AEP).

ITC Midwest (ITCMW) serves most of Iowa and parts of Minnesota, Illinois and Missouri with approximately 6,600 circuit miles of transmission assets formerly owned by Interstate Power and Light Company and its parent company Alliant Energy. ITC has invested over $1.4 billion into the ITCMW system since acquiring the assets in late 2007. The ITCMW footprint is predominantly rural and includes 34.5-kV, 69-kV, 115-kV, 161-kV and 345-kV facilities. ITCMW has existing interconnections with PJM (ComEd) as well.

Table B1 – ITC Line Miles by Voltage

Voltage	ITC Line miles
<100-kV	4,271
100-kV – 230-kV	7,338
345-kV	3,754
Total	15,363

ITC Great Plains (ITCGP) operates approximately 436-miles of 345-kV transmission facilities in Kansas and Oklahoma. Preconstruction activities are underway for another 30-miles of 345-kV transmission. Unlike ITC's other operating companies, ITCGP was not created from the acquisition of an existing transmission system; it was built from the ground up by establishing a presence in a new region, acquiring discrete transmission assets and acquiring the rights to construct, own and operate specific facilities through co-development agreements with utilities in Kansas and Oklahoma.

ITC is also expanding into PJM and is actively engaged in ensuring all PJM requirements will be met when the new Covert to Segreto 345-kV line in Southwest Michigan goes into service on June 1, 2016. This is expected to be ITC's first project energized in PJM.

In summary, ITC offers the following benefits to PJM:

- Largest independent transmission owner in the country: *resources needed to undertake complex projects*
- Experience in the PJM region through existing connections and the Covert-Segreto project: *reduces learning curve and enables ITC to hit the ground running on day one*
- Experience owning, operating and maintaining more than 15,600-miles of transmission line in seven states serving a combined peak load of more than 26,000 megawatts (MW): *processes in place to operate infrastructure in many different regions*
- Transmission-owning member of both Midcontinent Independent System Operator (MISO) and Southwest Power Pool (SPP) Regional Transmission Organizations (RTOs): *experience participating in multiple regional processes*
- Close working relationships with industry-leading consulting firms: *ability to scale up and down resources to match expertise with PJM's needs*

b. ITC Engineering

ITC's in-house engineering staff totals nearly 288 engineering employees across the Design, Project Management, Operations and Planning departments. These resources include: 46 engineers (over 600 total years of experience) in project development functions such as detailed design for high-voltage electrical infrastructure and 10 project management engineers (over 300 total years of experience). ITC has also developed close working relationships with industry-leading consulting firms that work hand-in-hand with ITC on detailed engineering and design packages. These consultants act as an extension of ITC and often have teams solely dedicated to ITC projects. This arrangement enables ITC to scale resources up and down to match expertise with the present transmission development needs.

All design packages are reviewed, finalized and approved for construction by ITC internal engineering staff. ITC will continue to use its internal expertise in both substation design engineering and transmission line design engineering in coordination with its consulting firms to develop future projects.

Through the detailed design process, ITC strives to create efficiency and optimize the system performance and functionality. This effort has resulted in standardization of substation layouts, protective relay and control panels, control center design, substation equipment and line structures. This standardization method streamlines design, creates efficiencies during maintenance practices and optimizes required inventories due to the use of interchangeable parts.

To ensure ITC's expectations are achieved, certain policies, practices, processes and field manuals have been developed. These include but are not limited to:

- [redacted]
- [redacted]
- [redacted]
- [redacted]

ITC's design and construction standards meet or exceed National Electric Safety Code (NESC) requirements. ITC has committed to constructing transmission to a NESC Grade B standard or above. It is the objective of ITC to maintain best-in-class construction standards and techniques to provide a reliable and efficient transmission system.

c. Operations & Maintenance

Effective maintenance ensures ITC's transmission facilities remain in proper condition to perform their intended function, whether during routine operations, switching or emergency conditions. ITC's maintenance program has four building blocks:

[redacted]

These maintenance practices, when taken together and applied to the various categories of maintenance we perform (i.e., preventative, reactive, facilities, vegetation and vehicular), form our comprehensive maintenance program.

The comprehensive maintenance program described above has increased reliability by maximizing the availability of critical equipment during the times of greatest need. ITC is committed to completing all annual maintenance activities necessary to ensure North American Electric Reliability Corporation (NERC) compliance in all areas (i.e., vegetation management, line and substation equipment). This is the link between the first and second components of ITC's maintenance practices. We have a set of robust practices for performing maintenance on the transmission system and we have consistently performed 100% of the annual maintenance plan.

ITC also has a reputable safety record, well inside the top quartile for both recordable incident rates and lost workday case incident rates as indicated in Tables B3 and B4 below.

Table B2 - Lost Work Day Case Incident Rate

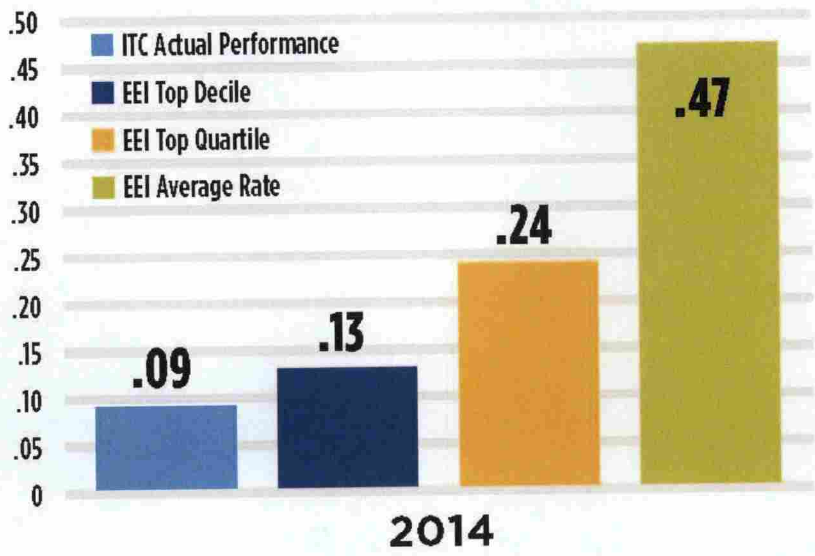
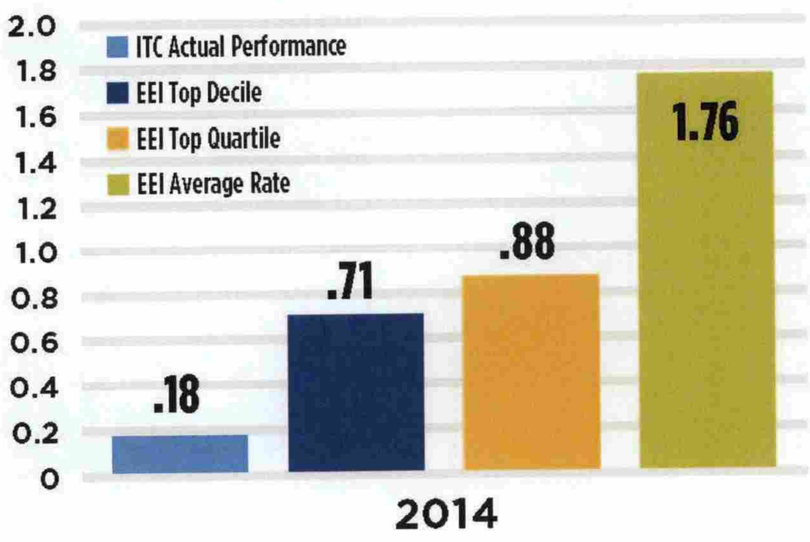


Table B3 - Recordable Incident Rate



4. Experience

a. Developing, Constructing, Operating and Maintaining

ITC has significant experience developing, constructing, operating and maintaining transmission facilities to help improve reliability, reduce congestion, improve system efficiency and interconnect new generation to load all leading to lowering the overall costs of delivered energy to ITC's customers. ITC's history demonstrates that we do this with the intent of holding those assets over the long-term (ITC does not "flip" transmission investments). Several recent examples of transmission development and construction are provided below. ITC's primary consultants have experience designing 500-kV lines, as well as experience with Project Management at those voltages. For the design and construction of 500-kV facilities, ITC would leverage the expertise of industry-leading consultants to perform the work. ITC is well prepared to successfully construct, own and operate the proposed facilities given the well-established ITC resources for similar facilities.

Thumb Loop Project

The Michigan Thumb Loop project was the first of MISO's Multi-Value Projects (MVPs) to be approved and will serve as the backbone of a system designed to meet requirements set by Michigan's Wind Energy Resource Zone Board. The Thumb Loop project will also provide additional power delivery capacity for future economic development thereby helping existing businesses grow and also attract new businesses, jobs and investment to the region. Representing a $510 million investment in Michigan's grid, the project consists of approximately 140-miles of double-circuit, 345-kV lines and four new substations. ITC has led the planning, construction and development phases, working with skilled labor, engineering and project management organizations to prudently manage project resources and deliver exceptional results. ITC continues to be on time and on budget with this project – a testament to the company's project management and construction team abilities.

Phase 1 of the project was placed in-service in September 2013, while Phase 2 entered into service in May, 2014. The remainder of the project was completed and put in-service in May 2015. In total, the Thumb Loop project includes nearly 800 structures consisting of both tubular steel poles and lattice steel towers. Additional lines and facilities are being added as wind generators go into service and connect to the system to fulfill the requirements of the State of Michigan's Renewable Portfolio Standard. The Thumb Loop project is an example of ITC's efforts to improve the national electric transmission system, create access to competitive energy markets and foster growth for local and regional economies – all for the benefit of customers.

KETA Project

The Kansas Electric Transmission Authority (KETA) identified this particular project in 2007 through its initiatives to bring significant economic and reliability benefits to Kansas and the regional transmission grid. KETA is an organization that was created in 2005 by the Kansas Electric Transmission Authority Act (HB 2263) and is intended to promote and facilitate the expansion of Kansas transmission infrastructure for the betterment of the Kansas economy. This 227-mile project runs from Spearville, Kansas, in the southwestern part of Kansas; north to the Post Rock substation just outside of Hays, Kansas; and then north to Axtell, Nebraska. ITCGP worked with the incumbent electric cooperatives to acquire the rights to build the Kansas portion of this 345-kV project, from Spearville to the Kansas/Nebraska state line. This allowed the electric cooperatives to deploy their own limited capital for other projects in their footprints and to utilize ITC's expertise in building, operating and maintaining the transmission project. Our agreement with the electric cooperatives prevented them from having to choose between new generation resources for meeting their load obligations and transmission investment to bring cheaper and renewable resources to the region. The electric cooperatives chose to allow ITC the opportunity to bring the transmission project to fruition. ITC placed its portion of the KETA (Spearville-Axtell) transmission project into service in 2012. The Nebraska portion was constructed and is operated by the Nebraska Public Power District. ITC completed its 174-mile portion in Kansas significantly under budget and ahead of schedule, which demonstrates ITC's focus and commitment to cost containment and operational excellence.

V-Plan

In cooperation with Sunflower Electric Power Corporation and Mid-Kansas Electric Company, ITC has designed has constructed two segments of the V-Plan project which totals approximately 122-miles of double-circuit 345-kV line. The high-voltage transmission line is designed to connect eastern and western Kansas to improve electric reliability and enable energy developers to tap into the transmission grid. The project was placed in-service in December 2014.

Au Sable Circuit

This 110-mile line from Zilwaukee to Mio, Michigan, is important to electric reliability in northeastern Michigan. In June 2014, ITC completed rebuilding and upgrading this line from single-circuit 138kV to future double-circuit 230-kV design and construction standards. This will increase its capacity and reliability, provide increased lightning protection and facilitate potential future 230-kV expansion in northern Michigan. The project is the result of ITC's rigorous planning process that is designed to anticipate future customer needs and provide the grid flexibility to meet those needs in an efficient and cost-effective manner.

Multi-Value Projects (MVPs)

ITC is advancing its portions of four Multi-Value Projects (MVPs) in Iowa, Minnesota and Wisconsin. Following approval of these projects by MISO in late 2011, ITC has focused on siting preparations and worked with other utilities to finalize ownership levels of the projects in support of our targeted in-service dates. In 2014, two 345-kV line sections received Iowa regulatory approval and easements have been secured. Also in 2014, regulatory hearings were completed toward the Certificate of Need and Route Permit in Minnesota. These projects are part of MISO's MVP portfolio and are anticipated to provide broad regional benefits while also supporting approved state and federal energy policy mandates in the MISO region. Anticipated in-service dates of the projects range from 2015 to 2020.

ITC will build portions of the following projects:

- MVP 3 – a joint project with MidAmerican Energy Company of about 70-miles in Minnesota and about 145-miles in Iowa.
- MVP 4 –a joint project with MidAmerican Energy Company of approximately 190-miles in Iowa.
- MVP 5 – a joint project with American Transmission Company (ATC) of about 160-miles in Wisconsin and Iowa.
- MVP 7 – a joint project with MidAmerican; approximately 90-miles in Iowa and Missouri.

Underground Experience

ITC owns, operates and maintains 53 circuits that are either partially or entirely underground. These transmission circuits are located in dense urban areas and serve as integral components of the ITC footprint. In locations with routing and siting constraints that make overhead transmission lines impractical, these underground circuits provide ITC a prudent method of ensuring vital system reliability.

ITC utilizes its strong relationships with qualified firms to install underground circuits via Engineering/ Procurement/ Construction (EPC) contracts. In 2005, ITC improved its underground facilities by reconductoring 7.29-miles of the Caniff-Stephens 345-kV circuit in Metropolitan Detroit.

High Pressure Oil-Filled 2500-kcmil conductor was installed, replacing the existing 2000-kcmil cable to provide a reliable solution to system issues. In2007, ITC installed a new 4.53-mile Erin to Stephens 120-kV circuit in Metropolitan Detroit. Both of these circuits, along with the remainder of its underground transmission circuits, supplement ITC's overhead backbone system, providing a comprehensive transmission network.

b. Standardized Construction Practices

Adherence to Standardized Construction, Maintenance & Operating Practices

ITC has an exceptionally strong record of adhering to standardized construction, maintenance and operating procedures. ITC's construction capabilities are demonstrated in numerous transmission projects that have been completed on time and, as noted above, within their original budget. ITC's operations and maintenance practices are equally strong with similar records of achievement. We have standard construction specification documents to which our construction teams adhere.

Operations and Maintenance

ITC's operations and maintenance activities deliver exceptional reliability benefits to our customers and help accommodate evolving demands on the systems such as increased use of the transmission system, integration into energy markets and facilitation of public policy initiatives. ITC has a fundamental responsibility to comply with all applicable NERC Reliability Standards and Requirements and to operate and maintain its systems in accordance with good utility practice. In addition to these, and perhaps most visible to our customers, is ITC's goal of striving for top quartile reliability performance. Reliability depends on four key system factors:

- Design
- Capital Improvements
- Operations
- Maintenance

Efficient system design and cost-effective capital improvements help ensure the system expands and is improved, promoting consistently fewer and shorter outages. The ITC Capital Maintenance Program involves the systematic upgrading of aging and/or obsolete equipment such as circuit breakers, switches, relays, surge arrestors, transmission line structures, security infrastructure and other equipment on a recurring basis. As an example, the average age of circuit breakers in the

ITCTransmission and METC systems has decreased more than 11 years as a result of this program. Additionally, unreliable or maintenance-intensive equipment is upgraded or replaced with state-of-the-art equipment that is more dependable, more environmentally friendly and easier to maintain.

Our focus on operations involves using existing assets in the most efficient and reliable manner possible. For example, advanced protection schemes and systems monitor the transmission grid and maintain reliability during outages. These systems have the ability to collect data, localize a fault, and help determine the cause of an outage.

The importance that ITC places on effective maintenance ensures ITC's transmission facilities remain in proper condition to perform their intended function, whether during routine operations, switching, or emergency conditions. ITC's maintenance practices are comprised of four components:

1. Practices must be thorough so that all individual components receive the appropriate level of preventive maintenance and they must be comprehensive so that all equipment is included.
2. Completion of 100% of the maintenance plan every year. If a component requires periodic maintenance, then it must receive the required maintenance within its scheduled interval.
3. The "immediate action" approach, which requires corrective actions be taken for any equipment deemed unfit for service.
4. Continuous improvement, by implementing outage root-cause analysis and feedback into both the maintenance and the capital improvement plans.

These maintenance practices, when applied to ITC's multiple maintenance categories (preventive, reactive, facilities, vegetation and vehicular) comprise our comprehensive maintenance program, which has increased reliability by maximizing the availability of critical equipment during times of greatest need. ITC's focus, commitment and execution in these areas has not only markedly improved system reliability, it has reduced the annual cost for reactive maintenance and enabled ITC to shift approximately three-quarters of the total operations and maintenance budget to preventive maintenance and operations/training. Trend data reveals a consistent reduction in reactive or unplanned maintenance, which indicates fewer outages, and an emphasis on proactive preventive maintenance.

Emergency Response & Restoration Capability

Quickly restoring power is critical is a core competency of ITC. ITC maintains an Emergency Operations Plan, which provides the framework for responding to and recovering from all types of transmission system emergencies, in accordance with FEMA's Incident Command System (ICS) principles.

All ITC operating companies use dedicated field O&M contractors that are under exclusive contract with ITC for storm restoration. ITC supplements its dedicated O&M contractor crews with construction crews contracted to work on existing ITC capital projects. Both ITC's dedicated field O&M contractors and capital project crews are large, national companies that ITC can call on for resources and logistics above and beyond what is required by ITC's existing ITCT, METC, ITCMW and ITCGP operating companies. ITC has the ability to leverage these existing national contractors to deploy crews to the PJM region or any other region in the United States to support both storm restoration efforts and post-storm work.

ITC follows a well-defined and straightforward approach in organizing emergency response activities. The approach includes:

- An Emergency Operations Center is established with leads from key functional areas.
- The Vice President of Operations or COO serves as the Emergency Response Coordinator. This responsibility often is delegated to a Regional Field Director for smaller incidents.
- Leaders are appointed for specific areas such as damage assessment, restoration, operations, communications and logistics. Personnel are assigned dependent upon the type of incident and operating company/region(s) involved.
- An emergency response coordinator schedules and conducts periodic conference calls to obtain updates and facilitate information sharing between all functional areas.
- Depending upon the size of the area impacted and what distribution entities are affected (municipal utility, electric cooperative or IOU) a liaison from ITC will be assigned to work at the local distribution company operations center. The liaison's primary purpose is to ensure information flow necessary to prioritize restoration efforts of areas affected.

As necessary, ITC also supports and relies on other utilities for mutual assistance. We are members and participants in the Midwest Mutual Assistance Group and the Great Lakes Mutual Assistance Group. We anticipate joining the North Atlantic Mutual Assistance Group as we broaden our operating footprint. We also have experience cross-supporting our own operating companies with warehouses in Michigan supporting Iowa or Minnesota, or vice versa.

One of ITC's strengths is the ability to mobilize quickly and effectively. Weather events often strike the ITC system with little or no warning, requiring an immediate response. ITC employees and contractors excel at prioritizing and focusing organized efforts on safely and quickly restoring the transmission system to ensure grid reliability and prompt restoration of service to customers.

One example of ITC's capability for emergency response and restoration of damaged equipment is our storm restoration record. In the early morning hours of July 11, 2011, a storm, with winds of more than 100-miles per hour, swept through central Iowa. At its peak, Interstate Power and Light, the electric utility providing retail service to many customers in the area, estimated that more than 45,000 of its retail customers across four counties lost power. Thousands more customers who were served by electric cooperatives and municipal utilities were also impacted. The storm knocked out nine 161-kV lines, two 69-kV lines and twenty 34.5-kV lines across the ITCMW system and affected approximately 60 substations. More than 300 poles required replacement. The National Oceanic and Atmospheric Administration said the storm was the most widespread and damaging wind event to affect central and east central Iowa since 1998.

Within 72 hours, ITCMW restored transmission service to all customers and customer substations that could take service, pending the repairs of their distribution systems. Once all customer connections were re-established, crews began working to provide backup feeds to those substations. The secondary feeds were critical to serve the returning load as distribution customers were returned to service.

Many other examples of ITC's timely remedying of facility failures due to weather or other events are available upon request.

c. Regional Experience

ITC has experience working with PJM through its multiple existing system interconnections and is familiar with its functions and history. Three of ITC's four operating companies have interconnections with PJM transmission owners.

ITC maintains a strong track record of providing crews to support PJM during extreme weather and other emergency events. Our extensive experience with other RTOs, combined with our experience in PJM, offers tangible benefits in the form of our independence and history as an owner, operator and developer of transmission throughout the country.

As an example of this, ITC resources have supported utilities in PJM in emergency situations, including deployment of 167 personnel to New Jersey and eastern Pennsylvania in response to

Hurricane Sandy. These resources came from Michigan, Iowa and Minnesota. ITC resources have also supported PJM member Commonwealth Edison during emergency situations.

Outside of PJM, ITC has extensive experience in a wide range of activities with multiple RTOs including transmission project development, advocacy and participation in Federal Energy Regulatory Commission (FERC) Order 890 Compliant stakeholder planning processes. ITC has MISO transmission assets in Michigan, Iowa, Minnesota, Illinois and Missouri. ITC also has SPP operational transmission assets in Oklahoma and Kansas.

ITC has been a member of MISO since the company's inception in 2003. ITC is one of the largest transmission owners in MISO and is actively involved in a wide range of activities, committees and working groups. We have a valuable working relationship with MISO management and staff and have proven to be a contributing and collaborative member.

ITC played a key leadership role in advocating regional transmission projects, which resulted in MISO's MVPs – a set of 17 regional projects valued at $5.2 billion.

ITCGP has been a member of the SPP since 2007. As an SPP transmission owner, we have strong working relationships with SPP management and staff. Since 2007, through its leadership positions on various task forces and working groups, ITCGP has been a consistent participant in the SPP planning process, advocating for specific large-scale regional projects. Participation and advocacy in these groups resulted in SPP's approval of approximately $500 million of transmission expansion projects that are in varying stages of development or operation by ITCGP.

ITC is also expanding into the PJM footprint and actively engaged in ensuring all PJM requirements will be met when the new Covert to Segreto 345-kV line in Southwest Michigan goes into service on June 1, 2016. This will be ITC's first project energized in PJM.

d. Acquiring Right-of-Way and Permitting

ITC has extensive experience acquiring rights-of-way (ROW) in the eastern interconnection. ITC's primary land acquisition firm, who would likely work on this project if we are successful, has extensive experience working on ROW acquisition projects in the region where this project is proposed. This experience is another strength offered by ITC. ITC will acquire ROW in PJM in the same manner that has generated success by obtaining broad stakeholder support in routing, siting and permitting. The siting process begins with a routing study that considers multiple stakeholders broadly and carefully. As a project advances, ITC begins ROW acquisition, working extensively and collaboratively with landowners to secure land rights on a voluntary basis. ROW is generally secured voluntarily and ITC makes every effort to work with landowners. However, even when ITC has filed condemnation actions, the company continues to work with the landowners and is often able to reach mutually acceptable resolution outside of the judicial forum.

Transmission development requires a wide variety of permits ranging from road crossing permits to Department of Natural Resources and U. S. Army Corps of Engineer permits. Since 2009, ITC has obtained more than 1,500 permits. ITC has a well-established permitting process involving a cross-functional team led by a Design Engineering group that also includes Project Engineering, Environmental, Legal and Local Governmental and Community Affairs groups. This team works closely with consulting firms to identify required permits for the project and provide the information needed for filing permit applications. ITC has effectively leveraged a variety of local, regional and national firms to successfully acquire the required permits, including [redacted] A few examples of our siting and permitting experience are cited below.

As part of our environmental management system and in line with our best-in-class approach to conducting business, ITC is committed to considering environmental impacts in its decision-making process when planning infrastructure improvement projects. Transmission line projects can span many miles and occasionally cross environmentally sensitive areas. ITC's project teams understand this and include environmental assessments for wetlands, threatened and endangered species and other sensitive habitats as part of the planning process.

Examples:

KETA project: A 174-mile, single-circuit, 345-kV line on new ROW in Kansas. ITC performed a routing study and worked with the state siting authority to secure route approval. ITC secured 10 Department of Transportation (DOT) permits and 15 Department of Environmental Quality (DEQ) permits for the project. ITC also worked with the U.S. Fish and Wildlife Service and the Kansas Department of Wildlife, Parks and Tourism on whooping crane protection and lesser prairie chicken habitat protection and remediation.

Salem-Hazleton project: An 81-mile, single-circuit, 345-kV line on mostly new ROW in Iowa. ITC was able to successfully negotiate co-locating approximately 20-miles of the new line jointly with another transmission company's facility. ITC worked through the Iowa Utilities Board siting process. ITC secured six Iowa DOT permits, one DEQ permit, 124 road crossing permits, two Department of Natural Resources permits or letters of no effect, three Federal Aviation Administration permits, three county floodplain permits and two Army Corp of Engineers permits or letters of no effect.

Thumb Loop project: A 140-mile, double-circuit, 345-kV line in Michigan. ITC actively participated in the Michigan Public Service Commission (MPSC), which approved the preferred route. Phase 1 of the project was energized in September 2013. Phase 2 was placed in-service in May 2014. The project has an in-service date of 2015. To date, ITC has obtained 16 Michigan DOT permits, 20 DEQ permits, six soil erosion permits, 175 county road crossing permits and 60 drain commission permits.

V-Plan project: A 122-mile, double-circuit, 345-kV line under construction in Kansas with a projected in-service date of December 2014. ITC obtained siting approval from the Kansas Corporation Commission and to date has obtained nine Kansas DOT and five DEQ permits. ITC worked with environmental stakeholders to find alternative routes to minimize impact to landowners and to lesser prairie chicken habitat and to help facilitate further wind farm development.

5. Financing Plan and Financial Statements

ITC Mid-Atlantic Development LLC is a wholly-owned subsidiary of ITC Holdings Corp. (ITC). ITC is the nation's largest independent electricity transmission company, operating in seven states and serving a combined peak load in excess of 26,000 MW through its regulated operating subsidiaries. ITC is a highly rated entity with senior unsecured ratings of BBB+/Stable from Standard & Poor's and Baa2/Stable at Moody's.

ITC has significant access to liquidity with a present maximum capacity on its revolving credit facility of $400 million. This facility is financed by banking institutions including [redacted] The facility also has an [redacted] expansion feature that would allow the company the capability to [redacted] in cash in a short time. Moreover, ITC has a proven track record of accessing both public and private capital markets on a timely basis to construct green-field projects and reinvestments in existing assets. In summary, ITC has a solid balance sheet, strong credit ratings and significant access to liquidity with deep access to capital markets.

Copies of the financial statements for the parent company ITC Holdings Corporation are contained in Appendix C to this proposal and include the Form 10K for 2012, 2013 and 2014 along with most recent second quarter 2015 10Q.

6. Commitment to execute Consolidated Transmission Owner Agreement

If ITC Mid-Atlantic LLC is the successful bidder of a project and becomes a Designated Entity, ITC Mid-Atlantic Development LLC commits to execute the PJM Interconnection Consolidated Transmission Owners Agreement.

C. CONSTRUCTABILITY INFORMATION

1. Scope and Detailed Breakdown of Project Elements

ITC has identified the Rawlings to Midlothian (15RTEP1-1), Rawlings to Lakeland (15RTEP1-2a), Rawlings to Steers (15RTEP1-2b), Brunswick to Carson (15RTEP1-3a) and Rawlings to Carson #2 (15RTEP1-3b) 500-kV line projects to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. A high level summary of each of these projects is provided in Table C1 below.

Table C1 – Project Scope Summaries

Project	Line	Project Scope
15RTEP1-1	Rawlings to Midlothian 500-kV Line	• 41.6-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to Midlothian substation (Dominion) • Modifications at Rawlings and Midlothian 500-kV Substations (Dominion)
15RTEP1-2a	Rawlings to Lakeland 500-kV Line	• 24.6-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to a new 500-kV Lakeland switchyard (ITC) • Modifications at the Rawlings 500-kV Substation (Dominion) • Greenfield ring bus Lakeland Switchyard (ITC) • Reconductor 12.5-miles of the Chesterfield-Messer-Charles City 230-kV line (Dominion)
15RTEP1-2b	Rawlings to Steers 500-kV Line	• 21-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to a new 500-kV Steers switchyard (ITC) • Modifications at the Rawlings 500-kV Substation (Dominion) • Greenfield ring bus Steers Switchyard (ITC) • Reconductor 12.5-miles of the Chesterfield-Messer-Charles City 230-kV line (Dominion)
15RTEP1-3a	Brunswick to Carson 500-kV Line	• 30.6-miles of new 500-kV single-circuit overhead line from Brunswick substation (Dominion) to Carson substation (Dominion)

		• Modifications at the Brunswick and Carson 500-kV Substations (Dominion) • Reconductor 12.5-miles of the Chesterfield-Messer-Charles City 230-kV line (Dominion)
15RTEP1-3b	Rawlings to Carson 500-kV Line	• 23.1-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to Carson substation (Dominion) • Modifications at the Rawlings and Carson 500-kV Substations (Dominion) • Reconductor 12.5-miles of the Chesterfield-Messer-Charles City 230-kV line (Dominion)

Any of these projects would be a highly beneficial addition to the PJM system 500-kV backbone upon which the entire PJM interconnection system heavily depends on for reliability and security as well as market efficiency. Due to this vital nature, the benefit of reusing or co-locating new transmission adjacent to existing right-of-way should be weighed against the benefit provided by using new right-of-way that provides locational diversity. Such diversity would improve security and potentially mitigate or reduce the occurrence of catastrophic and widespread outages.

[redacted]

For each project detailed below, the proposed configuration provides unique advantages with respect to constructability, cost and schedule and every project would enable the realization of benefits from ITC's standard processes, vendor alliances and other partnerships described in Section B above.

a. 15RTEP1-1: Rawlings to Midlothian 500-kV Transmission Line Project

The Rawlings to Midlothian 500-kV line is a comprehensive solution to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. This project, referred to as 15RTEP1-1, consists of constructing approximately 41.6-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to Midlothian substation (Dominion).

Greenfield Transmission Line Details

The project will use all-overhead construction with primarily steel towers and triple bundled 954-kcmil conductor. [redacted] Table C1a below shows the proposed project terminal points.

Table C1a – Terminal Points

	Beginning Station (Existing)	Ending Station (Existing)
Station Name	Rawlings	Midlothian
Owner	Dominion	Dominion
Voltage	500-kV	500-kV
State	Virginia	Virginia
County	Brunswick	Chesterfield
Coordinates	[redacted]	

Route and Geographic Description

For the development of this proposal, a high-level study was conducted to identify a route representative of what could reasonably be expected for a project of this type in this area. [redacted]

Portions of six cities are located within the study area (Table C2a). The largest of these cities is Petersburg, Virginia.

Table C2a – Major Cities within the Study Area

City	County	Population
[redacted]		

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Public Opposition

Overhead electric transmission line projects can be some of the most controversial projects in the United States. They typically involve the crossing of private property, the clearing of vegetation and the construction of large structures that are visible to the public. Often they cross multiple jurisdictions and political boundaries with competing interests. The risk for public opposition is always there, but the outcomes can be greatly mitigated by engaging and involving the full range of project stakeholders early, often and throughout the life of the project.

Physical Characteristics

The electrical and physical characteristics for the proposed line are shown in Table C7a below. A typical 500-kV overhead transmission structure cross-section is included as Figure 2 of Appendix A.

Table C7a – Line Characteristics

	Overhead Line – 41.6-miles
Construction	[redacted] See Figure 2, Appendix A
Nominal Voltage Rating	500-kV
AC or DC	AC
Summer Normal Rating	3[redacted] MVA
Summer Emergency Rating	4[redacted] MVA
Grounding Design (for underground circuits)	N/A

Configuration	[redacted]
Phase Conductor Type	
Shield Wire Conductor Type (for overhead circuits)	

Facilities to be Constructed by Others

The proposed project requires the expansion of the existing Midlothian substation and the under development Rawlings substation to accommodate the termination of the proposed line. The assumed scope of work required at each station is shown below; however, the final scope of work is subject to change and would be determined by the existing transmission owner in coordination with ITC.

Any proposed upgrades to existing TO-owned substations meet the publicly posted criteria on the PJM website and are subject to modification by the TO if necessary. If the proposed upgrades are deemed infeasible, with a PJM scope change, ITC could construct new greenfield facilities to minimize the impact to the existing TO facilities and to accommodate the project.

Midlothian Substation

Conceptual One Line Diagram: Figure 3, Appendix A

Conceptual Arrangement Plan: Figure 4, Appendix A

- Add three 500-kV SF6 gas circuit breakers and associated switches to create a four position ring bus in a breaker and a half configuration
- Add two new line entrance structures (A-frame or H-frame), one at each breaker and a half bay. The Carson-Midlothian line would re-terminate on the new structure in its existing bay.
- The North Anna-Midlothian line would re-terminate on the existing structure.
- The proposed line to Rawlings would enter from the southeast side of the station.
- The existing fence should not need to be expanded.
- The demarcation point for the Midlothian – Rawlings line would be the first structure within the substation fence.
- Install line and breaker relays to protect the proposed line.
- Install metering CTs and metering equipment for the proposed Midlothian – Rawlings line.

Documentation from a PJM TEAC presentation dated 5/8/2014 noted a proposed upgrade at the Midlothian station to replace 500-kV breaker 563T576 and motor operated switches with a three-breaker 500-kV ring bus. The presentation also shows terminations of lines #563 Carson to Midlothian and #576 Midlothian to North Anna and Transformer #2 in the new ring. If these upgrades are in service prior to the 2020 implementation of this proposal, the substation scope of work will be significantly reduced to adding a single entrance structure, single breaker & associated disconnect switches. This would reduce the cost of the upgrades at the Midlothian station, reduce outages at Midlothian and reduce the overall cost of the 15RTEP1-1 proposal.

Rawlings Substation

Conceptual One Line Diagram: Figure 5, Appendix A

Conceptual Arrangement Plan: Figure 6, Appendix A

- Add three 500-kV SF6 gas circuit breakers and associated switches to create a fully built out, two bay, breaker and a half configuration
- Add new line entrance structures (A-frame or H-frame) to existing bay to accommodate the new Midlothian – Rawlings line.
- The proposed line would likely enter from the east side of the station. However, details of exact site layout were not available due to either outdated satellite imagery or the site not currently constructed
- It is assumed the existing fence should not need to be expanded.
- The demarcation point on the Midlothian – Rawlings line would be the first structure within the substation fence.
- Install line, breaker & bus relays to protect the proposed line and the bus given the new configuration
- Install metering CTs and metering equipment for the proposed Midlothian – Rawlings line.

Relaying

The proposed substation expansion relaying at both stations would consist of primary and secondary line protection relays, breaker control relays, breaker failure relays, primary and secondary bus differential relaying and minor modifications to the existing line relaying schemes. It is assumed that the line relaying design would be the responsibility of the existing substation owners and that OPGW would be installed and used for line differential relaying.

Substation Land

The scope of work at Midlothian and Rawlings do not require expansion of the existing substation footprints. No additional land should be needed.

Transmission Line & Substation Outages

- [redacted]

Note: Revisions to constructability outages may be required upon detailed construction planning.

Total Cost of Project and Major Components

Table C8a below provides a summary of major component costs for the project, in 2015 dollars. Section E.2 discusses the costs associated with this project in further detail.

Table C8a – 15RTEP1-1 Project Costs

Components	COST ($MM)
Transmission Line Components	
[redacted]	
Substation Components	
[redacted]	
GRAND TOTAL (2015 dollars)	**$167.1**

b. 15RTEP1-2a: Rawlings to Lakeland 500-kV Transmission Line Project

The Rawlings to Lakeland 500-kV line is a balanced solution to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. This project, referred to as 15RTEP1-2a, consists of constructing approximately 24.6-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to a new ITC owned Lakeland switchyard.

Greenfield Switchyard Details

The project includes a greenfield substation, named Lakeland, that loops in the Carson-Midlothian 500-kV line. The assumed scope of work required at the new station is shown below;

Lakeland Substation (New Greenfield)

Conceptual One Line Diagram: Figure 13, Appendix A

Conceptual Arrangement Plan: Figure 14, Appendix A

- The 500-kV switchyard would be a three position ring bus, in a two-bay breaker and a half configuration
- The existing Carson-Midlothian line would be looped in on the northeast and northwest sides of the new switchyard at approximately 20 Transmission line miles from Carson substation.
- The new proposed Rawlings - Lakeland line would enter from the southeast side of the station.
- The demarcation point for the Rawlings - Lakeland line would be the first structure within the substation fence.

The exact location of the new substation would be determined by optimizing the final route of the transmission line combined with the ideal location for a new substation. Substation locations that were considered are shown in Figure 19 of Appendix A.

Relaying

The new substation relaying would consist of primary and secondary line relays for each 500-kV line, breaker control & breaker failure relays for each 500-kV breaker, an RTU & communications panel, a DFR panel and revenue meters for the new Rawlings - Lakeland proposed line. Line relay upgrades would also be required at the remote ends of the line (Carson & Midlothian).

ITC has developed standard relay system designs to protect its equipment and has long standing working relationships with its control panel vendors. Standard design packages are available for line relaying with power line carrier, line relaying using current differential, transformer differential, bus differential and breaker control panels. All design packages are redundant protection schemes. The use of pilot protection and direct transfer trip is determined by system stability studies and fault analysis.

ITC typically uses [redacted] relays that have established industry track records. ITC makes use of the advanced communication technologies available on these relays for system protection, operation, control and metering. ITC's use of standard relay panel designs allows for quick deployment and installation in the field and quick replacement and restoration in the event of a failure. It is assumed that ITC would coordinate the line relaying design with the existing substation owners and that OPGW would be installed and used for line differential relaying.

Substation Land

ITC has investigated land options and identified multiple feasible site options. A single site alternative was used to develop cost-estimates. This site is located at coordinates (37°15'21.40"N, 77°36'45.54"W) and is shown in Figure 19 in Appendix A. The switchyard would be approximately 5-acres in size.

Greenfield Transmission Line Details

The project will use all-overhead construction with primarily steel towers and triple bundled 954-kcmil conductor. ITC benefits from supplier alliances and recent construction experience with this conductor. Table C1b below shows the proposed project terminal points.

Table C1b – Terminal Points

	Beginning Station (Existing)	Ending Station (New)
Station Name	Rawlings	Lakeland
Owner	Dominion	ITC
Voltage	500-kV	500-kV
State	Virginia	Virginia
County	Brunswick	Dinwiddie
Coordinates	[redacted]	

Route and Geographic Description

For the development of this proposal, a high-level study was conducted to identify a route representative of what could reasonably be expected for a project of this type in this area. [redacted]

Portions of three cities are located within the study area (Table C2b). The largest of these cities is Sutherland, Virginia.

Table C2b – Major Cities within the Study Area

City	County	Population
[redacted]		

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Public Opposition

Overhead electric transmission line projects can be some of the most controversial projects in the United States. They typically involve the crossing of private property, the clearing of vegetation and the construction of large structures that are visible to the public. Often they cross multiple jurisdictions and political boundaries with competing interests. The risk for public opposition is always there, but the outcomes can be greatly mitigated by engaging and involving the full range of project stakeholders early, often and throughout the life of the project.

Physical Characteristics

The electrical and physical characteristics for the proposed line are shown in Table C7b below. A typical 500-kV overhead transmission structure cross-section is included as Figure 2 of Appendix A.

Table C7b – Line Characteristics

	Overhead Line – 24.6-miles
Construction	[redacted] See Figure 2, Appendix A
Nominal Voltage Rating	500-kV
AC or DC	AC
Summer Normal Rating	3[redacted] MVA
Summer Emergency Rating	4[redacted] MVA
Grounding Design (for underground circuits)	N/A
Configuration	[redacted]
Phase Conductor Type	
Shield Wire Conductor Type (for overhead circuits)	

Facilities to be Constructed by Others

The proposed project requires the expansion of the under development Rawlings substation to accommodate the termination of the proposed line. The assumed scope of work required at each station is shown below; however, the final scope of work is subject to change and would be determined by the existing transmission owner in coordination with ITC.

Any proposed upgrades to existing TO-owned substations meet the publicly posted criteria on the PJM website and are subject to modification by the TO if necessary. If the proposed upgrades are deemed infeasible, with a PJM scope change, ITC could construct new greenfield facilities to minimize the impact to the existing TO facilities and to accommodate the project.

Rawlings Substation

Conceptual One Line Diagram: Figure 11, Appendix A

Conceptual Arrangement Plan: Figure 12, Appendix A

- Add three 500-kV SF6 gas circuit breakers and associated switches to create a fully built out, two bay, breaker and a half configuration
- Add new line entrance structures (A-frame or H-frame) to existing bay to accommodate the new Rawlings - Lakeland line.
- The proposed Rawlings - Lakeland line would likely enter from the east side of the station. However, details of exact site layout were not available due to either outdated satellite imagery or the site not currently constructed
- It is assumed the existing fence should not need to be expanded.
- The demarcation point for the Rawlings - Lakeland line would be the first structure within the substation fence.
- Install line, breaker & bus relays to protect the proposed line and the bus given the new configuration
- Install metering CTs and metering equipment for the proposed Rawlings - Lakeland line.

Relaying

The proposed substation expansion relaying at Rawlings would consist of primary and secondary line protection relays, breaker control relays, breaker failure relays, primary and secondary bus differential relaying and minor modifications to the existing line relaying schemes. It is assumed that ITC would coordinate the line relaying design with the existing substation owners and that OPGW would be installed and used for line differential relaying.

Substation Land

The scope of work at Rawlings does not require expansion of the existing substation footprint. No additional land should be needed.

Transmission Line & Substation Outages

- [redacted]

Note: Additional constructability outages may be required upon detailed construction planning.

Total Cost of Project and Major Components

Table C8b below provides a summary of major component costs for the project, in 2015 dollars. Section E.2 discusses the costs associated with this project in further detail.

Table C8b – 15RTEP1-2a Project Costs

Components		COST ($MM)
Transmission Line Components		
	[redacted]	
Substation Components		
	GRAND TOTAL (2015 dollars)	**$118.9**

c. 15RTEP1-2b: Rawlings to Steers 500-kV Transmission Line Project

The Rawlings to Steers 500-kV line is a streamlined solution to address the Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. This project, referred to as 15RTEP1-2b, consists of constructing approximately 21.0-miles of new 500-kV single-circuit overhead line from the proposed Rawlings substation (Dominion) to a new ITC owned Steers switchyard.

Greenfield Switchyard Details

The project includes a greenfield substation, named Steers, that loops in the Carson-Midlothian 500-kV line. The assumed scope of work required at Steers is shown below.

Steers Substation (New Greenfield)

Conceptual One Line Diagram: Figure 24, Appendix A

Conceptual Arrangement Plan: Figure 25, Appendix A

- The 500-kV switchyard would be a three position ring bus, in a two-bay breaker and a half configuration
- The existing Carson-Midlothian line would be looped in on the northeast and northwest sides of the new switchyard at approximately 6.9 Transmission line miles from Carson station.
- The new proposed Rawlings – Steers line would enter from the southeast side of the station.
- The demarcation points would be the first structure within the substation fence.

The exact location of the new substation would be determined by optimizing the final route of the transmission line combined with the ideal location for a new substation. Possible substation locations are shown in Figure 21 of Appendix A.

Relaying

The new substation relaying would consist of primary and secondary line relays for each 500-kV line, breaker control & breaker failure relays for each 500-kV breaker, an RTU & communications panel, a DFR panel and revenue meters for the new proposed Rawlings – Steers line. Line relay upgrades would also be required at the remote ends of the line (Carson & Midlothian).

ITC has developed standard relay system designs to protect its equipment and has long standing working relationships with its control panel vendors. Standard design packages are available for line relaying with power line carrier, line relaying using current differential, transformer differential, bus differential and breaker control panels. All design packages are redundant protection schemes. The use of pilot protection and direct transfer trip is determined by system stability studies and fault analysis.

ITC typically uses [redacted] relays that have established industry track records. ITC makes use of the advanced communication technologies available on these relays for system protection, operation, control and metering. ITC's use of standard relay panel designs allows for quick deployment and installation in the field and quick replacement and restoration in the event of a failure. It is assumed that ITC would coordinate the line relaying design with the existing substation owners and that OPGW would be installed and used for line differential relaying.

Substation Land

ITC has investigated land options and identified multiple feasible site options. A single site alternative was used to develop cost-estimates. This site is located at coordinates (37° 7'50.88"N, 77°31'1.51"W). The switchyard would be approximately 5-acres in size. ITC is working closely with an existing landowner to obtain an option to construct the Steer substation on property near these coordinates and will update PJM when this finalized in the near future.

Greenfield Transmission Line Details

The project will use all-overhead construction with primarily steel towers and triple bundled 954-kcmil conductor. [redacted] Table C1c below shows the proposed project terminal points.

Table C1c – Terminal Points

	Beginning Station (Existing)	Ending Station (New)
Station Name	Rawlings	Steers
Owner	Dominion	ITC
Voltage	500-kV	500-kV
State	Virginia	Virginia
County	Brunswick	Dinwiddie
Coordinates	[redacted]	

Route and Geographic Description

For the development of this proposal, a high-level study was conducted to identify a route representative of what could reasonably be expected for a project of this type in this area. [redacted]

Portions of three cities are located within the study area (Table C2c). The largest of these cities is Sutherland, Virginia.

Table C2c – Major Cities within the Study Area

City	County	Population
[redacted]		

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Public Opposition

Overhead electric transmission line projects can be some of the most controversial projects in the United States. They typically involve the crossing of private property, the clearing of vegetation and the construction of large structures that are visible to the public. Often they cross multiple jurisdictions and political boundaries with competing interests. The risk for public opposition is always there, but the outcomes can be greatly mitigated by engaging and involving the full range of project stakeholders early, often and throughout the life of the project.

Physical Characteristics

The electrical and physical characteristics for the proposed line are shown in Table C7c below. A typical 500-kV overhead transmission structure cross-section is included as Figure 2 of Appendix A.

Table C7c - Line Characteristics

	Overhead Line – 21.0-miles
Construction	[redacted] See Figure 2, Appendix A
Nominal Voltage Rating	500-kV
AC or DC	AC
Summer Normal Rating	3[redacted] MVA
Summer Emergency Rating	4[redacted] MVA
Grounding Design (for underground circuits)	N/A
Configuration	[redacted]
Phase Conductor Type	
Shield Wire Conductor Type (for overhead circuits)	

Facilities to be Constructed by Others

The proposed project requires the expansion of the under development Rawlings substation to accommodate the termination of the proposed line. The assumed scope of work required at each station is shown below; however, the final scope of work is subject to change and would be determined by the existing transmission owner in coordination with ITC.

Any proposed upgrades to existing TO-owned substations meet the publicly posted criteria on the PJM website and are subject to modification by the TO if necessary. If the proposed upgrades are deemed infeasible, with a PJM scope change, ITC could construct new greenfield facilities to minimize the impact to the existing TO facilities and to accommodate the project.

Rawlings Substation

Conceptual One Line Diagram: Figure 22, Appendix A

Conceptual Arrangement Plan: Figure 23, Appendix A

- Add three 500-kV SF6 gas circuit breakers and associated switches to create a fully built out, two bay, breaker and a half configuration

- Add new line entrance structures (A-frame or H-frame) to existing bay to accommodate the new Rawlings – Steers line.
- The proposed line to Steers would likely enter from the east side of the station. However, details of exact site layout were not available due to either outdated satellite imagery or the site not currently constructed
- It is assumed the existing fence should not need to be expanded.
- The demarcation point on the Rawlings – Steers line would be the first structure within the substation fence.
- Install line, breaker & bus relays to protect the proposed line and the bus given the new configuration
- Install metering CTs and metering equipment for the proposed Rawlings – Steers line.

Relaying

The proposed substation expansion relaying at Rawlings would consist of primary and secondary line protection relays, breaker control relays, breaker failure relays, primary and secondary bus differential relaying and minor modifications to the existing line relaying schemes. It is assumed that ITC would coordinate the line relaying design with the existing substation owners and that OPGW would be installed and used for line differential relaying.

Substation Land

The scope of work at Rawlings does not require expansion of the existing substation footprint. No additional land should be needed.

Transmission Line & Substation Outages

- [redacted]
-
-

Note: Additional constructability outages may be required upon detailed construction planning.

Total Cost of Project and Major Components

Table C8c below provides a summary of major component costs for the project, in 2015 dollars. Section E.2 discusses the costs associated with this project in further detail.

Table C8c – 15RTEP1-2b Project Costs

Components	COST ($MM)
Transmission Line Components	
[redacted]	
GRAND TOTAL (2015 dollars)	**$105.7**

d. 15RTEP1-3a: Brunswick to Carson 500-kV Line Project

The Brunswick to Carson 500-kV line is a balanced solution to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. This project, referred to as 15RTEP1-3a, consists of constructing approximately 30.6-miles of new 500-kV single-circuit overhead line from Brunswick substation (Dominion) to Carson substation (Dominion).

Greenfield Transmission Line Details

The project will use all-overhead construction with primarily steel towers and triple bundled 954-kcmil conductor. ITC benefits from supplier alliances and recent construction experience with this conductor. Table C1d below shows the proposed project terminal points.

Table C1d – Terminal Points

	Beginning Station (Existing)	Ending Station (Existing)

Station Name	Brunswick	Carson
Owner	Dominion	Dominion
Voltage	500-kV	500-kV
State	Virginia	Virginia
County	Brunswick	Dinwiddie
Coordinates	[redacted]	

Route and Geographic Description

For the development of this proposal, a high-level study was conducted to identify a route representative of what could reasonably be expected for a project of this type in this area. [redacted]

Portions of six cities are located within the study area (Table C2d). The largest of these cities is DeWitt, Virginia.

Table C2d – Major Cities within the Study Area

City	County	Population
[redacted]		

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Public Opposition

Overhead electric transmission line projects can be some of the most controversial projects in the United States. They typically involve the crossing of private property, the clearing of vegetation and the construction of large structures that are visible to the public. Often they cross multiple jurisdictions and political boundaries with competing interests. The risk for public opposition is always there, but the outcomes can be greatly mitigated by engaging and involving the full range of project stakeholders early, often and throughout the life of the project.

Physical Characteristics

The electrical and physical characteristics for the proposed line are shown in Table C6d below. A typical 500-kV overhead transmission structure cross-section is included as Figure 2 of Appendix A.

Table C6d – Line Characteristics

	Overhead Line – 30.6-miles
Construction	[redacted] See Figure 2, Appendix A
Nominal Voltage Rating	500-kV
AC or DC	AC
Summer Normal Rating	3[redacted] MVA
Summer Emergency Rating	4[redacted] MVA
Grounding Design (for underground circuits)	N/A
Configuration	[redacted]
Phase Conductor Type	
Shield Wire Conductor Type (for overhead circuits)	

Facilities to be Constructed by Others

The proposed project requires the expansion of the existing 500-kV Brunswick substation and the existing 500-kV Carson substation to accommodate the termination of the new proposed line. The assumed scope of work required at each station is shown below; however, the final scope of work is subject to change and would be determined by the existing transmission owner in coordination with ITC.

Any proposed upgrades to existing TO-owned substations meet the publicly posted criteria on the PJM website and are subject to modification by the TO if necessary. If the proposed upgrades are deemed infeasible, with a PJM scope change, ITC could construct new greenfield facilities to minimize the impact to the existing TO facilities and to accommodate the project.

Transmission Line Modifications

The proposed line would cross the existing 500-kV Rawlings to Carson line. If required, modifications to the existing line facilities would be performed by the existing transmission owner.

Brunswick Substation

Conceptual One Line Diagram: Figure 26, Appendix A

Conceptual Arrangement Plan: Figure 27, Appendix A

- Add one 500-kV SF6 gas circuit breaker and associated disconnect switches to create a fully built out breaker and a half configuration in the bay of the new 500-kV line
- Add new line entrance structures (A-frame or H-frame) to existing bay to accommodate the new Brunswick – Carson line.
- The proposed line would likely enter from the west side of the station. However, details of exact site layout were not available due to either outdated satellite imagery or the site not currently constructed
- It is assumed the existing fence should not need to be expanded.
- The demarcation point for the Carson line would be the first structure within the substation fence.
- Install line & breaker relays to protect the proposed line in the new configuration
- Install metering CTs and metering equipment for the proposed Brunswick – Carson line.

Carson Substation

Conceptual One Line Diagram: Figure 28, Appendix A

Conceptual Arrangement Plan: Figure 29, Appendix A

- Add one 500-kV SF6 gas circuit breaker and associated disconnect switches to create a fully built out breaker and a half configuration
- No new line entrances would be required. The Carson-Midlothian line would be reterminated to the bay with the added breaker. The new Brunswick-Carson line would then be terminated in the previous position of the Carson-Midlothian line
- The proposed Brunswick – Carson line would enter from the west side of the station.
- The existing fence should not need to be expanded.
- The demarcation point for the Brunswick – Carson line would be the first structure within the substation fence.
- Install two new line relays and breaker relays to protect the reterminated Carson – Midlothian line and new proposed Brunswick – Carson line.
- Install metering CTs and metering equipment for the proposed Brunswick – Carson line.

Available planning data indicates that significant line termination modifications are under development at Carson substation. Based on this data, the following one line diagrams depict the existing, intermediate and proposed equipment arrangements at Carson substation.

[redacted]

It shall be noted that in order to accommodate the re-termination of the Carson-Midlothian line and the addition of the new Brunswick-Carson line, this work will likely require replacing up to two transmission structures currently utilized by the Carson-Midlothian line. Replacing these structures and modifying their location will allow the new Brunswick-Carson line to be brought into the west side of the substation. It is also worth noting that at least one 500-kV line crossing of the under development Rawlings-Carson line may be required.

Relaying

The proposed relaying would consist of primary and secondary line protection relays, breaker control relays, breaker failure relays and minor modification to the existing line & bus relaying schemes. It is assumed that the existing substation owners will be responsible for the line relaying design and that OPGW would be installed and used for line differential relaying.

Substation Land

The scopes of work at Brunswick and Carson do not require expansion of the existing substation footprints. No additional land should be needed.

Transmission Line & Substation Outages

- [redacted]

Note: Additional constructability outages may be required upon detailed construction planning.

Total Cost of Project and Major Components

Table C7d below provides a summary of major component costs for the project, in 2015 dollars. Section E.2 discusses the costs associated with this project in further detail.

Table C7d – 15RTEP1-3a Project Costs

Components	COST ($MM)
Transmission Line Components	
	[redacted]
Substation Components	
GRAND TOTAL (2015 dollars)	$135.2

e. 15RTEP1-3b: Rawlings to Carson #2 500-kV Line Project

Tthe Rawlings to Carson #2 500-kV line is a streamlined solution to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. The project alleviates the overloads seen on the Rogers Rd – Carson 500-kV line as reported by PJM for the Generator Deliverability test. This project, referred to as 15RTEP1-3b, consists of constructing approximately 23.1-miles of new 500-kV single-circuit overhead line from Rawlings substation (Dominion) to Carson substation (Dominion).

Greenfield Transmission Line Details

The project will use all-overhead construction with primarily steel towers and triple bundled 954-kcmil conductor. ITC benefits from supplier alliances and recent construction experience with this conductor. Table C1e below shows the proposed project terminal points.

Table C1e – Terminal Points

	Beginning Station (Existing)	Ending Station (Existing)
Station Name	Rawlings	Carson
Owner	Dominion	Dominion
Voltage	500-kV	500-kV
State	Virginia	Virginia

County	Brunswick	Dinwiddie
Coordinates	[redacted]	

Route and Geographic Description

For the development of this proposal, a high-level study was conducted to identify a route representative of what could reasonably be expected for a project of this type in this area. [redacted]

Portions of six cities are located within the study area (Table C2e). The largest of these cities is DeWitt, Virginia.

Table C2e – Major Cities within the Study Area

City	County	Population
[redacted]		

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

[redacted]

Public Opposition

Overhead electric transmission line projects can be some of the most controversial projects in the United States. They typically involve the crossing of private property, the clearing of vegetation and the construction of large structures that are visible to the public. Often they cross multiple jurisdictions and political boundaries with competing interests. The risk for public opposition is always there, but the outcomes can be greatly mitigated by engaging and involving the full range of project stakeholders early, often and throughout the life of the project.

Physical Characteristics

The electrical and physical characteristics for the proposed line are shown in Table C6e below. A typical 500-kV overhead transmission structure cross-section is included as Figure 2 of Appendix A.

Table C6e – Line Characteristics

	Overhead Line – 23.1-miles
Construction	[redacted]

	[redacted] See Figure 2, Appendix A
Nominal Voltage Rating	500-kV
AC or DC	AC
Summer Normal Rating	3[redacted]MVA
Summer Emergency Rating	4[redacted]MVA
Grounding Design (for underground circuits)	N/A
Configuration	[redacted]
Phase Conductor Type	
Shield Wire Conductor Type (for overhead circuits)	

Facilities to be Constructed by Others

The proposed project requires the expansion of the existing 500-kV Rawlings substation and the existing 500-kV Carson substation to accommodate the termination of the new proposed line. The assumed scope of work required at each station is shown below; however, the final scope of work is subject to change and would be determined by the existing transmission owner in coordination with ITC.

Any proposed upgrades to existing TO-owned substations meet the publicly posted criteria on the PJM website and are subject to modification by the TO if necessary. If the proposed upgrades are deemed infeasible, with a PJM scope change, ITC could construct new greenfield facilities to minimize the impact to the existing TO facilities and to accommodate the project.

Transmission Line Modifications

The proposed line would cross the existing 500-kV Rawlings to Carson line. If required, modifications to the existing line facilities would be performed by the existing transmission owner.

Rawlings Substation

Conceptual One Line Diagram: Figure 35, Appendix A

Conceptual Arrangement Plan: Figure 36, Appendix A

- Add three 500-kV SF6 gas circuit breakers and associated switches to create a fully built out, two bay, breaker and a half configuration
- Add new line entrance structures (A-frame or H-frame) to existing bay to accommodate new Carson – Rawlings #2 line.

- The proposed Carson – Rawlings #2 line would likely enter from the east side of the station. However, details of exact site layout were not available due to either outdated satellite imagery or the site not currently constructed
- It is assumed the existing fence should not need to be expanded.
- The demarcation point for the Carson – Rawlings #2 line would be the first structure within the substation fence.
- Install line, breaker & bus relays to protect the proposed line and the bus given the new configuration
- Install metering CTs and metering equipment for the proposed Carson – Rawlings #2 line.

Carson Substation

Conceptual One Line Diagram: Figure 37, Appendix A

Conceptual Arrangement Plan: Figure 38, Appendix A

- Add one 500-kV SF6 gas circuit breaker and associated disconnect switches to create a fully built out breaker and a half configuration
- No new line entrances would be required. The Carson-Midlothian line would be reterminated to the bay with the added breaker. The new Carson – Rawlings #2 line would then be terminated in the previous position of the Carson-Midlothian line
- The proposed Carson – Rawlings #2 line would enter from the west side of the station.
- The existing fence should not need to be expanded.
- The demarcation point for the Carson – Rawlings #2 line would be the first structure within the substation fence.
- Install two new line relays and breaker relays to protect the reterminated Carson – Midlothian line and new proposed Carson – Rawlings #2 line.
- Install metering CTs and metering equipment for the proposed Carson – Rawlings #2 line.

Available planning data indicates that significant line termination modifications are under development at Carson substation. Based on this data, the following one line diagrams depict the existing, intermediate and proposed equipment arrangements at Carson substation.

[redacted]

[redacted]

It shall be noted that in order to accommodate the re-termination of the Carson-Midlothian line and the addition of the new Carson – Rawlings #2 line, this work will likely require replacing up to two transmission structures currently utilized by the Carson-Midlothian line. Replacing these structures and modifying their location will allow the new Rawlings-Carson #2 line to be brought into the west side of the substation. It is also worth noting that at least one 500-kV line crossing of the under development Rawlings-Carson #1 line will be required.

Relaying

The proposed relaying would consist of primary and secondary line protection relays, breaker control relays, breaker failure relays, primary and secondary bus differential relaying and minor modification to the existing line & bus relaying schemes. It is assumed that the existing substation owners would be responsible for the line relaying design and that OPGW would be installed and used for line differential relaying.

Substation Land

The scope of work at Rawlings and Carson do not require expansion of the existing substation footprints. No additional land should be needed.

Transmission Line & Substation Outages

- [redacted]

Note: Additional constructability outages may be required upon detailed construction planning.

Total Cost of Project and Major Components

Table C7e below provides a summary of major component costs for the project, in 2015 dollars.

Section E.2 discusses the costs associated with this project in further detail.

Table C7e – 15RTEP1-3b Project Costs

Components	COST ($MM)
Transmission Line Components	[redacted]
Substation Components	
GRAND TOTAL (2015 dollars)	$94.2

2. Regional and Interregional Requirements

All proposed project options are wholly contained within the boundaries of PJM's operating territory and, more specifically, within Dominion's existing territory. There are no proposed interconnections with any other PJM Transmission Owners (TO) or neighboring ISO/RTO operating regions. For these reasons, ITC notes that these projects are not considered to be interregional in nature and will not be seeking interregional cost allocation.

D. ANALYTICAL ASSESSMENT

1. Equipment Parameters and Assumptions

[redacted]

[redacted]

2. Model Data

On July 20th, 2015 ITC submitted all the modeling data to PJM for each of the proposals. The information below is a summary of the information that was previously provided.

Rawlings to Midlothian 500-kV Line

The transmission line characteristics used for modeling the new 15RTEP1-1 500-kV line is shown in Table D1 below.

Table D1: 15RTEP1-1 Model Data

From		To		CKT	R (p.u.)	X (p.u.)	B (p.u.)	Rate A (MVA)	Rate B (MVA)	Length (miles)
314936	8RAWLINGS	314914	8MIDLTHAN	1	0.0002[redacted]	0.004[redacted]	1.7[redacted]	3[redacted]	4[redacted]	41.6

Rawlings to Lakeland 500-kV Line

The transmission line characteristics used for modeling the new 15RTEP1-2a 500-kV line is shown in Table D2 below.

Table D2: 15RTEP1-2a Model Data

From		To		CKT	R (p.u.)	X (p.u.)	B (p.u.)	Rate A (MVA)	Rate B (MVA)	Length (miles)
314936	8RAWLINGS	999991	NEWSWYD	1	0.0001[redacted]	0.002[redacted]	1.0[redacted]	3[redacted]	4[redacted]	24.6

Rawlings to Steers 500-kV Line

The transmission line characteristics used for modeling the new 15RTEP1-2b 500-kV line is shown in Table D3 below.

Table D3: 15RTEP1-2b Model Data

From		To		CKT	R (p.u.)	X (p.u.)	B (p.u.)	Rate A (MVA)	Rate B (MVA)	Length (miles)
314936	8RAWLINGS	999991	NEWSWYD	1	0.0001[redacted]	0.002[redacted]	0.9[redacted]	3[redacted]	4[redacted]	21.0

Brunswick to Carson 500-kV Line

The transmission line characteristics used for modeling the new 15RTEP1-3a 500-kV line is shown in Table D4 below.

Table D4: 15RTEP1-3a Model Data

From		To		CKT	R (p.u.)	X (p.u.)	B (p.u.)	Rate A (MVA)	Rate B (MVA)	Length (miles)
314935	8BRUNSWICK	314902	8CARSON	2	0.0001[redacted]	0.003[redacted]	1.3[redacted]	3[redacted]	4[redacted]	30.6

Rawlings to Carson #2 500-kV Line

The transmission line characteristics used for modeling the new 15RTEP1-3b 500-kV line is shown in Table D5 below.

Table D5: 15RTEP1-3b Model Data

From		To		CKT	R (p.u.)	X (p.u.)	B (p.u.)	Rate A (MVA)	Rate B (MVA)	Length (miles)
314936	8RAWLINGS	314902	8CARSON	2	0.0001[redacted]	0.002[redacted]	0.9[redacted]	3[redacted]	4[redacted]	23.1

Reconductor Chesterfield to Basin 230kV Line

In the event that the reconductor of the Chesterfield to Basin 230kV line is the required solution to the marginal overloading caused by the new 500kV lines the detail is provided below. These were included in each of the project idevs and cases with label of Chesterfield in the file name. The transmission line characteristics used for modeling the upgraded line is shown in Table D6 below.

Table D6: Reconductor Chesterfield-Basin 230kV Model Data

From		To		CKT	R (p.u.)	X (p.u.)	B (p.u.)	Rate A (MVA)	Rate B (MVA)
314287	6CHSTFB	314276	6BASIN	1	0.001[redacted]	0.01[redacted]	0.03[redacted]	6[redacted]	8[redacted]

3. Detailed Analysis Report on Proposed Solutions

The projects are proposed to address Generator Deliverability thermal violations identified as a part of the 2015 RTEP Proposal Window 1. Generator Deliverability analysis was performed using the PowerGEM TARA software package V810. The results of the simulation with the project included were compared against the base case simulation without the project to determine the effectiveness of the projects in resolving the identified Generator Deliverability thermal violations. Although ITC could not identically replicate the PJM calculations the % change between the ITC base and project case was used as the expected % change on the initial PJM base case loading and thus show the effectiveness of the ITC proposals.

Rawlings to Midlothian 500-kV Line

Project 15RTEP1-1 was shown to be effective in resolving the PJM identified flowgates as shown below in Table D6.

Table D6: 15RTEP1-1 Identified Flowgates

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-32	GD	[redacted]				
NEW-34	GD	[redacted]				
NEW-36	GD	[redacted]				
NEW-37	GD	[redacted]				
NEW-52	GD	[redacted]				

The project alleviates the overloads seen on the Rogers Rd – Carson 500-kV line and the Chesterfield – Messer – Charles City 230-kV line as reported by PJM for the Generator Deliverability test. This robust project strengthens the 500kV area south of Richmond. It provides relief to the underlying 230kV system throughout the region and has the potential to enable generation expansion in the future.

Rawlings to Lakeland 500-kV Line

Project 15RTEP1-2a was shown to be effective in resolving the PJM identified flowgates as shown below in Table D7.

Table D7: 15RTEP1-2a Identified Flowgates

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-52	GD	[redacted]				
NEW-32	GD					
NEW-36	GD					

The project alleviates the overloads seen on the Rogers Rd – Carson 500-kV line as reported by PJM for the Generator Deliverability test. This project does not address the following nearby violations summarized in Table D8 below.

Table D8: 15RTEP1-2a Violations Not Addressed

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-34	GD	[redacted]				
NEW-37	GD					

Rawlings to Steers 500-kV Line

Project 15RTEP1-2b was shown to be effective in resolving the PJM identified flowgates as shown below in Table D9.

Table D9: 15RTEP1-2b Identified Flowgates

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-52	GD	[redacted]				

NEW-32	GD	[redacted]				
NEW-36	GD					

The project alleviates the overloads seen on the Rogers Rd – Carson 500-kV line as reported by PJM for the Generator Deliverability test. This project does not address the following nearby violations summarized in Table D10 below.

Table D10: 15RTEP1-2b Violations Not Addressed

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-34	GD	[redacted]				
NEW-37	GD					

Brunswick to Carson 500-kV Line

Project 15RTEP1-3a was shown to be effective in resolving the PJM identified flowgates as shown below in Table D11.

Table D11: 15RTEP1-3a Identified Flowgates

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-52	GD	[redacted]				
NEW-32	GD					
NEW-36	GD					

The project alleviates the overloads seen on the Rogers Rd – Carson 500-kV line as reported by PJM for the Generator Deliverability test. This project does not address the following nearby violations summarized in Table D12 below.

Table D12: 15RTEP1-3a Violations Not Addressed

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-34	GD	[redacted]				
NEW-37	GD					

Rawlings to Carson #2 500-kV Line

Project 15RTEP1-3b was shown to be effective in resolving the PJM identified flowgates as shown below in Table D13.

Table D13: 15RTEP1-3b Identified Flowgates

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-52	GD	[redacted]				
NEW-32	GD					
NEW-36	GD					

The project alleviates the overloads seen on the Rogers Rd – Carson 500-kV line as reported by PJM for the Generator Deliverability test. This project does not address the following nearby violations summarized in Table D14 below.

Table D14: 15RTEP1-3b Violations Not Addressed

FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
				Without Project	With Project	
NEW-34	GD	[redacted]				
NEW-37	GD					

4. Additional Supporting Documentation

In addition to testing the project's effectiveness in alleviating the identified Generator Deliverability thermal violations, N-1 and N-1-1 reliability analysis was performed. These reliability analyses were performed using the posted data for PJM's 2015 RTEP Proposal Window 1. These analyses were performed using the posted case (base summer peak) and the modified base cases with the inclusion of the project. Siemens PSSE v32.2.5 and the PowerGEM TARA software package v810 AC Contingency Analysis tools were used for simulation. The raw results files can be made available upon PJM request. Bus, failed breaker, single and tower contingencies were evaluated for the N-1 analysis. Single contingencies involving the 230-kV and above network in a three bus radius from the Midlothian 500-kV bus were considered for the N-1-1 analysis. The entire PJM footprint was monitored for thermal and voltage impacts. Any facility that became overloaded with the addition of the project and showed greater than 1% difference between the base case and the project case was considered an adverse impact.

Rawlings – Midlothian 500-kV Line

No adverse thermal or voltage impacts to the transmission system were reported as a result of the addition of the project. Notably, the loading on the Chesterfield-Basin 230-kV line is reduced significantly for the outage of the Carson – Midlothian 500-kV line with the inclusion of the project.

Rawlings to Lakeland 500-kV Line

The results for the Generator Deliverability analysis indicate that for the loss of the Lakeland - Midlothian 500-kV line, the Chesterfield-Basin 230-kV line is overloaded as a result of the project addition. No additional thermal impacts were identified.

No adverse voltage impacts to the transmission system were reported as a result of the addition of the project.

Rawlings to Steers 500-kV Line

The results for the Generator Deliverability analysis indicate that for the loss of the Steers - Midlothian 500-kV line, the Chesterfield-Basin 230-kV line is overloaded as a result of the project addition. No additional thermal impacts were identified.

No adverse voltage impacts to the transmission system were reported as a result of the addition of the project.

Brunswick to Carson 500-kV Line

The results for the Generator Deliverability analysis indicate that for the loss of the Carson - Midlothian 500-kV line, the Chesterfield-Basin 230-kV line is overloaded as a result of the project addition. No additional thermal impacts were identified.

No adverse voltage impacts to the transmission system were reported as a result of the addition of the project.

Rawlings to Carson #2 500-kV Line

The results for the Generator Deliverability analysis indicate that for the loss of the Carson - Midlothian 500-kV line, the Chesterfield-Basin 230-kV line is overloaded as a result of the project addition. No additional thermal impacts were identified.

No adverse voltage impacts to the transmission system were reported as a result of the addition of the project.

Chesterfield - Basin 230-kV Line Upgrade

As indicated above, the Chesterfield-Basin 230-kV line is marginally overloaded for the outage of the Lakeland – Midlothian 500-kV line, the Steers – Midlothian 500-kV line, or the Carson – Midlothian 500-kV line, for all projects except 15RTEP1-1. 15RTEP1-1 actually relieves the loading which provides a more robust solution. This flowgate was labeled NEW-A and the loadings on Chesterfield – Basin 230-kV line are shown below in Table D15. The loading without the project is derived from the corresponding outage of the Carson – Midlothian 500-kV line before it is tapped into the new Lakeland or Steers switchyard.

Table D15: Chesterfield – Basin 230-kV Line Loadings (NEW-A)

Project	FG #	Analysis Type	Facility	Outage Type	% Loading		% Change
					Without Project	With Project	
15RTEP1-1	NEW	GD	[redacted]				
15RTEP1-2a	NEW	GD	[redacted]				
15RTEP1-2b	NEW	GD	[redacted]				
15RTEP1-3a	NEW	GD	[redacted]				
15RTEP1-3b	NEW	GD	[redacted]				

In order to alleviate the newly identified overload, it is assumed that the incumbent transmission owner will upgrade the Chesterfield-Basin 230-kV line with 1431 ACSR (Bobolink) conductor, or equivalent, to achieve ratings of at least 6[redacted]/8[redacted] MVA. It should be noted that these issues highlight a stressed part of the system that will need to be upgraded in the very near future regardless of the project that has minimal (~2%) increased loading on the facility. It is anticipated that a better alternative solution, for example the 15RTEP1-1 project or a lower cost incumbent upgrade alternative, will be identified that would eliminate the harm caused by project proposals 15RTEP1-2a, 15RTEP1-2b, 15RTEP1-3a, and 15RTEP1-3b so they no longer cause any adverse impacts.

5. Additional Benefits

15RTEP1-1 Reliability Benefits

The 15RTEP1-1 project relieves the NEW-A flowgate which is nearly overloaded in the base case model and marginally overloaded by the other proposed projects. The 15RTEP1-1 provides the best long-term solution to the region.

Economic Benefits

The economic benefits of each project were analyzed using PROMOD models released during the 2014 Long Term Market Efficiency window. The analysis was conducted for years 2015, 2019, 2022 and 2025 and analysis shows that implementing each of these projects would realize APC and NLP economic benefits that could substantially offset the cost of the project shown in Table D16 below.

Table D16 – Economic Benefits

Project	Net Load Payment ($MM)	Adj. Production Cost ($MM)	Benefits ($MM, 2020)	Net Project Cost ($MM, 2020)
15RTEP1-1	63.9	24.6	44.2	133.6
15RTEP1-2a	74.4	20.3	47.4	79.1
15RTEP1-2b	77.8	14.9	46.4	66.2
15RTEP1-3a	57.5	22.1	39.8	105.0
15RTEP1-3b	114.9	10.8	62.9	37.0

Note: Escalation factor 2.5% and benefit column determined using the PJM methodology to determine benefits from transmission projects

6. Proposal Template Spreadsheet

The following proposal template spreadsheets can be located in Appendix B:

- RTEP Proposal Template 2015 – 15RTEP1-1
- RTEP Proposal Template 2015 – 15RTEP1-2a
- RTEP Proposal Template 2015 – 15RTEP1-2b
- RTEP Proposal Template 2015 – 15RTEP1-3a
- RTEP Proposal Template 2015 – 15RTEP1-3b

E. COST

1. Cost-estimates

The capital cost of the proposed projects, including the scope that would be assigned to incumbent transmission owners, are shown in Table E1 below. Project totals are shown in both current year (2015) dollars as well as In-Service Date (ISD) dollars (2020) which have been escalated at a rate of 2.5% per the standard PJM escalation rate. This is based on Consumer Pricing Index (CPI) projections.

Table E1 – Total Project Costs

Project	Greenfield ITC Cost in 2015 Dollars ($MM)	Incumbent Cost in 2015 Dollars ($MM)	Total Project Cost in 2015 Dollars ($MM)	Total Project Cost in 2020 ISD Dollars ($MM)
15RTEP1-1	$153.8	$13.4	$167.1	$184.1
15RTEP1-2a	$101.5	$17.5	$118.9	$131.4
15RTEP1-2b	$90.7	$15.0	$105.7	$116.8
15RTEP1-3a	$123.3	$11.9	$135.2	$149.3
15RTEP1-3b	$78.3	$15.9	$94.2	$104.1

Yearly cash flows for each of the proposed projects are shown in Tables E2 – E6 below.

Table E2 - 15RTEP1-1 Yearly Cash Flow (2020 ISD Dollars)

	2016	2017	2018	2019	2020	Total
ITC T-Line Costs	[redacted]					
Incumbent TO Costs						

Table E3 – 15RTEP1-2a Yearly Cash Flow
(2020 ISD Dollars)

	2016	2017	2018	2019	2020	Total
ITC T-Line Costs	[redacted]					
ITC Switchyard Costs	[redacted]					
Incumbent TO Costs	[redacted]					

Table E4 – 15RTEP1-2b Yearly Cash Flow
(2020 ISD Dollars)

	2016	2017	2018	2019	2020	Total
ITC T-Line Costs	[redacted]					
ITC Switchyard Costs	[redacted]					
Incumbent TO Costs	[redacted]					

Table E5 – 15RTEP1-3a Yearly Cash Flow
(2020 ISD Dollars)

	2016	2017	2018	2019	2020	Total
ITC T-Line Costs	[redacted]					
Incumbent TO Costs	[redacted]					

Table E6 – 15RTEP1-3b Yearly Cash Flow
(2020 ISD Dollars)

	2016	2017	2018	2019	2020	Total
ITC T-Line Costs	[redacted]					
Incumbent TO Costs	[redacted]					

2. Detailed Breakdown of Cost Elements

Breakdown of costs for each of the proposed projects are shown in Tables E7 – E11 below.

***= Incumbent Costs**

Table E7: 15RTEP1-1 Project Costs

ITEM	COST ($MM)
[redacted]	
GRAND TOTAL (2015 dollars)	$167.1

Table E8: 15RTEP1-2a Project Costs

ITEM	COST ($MM)
[redacted]	

[redacted]

GRAND TOTAL (2015 dollars)	$118.9

Table E9: 15RTEP1-2b Project Costs

ITEM	COST ($MM)
[redacted]	

[redacted]

GRAND TOTAL (2015 dollars)	$105.7

Table E10: 15RTEP1-3a Project Costs

ITEM	COST ($MM)
[redacted]	

[redacted]

GRAND TOTAL (2015 dollars)	$135.2

Table E11: 15RTEP1-3b Project Costs

ITEM	COST ($MM)
[redacted]	

[redacted]

GRAND TOTAL (2015 dollars)	$94.2

3. Cost Commitment

[redacted]

[redacted]

F. SCHEDULE

1. Detailed Conceptual Schedule

The schedule below would apply to each of the projects.

Table F1 – Proposed Schedule

[redacted]

G. OPERATIONS/MAINTENANCE

1. Overview of Plans for Operations and Maintenance

Operational Plan Including Intentions for Control Center

ITC incorporated new service territories into its existing operations and control center as the company has grown. This is both a result of existing systems and organic growth of ITCGP and other operations.

ITC has navigated the interconnection process with various PJM Transmission Owners related to our multiple system interconnections. As noted in the response to question B.1, three of four ITC operating companies have interconnections with PJM transmission owners.

ITC will operate the new transmission facilities from its primary control center, which is operates 15,000-miles of transmission lines and associated facilities in three NERC regions (Midwest Reliability Organization, RF and SPP) as well as in two ISO/RTO footprints (MISO and SPP). In anticipation of continued growth, the control center was designed with flexibility to allow additional capacity as ITC's system expands.

All ITC system operators and key management staff are NERC certified at the Reliability Coordinator level and maintain this certification through a comprehensive ongoing training program. ITC also has a redundant and independent backup control center capable of operating all of ITC's transmission facilities, including all future assets. The ITC control center facilities provide all required telemetry on existing facilities to the MISO and SPP RTOs and we would develop similar links for any projects secured in PJM. ITC will become a PJM Member in conjunction with the future Covert to Segreto 345-kV line and is in the process of ensuring all requirements of the PJM manuals are met before the scheduled in-service date of June 1, 2016, including the PJM telemetry requirements identified in Attachment A of Manual 01 and the operator certification requirements in Manual 40. Many of the requirements covered in the manuals are similar to those ITC already meets for other RTO footprints.

Maintenance Plan/Contracts

ITC has a comprehensive program and established procedures for substation maintenance on its existing systems that includes routine inspection of equipment in substations and control houses. Items identified for follow-up maintenance or repair are monitored and documented in a computerized maintenance management system. The program also includes cyclical and predictive maintenance intervals on major substation equipment including, but not limited to, circuit breakers, switches, transformers, relay and protective systems, distributed control systems and capacitor banks.

A similar comprehensive program exists for transmission line maintenance. It includes annual aerial inspections and cyclical ground line inspections and wood pole/steel tower maintenance. Items identified for follow up maintenance or repair are monitored and documented in a computerized maintenance management system. ITC's vegetation management policy is to actively manage, through removal, pruning, mowing and/or herbicides applications, the vegetation that grows within the electric transmission line easement area or right-of-way in order to ensure safety, reliability and, in the case of 200-kV and above facilities, meet mandatory reliability requirements established by NERC and approved by FERC on March 16, 2007. It is ITC's corporate goal to have zero outages as a result of vegetation interference.

ITC uses modern high-speed networked Supervisory Control and Data Acquisition (SCADA) equipment health monitoring on key ITC assets such as transformers, circuit breakers and protective relaying. Alarming on these systems monitored 24-7 by the ITC central operations control room. When under active alarm, corrective action is initiated including dispatch of appropriate field maintenance resources.

ITC has a philosophy of maintaining minimum spare stock of substation and line equipment (including key assets such as circuit breakers and transformers). By analyzing past storm related damage and the associated material needed to respond, ITC has proactively staged emergency spare material along with general maintenance material at ITC warehouses. These warehouses are strategically located throughout the company's footprint to supply spare material 24-7 in emergencies. These strategic materials are replenished as needed.

In various geographic regions, ITC has addressed operations and maintenance staffing in a variety of ways, including service agreements with existing transmission-owning entities and establishing an O&M staff. For example, in Kansas, Sunflower Cooperative and Midwest Energy provided maintenance service for ITCGP's assets in Kansas. Following the philosophy of identifying strategic response material, certain materials and items are staged at maintenance partner locations for potential emergency needs.

Based on past experience, ITC has the flexibility to handle this important function in the optimal and most cost-effective manner.

H. APPENDIX A - SUPPORTING FIGURES

I. APPENDIX B – SUPPORTING DATA

RTEP Proposal Template 2015 – 15RTEP1-1

RTEP Proposal Template 2015 – 15RTEP1-2a

RTEP Proposal Template 2015 – 15RTEP1-2b

RTEP Proposal Template 2015 – 15RTEP1-3a

RTEP Proposal Template 2015 – 15RTEP1-3b

J. APPENDIX C – FINANCIAL STATEMENTS

ITCH 2012 Annual Financial Statement

ITCH 2013 Annual Financial Statement

ITCH 2014 Annual Financial Statement

ITCH 2015 Second Quarter Financial Statement