

# NORTHEAST TRANSMISSION DEVELOPMENT

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*a Member of the LS Power Group*

## PROPOSALS



*In Response to the:*

PJM RTEP – 2014/15 RTEP Long Term Proposal Window

*February 27, 2015*

# NORTHEAST TRANSMISSION DEVELOPMENT

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# NORTHEAST TRANSMISSION DEVELOPMENT

## A. EXECUTIVE SUMMARY

Northeast Transmission Development, LLC (“NTD”), a member of the LS Power Group (“LS Power”)<sup>1</sup> is pleased to present the following projects (individually “Project” or collectively “Projects”) to resolve market efficiency congestion identified by PJM. Each Project should be evaluated independently and can be placed in service in advance of the identified need.

### 1. Harrison – Bath County

The Project consists of a new approximately 99-mile 500 kV transmission line connecting the existing Harrison 500 kV substation to the existing Bath County 500 kV substation. The Project has an estimated construction cost of approximately \$432.5 million and can be placed in service by June 1, 2023.

### 2. Green Ridge (230 kV)

The Project consists of a new approximately 26-mile 230 kV transmission line connecting the existing Ringgold 230 kV substation to the new Green Ridge 500 kV substation along the existing Conemaugh to Hunterstown 500 kV transmission line. The Project has an estimated construction cost of approximately \$104.5 million and can be placed in service by June 1, 2020.

### 3. Green Ridge (138 kV)

The Project consists of a new approximately 6-mile 138 kV transmission line connecting the existing Grand Point 138 kV substation to the new Green Ridge 500 kV substation along the existing Conemaugh to Hunterstown 500 kV transmission line. The Project has an estimated construction cost of approximately \$38.9 million and can be placed in service by June 1, 2020.

### 4. Keysers Run

The Project consists of a new Keysers Run 500/230 kV substation interconnecting the existing Conastone to Brighton 500 kV transmission line to the existing Northwest 230 kV substation. The Project has an estimated construction cost of approximately \$48.6 million and can be placed in service by June 1, 2020.

### 5. Renton

The Project consists of a new Renton 138 kV switching station connecting the existing Plum to Cheswick 138 kV transmission line to the existing Springdale to Huntingdon 138 kV transmission line. The Project has an estimated construction cost of approximately \$9.2 million and can be placed in service by June 1, 2020.

### 6. Harpers Run

The Project consists of a new 750 MVAR Static VAR Compensator (“SVC”) interconnected to the Morrisville 500 kV substation. The Project has an estimated construction cost of approximately \$53.7 million and can be placed in service by June 1, 2020.

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<sup>1</sup> Located at 400 Chesterfield Center, Suite 110, St. Louis, MO 63017

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### **7. Pontiac Midpoint – Katydid Road**

The Project consists of a new approximately 22-mile 345 kV transmission line connecting the existing Pontiac Midpoint 345 kV substation to the existing Katydid Road 345 kV substation. The Project has an estimated construction cost of approximately \$42.9 million and can be placed in service by June 1, 2020.

### **8. Garrison Creek**

The Project consists of a new Garrison Creek 345 kV switching station connecting the existing Miami Fort to Tanners Creek 345 kV transmission line to the existing Miami Fort to Terminal 345 kV transmission line. The Project has an estimated construction cost of approximately \$18.6 million and can be placed in service by June 1, 2020.

NTD seeks to be the Designated Entity<sup>2</sup> for these Projects, designated by PJM to develop, construct, own, operate, maintain, and finance the Projects. NTD has demonstrated its capability to develop, finance, construct, own and operate large scale power projects, including high-voltage transmission projects. LS Power has a strong track record of success throughout the United States, including significant generation experience and the successful development, construction, and operation of hundreds of miles of high-voltage transmission. Among its broad nationwide experience, LS Power has substantial Project-applicable experience – including PJM experience totaling over 4,000 MW of generation in operation and more than 2,000 MW of generation under development.

Based on the work already completed as well as LS Power's extensive experience, NTD is uniquely positioned to successfully complete the Projects and provide the PJM system enhancement for the benefit of electricity consumers within PJM.

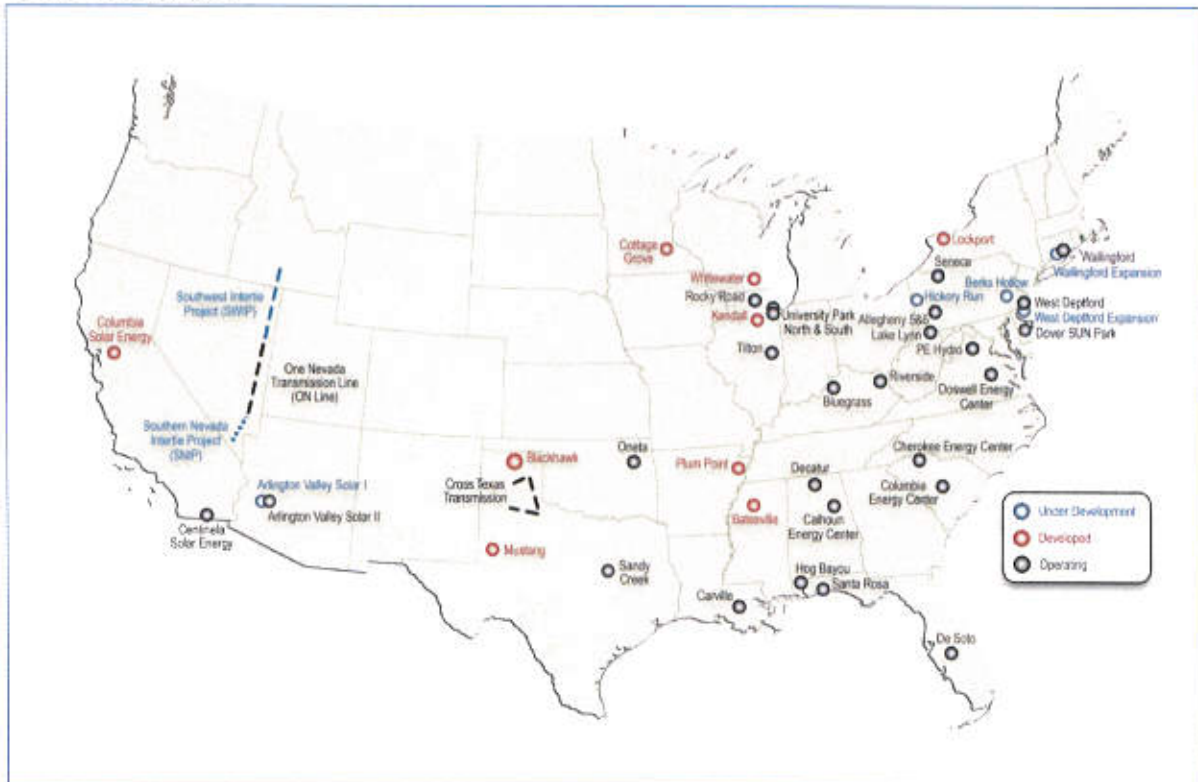
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<sup>2</sup> Pre-qualification ID 13-06.

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## B. COMPANY EVALUATION INFORMATION

Northeast Transmission Development is a member of the LS Power Group. LS Power is an experienced developer of large-scale energy projects, including several transmission projects. Since 1990, LS Power has had the technical and engineering capability to develop, own and/or operate over 30,000 MW of power generation facilities and two large high-voltage (345 kV and 500 kV) transmission projects totaling over 700 circuit-miles. *Figure 1* provides an overview of the national footprint of LS Power Group's experience.



*Figure 1 – LS Power Experience*

LS Power currently has operating assets and development projects within PJM in Delaware, Illinois, Kentucky, New Jersey, Pennsylvania and Virginia. LS Power currently has over 4,000 MW of generation in operation within PJM, as well as over 2,000 MW of generation under development in PJM.

### 1. Project-Applicable Experience and Qualifications

LS Power has experience in developing, owning and operating transmission facilities both as a non-incumbent transmission developer and an aspect of its generation facilities. LS Power has found that its expertise in the development of power generation facilities translates well to the development of large-scale transmission facilities. LS Power initiated its transmission development efforts in 2005 with the Southwest Intertie Project in Nevada and Idaho. A portion of this project was later renamed One Nevada Transmission Line (“ON Line”) and is currently in service. In 2009, Cross Texas Transmission (“Cross Texas”), an LS Power entity, was selected by the Public Utility Commission of Texas (“PUCT”) as



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one of the best qualified new entrants for designation for construction of new transmission facilities; specifically, the PUCT determined that the LS Power entity was one of the new entrants that “possess the current and expected capabilities to adequately finance, license, construct, operate, and maintain the facilities in the most beneficial and cost-effective manner.” Both of these projects, totaling more than 700 circuit miles of new transmission lines, began construction in 2011 and both are currently energized. *Table 1* provides an overview of some of the transmission facility experience of LS Power.

*Table 1 – LS Power Transmission Experience*

| Project                              | Location | Voltage (kV) | Length (miles) | Permitting & Development | Construction Management | Operations Management | Currently Owned |
|--------------------------------------|----------|--------------|----------------|--------------------------|-------------------------|-----------------------|-----------------|
| Cross Texas Transmission             | ERCOT    | 345          | 240            | ✓                        | ✓                       | ✓                     | ✓               |
| ON Line                              | WECC     | 500          | 235            | ✓                        | ✓                       |                       | ✓               |
| Southwest Intertie Project (Phase 2) | WECC     | 500          | 260            | ✓                        |                         |                       | ✓               |
| Other Generation Interconnections    | Various  | Various      | Various        | ✓                        | ✓                       | ✓                     | ✓               |

## a. Cross Texas Transmission

Cross Texas, a subsidiary of LS Power, is a rate-regulated Texas public utility operating within the Electric Reliability Council of Texas (“ERCOT”). Cross Texas was selected in early 2009 by the PUCT to construct, operate and maintain a portion of the Competitive Renewable Energy Zone (“CREZ”) Transmission Plan to enable the delivery of renewable resources. The transmission service providers were selected through a competitive process including incumbent utilities and new entrants. More recently, Cross Texas was selected to construct a new transmission line in the vicinity of College Station, TX. The Cross Texas proposal was selected by ERCOT as the best solution to solve the existing transmission constraints in this region of ERCOT.

The Cross Texas facilities consist of approximately 240 miles of double-circuit 345 kV transmission lines and associated equipment, including two new substations and a series compensation station, located in a seven-county area in the Texas Panhandle with an estimated capital cost of approximately \$470 million. The Cross Texas facilities are primarily comprised of the Gray to Tesla 345 kV transmission line, the Gray to Alibates 345 kV transmission line, the Tule Canyon to Cross 345 kV transmission line and the Cross to Tesla 345 kV transmission line, the Gray Substation, Railhead Substation and the Cross Series Compensation Station. Additionally, Cross Texas is processing interconnection requests for several generation interconnection customers and is currently expanding some of their existing facilities to connect additional power generation to its system. As previously mentioned, Cross Texas is in the early stages of development of a new 60 to 70 mile double circuit 345kV line in the vicinity of College Station, TX.

Cross Texas conducted extensive community outreach, obtained routing approval from the PUCT, completed engineering and executed procurement and construction contracts for the project. Cross



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Texas was able to reach settlement in all three of its Certificate of Convenience and Necessity proceedings, where accommodations were reached with all intervening parties (73 total interveners) on acceptable routes. These intervening parties included landowners, utilities, PUCT Staff and the Texas Parks and Wildlife Department.

In 2010 and 2011, Cross Texas obtained the following final and non-appealable permits and approvals required for construction of 240 miles of double-circuit 345 kV transmission lines and associated facilities:

- PUCT Certificate of Convenience and Necessity;
- Texas General Land Office approvals for crossing submerged land;
- Nationwide Permit 12 (Federal Clean Water Act Section 404 Permit approval);
- Informal Consultations with US Fish and Wildlife and Texas Parks and Wildlife Department;
- Federal Aviation Administration No Hazard Determination;
- Texas Historical Commission Approval;
- Texas State Highway Crossing Approval; and
- Various Electric Utility and Pipeline Crossings Approvals.

In addition, Cross Texas obtained project financing legal opinions that Cross Texas had appropriately identified and obtained the necessary development permits appropriate for the planning and construction phase of the Cross Texas facilities. Cross Texas closed on its construction financing in July 2011, acquired right-of-way from over 300 landowners, and has completed construction of its facilities – on-schedule and under-budget. Notably, Cross Texas was the only CREZ participant to complete construction of its transmission line facilities under the cost estimate provided by ERCOT.

The following is a representative list of major contractors, consultants and suppliers utilized for the Cross Texas transmission projects. In addition to its internal resources, LS Power has established strong working relationships with these contractors, consultants, and suppliers, which provided additional technical and engineering support for the Project.

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Cross Texas has staff in Amarillo, Texas and Austin, Texas with support from LS Power corporate support services employees in other offices. Operations and maintenance is conducted by Cross Texas staff with the support of third party contractors. Zachry Industrial, Inc. provides inspection and emergency response services. Cross Texas also has agreements with other major transmission line contractors for additional emergency response support if necessary. Cross Texas is currently registered with NERC as a Transmission Planner and had no findings of non-compliance in its initial audit. Cross Texas is registered with North American Electric Reliability Corporation ("NERC") as a Transmission Owner and Transmission Planner and successfully completed its initial audit with no adverse findings. Cross Texas is currently operating a real time operations center in Austin, TX. CTT key personnel have an average of over 25 years of operating and compliance experience in ERCOT and other RTOs in North America.

From a broader regulatory perspective, Cross Texas established its Code of Conduct in accordance with the Texas public utility regulatory requirements in 2009. Consistent with its Code of Conduct, LS Power has established separate, secure space for Cross Texas operations, maintains independent books and records and conducts regular training of all company employees regarding the Code of Conduct and its requirements. LS Power also ensures compliance with the FERC Standards of Conduct for transmission related businesses outside of ERCOT.

In addition to confirming LS Power's ability to develop, construct, operate and maintain transmission facilities, the success of Cross Texas demonstrates LS Power's ability to do so in a highly cost effective manner. *Table 2* illustrates current estimates reported to the PUCT for the installed cost per mile of all double-circuit 345 kV CREZ transmission lines currently under construction by similarly situated utilities.

**Table 2 - CREZ Capital Costs by Participant**

| <b>Transmission Service Provider</b>                           | <b>Capital Cost for Double-Circuit 345 kV (\$/Mile)</b> |
|--|---|
| Cross Texas Transmission (LS Power affiliate)                  | \$1,560,000   |
| Oncor  | \$1,830,000   |
| Wind Energy Transmission Texas (Brookfield / Isolux affiliate) | \$1,900,000   |
| Lone Star (NextEra affiliate)                                  | \$1,910,000   |
| Sharyland  | \$ 2,040,000  |
| Electric Transmission Texas (AEP / MidAmerican affiliate)      | \$ 2,080,000  |
| Lower Colorado River Authority                                 | \$ 2,420,000  |

*CREZ Progress Report No. 11 (April 2014 Update) prepared by RS&H for the Public Utility Commission of Texas*



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### b. ON Line / Southwest Intertie Project

LS Power began its development of large-scale transmission facilities in 2005 with the Southwest Intertie Project ("SWIP"). The SWIP is a 500 kV transmission line traversing approximately 570 miles from southern Idaho to southern Nevada that is expected to have a Western Electricity Coordinating Council-approved path rating of approximately 2,000 MW. The SWIP is being developed in two phases.

The first phase, the One Nevada Transmission Line or ON Line, consists of approximately 235 miles of single-circuit 500 kV overhead transmission and associated transmission facilities that began commercial operations on December 31, 2013. The ON Line is jointly-owned with NV Energy, with LS Power affiliate Great Basin Transmission South, LLC (Great Basin) owning 75%. The project connects the Harry Allen Substation (Nevada Power Company) north of Las Vegas with the newly constructed 500 kV Robinson Summit Substation located near Ely, Nevada. Robinson Summit also interconnects with the existing NV Energy (Sierra Pacific Power Co.) Falcon-Gonder 345 kV line and includes two 600 MVA 345 kV phase-shifting transformers. One phase-shifting transformer connects the newly reconfigured Falcon-Robinson Summit 345 kV line and the other connects the Robinson Summit-Gonder 345 kV line. Both the 500 kV and 345 kV yards are a breaker and a half configuration. This substation encompasses an area of approximately 77 acres with spacing designed to accommodate an ultimate build out of up to seven 500 kV line positions and up to nine 345 kV line positions. The majority of the line uses tubular steel guyed-V structures to minimize impacts to certain species of concern, while self-supporting steel poles, steel lattice and steel H-frame structures are used for heavy angles or dead-end structures.

The ON Line project enables the development of numerous renewable energy projects in Nevada, connects NV Energy's two main service areas (Nevada Power Company and Sierra Pacific Power Co.) for the first time and enhances the overall energy-sharing efficiencies for NV Energy's power generation resources.

LS Power obtained all required right-of-way grants and private easements as well as acquisition of all major permits and approvals required for construction, which include NEPA review, Bureau of Land Management ("BLM") Right-of-Way Grant, Endangered Species Act consultation and approval of a detailed Construction, Operation and Maintenance Plan by the BLM. The NEPA review was prepared by BLM as the lead agency, with the involvement of the Forest Service, National Park Service, Bureau of Indian Affairs, and Bureau of Reclamation as cooperating agencies.

In August 2010, Great Basin Transmission and NV Energy entered into a Transmission Use and Capacity Exchange Agreement (TUA). The TUA was approved by the Public Utilities Commission of Nevada and the Federal Energy Regulatory Commission. ON Line demonstrates LS Power's ability to develop and construct 500 kV transmission facilities and work cooperatively with incumbent transmission owners to the benefit of all project participants.

In February 2011, Great Basin arranged construction financing for its ownership in ON Line, in part through participation in the DOE's Loan Guarantee Program. In order to qualify for the program, DOE



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completed extensive due diligence on LS Power's development, construction and operating capabilities and the project permits and arrangements.

ON Line consists of approximately 850 transmission structures, nearly 11 million feet of conductor and 25 million pounds of steel. LS Power competitively sourced and negotiated equipment and material supply contracts and construction contracts to ensure competitive pricing. POWER Engineers, Great Basin's engineer, procurement agent, and construction manager, assisted in developing and reviewing the proposed technical and commercial terms to ensure all terms were reasonable and appropriate, resulting in cost-effective and reliable performance by the contractors and suppliers. Under the TUA, NV Energy is providing all O&M services for ON Line.

The following is a representative list of major contractors, consultants and suppliers utilized for the ON Line. In addition to its internal resources, LS Power has established strong working relationships with these contractors, consultants, and suppliers, which may provide additional technical and engineering support for the Project.

Construction of ON Line was completed in 2013 and is currently energized. Despite the discovery during construction of a transmission structure design issue beyond Great Basin's control, the final

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project cost was within 2% of the budget estimation at the time of financing. This demonstrates LS Power’s ability to react at any project stage to dynamic conditions to meet project goals. In spite of these unforeseen circumstances, ON Line cost per mile is significantly less than similar high-voltage transmission projects in the same region during the same period, as shown in *Table 3*.

*Table 3 - Recent Transmission Projects in the Western U.S.*

| Transmission Service Provider                          | Approximate Length (miles) | Capital Cost (\$MM/mile) |
|--|----------------------------|--------------------------|
| ON Line 500 kV (LS Power, NV Energy)                   | 235                        | \$2.3                    |
| Pinal Central-Tortolita 500 kV (Tucson Electric Power) | 40                         | \$2.7                    |
| Mona-Oquirrh 345/500 kV (MidAmerican)                  | 100                        | \$4.4                    |
| Devers-Colorado River (Edison)                         | 153                        | \$4.6                    |
| Populus-Terminal 345 kV (MidAmerican)                  | 135                        | \$6.1                    |
| Tehachapi (1-3) (Edison)                               | 82                         | \$7.3                    |
| Tehachapi (4-11) [Above Ground Portion Only] (Edison)  | 173                        | \$11.2                   |
| Sunrise [Above Ground Portion Only] (SDG&E)            | 112                        | \$13.6                   |

*Information taken from project websites, other sources*

In addition to its success with ON Line, LS Power affiliates have obtained permits for construction of the majority of Phase 2 of SWIP, which is comprised of two components: (i) SWIP North, which will run approximately 275 miles from the Midpoint substation near Twin Falls, Idaho to the Robinson Summit substation near Ely, Nevada; and (ii) a 60-mile southern portion known as the Southern Nevada Intertie Project (SNIP) which will run from the Harry Allen substation to the Eldorado substation both near Las Vegas, NV. Federal National Environmental Protection Act (“NEPA”) review has been completed for SWIP North the final NEPA Decision for SNIP is expected in 2014.

### **c. Right-of-Way Procurement Experience**

Cross Texas obtained approximately 240 miles of transmission line rights-of-way, predominantly on private lands over the past several years. This required applying for and receiving three Certificates of Public Convenience and Necessity from the PUCT. To initiate the process, Cross Texas completed routing studies and identified preferred and alternative routes, held a dozen public meetings, provided landowner notification, and negotiated provisions to minimize impacts on landowners. Cross Texas provided notices to over 1,450 stakeholders, and acquired over 300 easements.

For the ON Line and Southwest Intertie Project, LS Power affiliates have secured approximately 515 miles of rights-of-way, including approximately 456 miles on Federal lands. The ON Line right-of-way is entirely located on BLM lands except for one segment of privately owned land. Obtaining right-of-way on Federal land required compliance with NEPA and a full environmental review and BLM Decision Record on the full length of the 235-mile transmission line. LS Power developed a comprehensive Construction Operation and Maintenance Plan, which detailed the specific location of all towers in the field, along with all project disturbances during construction, operation and maintenance, including



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construction laydown, tensioning sites, etc. and required cultural, biological resource investigation of all affected areas and identification of best management practices and all methods to ensure compliance with the provisions of the projects approval. In addition to the Federal land right-of-ways, LS Power has negotiated easements with private landowners on a mutually agreeable basis.

LS Power successfully acquired the real estate for all of its generation projects, which has included real estate for dozens of project sites and over 120 miles of linear infrastructure including transmission lines, rail lines, gas pipelines and water pipelines easements. For these competitive generation projects, the rights-of-way were negotiated with landowners without the ability to use eminent domain.

### **d. Project Cost and Schedule Management Experience**

LS Power has successfully managed the development and construction of 15 large-scale power generation and transmission projects representing over \$8 billion in invested capital. Over the past few years, LS Power has been managing the construction of four power generation projects and two transmission projects totaling approximately \$5 billion in invested capital. All of these projects have been placed in service within the past two years.

LS Power employs a detail-oriented and hands-on philosophy to all of its development, construction and asset management activities. LS Power employees directly oversee all project development activities including siting, permitting, community relations, real estate acquisition, engineering, and contracting. LS Power self performs a considerable amount of the development activities, while managing consulting firms for portions of the work that are specialized (e.g. surveying, environmental studies).

LS Power has used both an owner-managed and a lump sum, turn-key approach for the detailed engineering, procurement, and construction of its projects. In either case, LS Power performs its own construction management; directly overseeing the contractors to ensure compliance with the cost, schedule, and design of the project. LS Power will have a dedicated project director, on-site construction managers and inspectors, and its entire support team available to assist in managing the various scopes of construction to ensure performance. LS Power does not accept completion of a facility from a construction contractor until it has been confirmed that all requirements have been met.

### **e. Financial Capability**

LS Power's financial position has long been considered one of its strengths, and it is highly respected within the financial community. Since 2005, LS Power has raised more than \$25 billion in debt and equity for project financing, acquisitions or investment purposes within the power sector. The common feature of all these financings is that a subsidiary created by LS Power raises the capital required to construct, acquire, and/or operate a power-related business, with equity support and asset management services provided by LS Power. Every LS Power sponsored project that has been taken to the financing community has been successfully financed. *Figure 2* provides an overview of the financing activity undertaken by the LS Power Group since 2005.



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Each LS Power developed project has been financed on the basis of a strong structure which includes project permits, real estate rights, and project documents such as long-term off-take contracts. LS Power has successfully developed power generation and transmission facilities throughout the United States and been able to satisfy the credit requirements of numerous investor owned utilities, municipal utilities and electric cooperatives.

LS Power's financing and structuring expertise has been recognized in the financial press with awards such as the 2006 Americas Power Deal of the Year (Project Finance International), 2006 North American Single Asset Deal of the Year (Project Finance Magazine), the 2007 North American Single Asset Deal of the Year (Project Finance Magazine) and the 2012 North American Single-Asset Power Deal of the Year (Project Finance Magazine).

In addition to accolades from the financial press, LS Power's disciplined development and project finance approach has attracted a broad spectrum of investors and lenders. Every LS Power-sponsored business that has been taken to the financing community has been successfully financed, even at times of market distress. For instance, the \$1.6 billion of Sandy Creek Energy Associates closed at the end of August 2008, as the financial crisis was taking shape and other borrowers were shut out of the credit markets. LS Power has established a strong reputation and long-standing, productive relationships within the financing community.

### **f. Additional LS Power Experience**

Since its inception in 1990, LS Power has remained a leader among independent power producers by continuing to provide highly competitive, flexible, and innovative product offerings for its customers.

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LS Power has successfully permitted and developed over a dozen greenfield domestic power generation totaling in excess of 8,000 megawatts of electrical output and 470 miles of high-voltage transmission facilities, representing a total capital investment of over \$8 billion.

In 2005, LS Power launched LS Power Equity Advisors, a private investment vehicle focused on the power industry. To date, LS Power Equity Partners has acquired forty power generation plants with over 20,000 MW of generation capacity located in various markets across the United States.

LS Power provides a full range of asset management services for the power generation projects it develops or acquires. These services include the management of all construction, operational, commercial, financial, legal and regulatory issues for the projects. The firm has managed more than 30,000 MW of power generation under construction or in operations. *Figure 3* summarizes LS Power's experience permitting, developing, constructing, owning and operating generation in the U.S., totaling over 50 facilities with a total capacity in excess of 30,000 MW.

Much of LS Power's success in executing these generation projects can be attributed to an efficient organization and internal expertise in combination with external resources as appropriate. As with generation, successful and cost effective transmission development and construction requires strong internal capabilities and careful management of a large number of major contractors, consultants, and suppliers. Possessing these capabilities through its extensive experience uniquely positions NTD to successfully complete the Project and provide the PJM system enhancement for the benefit of electricity consumers within PJM.

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## C. PROJECT MERITS

NTD has completed an extensive modeling effort to evaluate the merits of the Projects. The model results demonstrate that each of the Projects will result in substantial benefits for the PJM system providing both congestion relief and market efficiency benefits.

Each Project exceeds the Benefit/Cost Ratio Threshold of 1.25:1, which is the threshold to warrant inclusion in the Regional Transmission Expansion Plan as identified in *Table 5* below.

Market efficiency model results, including congestion relief, energy market benefits and reactive interface impacts, are presented in Appendix B.

NTD conducted a power flow contingency analysis using the power flow case and contingency files provided by PJM to identify any potential violations of thermal ratings due to the addition of each Project. NTD's analysis showed that each Project did not create any new thermal overloads on the PJM system, except as discussed below.



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## **D. HARRISON – BATH COUNTY CONSTRUCTABILITY INFORMATION**

The Project consists of a new approximately 99-mile 500 kV transmission line connecting the existing Harrison 500 kV substation to the existing Bath County 500 kV substation.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in PJM's RTEP 2014/15 Long Term Proposal Window Problem Statement ("Problem Statement").

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### **1. Component Scope**

#### **a. Harrison – Bath County 500 kV Transmission Line**

The primary component of the Project is a new approximately 99-mile 500 kV overhead single-circuit transmission line interconnecting the existing Harrison 500 kV substation to the existing Bath County 500 kV substation.

## **2. Project Component Cost Estimates**

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 8*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

## **3. Schedule**

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2023 without risking a delay if unforeseen issues would arise.

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## **E. GREEN RIDGE 230 kV CONSTRUCTABILITY INFORMATION**

The Project consists of a new approximately 26-mile 230 kV transmission line connecting the existing Ringgold 230 kV substation to the new Green Ridge 500 kV substation along the existing Conemaugh to Hunterstown 500 kV transmission line.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### **1. Component Scope**

#### **a. Green Ridge Substation**

The first component of the Project is a new 500/230 kV substation interconnecting the existing Conemaugh to Hunterstown 500 kV transmission line.



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## b. Green Ridge - Ringgold 230 kV Transmission Line

The second component of the Project is a new approximately 26-mile 230 kV overhead single-circuit transmission line interconnecting the Green Ridge 230 kV substation to the existing Ringgold 230 kV substation.

## 2. Project Component Cost Estimates

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 11*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

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## 3. Schedule

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.

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## **F. GREEN RIDGE 138 kV CONSTRUCTABILITY INFORMATION**

The Project consists of a new approximately 6-mile 138 kV transmission line connecting the existing Grand Point 138 kV substation to the new Green Ridge 500 kV substation along the existing Conemaugh to Hunterstown 500 kV transmission line.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### **1. Component Scope**

#### **a. Green Ridge Substation**

The first component of the Project is a new 500/138 kV substation interconnecting the existing Conemaugh to Hunterstown 500 kV transmission line.



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### **b. Green Ridge - Grand Point 138 kV Transmission Line**

The second component of the Project is a new approximately 6-mile 138 kV overhead single-circuit transmission line interconnecting the Green Ridge 138 kV substation to the existing Grand Point 138 kV substation.

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## **2. Project Component Cost Estimates**

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 14*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

## **3. Schedule**

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.

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## G. KEYSERS RUN CONSTRUCTABILITY INFORMATION

The Project consists of a new Keyzers Run 500/230 kV substation interconnecting the existing Conastone to Brighton 500 kV transmission line to the existing Northwest 230 kV substation.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### 1. Component Scope

#### a. Keyzers Run Substation

The Project is a new 500/230 kV substation interconnecting the existing Conastone to Brighton 500 kV transmission line to the existing Northwest 230 kV substation.

### 2. Project Component Cost Estimates

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 16*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.



### **3. Schedule**

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.

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## H. RENTON CONSTRUCTABILITY INFORMATION

The Project consists of a new Renton 138 kV switching station connecting the existing Plum to Cheswick 138 kV transmission line to the existing Springdale to Huntingdon 138 kV transmission line.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### 1. Component Scope

#### a. Renton Switching Station

The Project is a new 138 kV substation interconnecting switching station connecting the existing Plum to Cheswick 138 kV transmission line to the existing Springdale to Huntingdon 138 kV transmission line.

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## **2. Project Component Cost Estimates**

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 17*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

## **3. Schedule**

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.



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## I. HARPERS RUN CONSTRUCTABILITY INFORMATION

The Project consists of a new 750 MVAR Static VAR Compensator ("SVC") interconnected to the Morrisville 500 kV substation.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### 1. Component Scope

#### a. **Harpers Run SVC**

The Project is a new 750 MVAR SVC interconnected to the existing Morrisville 500 kV substation.

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## 2. Project Component Cost Estimates

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 18*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

## 3. Schedule

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.

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## J. PONTIAC MIDPOINT – KATYDID ROAD CONSTRUCTABILITY INFORMATION

The Project consists of a new approximately 22-mile 345 kV transmission line connecting the existing Pontiac Midpoint 345 kV substation to the existing Katydid Road 345 kV substation.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### 1. Component Scope

#### a. Pontiac Midpoint – Katydid Road 345 kV Transmission Line

The primary component of the Project is a new approximately 22-mile 345 kV overhead single-circuit transmission line interconnecting the existing Pontiac Midpoint 345 kV substation to the existing Katydid Road 345 kV substation.

### 2. Project Component Cost Estimates

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is



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provided in *Table 20*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

### **3. Schedule**

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.

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## **K. GARRISON CREEK CONSTRUCTABILITY INFORMATION**

The Project consists of a new Garrison Creek 345 kV switching station connecting the existing Miami Fort to Tanners Creek 345 kV transmission line to the existing Miami Fort to Terminal 345 kV transmission line.

NTD has performed a preliminary engineering and design study to determine the technical specifications required for the Project to resolve market efficiency congestion as defined in the Problem Statement.

A general project location map can be found in Appendix C. A more detailed map depicting the representative location can be found in Appendix D. The Project one-line diagram can be found in Appendix E. The following sections describe the technical aspects of each major Project component.

### **1. Component Scope**

#### **a. Garrison Creek Switching Station**

The Project is a new 345 kV switching station connecting the existing Miami Fort to Tanners Creek 345 kV transmission line to the existing Miami Fort to Terminal 345 kV transmission line.

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## 2. Project Component Cost Estimates

NTD completed a preliminary engineering and design study using the representative location as the basis for estimating Project costs. A summary of major Project cost categories as requested by PJM is provided in *Table 21*. Additionally, NTD has generated a more detailed Project cost estimate included as Appendix G that categorizes costs per Project component.

## 3. Schedule

A milestone schedule for each proposed Project component can be found in Appendix H. The Project Schedule identifies major Project activities as requested by PJM. NTD's schedule allots sufficient time to complete each aspect of the Project to meet an in-service date of June 1, 2020 without risking a delay if unforeseen issues would arise.



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## L. GENERAL PROJECT INFORMATION

### 1. Environmental, Permitting and Land Acquisition

NTD has prepared a detailed Project execution plan for all Project components which outlines all major Project development, construction and operations activities. Additionally, NTD identified, evaluated and subsequently dismissed potential fatal flaws for the Project, confirming preliminary feasibility of the Project.

LS Power will assign a Project Director to oversee the Project through development, construction and operations/maintenance. Appendix I contains an organizational chart depicting the management structure NTD intends to implement the Project. The following sections summarize each of the major activities during the development, construction, and operations and maintenance phases of the Project.

#### *e.1 Site Selection/Routing Analysis*

NTD will conduct a detailed analysis to identify preferred and alternative routes/sites taking into consideration factors such as safety, environmental impacts and land use. The detailed analysis will include data collection, field evaluation, environmental review, engineering analysis, right-of-way review and agency and public review. The detailed analysis will identify all information necessary to support development of the application for any siting approval process

#### *e.2 Community and Landowner Engagement*

NTD will identify and engage stakeholders, such as community officials and landowners within the Project area, early in the process and maintain an active dialogue throughout. Public meetings may be held to offer a venue for landowners and other interested community members to learn about the Project and for NTD to learn more about specific landowner and community preferences. NTD plans to make information available on its website and provide notification of public meetings to landowners within the Project area as required in the siting approval process.

#### *e.3 Permitting*

As with all of LS Power's development projects, LS Power employees will directly oversee all Project permitting activities. From senior management to project managers and environmental, electrical and project engineers to support services including legal, administrative, regulatory and others, the Project will benefit from LS Power's detail-oriented and hands-on philosophy. In addition to LS Power personnel, NTD will utilize qualified third-party firms to support permitting and development efforts. In its experience, LS Power has found that working with local consultants and legal counsel provides both invaluable insight and the benefit of established relationships with permitting agencies. Additionally, LS Power has strong working relationships with numerous equipment manufacturers, suppliers, contractors and engineers to provide specialized technical data as necessary to support permitting; such information includes, for example, the most current equipment offerings and respective performance data, construction techniques to minimize impacts and permitting complexity and procurement and installation schedules. NTD has already held preliminary discussions with third-party support firms to confirm expectations on schedule and feasibility for permitting processes, procurement and

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construction, which information is incorporated in this Proposal. NTD will be involved in each step of the development process, carefully managing and reviewing work to ensure the various aspects of the Project fit together upon completion, ultimately being financeable and constructible.

### *e.4 Siting Approval*

Most high-voltage transmission projects will require a state siting approval. To begin the siting approval process, NTD plans to hold pre-application meetings with the regulatory agency to introduce NTD and the Project, as well as confirm its understanding of the process. Shortly thereafter, NTD will simultaneously begin collecting siting data and start its outreach efforts so that public siting input is incorporated at the earliest stages of the Project. Once NTD identifies a preferred site/route and at least one viable alternative site/route, NTD will carry out the environmental and detailed engineering work described in the Site Selection/Routing Analysis section above in order to establish a highly-detailed Project plan to support the siting applications.

### *e.5 Wetlands and Waterways*

It is possible that the Project's will impact a limited number of wetlands and waterways. If so, NTD expects the Project will be subject to regulation under certain permitting programs, namely Section 404 of the Clean Water Act, Section 10 of the Rivers and Harbors Act, and Section 401 of the Clean Water Act. NTD will engage a qualified consultant to conduct a wetlands delineation of the selected site/route in order to establish the extent of proposed impacts and the need for specific permits from the state or U.S. Army Corps of Engineers.

### *e.6 Various Minor Permits*

In addition to the permits described above, NTD has identified other permits which may be required for the construction of the Project. NTD considers these permits to be minor due to the more limited effort to prepare applications and the less intensive permitting processes which follow. These include permits related to airspace clearance, stormwater/erosion and sedimentation control, road crossings, and utility and railroad crossings.

### *e.7 Right-of-Way Acquisition*

The Project will be located primarily on new right-of-way to be acquired by NTD predominately in the form of easements. NTD will assign a Right-of-Way Manager to oversee all real estate related activities for the Project including appraisals, title work, surveying, land acquisition and restoration.

A land valuation study will be prepared to establish acreage values for the Project area to serve as the basis for consistent offers for securing easements. Title work will be prepared for each parcel and provided to the survey team for use in preparing legal descriptions for each easement. A right-of-way agent will contact each property owner in person to explain the Project and, as necessary, secure permission to conduct surveys, archaeological studies, etc. Right-of-way agents will be the primary point of contact and negotiate with property owners to acquire the easements on a mutually agreeable basis. To the extent that negotiations reach an impasse, NTD will be able to pursue eminent domain.



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The right-of-way agents will continue to act as a liaison with the property owners during construction and through the restoration process.

## *e.8 Project Construction*

NTD intends to follow the same approach for construction as was most recently used to construct the Cross Texas Transmission facilities in Texas. NTD will assign a Construction Manager, an Engineering Manager and a Permit/Compliance Manager to oversee, construction, engineering and compliance activities. This will include quality assurance, field inspectors, coordination activities, outage planning, document control, and various specialists. Appendix I provides an organizational structure depicting NTD's planned management arrangement.

NTD will use a combination of owner-managed and lump sum turn-key approaches for engineering, procurement and construction of the transmission line and substation equipment.

NTD will retain an owner's engineer to complete all detailed transmission line engineering and to support construction planning, scheduling, bid document preparation, and related activities. At this time, NTD plans to directly procure the Project transmission structures, conductors, and optical ground wire and associated hardware. NTD will enter into a line construction contract for the procurement of the remaining materials and construction of the transmission line including all access development, clearing, foundation construction, structure erection, and conductor, shield wire and OPGW stringing.

For a new switching station, NTD will likely enter into a turn-key contract for the design, engineering, procurement, construction, start-up and testing of the station equipment.

## **2. On-going Transmission Facility Items**

For all Project components, NTD intends to follow the same approach for operations and maintenance as is being used for the Cross Texas Transmission Facilities in Texas. NTD will maintain a reliable system and ensure safety and compliance with all applicable codes and standards. NTD will assign a Planning and Operations Manager to oversee the planning, maintenance, real-time operations, and emergency response activities. NTD will actively monitor the condition of the Project, perform condition based maintenance activities and replace equipment as needed. Appendix I provides an organizational structure depicting NTD's planned management arrangement.

### **a. Operational Plan**

NTD will have a transmission operations center to provide 24/7 monitoring of the Project to monitor and control voltage levels, power flows, or other parameters of the Project, as well as implement procedures needed for emergency or planned maintenance.

### **b. Maintenance Plan**

NTD will implement an active, thorough inspection and maintenance program for the Project consistent with industry practices including transmission line inspections, vegetative and right-of-way



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maintenance, and substation maintenance.

### 3. Assumptions

The key assumptions used in preparing the estimated costs and schedules are detailed above and in the attachments.