PPL Corporation

Company Background:

- As one of the largest investor-owned companies in the U.S. utility sector, PPL Corporation delivers on its promises to customers, investors, employees and the communities we serve.
- Our utilities – Western Power Distribution, Louisville Gas & Electric and Kentucky Utilities, and PPL Electric Utilities – provide an outstanding service experience for our customers, consistently ranking among the best in the U.S. and the U.K.
- $7.7 billion in annual revenue
- Total assets of $39.5 billion
- 10.5 million customers in the U.S. and U.K.
- 13,000 employees
- About 8,000 megawatts of regulated generation capacity in the U.S.
- 41 J.D. Power awards for customer satisfaction

PPL Electric Utilities

Company Background:

- PPL Electric Utilities is a unit of PPL Corporation and serves approximately 1.4 million customers in central and eastern Pennsylvania.
- PPL Electric Utilities in a member of PJM, operates approximately 48,000 miles of power line and is consistently ranked among the best companies for customer service in the United States.
- PPL Electric Utilities is investing more than $5 billion over the next five years to improve the electric delivery system – replacing aging facilities and building new ones to meet growth in demand and to make our network even more reliable.
Lauschtown 500/230/69 kV Substation

**Description:** The project involves construction of new 500/230 kV and 230/69 kV substations in Lancaster County Pennsylvania at the intersection of the TMI Hosensack 500 kV, South Akron – S. Reading 230 kV and South Akron – Berks 230 kV lines. The 230 kV substation will consist of double breaker, double bus AIS configuration and the 500/230 kV substation will be a GIS installation in a double breaker, double bus configuration.

**Benefits:** The new substations will address short and long term transmission system reliability violations and provide load relief to substations in the region.

**Status:** Construction started in the fall of 2015, all foundations and underground utilities are complete. Above ground electrical installation and testing is in progress. The project is 75% complete. Anticipated in-service date is March of 2017 for 230/69 kV facilities and May of 2017 for 500/230 kV facilities.

**Investment Partners:** None

**Cost:** The estimated cost of the project is $100 million.

Northeast/Pocono Reliability Project

**Description:** The project comprises three new 230 kV/69 kV electrical substations (Acahela, Paupack, Pocono) and almost 60 miles of new 230 kV transmission lines that will interconnect them. Additionally, the project includes rebuilding almost 30 miles of existing 69 kV transmission lines to 138 kV standards and about 10 miles of transmission lines to tie the new substations into the local power lines. Finally, upgrades and enhancements will be performed at multiple remote end existing substation locations.

**Benefits:** The Northeast Pocono Reliability Project was established to meet the growing demand for electricity and to improve reliability in northeastern Pennsylvania and, specifically, Pocono Mountains resort areas.

**Status:** The project is 99% complete with all facilities in-service as of April of 2016.

**Investment Partners:** None

**Cost:** The project is estimated to cost approximately $335 million.
Greater Scranton Reliability Project

**Description:** This project involves construction of a new 230/69 kV Summit substation and rebuilding of an existing 230/69 kV Stanton substation in the Lackawanna County area as well as rebuilding and redistributing the load on the 69 kV system in the region. Each substation will be designed for breaker-and-a-half configuration at both 230 and 69 kV.

**Benefits:** Improved reliability and operational flexibility at both bulk and regional levels of the transmission system.

**Status:** In construction and engineering stages.

**Investment Partners:** None

**Cost:** The estimated cost of the project is approximately $225 million.

Sugar Notch Area Reliability Improvement

**Description:** This project involves rebuilding and increasing capacity of the existing 230 kV Harwood Jenkins transmission line. In addition a new 230/69 kV substation will be constructed, along with rebuilding the associated sub-transmission lines in the region to current standard. The substation will be designed for breaker-and-a-half configuration at both 230 and 69 kV.

**Benefits:** Improved bulk power flow with increased reliability and operational flexibility on the sub-transmission in the area.

**Status:** The 230kV rebuild is in construction with the remaining scope in design stages.

**Investment Partners:** None

**Cost:** The estimated cost of the project is approximately $300 million.
Northern Lehigh Reliability Project

**Description:** This project involves the addition of a second circuit on the 500 kV line between Alburtis 500kV switchyard and Breinigsville 500/138/69 kV substation. In addition, the project includes upgrading the 500 kV Wescosville substation and Alburtis switchyard, rebuilding both the 230/69 kV Siegfried and Quarry Substations and rebuilding many of the surrounding 69 kV system in the area. The Wescosville 500 kV substation will be built to double breaker double bus configuration, while each 230/69 substation will be designed for breaker-and-a-half configuration at both 230 and 69 kV.

**Benefits:** Improved reliability at both bulk and regional levels of the transmission system.

**Status:** Initial segments of this project are under construction with the majority of the project in design and development stages.

**Investment Partners:** None

**Cost:** The estimated cost of this project is approximately $385 million.

### Louisville Gas & Electric and Kentucky Utilities (LG&E/KU)

**Company Background:**

- Louisville Gas and Electric Company and Kentucky Utilities Company (LG&E/KU), part of the PPL Corporation family of companies, are regulated utilities that serve a total of 1.3 million customers.
- LG&E serves 322,000 natural gas and 403,000 electric customers in Louisville, KY and 16 surrounding counties.
- KU serves 546,000 customers in 77 Kentucky counties and five counties in Virginia.
- LG&E/KU operate over 5,000 miles of transmission and is consistently ranked among the best companies for customer service in the United States.
Cane Run Unit 7 Transmission

**Description:** Cane Run coal units 4, 5 and 6 were retired during mid-2015 to maintain compliance with new Environmental Protection Agency (EPA) rules. To replace this lost generation, a combined cycle generator (unit 7) which includes two natural gas turbines and one heat recovery unit, was installed at the Cane Run Plant site. In order to accommodate this major generation change, some existing transmission facilities were required to be moved. A new switchyard, control house, 345/138 kV transformer, and 345 kV line were constructed, 138 kV lines were relocated, and various equipment at the existing switchyard were upgraded in order to accommodate this move.

**Benefits:** The project supports the operation of the new Cane Run 7 unit and the retirement of Cane Run units 4, 5, & 6.

**Status:** The project was placed in-service during mid-2015.

**Investment Partners:** None

**Cost:** The total project cost was $23 million.

Kenzig Road

**Description:** The project includes a new 345 kV switching station and interconnection with Duke Energy Indiana in New Albany, IN.

**Benefits:** The project improves reliability in the region surrounding Louisville, KY by eliminating overload conditions under certain contingencies.

**Status:** The project was placed in-service during mid-2015.

**Investment Partners:** None

**Cost:** The total project cost was $26 million.
Public Service Company of New Mexico

Company Background:

- Public Service Company of New Mexico (PNM), utility operating company subsidiary of PNM Resources, Inc. ("PNMR"), is a regulated New Mexico utility with operations primarily engaged in the generation, transmission and distribution of electricity.
- PNM is the state’s largest retail electricity provider serving more than 500,000 New Mexico residential and business customers the majority of whom are located in north central New Mexico.
- PNM owns and operates over 14,000 miles of transmission and distribution lines.

Rio Puerco Static Var Compensator

Description: The Rio Puerco Static Var Compensator (SVC) project was installed at PNM’s Rio Puerco 345 kV switching station. The operating range of the SVC (i.e., the capability to produce or absorb reactive power) is -100 (reactive) Mvar to +250 (capacitive) Mvar. The Rio Puerco switching station is located in the Central Rio Grande Valley of New Mexico. The SVC provides voltage support to the transmission system that serves the City of Albuquerque and surrounding area, and helps maintain compliance with North American Electric Reliability Corporation (NERC) and WECC reliability standards.

The purpose of this SVC project is to maximize utilization of existing transmission assets and insure that PNM’s bulk transmission system will continue to provide reliable service. PNM’s Northern New Mexico transmission system is used to deliver remote coal and nuclear generation resources from the Four Corners area to PNM’s native load customers and network transmission customers in the north central
New Mexico, which accounts for approximately eighty percent (80%) of PNM’s peak load. Utilization of the Northern New Mexico transmission system has been increasing, which leads to greater impacts when facilities are out of service and increases risk in complying with mandatory reliability standards that have become more stringent.

Benefits:

• Greatly improving voltage support during forced or planned outages of major transmission lines or equipment.
• Simplified operation of the system by eliminating the need to maintain a number of complex tools (nomograms) and procedures to address voltage limits.
• Reduce the need to commit Albuquerque load-side generation for voltage support, before the full capacity of the transmission lines is utilized, saving on generation costs.
• Provide additional voltage support while reducing dependence on System Operator action and load-side generation to more fully utilize the capacity of PNM’s northern New Mexico transmission system.

Status: SVC went into service June 2016.

Investment Partners: None

Cost: $33.3 million
Guadalupe Static Var Compensator (SVC) Project

**Description:** The Guadalupe Static Var Compensator (SVC) project will be installed at PNM’s Guadalupe 345 kV switching station. The operating range of the SVC (i.e., the capability to produce or absorb reactive power) is -100 (reactive) Mvar to +250 (capacitive) Mvar. The Guadalupe switching station is located in eastern New Mexico on a PNM owned 216 mile 345 kV transmission line routed in proximity to areas of New Mexico with very large wind generation potential. With the national and regional push for renewable generation resources (e.g., California targeting 50 percent renewables by 2030), there has been substantial interest by wind developers to interconnect to this transmission line. The SVC will provide voltage support to the transmission system to transfer up to 1000 MW of wind generation and will help maintain compliance with North American Electric Reliability Corporation (NERC) and WECC reliability standards.

The purpose of this SVC project is to maximize utilization of existing transmission assets and insure that PNM’s bulk transmission system will continue to provide reliable service.

**Benefits:** Provide additional voltage support to more fully utilize the capacity of PNM’s northern New Mexico transmission system.

**Status:** In progress with an anticipated completion date of March 2018.

**Investment Partners:** None

**Cost:** Approximately $38.6 million
Public Service Electric and Gas Company (PSE&G)

Company Background:

- Public Service Electric and Gas Company (PSE&G) serves 2.2 million electric customers and 1.8 million gas customers in New Jersey. These customers reside in a 2,600 square mile diagonal corridor across the state from Bergen to Gloucester Counties.
- System-wide there are approximately 1,800 circuit miles of transmission line.

Northeast Grid Reliability Project

Description: The Northeast Grid Reliability Project consists of upgrading approximately 50 miles of overhead transmission circuits from 138 kV to 230 kV operation, constructing a new 230 kV underground circuit from Bergen to Athenia Stations looping through Saddle Brook Station, constructing a new underground circuit from South Waterfront Station to Hudson Station, and upgrading the 230 kV or converting to 230 kV operation at 12 existing stations. This is an electric reliability transmission baseline upgrade to the PJM transmission system. PSE&G designed, procured and constructed all transmission facilities within the scope of this project.

Benefits: This project is needed to maintain transmission system reliability by addressing several PJM-identified voltage violations. The project will prevent these violations and reinforce the transmission system in northern New Jersey.

Status: The project was fully placed in service in July 2016.

Investment Partners: None

Cost: Approximately $975 million
Susquehanna – Roseland 500 kV Transmission Line Project

Description: The Susquehanna – Roseland 500 kV Transmission Line Project consists of approximately 45 miles of new 500 kV transmission line running from the Delaware Water Gap east to the Roseland Switching Station, and two new 500 kV switching stations; one in Hopatcong and one in Roseland. This project is an electric reliability transmission baseline upgrade to the PJM transmission system, extending from the Berwick area in Pennsylvania to the Roseland-East Hanover area in northern New Jersey. PSE&G constructed the New Jersey portion of the project, while PPL Electric Utilities constructed the Pennsylvania portion of the project.

Benefits: The project is needed to maintain reliability by addressing several PJM-identified reliability criteria violations. The project will prevent overloads on existing power lines in New Jersey and Pennsylvania.

Status: The Hopatcong to Roseland portion of the project was placed in service in April 2014. The portion West of Hopatcong and through the New Jersey side of the National Park was placed in service when PPL completed its work in May 2015.

Investment Partners: PPL Electric Utilities Corporation

Cost: Approximately $1.4 billion, of which approximately $790 million is PSE&G’s responsibility.
Mickleton – Gloucester – Camden Reinforcement Project

**Description:** The Mickleton – Gloucester – Camden Reinforcement Project (referred to as Southern Reinforcement Project) scope consists of building two new 230 kV underground circuits from Gloucester Switch to Camden Switch looping one into Cuthbert Boulevard Substation, building a second parallel overhead circuit from Gloucester Switch to Atlantic City Electric’s Mickleton Station, and re-conductoring the existing Gloucester – Mickleton. The project installed 36 miles of transmission line, 10 miles of overhead reconductoring, 10 miles of new overhead, and 16 miles of new underground. PSE&G designed, procured and constructed all transmission facilities within the scope of this project.

**Benefits:** The project is needed to maintain transmission system reliability by addressing several PJM-identified thermal overloads. The project will prevent these violations and reinforce the transmission system in Southern New Jersey.

**Status:** The project was placed in service in June 2015.

**Investment Partners:** None

**Cost:** Approximately $435 million
The Bergen Linden Corridor 345 kV Project

**Description:** The Bergen Linden Corridor 345 kV transmission project will construct double circuit 345 kV infrastructure. Approximately 25 miles will be overhead and 35 miles of underground line will be either upgraded or added to the system to operate at 345 kV. The project includes the following major stations: Bergen, Marion, Bayonne, North Avenue, Bayway, Linden and a new station at Newark Airport. Overhead circuits will connect Bergen and Marion stations and Bayway and Linden stations. Underground circuits will connect Marion, Bayonne, North Ave, Airport and Bayway. This is a proposed electric reliability transmission baseline upgrade to the PJM transmission system. PSE&G will design, procure, and construct all transmission facilities within the scope of this project.

**Benefits:** This is a proposed electric reliability transmission baseline upgrade to the PJM transmission system which addresses thermal and short-circuit reliability.

**Status:** A phased implementation of the project has been considered an appropriate and effective means to resolve the various reliability criteria violations resolved by this project. Phase 1 targets Marion to Bergen portions and was placed in service in May 2016; Phase 2 targets Bayway to Linden portions for completion by June 2017; and Phase 3 targets Marion to Bayway portions for completion by June 2018.

**Investment Partners:** None

**Cost:** Approximately $1.2 billion
SCANA Corporation

Company Background:

- South Carolina Electric & Gas (SCE&G) delivers electricity to more than 668,000 retail and wholesale customers throughout South Carolina.
- SCE&G owns more than 3,650 miles of transmission lines and participates in numerous transmission assessment and planning efforts; including the Eastern Interconnection Planning Collaborative (EIPC), SERC reliability assessment activities, the Carolinas Transmission Coordination Arrangement (CTRA) and the South Carolina Regional Transmission Planning (SCRTP) process.

V.C. Summer #2 and #3 Interconnection Project

Description: The V.C. Summer #2 and #3 Interconnection Project includes four (4) new 230 kV transmission circuits originating at the V.C. Summer Nuclear Station and connecting to existing and new transmission substations within the SCE&G system. These 4 circuits will reliably interconnect and integrate these generators into the electrical transmission grid. These 4 circuits total over 250 miles of new construction including the V.C. Summer – Killian 230 kV line (37 miles), the Summer – Lake Murray 230 kV #2 line (22 miles) and the V.C. Summer – St. George double circuit 230 kV lines (96 miles each). All but 6 miles of this transmission construction will be located on existing rights-of-way. Because 245 miles of this construction will be on existing rights-of-way, a significant amount of existing 115 kV circuits is being rebuilt/relocated on these existing rights-of-way to provide space for the new 230 kV construction. These circuits will be located entirely within the state of South Carolina.

Benefits: This transmission project will reliably interconnect the V.C. Summer #2 and #3 Nuclear Generators, which will provide continued electric power to meet South Carolina’s energy needs.
Status: The V.C. Summer – Killian 230 kV line was placed in-service in May 2014 and the V.C. Summer – Lake Murray #2 230 kV line was placed in-service in September 2014. The V.C. Summer – St. George 230 kV lines are currently under construction and the estimated in-service date is May 2018.

Investment Partners: None

Cost: The estimated cost of these 4 circuits is $272 million.
Southern California Edison (SCE)

Company Background:

- SCE provides power to 180 cities in 50,000 square miles encompassing 11 counties in central, coastal, and Southern California serving 13 million people and nearly 300,000 businesses.
- The SCE-owned transmission grid is under the operational control of the California Independent System Operator (CAISO).
- SCE’s system consists of over 12,000 circuit miles of transmission lines.
- In 2015, SCE invested approximately $440 million (direct costs in nominal dollars, excluding corporate overheads) of capital in transmission projects.
- From 2016-2019, SCE plans to invest approximately $2.2 billion (direct costs in nominal dollars, excluding corporate overheads) of capital in transmission projects.

Transmission Related Smart Grid Initiatives: SCE is also making substantial investments in advanced technologies that will move SCE towards a more integrated Smart Grid. Two such projects are the Tehachapi Wind Energy Storage Project (TSP) and Centralized Remedial Action Schemes (CRAS).
Tehachapi Renewable Transmission Project (TRTP)

Description: The TRTP is an 11 segment project consisting of new and upgraded 220 kV and 500 kV transmission lines and associated substations built primarily to assist the development of renewable energy generation projects in remote areas of eastern Kern County, California. Segments 1-3 consist of 83 miles of new transmission and TRTP Segments 4-11 consist of 173 miles of transmission.

TRTP Segments 1-3 are specific to the Tehachapi Wind Resource Area in southern Kern County and Los Angeles County, and include:

- Segment 1: 26.5 miles of 500 kV transmission line from Santa Clarita to Lancaster;
- Segment 2: 21 miles of new 500 kV and 220 kV transmission lines and modifications at the Vincent Substation in Lancaster;
- Segment 3a: 25.6 miles of 500 kV and 220 kV transmission lines connecting SCE’s Antelope Substation in Lancaster to a new substation west of Mojave in Kern County; and
- Segment 3b: 9.6 miles of 220 kV transmission line from Mojave to east of Tehachapi.

TRTP Segments 4-11 are specific to new and upgraded electric transmission lines and substations between eastern Kern County and San Bernardino County, and include:

- Segment 4: Construction of the new 15 mile 500 kV transmission line from Whirlwind Substation to Vincent Substation. Construction would be in a new ROW, parallel to the existing ROW;
- Segment 5: Construction of a new 18 mile 500 kV transmission line that would connect SCE’s existing Antelope Substation with SCE’s existing Vincent Substation near Acton. This new line would be built next to an identical existing 500 kV line and would replace two 220 kV lines that would be removed. An existing ROW would be utilized. This new line would be initially energized at 220 kV;
- Segment 6: Replacement of approximately 16 miles of an existing 220 kV transmission line that runs from SCE’s existing Vincent Substation to the southern edge of the Angeles National Forest (ANF) near the city of Duarte with a new 500 kV transmission line that would initially be energized at 220 kV. An existing ROW would be utilized. Replacement of approximately five miles of an existing SCE 220 kV transmission line between Vincent Substation and the northern border of the ANF with a new 500 kV transmission line;
- Segment 7: Replacement of 16 miles of the existing 220 kV line from the ANF border near the city of Duarte south to SCE’s existing Rio Hondo Substation in the city of Irwindale and then continuing southwest across various San Gabriel Valley cities toward SCE’s existing Mesa Substation in the Monterey Park/Montebello area with a double-circuit, 500 kV transmission line.
Existing ROWs would be utilized and various lower-voltage subtransmission lines between the Rio Hondo and Mesa Substations would require relocation within existing ROW or public ROW;

- Segment 8: Replacement of existing single-circuit, 220 kV line that runs from the existing Mesa Substation area to the Chino Substation area and existing double-circuit, 220 kV line from Chino Substation to the existing Mira Loma Substation with a 33 mile double-circuit, 500 kV line. Replacement of approximately seven miles of existing 220 kV line that run from SCE’s Chino Substation to its Mira Loma Substation located in the city of Ontario with a double-circuit, 220 kV line. Existing ROWs would be utilized except for where approximately three miles of new ROW would be required in limited areas. Various lower-voltage sub-transmission lines in the Chino area would require relocation within existing ROW or public ROW;

- Segment 8a Underground: Construction of approximately 3.5 miles of underground single-circuit 500 kV transmission line in existing ROW through Chino Hills;

- Segment 9: Installation of equipment and upgrades at Antelope, Vincent, Windhub, and Whirlwind Substations to connect new 220 kV and 500 kV transmission lines to facilitate interconnection of renewable resources;

- Segment 10: Construction of 17 miles of new single-circuit, 500 kV transmission line to connect the proposed Whirlwind Substation (Segment 4) with the Windhub2 Collector substation. New ROW would be required; and

- Segment 11: Replacement of approximately 20 miles of 220 kV transmission line between the existing Vincent Substation and Gould Substation near La Cañada Flintridge with 17 miles of new single-circuit, 500 kV transmission line. Installation of a second 220 kV transmission line on the currently empty side of the transmission towers that already extend from the area of Gould Substation across various San Gabriel Valley cities to the area of Mesa Substation in Monterey Park. An existing ROW would be utilized.

**Benefits:** TRTP will support interconnection of up to 4,500 MWs of generation, most of which are expected to be renewable resources. This will assist California to meet its RPS goals; improve the reliability of the California transmission grid by enabling the expansion of the transfer capability of Path 26; serve load growth in the Antelope Valley; and ease transmission constraints in the Los Angeles basin.

**Status:** Regulatory approvals granted for Tehachapi Segments 4-11 include: CPUC CPCN in December 2009, US Forest Service Biological Opinion in July 2010, US Forest Service Record of Decision (ROD) in October 2010, US Army Corp of Engineers ROD in February 2011, and Angeles National Forest Special Use Permit in September 2011. Construction of segments 4-11 began in 2010. A Petition for Modification was filed with the CPUC in October 2011 and a July 2013 decision directed SCE to underground a 500 kV transmission line segment through Chino Hills. A Petition for Modification to implement Federal Aviation Authority (FAA) mitigations was filed with the CPUC in October 2011 and was approved in October 2013. Segments 1-10, Windhub, Whirlwind, and Highwind Substations are in service. Segment 11, Segment 8a Underground and the associated remaining work are in construction to meet the forecast in-service dates through 2016.

**Investment Partners:** None

**Cost:** Approximately $3.2 billion (estimated direct costs in nominal dollars, excluding corporate overheads).
Path 42

**Description:** The Path 42 project, in partnership with Imperial Irrigation District (IID), will enable the delivery of additional renewable energy to the CAISO controlled grid. The SCE portion of this project primarily consists of the reconductor of approximately 15 miles of the Devers – Mirage #1 and Devers – Mirage #2 230 kV transmission lines along with various upgrades at both the Devers Substation and Mirage Substation.

**Benefit:** This project will enable transfer of approximately 1,090 MWs of additional renewable energy from IID to SCE's portion of the CAISO controlled grid. Once IID completes their portion of the project, this project will contribute to meeting California's RPS goal of 33 percent of retail load served by renewable resources by 2020.

**Status:** IID obtained California Environmental Quality Act and National Environmental Policy Act approval in November 2013. The project was completed in January 2015.

**Investment Partners:** Imperial Irrigation District.

**Cost:** (SCE Portion): Approximately $31 million (estimated direct costs in nominal dollars excluding corporate overheads).

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**Tehachapi Wind Energy Storage Project (TSP)**

**Description:** The Tehachapi Wind Energy Storage Project (TSP) is evaluating the performance of an 8 MW, 32 MWh (4-hour), lithium-ion utility-scale battery energy storage system (BESS) to improve grid performance and assist with the integration of large-scale high-penetration variable energy resources. The project is located in the Tehachapi Wind Resource area, with over 4,500 MW of wind development potential. The system is connected to the regional transmission network and was the largest lithium-ion BESS in North America at the time of commissioning, in terms of energy storage capacity. Project performance is being evaluated across 13 operational uses: provide voltage support and grid stabilization; decrease transmission losses; diminish congestion; increase system reliability; defer transmission investment; optimize renewable-related transmission; provide system capacity and resource adequacy; integrate renewable energy (smoothing); shift wind generation output; provide frequency regulation, spin/non-spin replacement reserves, and ramp management, and perform energy price arbitrage. The 13 operational uses are consolidated into eight core test modes, some of which include concurrent
active and reactive power dispatch. The system also features dual control interfaces for providing either grid or market operations functions.

Benefits: The project evaluates the capability of utility-scale lithium-ion battery technology to improve grid performance and assist with the integration of variable energy resources. The system has proved the concept of a “dual-use” BESS by providing either grid or market operations functions as required. The system continues to be used to refine the dual-use strategy, especially the integration and dispatch of battery systems in the CAISO market. If the system operates beyond the DOE M&V period, SCE expects to learn even more about the long-term management and viability of large-scale lithium-ion battery system integration.

Status: The BESS was commissioned and completed System Acceptance Testing in July 2014, marking the start of a two-year DOE measurement and validation (M&V) period. Since then, the system has been operated in each of the core test modes supporting grid operations. SCE gained valuable experience throughout the M&V period regarding the reliability and stability of the system, including working through various battery and power conversion system integration issues with the manufacturers. In mid-2016, the system switched to market operations, when it was bid to provide ancillary services on the California Independent System Operation (CAISO) market. Both SCE and CAISO have been using the system to improve the telemetry and optimize the dispatch of this and future battery systems that will participate in the market. The system will continue a mixture of grid and market operations through the end of 2016 and the conclusion of the DOE M&V period. A final technical report will be delivered to DOE in early 2017, officially closing the original project. However, SCE is seeking approval from the California Public Utilities Commission (CPUC) to continue operations for another ten years as a CAISO market participant.

Investment Partners: Department of Energy through an American Recovery and Reinvestment Act (ARRA) project grant, and LG Chem Inc. as an ARRA cost share participant.

Cost: Approximately $50 million: $25 million Department of Energy (DOE) funding, remainder of project costs funded by SCE and its partners (estimated direct costs in nominal dollars, excluding corporate overheads).
Centralized Remedial Action Schemes (CRAS)

**Description:** The Centralized Remedial Action Schemes (CRAS) project will centralize control and operation of SCE's special protection systems on the SCE transmission grid. The CRAS will transition existing special protection systems from an Intelligent Electronic Device (IED) at substations to a redundant and highly secure centralized processing system. The CRAS will accommodate complex special protection systems that would not be possible with individual IED systems.

**Benefits:** The CRAS will 1) mitigate and permit existing and new generation projects to connect to the grid and to meet California’s RPS goal; 2) enhance the coordination and effectiveness of existing special protection technology; 3) enhance the ability to build new schemes to enable a more efficient generator interconnection process; and 4) improve the efficiency of managing and maintaining existing and new special protection systems.

**Status:** The CRAS Project was completed with two stand-alone RASs incorporated during April 2016. Currently the project is ramping down and in a stabilization phase. CRAS is performing as designed and there are no major anomalies to date.

**Investment Partners:** None

**Cost:** Approximately $50 million (estimated direct costs in nominal dollars, excluding corporate overheads).
Southern Company

Company Background:

- Serving more than 9 million customers, Southern Company owns electric utilities in four states, natural gas distribution utilities in seven states, a competitive generation company serving wholesale customers across America and a nationally recognized provider of customized energy solutions, as well as fiber optics and wireless communications.
- Southern Company's regulated retail electric utilities include Alabama Power; Georgia Power; Gulf Power; and Mississippi Power.
- System-wide there are approximately 27,000 circuit miles of transmission line.
- Between 2006 and 2015, Southern Company invested over $4.4 billion in transmission.

East Pelham 230/115 kV Transmission Substation Project

Description: The East Pelham 230/115 kV Transmission Substation project includes approximately one mile of new single-circuit, 230 kV transmission line; 33.5 miles of new single-circuit, 115 kV transmission line; upgraded structures on approximately 18 miles of single-circuit, 230 kV transmission line; constructs a new 400 MVA, 230/115 kV substation on a 26 acre site; and constructs two new 115 kV switching stations (Alabaster and East Chelsea).

Benefits: This project will meet load growth and provide infrastructure reliability in the Birmingham, Alabama area.

Status: This project is in service as of the summer of 2015.

Investment Partners: None

Cost: Approximately $57 million
Greene County – Bassett Creek 230 kV Line Project

**Description:** The Greene County – Bassett Creek 230 kV line project consists of approximately 58 miles of new single-circuit, 230 kV transmission line between Greene County SP and Bassett Creek 230/115 kV Substations.

**Benefits:** This project is for infrastructure reliability in the Thomasville area of Alabama.

**Status:** This project is in service as of the summer of 2015.

**Investment Partners:** None

**Cost:** Approximately $68 million

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Mobile Area Network Project

**Description:** The Mobile Area Network Project consists of constructing a 115 kV six terminal switching station at North Crichton; approximately 6 miles of new single-circuit, 115 kV transmission line; reconductoring 26 miles of existing single and double-circuit, 115 kV transmission line; and installing associated network switches and distance relaying.

**Benefits:** This project is for infrastructure reliability and operational flexibility in the Mobile Metropolitan area of Mobile County, Alabama.

**Status:** This project is currently scheduled to be in service the fall of 2016.

**Investment Partners:** None

**Cost:** Approximately $44 million
North Brewton – Alligator Swamp 230 kV Line Project

**Description:** The North Brewton – Alligator Swamp 230 kV line project consists of approximately 54.7 miles of new single-circuit, 230 kV transmission line between North Brewton 230/115 kV and Alligator Swamp 230 kV Substations.

**Benefits:** This project is for infrastructure reliability in the Pensacola area of Florida.

**Status:** This project is in service as of the summer of 2015.

**Investment Partners:** None

**Cost:** Approximately $73 million

Pinckard – Holmes Creek – Highland City 230 kV Transmission Line Project

**Description:** The Pinckard – Holmes Creek – Highland City 230 kV Transmission Line Project consists of approximately 73 miles of new single-circuit, 230 kV transmission line from the Holmes Creek Substation to the Highland City Substation (in the northeastern area of the Florida Panhandle) and rebuilding the existing Pinckard TS – Holmes Creek 115 kV transmission line and converting it to 230 kV operation.

**Benefits:** This project is for load growth and reliability in Southeast Alabama and in the central Panhandle, Panama City, and Destin areas of Florida.

**Status:** This project is in service as of the summer of 2015.

**Investment Partners:** None

**Cost:** Approximately $92 million
Plant Smith – Laguna Beach – Santa Rosa 230 kV Transmission Line Project

**Description:** The Plant Smith – Laguna Beach – Santa Rosa 230 kV Transmission Line Project consists of converting 14 miles of existing single-circuit, 115 kV line to 230 kV operation between Plant Smith and Laguna Beach Substations; a second 230 kV Autobank at Laguna Beach Substation; replace Laguna Beach – Santa Rosa #1 115 kV transmission line with a 230 kV transmission line; and add a new Santa Rosa 230 kV Substation with one, 400 MVA transformer bank (in the Central Florida Panhandle, Destin, and Panama City Beach areas).

**Benefits:** This project is for load growth and reliability in the Panama City and Destin areas of the Florida Panhandle.

**Status:** This project is in service as of the summer of 2015.

**Investment Partners:** None

**Cost:** Approximately $54 million

Plant Vogtle Network Improvement Project

**Description:** The Plant Vogtle Network Improvement Project consists of approximately 50 miles of new single-circuit, 500 kV transmission line between Vogtle and Thomson 500/230 kV Substations, and expanding the 500 kV switchyard at Plant Vogtle.

**Benefits:** This project will support the expansion of the existing Plant Vogtle facility.

**Status:** This project is currently scheduled to be in service the fall of 2017.

**Investment Partners:** None

**Cost:** Approximately $133 million
### Tuscaloosa Area Solution

**Description:** The South Tuscaloosa – Eutaw Area Network Project consists of 23 miles of new single-circuit, 115 kV transmission line from the Epes Substation to the Eutaw Substation; a new 230/115 kV substation at Moundville T.S.; approximately 21.2 miles of new single-circuit, 115 kV transmission line; converting two 46 kV substations to 115 kV operation; constructing approximately 25 miles of new single-circuit 230 kV transmission line; and reconductoring approximately 30 miles of existing 115 kV TL from Eutaw TS to South Tuscaloosa.

**Benefits:** This project is for load growth, infrastructure reliability and operational flexibility in the Tuscaloosa County and Greene County areas of Alabama.

**Status:** The first two phases of the project are completed. The final phase of the project will be completed by summer of 2019.

**Investment Partners:** None

**Cost:** Approximately $119 million

### Wadley 500/230 kV Project

**Description:** The Wadley 500/230 kV Project consists of expanding the existing Wadley 230/115 kV substation by constructing a 500 kV ring bus and installing a new 2,016 MVA 500/230 kV autotransformer.

**Benefits:** This project will enhance reliability in the Augusta area and support the expansion of the existing Plant Vogtle facility.

**Status:** This project is currently scheduled to be in service the fall of 2019.

**Investment Partners:** Municipal Electric Authority of Georgia (MEAG Power)

**Cost:** Approximately $56 million
Jasper 161 kV Area Improvements

**Description:** The Jasper Area Improvement Project consists of reconductoring 20 miles of existing 161 kV line, constructing .8 miles of new 161 kV TL and installing a new 161 kV substation.

**Benefits:** This project is for load growth, infrastructure reliability and operational flexibility in the Jasper area.

**Status:** This project is currently scheduled to be in service the summer of 2017.

**Investment Partners:** None

**Cost:** Approximately $27 million

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Eastern Area Improvements

**Description:** The Eastern Area Improvement Project consists of reconductoring approximately 5 miles of existing 115 kV line; adding a new 115 kV switching station; and constructing approximately 34 miles of new 115 kV line.

**Benefits:** This project is for load growth, infrastructure reliability and operational flexibility in the Anniston and Gadsden areas.

**Status:** This project is currently scheduled to be in service the summer of 2019.

**Investment Partners:** None

**Cost:** Approximately $41 million
**Auburn – Opelika 115 kV Networking**

**Description:** The Auburn – Opelika 115 kV Networking project consists of constructing four new 115 kV switching stations, reconductoring approximately 23 miles of existing 115 kV line and constructing 4 miles of new 115 kV line.

**Benefits:** This project is for load growth, infrastructure reliability and operational flexibility in the Auburn and Opelika areas.

**Status:** This project is currently scheduled to be in service the fall of 2018.

**Investment Partners:** None

**Cost:** Approximately $34 million

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**Panama City Area Voltage Improvements**

**Description:** The Panama City Area Voltage Improvements consist of a new +125/-100 MVAR 230 kV Static Var System in the area.

**Benefits:** This project will provide dynamic voltage support for the Panama City area.

**Status:** This project is in service as of the summer of 2015.

**Investment Partners:** None

**Cost:** Approximately $20 million
Jasper – Pine Grove Primary 115 kV Project

**Description:** The Jasper – Pine Grove Primary 115 kV rebuild project consists of rebuilding approximately 22 miles with 230 kV constructed single pole structures with 100˚C 1351 ASCR conductor.

**Benefits:** This project is for infrastructure reliability in the Valdosta area of Georgia.

**Status:** This project is in service as of winter 2015.

**Investment Partners:** Georgia Transmission Corporation (GTC)

**Cost:** Approximately $26 million

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Boulevard 230/115 kV Project

**Description:** At the Boulevard 115/46/13.8 kV substation, install a 230/115, 400 MVA transformer. Increase the capacity of the 36 MVAR, 115 kV capacitor to 60 MVAR. Terminate the Dean Forest 230 kV line. This will require a complete rebuild of the Boulevard substation.

- Rebuild the Boulevard – Dean Forest 115 kV Black/ White common tower lines, to 230 kV specs using 170C, 1351 ACSS conductor. Operate one side at 230 kV and the other side at 115 kV.
- Expand the Dean Forest 230 kV ring-bus and terminate the Boulevard 230 kV line and the Crossgate 230 kV line.
- At a point approximately 2.0 miles from Plant Kraft on the Kraft – McIntosh 230 kV Black/White lines, construct a three-element, 230 kV ring-bus switching station. Tap the Kraft – McIntosh 230 kV White line creating the Dean Forest, Kraft and McIntosh 230 kV lines. Construct a 5.5 mile, Crossgate – Dean Forest 230 kV line using 170C, 1351 ACSS conductor.
**Transmission Projects: At A Glance — Southern Company**

**Edison Electric Institute**

**Transmission Projects: At A Glance — Southern Company**

**Benefits:** This project is for infrastructure reliability and operational flexibility in the Savannah area of Georgia.

**Status:** This project is currently scheduled to be in service the summer of 2015.

**Investment Partners:** Georgia Transmission Corporation (GTC)

**Cost:** Approximately $70 million

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**Dublin Area Solution**

**Description:** The Dublin area solution project consists of constructing a Dudley – North Dublin 115 kV line, constructing 115 kV 3 breaker switching stations at the Jeffersonville tap and at Beckham Road, upgrading the Bonaire – Jeffersonville tap line section, rebuilding the existing Jeffersonville/ Danville tap, upgrading the Soperton 115 kV bus, and performing various normal open point changes.

**Benefits:** This project is for infrastructure reliability and operational flexibility in the Dublin area of Georgia.

**Status:** This project is currently scheduled to be in service the summer of 2017.

**Investment Partners:** Georgia Transmission Corporation (GTC)

**Cost:** Approximately $27 million

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*Map is representative and not to scale.*
Pinecrest (formerly Sharon Springs) 230/115 kV Substation Project

**Description:** The Pinecrest 230/115 kV Project consists of constructing a new 230 kV line from Cumming to Pinecrest, installing a 300 MVA 230/115 kV autotransformer at the Pinecrest distribution station with two 115 kV line breakers. Terminate the 115 kV lines from Hopewell and Suwanee.

**Benefits:** This project is for infrastructure reliability in North Metro Atlanta area of Georgia.

**Status:** This project is currently scheduled to be in service the summer of 2017.

**Investment Partners:** Georgia Transmission Corporation (GTC)

**Cost:** Approximately $28 million

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Project Name: Crisp County Area Project

**Description:** The Crisp county area project consists of constructing a new 115 kV line from Crisp #2 (Warwick) to Crisp #8 and add three 115 kV line breakers at Warwick. Also, construct a 115 kV line from Crisp County #8 to Crisp County #6.

**Benefits:** This project is for infrastructure reliability in Southwest area of Georgia.

**Status:** This project is currently scheduled to be in service the summer of 2018.

**Investment Partners:** Municipal Electric Authority of Georgia (MEAG Power)

**Cost:** Approximately $20.3 million
Holt – South Bessemer 230 kV TL

**Description:** Construct approximately 25 miles of 230 kV TL from Holt TS to South Bessemer TS and construct 230 / 115 kV TS.

**Benefits:** This project is for load growth, infrastructure reliability and operational flexibility in the Tuscaloosa area.

**Status:** This project is currently scheduled to be in service the fall of 2018.

**Investment Partners:** None

**Cost:** Approximately $60 million

Mobile Area Networking Phase II

**Description:** Construct new SS and reconductor 10.3 miles of 115 kV TL.

**Benefits:** This project is for load growth, infrastructure reliability and operational flexibility in the Mobile area.

**Status:** This project is currently scheduled to be in service the fall of 2019.

**Investment Partners:** None

**Cost:** Approximately $20 million