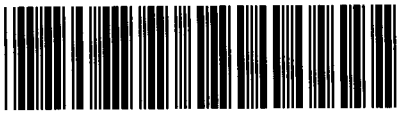

Control Number: 45624

Item Number: 4

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**DOCKET NO. 45624**

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|---|---|---|
| **APPLICATION OF THE CITY OF GARLAND, TEXAS, FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE PROPOSED RUSK TO PANOLA DOUBLE-CIRCUIT 345-KV TRANSMISSION LINE IN RUSK AND PANOLA COUNTIES, TEXAS** | § | **BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS** |



## MOTION TO INTERVENE OF SOUTHERN CROSS TRANSMISSION LLC

Southern Cross Transmission LLC (SCT) is an affiliate of Pattern Energy Group LP (Pattern Development) and is the developer of the Southern Cross Project (SCT Project). The SCT Project is an approximately 400-mile long, high voltage direct current (HVDC), bi-directional transmission line that will connect the ERCOT transmission system at the Texas-Louisiana border to the SERC transmission system in northeast Mississippi/northwest Alabama. Specifically, the SCT Project will connect to ERCOT at the Texas-Louisiana border by interconnecting with the new Panola Switching Station and the 345 kV transmission line that is the subject of the instant proceeding. The Panola Switching Station and the 37-40 mile 345 kV transmission line will be owned by the City of Garland, dba Garland Power & Light. Accordingly, SCT has a justiciable interest that may be adversely affected by the outcome of this proceeding and hereby moves to intervene.

SCT's contact person, address and telephone number are as follows:

Southern Cross Transmission LLC
Attn: Mr. David Parquet
1600 Smith Street, Suite 4025
Houston, Texas 77002
415-531-6683 Phone

SCT requests that all documents in this proceeding be served upon their authorized representative, Robert A. Rima, at the following address, fax number, or email address:

Robert A. Rima
Law Offices of Robert A. Rima
7200 N. MoPac Expy, Ste 160
Austin, TX 78731-2560
512-349-9449 Phone
512-343-9339 Fax
bob.rima@rimalaw.com

SCT files this intervention in support of the CCN Application filed by the City of Garland and has included its direct testimony in support of the Application with its motion to intervene. Accordingly, the Direct Testimony of David Parquet, Senior Vice President –Special Projects for



4

Pattern Development and the Direct Testimony of Ellen Wolfe, President of Resero Consulting, are attached.

Mr. Parquet explains that the SCT Project will be designed to deliver up to 2,000 MW in either direction between ERCOT and SERC and describes the SCT Project's relationship to the Garland 345 kV transmission line project. Mr. Parquet also discusses the applicable FERC interconnection order; submission of the Garland and SCT projects to ERCOT; the interconnection studies performed by Oncor Electric Delivery Company; certain logistical issues to be resolved; possible conditions on the Commission's order; and benefits that the SCT Project can provide in Texas.

Ms. Wolfe presents the results of an economic analysis conducted by her firm concerning the expected production cost savings and consumer energy benefits of the SCT project to ERCOT, as well as expected flows between ERCOT and the Eastern Interconnect over the project and anticipated revenues from charges for exports from ERCOT.

SCT prays that its Motion to Intervene be granted, that it be afforded all the rights and obligations of a party in this proceeding, and that it be granted such other relief to which it is justly entitled.

Respectfully submitted,

Robert A. Rima
State Bar No. 16932500
Law Offices of Robert A. Rima
7200 N. MoPac Expy, Ste 160
Austin, TX 78731-2560
512-349-9449
512-343-9339 Fax
bob.rima@rimalaw.com

*Attorney for Southern Cross Transmission LLC*

**CERTIFICATE OF SERVICE**

I, Robert A. Rima, Attorney, certify that a copy of this document was served on all parties of record in this proceeding on February 25, 2016, by hand delivery, facsimile, email, and/or first-class mail.

Robert A. Rima

**PUC DOCKET NO. 45624**

| | | |
|---|---|---|
| **APPLICATION OF THE CITY OF GARLAND, TEXAS, FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE PROPOSED RUSK TO PANOLA DOUBLE-CIRCUIT 345-KV TRANSMISSION LINE IN RUSK AND PANOLA COUNTIES, TEXAS** | §<br>§<br>§<br>§<br>§<br>§<br>§<br>§ | **BEFORE THE**<br><br>**PUBLIC UTILITY COMMISSION**<br><br>**OF TEXAS** |

## STATEMENT UNDER SECTION 4 OF THE PROTECTIVE ORDER

The undersigned attorney for Southern Cross Transmission LLC (SCT) submits this statement under Section 4 of the Protective Order in this case.

The Direct Testimony of David Parquet, in support of Garland's CCN application, includes a Highly Sensitive Protected exhibit. The confidential document consists of non-public critical energy infrastructure information concerning transmission system infrastructure and performance. This information is confidential and exempt from public disclosure under the Freedom of Information Act and 18 CFR § 388.113. Therefore, this information is protected under the Public Information Act, Tex. Gov't Code Ann. § 552.101.

The undersigned counsel for SCT has reviewed the information sufficiently to state in good faith that the information is exempt from public disclosure under the Public Information Act and merits the applicable designation of Highly Sensitive Protected Materials detailed in the Protective Order accompanying the Application.

Robert A. Rima

Date: February 25, 2016

PUC DOCKET NO. 45624

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|---|---|---|
| APPLICATION OF THE CITY OF GARLAND, TEXAS, FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE PROPOSED RUSK TO PANOLA DOUBLE-CIRCUIT 345-KV TRANSMISSION LINE IN RUSK AND PANOLA COUNTIES, TEXAS | § | BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS |

# DIRECT TESTIMONY

# OF

# DAVID PARQUET

# ON BEHALF OF

# SOUTHERN CROSS TRANSMISSION LLC

# AND IN SUPPORT OF THE APPLICATION OF

# THE CITY OF GARLAND

FEBRUARY 25, 2016

**SOUTHERN CROSS TRANSMISSION LLC**
**DIRECT TESTIMONY OF DAVID PARQUET**

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## EXHIBITS


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| Exhibit DP-1 | Resume of David Parquet |
| Exhibit DP-2 | Oncor Studies and Report **[Highly Sensitive]** |

## I. INTRODUCTION AND EXPERIENCE

Q1. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, EMPLOYER, AND JOB TITLE.

A. My name is David Parquet. My business address is Pattern Energy Group LP, Pier 1 Bay 3 San Francisco, California, 94111. I am employed by Pattern Energy Group LP as Senior Vice President – Special Projects.

Q2. ON WHOSE BEHALF ARE YOU TESTIFYING?

A. I am testifying on behalf of Southern Cross Transmission LLC ("SCT") and in support of the application filed in this case by the City of Garland ("Garland"), doing business as Garland Power & Light ("GP&L").

Q3. PLEASE DESCRIBE YOUR EDUCATIONAL BACKGROUND AND EXPERIENCE.

A. I have a Bachelors of Science degree in Mechanical Engineering from Iowa State University and a Masters of Business Administration degree with a specialization in finance from the University of California – Berkeley. I have over 30 years of infrastructure experience and have participated in the development, acquisition, and executive management of several power plant and transmission line projects and companies. I have managed staffs responsible for development of more than 2,000 MW of power plant projects and a 400 MW transmission project, and I have negotiated public-private partnerships that concluded with successful development of a merchant power plant project or transmission line project. I

have also managed large industrial air pollution control projects from engineering design through construction and startup, and I have negotiated international licensing agreements for technology transfer for specialized air pollution control projects. I am one of the original members of the Board of Governors of the California Independent System Operator. My resume is attached as Exhibit DP-1.

Q4. HAVE YOU TESTIFIED PREVIOUSLY BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS?

A. Yes. In 2008, while I was employed at Babcock & Brown LP, I testified in PUCT Docket No. 35665 on behalf of Tejas Transmission, LLC. More recently, I served on a panel in PUCT Project No. 42647.

Q5. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. During its 84th Regular Session last year, the Texas Legislature approved two pieces of legislation, SB 776 and SB 933, that had the effect of requiring Garland to obtain a Certificate of Convenience and Necessity ("CCN") for the Rusk to Panola transmission line (the "Garland Project"). The purpose of my testimony is to describe SCT, the Southern Cross transmission project (the "SCT Project") and its relationship to the Garland Project (the Garland Project and the SCT Project are collectively referred to as the "Projects"), and the Order received from the Federal Energy Regulatory Commission ("FERC") requiring certain ERCOT entities provide interconnection and transmission service, described in greater detail below. I will also describe the submission of the Projects to ERCOT and the

reliability studies performed by Oncor Electric Delivery Company ("Oncor"). In addition, I will address SCT's coordination and compliance with ERCOT requirements. Finally, I will discuss certain reliability, economic, and competitive benefits that the SCT Project can provide in Texas.

## II. OVERVIEW OF THE SCT PROJECT

Q6. PLEASE DESCRIBE SOUTHERN CROSS TRANSMISSION LLC.

A. Southern Cross Transmission LLC is an affiliate of Pattern Energy Group LP (referred to as "Pattern Development"). Pattern Development is an independent energy company that develops, constructs, owns and operates renewable energy projects and transmission assets throughout North America, Latin America and Japan.

Q7. PLEASE DESCRIBE THE SCT PROJECT.

A. The SCT Project is an approximately 400-mile long, high voltage direct current ("HVDC"), bi-directional transmission line that will connect the ERCOT transmission system at the Texas-Louisiana border to the SERC transmission system in northeast Mississippi/northwest Alabama. The SCT Project has received its FERC 210 and 211 Orders for interconnection to and transmission service in ERCOT, respectively, for "up to 3,000 MW." Consistent with the FERC Order, Pattern Development has determined that it will design the SCT Project to accept approximately 2,100 MW in either direction and, after losses, to deliver 2,000 MW in either direction.

Q8. PLEASE EXPLAIN THE CONFIGURATION OF THE INTERCONNECTION BETWEEN THE SCT PROJECT AND GARLAND PROJECT.

A. The interconnection point between the Garland Project and the SCT Project is at the Texas-Louisiana border. GP&L will own and operate a new switching station in Panola County at the Texas-Louisiana border in Texas (the "Panola Switching Station") and a double circuit 37-40 mile, 345 kV alternating current ("AC") transmission line in Texas that will connect the Panola Switching Station to a new Oncor switching station ("the Rusk Switching Station") near existing Oncor transmission lines in Rusk County. GP&L's double circuit 345 kV line is the subject of this CCN proceeding. The Panola Switching Station will connect with SCT's HVDC converter station, located immediately adjacent to the Panola Switching Station across the border in Louisiana.

Q9. WHY DO THE PANOLA SWITCHING STATION AND THE SCT PROJECT'S CONVERTER STATION HUG THE TEXAS BORDER?

A. SCT has tried to keep the Commission and interested parties informed as project planning and development evolved. In one such discussion, a concern was raised by Texas Industrial Electric Consumers ("TIEC") that a generator might be able to interconnect to the Louisiana portion of an AC line between SCT's western converter station and the Panola Switching Station such that the generator could introduce energy into the ERCOT system without being subject to PUCT regulation or oversight. To accommodate this concern, SCT moved the western converter station next to the Texas-Louisiana border such that the only feasible

interconnection would be located on the Texas side of the border and subject to Commission regulation and oversight.

Q10. HOW IS SCT REGULATED?

A. SCT is subject to the jurisdiction of the FERC and to applicable North American Electric Reliability Corporation ("NERC") reliability standards. Additionally, some SCT activities will be subject to compliance with ERCOT Protocols and other binding documents, as discussed in more detail below.

## III. FEDERAL ENERGY REGULATORY COMMISSION ORDERS RELATING TO THE PROJECTS

Q11. PLEASE DESCRIBE THE APPLICATION FILED BY SCT AT THE FEDERAL ENERGY REGULATORY COMMISSION UNDER SECTIONS 210, 211 AND 212 OF THE FEDERAL POWER ACT.

A. On September 6, 2011, SCT filed an application requesting that the FERC issue an order requiring the physical interconnection of the SCT Project with the proposed new GP&L transmission facilities and directing Oncor and CenterPoint Energy Houston Electric, LLC ("CenterPoint') to provide the transmission service necessary for eligible customers to deliver energy over the interconnection into and out of ERCOT. The application included an Offer of Settlement as well as a request that the FERC declare that transactions over the Project would not result in any ERCOT utilities that are not already public utilities as defined by the

Federal Power Act ("FPA") becoming public utilities subject to FERC's plenary jurisdiction.

Q12. WHY WAS GARLAND ASKED TO PARTICIPATE AS THE INTERCONNECTING ENTITY IN THE SCT APPLICATION?

A Since the investor-owned utilities were unbundled in ERCOT, Garland is one of the few remaining entities that can be ordered by FERC to provide interconnection service under the FPA.

Q13. WHO INTERVENED IN THE PROCEEDING?

A. Interventions were filed by the Commission, ERCOT, Oncor, CenterPoint, Exelon Corporation, Sharyland Utilities, L.P., Calpine Corporation, Texas Industrial Energy Consumers, the American Wind Energy Association ("AWEA"), and Garland. SCT did not oppose any request to intervene and all interventions were granted.

Q14. DID THE FERC IMMEDIATELY GRANT THE REQUESTED ORDER?

A. No. The FERC issued a Proposed Order on December 15, 2011. In the Proposed Order, the FERC found, on a preliminary basis, that the requested interconnection and transmission service would meet the requirements of sections 210, 211, and 212 of the FPA, and confirmed that the FERC's exercise of jurisdiction would not cause any ERCOT utility not already a public utility as defined by the FPA to become a public utility subject to FERC jurisdiction. The FERC also found that

without completed interconnection and reliability studies, including final identification of the necessary interconnection facilities, the application contained insufficient detail to enable the FERC to issue a final order.

Q15. WHEN DID SCT SUBMIT ITS COMPLIANCE FILING?

A. The compliance filing was submitted on February 20, 2014. SCT informed the Commission that the interconnection and reliability studies undertaken by Oncor and reviewed by ERCOT and the ERCOT transmission owners confirm that, with the construction and operation of the additional facilities identified in Exhibit A to the Oncor/Garland Interconnection Agreement, the Southern Cross Project could be interconnected to the ERCOT grid without any adverse impacts on the continued reliability of the grid. The filing included interconnection agreements that specifically identified the interconnection facilities to be owned, operated and maintained by Oncor, GP&L, and SCT. The filing confirmed that the cost of the facilities identified in the interconnection agreements to be owned by GP&L and SCT will be the responsibility of SCT and that neither GP&L nor SCT will seek recovery of the costs from ratepayers. With regard to a requirement in the Proposed Order to identify the precise location of the western point of interconnection of the SCT Project to the new GP&L facilities at the Panola Switching Station, a schematic diagram and a confidential document that identified the specific location of the property to be acquired for the Panola Switching Station were submitted.

Q16. PLEASE SUMMARIZE THE FINAL ORDER ISSUED BY THE FERC.

A. The Final Order was issued by the FERC in May, 2014. The FERC ordered GP&L to interconnect with the SCT Project (the 210 Order) and ordered Oncor and CenterPoint to provide transmission service (the 211 Order). Among other things, the Order contains a specific finding, based on the completion of reliability studies by Oncor, that nothing in the application indicated that ordering the requested interconnection and transmission service would impair the continued reliability of the affected electric systems, and that the application for interconnection is in the public interest. The FERC order also specifically stated:

> Compliance with this order and the Offer of Settlement shall not cause ERCOT, Oncor, CenterPoint, or any other ERCOT utility or other entity that is not already a public utility to become a "public utility" as that term is defined by section 201 of the FPA and subject to the jurisdiction of the Commission for any purpose other than for purposes of carrying out the provisions of sections 210 and 211 of the FPA.

## IV. ERCOT REVIEW

Q17. HAVE THE SCT AND GP&L PROJECTS BEEN SUBMITTED TO ERCOT FOR REVIEW?

A. Yes. The Projects were submitted to ERCOT's Regional Planning Group ("RPG") for review in August, 2010. The Projects were submitted together as a single project. ERCOT and numerous RPG stakeholders made comments, to which Pattern Development responded in detail. Thereafter, ERCOT Staff designated Oncor to perform the required reliability and interconnection studies. The comments received and Pattern's responses were considered in the Oncor

study scoping process. ERCOT also notified the Transmission Service Providers on the ERCOT confidential Transmission Owner Generation Interconnection email list that the studies were going to be performed so any affected TSP could evaluate the extent, if any, they wished to participate in the studies.

Q18. DID ANY OTHER TSP PARTICIPATE IN THE STUDIES?

A. No.

Q19. DID ONCOR PERFORM THE STUDIES AS DIRECTED BY ERCOT?

A. Yes. Oncor performed studies based on ERCOT Planning Criteria, NERC Reliability Standards and other ERCOT Requirements. A steady state analysis, a stability analysis, a short circuit analysis, and a facilities study were performed. The results are attached as Highly Sensitive Exhibit DP-2. Oncor's studies were concluded in 2013, reviewed by the ERCOT Transmission Service Providers on the ERCOT confidential Transmission Owner Generation Interconnection email list, and finalized. Shortly thereafter, SCT made the compliance filing at FERC I discussed earlier.

## V. SCT COORDINATION AND COMPLIANCE WITH ERCOT REQUIREMENTS

Q20. HOW WILL SCT COORDINATE WITH ERCOT REGARDING THE FLOW OF ELECTRICITY INTO AND OUT OF THE ERCOT GRID?

A. SCT will perform many of the same functions as the existing DC Tie operators such as: following the ERCOT Protocols, participating in the NERC E-Tag process, receiving ERCOT operator instructions for facilitating flows across the tie, and maintaining an Inadvertent Energy Account. It is my expectation that ERCOT will develop and execute a coordination agreement for the SCT Project, similar to the coordination agreements ERCOT has in place today with the Southwest Power Pool, Comision Federal de Electricidad (CFE) as well as owners of switchable generation units and HVDC facilities.

Q21. HOW WILL SCT BE LEGALLY BOUND BY THE ERCOT PROTOCOLS AND ERCOT OPERATOR INSTRUCTIONS?

A. Any entity engaged in an activity that is the subject of the ERCOT Protocols is, by definition, an ERCOT Market Participant. All ERCOT Market Participants are required to execute the Section 22A Standard Form Market Participant Agreement, which legally binds the participant to the ERCOT Protocols and certain other documents. However, it appears SCT does not yet qualify to register in any market segment under current ERCOT Bylaws and Protocols. Therefore, the ERCOT Bylaws and Protocols need to be amended to accommodate the

unique characteristics of an out-of-state DC Tie interconnected to the ERCOT system.

Q22. WOULD IT BE REASONABLE FOR THE COMMISSION TO ATTACH A CONDITION TO THE ORDER IN THIS CASE REQUIRING SCT TO EXECUTE AN ERCOT MARKET PARTICIPANT AGREEMENT BEFORE GP&L ENERGIZES THE INTERCONNECTION FACILITIES?

A. Yes. As stated in the unopposed Offer of Settlement adopted by FERC, SCT fully expects to be legally bound by the ERCOT Protocols and ERCOT operator instructions. The appropriate binding mechanism is the ERCOT Market Participant Agreement. However, because neither GP&L nor SCT has control over the ERCOT stakeholder process through which ERCOT's binding documents are amended, it would also be reasonable and appropriate in this case for the Commission to provide instructions or guidance to ERCOT to make the bylaw and protocol revisions necessary to allow SCT to execute the Standard Form Market Participant Agreement as well as any other changes necessary to ensure SCT's adherence to the ERCOT Protocols.

Q23. ARE THERE OTHER CONDITIONS SCT WOULD EITHER SUPPORT OR NOT OPPOSE IN THIS CASE?

A. Yes. As discussed by Darrell Cline in his direct testimony, SCT supports Garland's commitment not to include the cost of the Garland Project or the Panola Station in transmission rates, as SCT has committed to pay the costs for those

facilities, all as described more fully in the Transmission Line Agreement by and between Garland and Rusk Interconnection LLC, an affiliate of SCT. The Transmission Line Agreement is provided with Darrell Cline's direct testimony. In addition, since SCT will be subject to FERC's standards of conduct for transmission providers, SCT would accept a condition that it be subject to ERCOT-adopted standards of conduct as long as they do not affect or modify the FERC standards.

## VI. ANTICIPATED BENEFITS OF THE SCT PROJECT

Q24. HOW DO YOU EXPECT THAT THE SCT PROJECT WILL OPERATE?

A. Generally, power will flow from ERCOT to SERC or vice versa based on the relative power costs in each area.

Q25. WHAT BENEFITS DO YOU ANTICIPATE FROM THE PROJECT?

A. SERC will provide a lower cost power supply during periods of high cost in ERCOT. Alternatively, during periods of low nodal prices in ERCOT (generally off-peak periods with high wind generation), power in ERCOT will be sold for resale to consumers in SERC. Various factors will contribute to differences in power costs, including for example, differences in weather, peak period loads, and generation resource mixes in ERCOT and SERC. I anticipate that each region will benefit from this ability to obtain access to diverse generation resources. The SCT Project will also promote competition in the ERCOT wholesale market and produce the type of consumer cost savings that typically result from increased

competition, as well as providing an additional market for excess wind generation during low-load periods in ERCOT. Ellen Wolfe discusses the economic benefits of the SCT Project more fully in her direct testimony.

The SCT Project will also provide a significant additional power supply source to ERCOT during shortage conditions and system emergencies, providing important reliability support to ERCOT. DC ties between ERCOT and neighboring regions have historically served this function, but the SCT Project will serve it at a significantly higher level than the existing ties.

Q26. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

NAME: DAVID PARQUET

PRESENT POSITION: Senior Vice President – Special Projects

OFFICE LOCATION: Pattern Energy Group LP, San Francisco, California

# YEARS IN INFRASTRUCTURE: +30

PREVIOUS EXPERIENCE: Lockheed Missiles & Space Co. (Research Engineer, Project Manager); Industrial Clean Air Inc. (Project Manager); Combustion Power Company (affiliated with Weyerhaeuser Corp.) (Project Manager, Marketing Manager); Energy America Inc. (affiliated with Occidental Petroleum Corporation) (Vice President, Member of Board of Directors); Enron North America Corp. (Vice President); and Babcock & Brown LP (Marketer).

AREAS OF EXPERTISE: executive and boards of directors management both in the private as well as utility industry; transmission and power plant project acquisition, development, finance, construction, operation and maintenance, and asset management; energy development company acquisition and startup; business management; joint venture and public-private partnership negotiation and management; political and regulatory strategy and policy development and implementation; domestic and international sales, marketing, licensing and business and corporate development; and gas and power marketing.

REPRESENTATIVE INFRASTRUCTURE EXPERIENCE: managed large industrial air pollution control projects from engineering through construction and startup; negotiated international licensing agreements for technology transfer for specialized air pollution control projects; participated in development, acquisition and executive management of power plant and electric transmission line projects/companies; managed staff responsible for development of +2000 MW of power plant projects and a 400 MW transmission project; negotiated public/private partnerships which concluded with successful development of a merchant power plant and transmission line projects; one of the original members of the Board of Governors of the California Independent System Operator.

BSME, Iowa State University, 1970
MBA Finance, University of California – Berkeley, 1978
Registered Professional Mechanical Engineer, California

**BUSINESS RECORDS AFFIDAVIT**
**OF ONCOR ELECTRIC DELIVERY COMPANY LLC**

STATE OF TEXAS §
§
COUNTY OF DALLAS §

Before me, the undersigned authority, personally appeared Jennifer M. Lee-Sethi, who, being by me duly sworn, deposed as follows:

"My name is Jennifer M. Lee-Sethi. I am over 21 years of age, of sound mind, and capable of making this affidavit.

I am employed by Oncor Electric Delivery Company LLC ("Oncor") as Chief Compliance Officer, Senior Counsel and Assistant Secretary. By virtue of my duties and responsibilities, I serve as custodian of Oncor's records and am familiar with the manner in which its records are created and maintained.

Attached hereto are 106 pages of records from Oncor. The attached records are the original records or exact duplicates of the original records.

These records include three reports created by Oncor in the course of performing a reliability study for Southern Cross Transmission, LLC. The studies were conducted in conjunction with the Electric Reliability Council of Texas, Inc. ("ERCOT") and the transmission service providers in ERCOT to analyze a potential interconnection for an asynchronous tie between ERCOT and the SERC Reliability Corp. The three reports include the steady state and stability report, the short circuit report, and the facilities report. Together, these reports generally evaluate one or more levels of potential power imports and exports to assess the resulting impacts to facilities and operations as well as the potential need for additional system upgrades or modifications.

It is the regular practice of Oncor to make this type of record at or near the time of each act, event, condition, opinion, or diagnosis set forth in the record.

It is the regular practice of Oncor for this type of record to be made by, or from information transmitted by, persons with knowledge of the matters set forth in them.

It is the regular practice of Oncor to keep this type of record in the course of regularly conducted business activity.

It is the regular course of the business activity to make the records."

FURTHER AFFIANT SAYETH NOT.

Jennifer M. Lee-Sethi
Chief Compliance Officer, Senior Counsel
and Assistant Secretary
Oncor Electric Delivery Company LLC

SWORN TO AND SUBSCRIBED before me on this 22nd day of February, 2016.

Notary Public, State of Texas

This sheet replaces the HSPM pages from

Exhibit DP-2

filed separately under seal.

**PUC DOCKET NO. 45624**

| | | |
|---|---|---|
| **APPLICATION OF THE CITY OF GARLAND, TEXAS, FOR A CERTIFICATE OF CONVENIENCE AND NECESSITY FOR THE PROPOSED RUSK TO PANOLA DOUBLE-CIRCUIT 345-KV TRANSMISSION LINE IN RUSK AND PANOLA COUNTIES, TEXAS** | § | **BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS** |

# DIRECT TESTIMONY

# OF

# ELLEN WOLFE

# ON BEHALF OF

# SOUTHERN CROSS TRANSMISSION LLC

# AND IN SUPPORT OF THE APPLICATION OF

# THE CITY OF GARLAND

**FEBRUARY 25, 2016**

**SOUTHERN CROSS TRANSMISSION LLC**
**DIRECT TESTIMONY OF ELLEN WOLFE**

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## EXHIBITS


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|---|---|
| Exhibit EW-1 | Resume of Ellen Wolfe |
| Exhibit EW-2 | Economic Evaluation Presentation Report |

## I. INTRODUCTION

Q1. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A. My name is Ellen Wolfe. My business address is 9289 Shadow Brook Place, Granite Bay, California 95746.

Q2. BY WHOM ARE YOU EMPLOYED AND IN WHAT CAPACITY?

A. I am employed by Resero Consulting ("Resero"), part of Resero Corporation, where I am the President and act as a consultant and oversee the administration of the company.

Q3. PLEASE DESCRIBE THE BUSINESS OF RESERO CONSULTING.

A. Resero is a consulting firm specializing in the nexus of the engineering, economics, and policies of the electric grid. Resero consultants facilitate industry leaders' critical decisions, design market policies, and assist system operators and market participants on matters related to market rules, strategic decisions, settlement impacts, and operational infrastructure in markets across North America. Resero's consultants have performed numerous public and private economic analyses using techniques comparable to the ones employed in the economic analysis that is the subject of this testimony.

Q4. PLEASE DESCRIBE YOUR EDUCATIONAL AND PROFESSIONAL QUALIFICATIONS AND BUSINESS EXPERIENCE.

A. I have a Bachelor's of Science degree in Electrical Engineering from the University of California, Davis, and Masters' degrees in Management and in Technology and Policy from the Massachusetts Institute of Technology. I am a registered Professional Electrical Engineer in the State of California. I have over 28 years' experience in the electric utility industry and have been consulting on issues related to industry restructuring and performing economic analyses such as the one described herein since the mid 1990s. My detailed resume is attached as Exhibit EW-1.

Q5. HAVE YOU TESTIFIED PREVIOUSLY BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS?

A. No, I have not. I have presented analyses in the Electric Reliability Council of Texas ("ERCOT") market related to implementing a nodal market before the Public Utility Commission of Texas ("PUCT") commissioners and staff, but I have not submitted formal testimony to the PUCT.

Q6. HAVE YOU PREVIOUSLY PERFORMED OTHER ECONOMIC ANALYSES SIMILAR TO THE ANALYSIS UPON WHICH YOUR TESTIMONY IS BASED?

A. Yes. I have led several such studies in the past. In the 1990s, part of my responsibilities as a consultant, primarily to independent power producers, was to perform production-cost modeling to value new generation and to value grid

congestion, for example. In 2002, I led a study for a group of northwestern utilities and energy companies to assess the costs and benefits of the northwestern United States utilities joining a regional transmission organization as RTO West, and in 2004 performed a similar study in the Southwest for organizations considering the formation of WestConnect. Also in 2004, I led a cost-benefit study for ERCOT to assess the merits of ERCOT forming a nodal market from its then-existing zonal market, which was subsequently filed by ERCOT with the PUCT (PUC Project No. 28500). That nodal cost-benefit analysis was updated in 2008. In 2009, I led a study for the Regional State Commissions from the member states of the Southwest Power Pool ("SPP") on the benefits of SPP implementing a nodal energy imbalance market, and in 2010 I conducted a study for the Federal Energy Regulatory Commission ("FERC") on the benefits of Entergy and Cleco joining the SPP. I have led other studies associated with individual transmission projects, including a 2010 study of the Southern Cross Transmission ("SCT") project that was presented to ERCOT's RPG in August of that year. All of these studies used techniques similar to those employed for the analyses described herein.

## II. PURPOSE OF TESTIMONY

Q7. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to report on an economic analysis of the SCT project. The analysis was performed by Resero in conjunction with its subcontractor LCG

Consulting ("LCG"). I will also compare the results of this study to the above-referenced 2010 study.

Q8. PLEASE SUMMARIZE YOUR TESTIMONY.

A. My testimony presents the economic analysis that Resero and LCG performed in late 2015 (the "2015 analysis") to measure the expected benefits of the 2,000-MW SCT DC project between Rusk and the Mississippi/Alabama 500-kV system, under both a case with the SCT project alone ("SCT Only") and with a case in which 2000 MW of extra wind is developed coincident with the project ("SCT + 2000 MW Wind"). In the benefits evaluation, a fully integrated ERCOT and Eastern Interconnect 8,760-hour, nodal market model was employed, using primarily ERCOT-provided assumptions for the ERCOT market, and using publicly available and LCG-generated assumptions for the Eastern Interconnect.

The benefits evaluation shows that the SCT Only scenario is expected to result in annual production-cost benefits of $173 million and in consumer energy benefits of $162 million per year for ERCOT. Under a scenario of an extra 2,000 MWs of wind development (SCT + 2000 MW Wind scenario), ERCOT's expected production-cost benefits are $365 million per year and consumer energy benefits are $306 million per year. Additionally, the simulations show that approximately $65 million (for the SCT Only scenario; $68 million for the SCT + 2000 MW Wind scenario) is expected to be collected through export-related charges for flows out of ERCOT on the SCT project. The SCT project would result in exports of energy to neighboring markets when

renewables are producing abundant low-cost energy, and imports into ERCOT during a few hours of the summer months. Overall, according to the study, the SCT project would lower LMPs in ERCOT by $0.42/MWh on average (SCT Only scenario), and would reduce both wind and solar curtailment. The results comport with the prior analysis performed in 2010 under the guidance of the ERCOT RPG, although the results of this analysis reflect differences consistent with lower gas prices, additional ERCOT renewable buildout, and noted transmission grid upgrades.

My testimony also presents a sensitivity analysis that was performed to test the impact on the benefits of changes in the assumed transmission fees associated with ERCOT exports. The sensitivity runs show that an approximate doubling of peak-month fees on ERCOT exports is shown to result production cost saving reduction of $20 million to $25 million, a 7% - 12% decrease in production cost savings benefits.

Q9. WERE YOUR TESTIMONY AND THE INFORMATION YOU HAVE BEEN IDENTIFIED AS SPONSORING PREPARED BY YOU OR BY KNOWLEDGEABLE PERSONS UNDER YOUR SUPERVISION AND UPON WHOSE EXPERTISE, JUDGMENT AND OPINIONS YOU RELY IN PERFORMING YOUR DUTIES?

A. Yes; the study was performed by me personally and by my staff members and LCG under my direction.

Q10. PLEASE DESCRIBE WHAT LCG DOES AND THEIR ROLE IN THE PROJECT?

A. LCG is a widely recognized leader in performing electric industry restructuring studies and a pioneer in developing energy simulation tools. The LCG team has more than 30 years of experience in the electric and gas utility industry, has conducted numerous studies on the impact of electricity industry restructuring in the United States and abroad, and has developed and supported models for many aspects of short- and long-term planning for these industries. They developed the simulation package UPLAN, used by many utilities, market participants, and regional transmission operators ("RTOs") throughout the country, including ERCOT. For this study, LCG conducted the simulations using UPLAN, and provided model outputs for purpose of the analysis.

Q11. IS THE INFORMATION THAT IS CONTAINED IN YOUR TESTIMONY AND THAT YOU ARE SPONSORING TRUE AND CORRECT TO THE BEST OF YOUR KNOWLEDGE AND BELIEF?

A. Yes, it is.

## III. BENEFITS ANALYSIS

Q12. WHY DID RESERO CONSULTING PERFORM THE BENEFITS ANALYSIS AND EMPLOY THE METHODS IT EMPLOYED?

A. Resero was asked by SCT to perform the analysis to test the expected benefits of the SCT project within the ERCOT market. This economic analysis performed by Resero

applied methods consistent with those used in studies that Resero has performed for other economic analyses and in studies accepted by regulatory decision-making authorities elsewhere in the industry.

Q13. PLEASE DESCRIBE THE PURPOSE OF THE BENEFITS ANALYSIS.

A. The purpose of the analysis was to use best estimates of expected future grid and market conditions to establish a baseline simulation model, and to then test the extent to which the SCT project's connection to the Eastern Interconnect is expected to offer economic benefits to the ERCOT electric system and to the consumers within the ERCOT market.

Q14. WHAT DOES THE BENEFITS ANALYSIS ADDRESS?

A. The economic analysis compares the modeled behavior of the system when the SCT project is in place to the modeled system without the SCT project in place. The comparison addresses expected changes to the commitment and dispatch of generating resources, as well as changes to the flows of energy within ERCOT and between ERCOT and the Southeastern Electric Reliability Council ("SERC") area. To this end, the analysis modeled all the electric flows on the ERCOT and Eastern Interconnect systems and the significant electric characteristics of the transmission system, electric loads, and resources on the respective systems. Detailed generating facility characteristics were represented, including (for example) ramp rates that

reflect the inherent limitations of the system to respond quickly to changed conditions.

Q15. WHO PARTICIPATED IN THE PREPARATION OF THE BENEFITS ANALYSIS?

A. I led the analysis and LCG performed the simulation modeling. Consultants from Resero and LCG aided in processing the simulation results.

Q16. WAS THIS THE FIRST SUCH BENEFITS ANALYSIS OF THIS KIND PRESENTED TO ERCOT OR ITS STAKEHOLDERS ON THE SCT PROJECT?

A. No. In 2010, Resero and LCG conducted a similar analysis evaluating the benefits of the SCT project as it was envisioned at that time. That analysis was done with the collaboration of the ERCOT Regional Planning Group ("RPG").

Q17. PLEASE DESCRIBE THE STEPS TAKEN IN PREPARING THE BENEFTIS ANALYSIS.

A. To prepare the economic analysis, we gathered a detailed set of data on assumptions for the simulation, including a recent transmission data topology, recent load and fuel forecasts, planned new generation, and planned retirements. The input assumptions were obtained directly from ERCOT or otherwise derived to the extent possible consistent with the assumptions ERCOT would use in performing economic analyses for PUCT Certificate of Convenience and Necessity. The models were then prepared

for simulations, the Eastern Interconnect and the ERCOT models interconnected, and the simulations were executed as a single integrated market. The analysis included comparing a "Base Case" simulation (a case without the SCT project) with two "change case" simulations. One change case ("SCT Only") added the SCT project only, and a second change case ("2020 Case + 2000 MW Wind") added the SCT project and an additional 2,000 megawatts ("MWs") of wind generation over the ERCOT 2020 buildout assumptions. Comparing a change case with the Base Case identified the impacts of the project within the electric system. Following the simulations, additional data processing was performed to determine the impacts that were attributable to the project, and to the project with 2000 MWs of new wind capacity, and to present the results in a form understandable to a wide audience.

Q18. DID YOU PREPARE A REPORT AS PART OF YOUR EFFORT?

A. Yes. I prepared a presentation-style report ("Report") summarizing the analysis and the findings. It is attached as Exhibit EW-2.

Q19. PLEASE DESCRIBE FURTHER THE MODELING ASSUMPTIONS; WHAT MODELING YEAR HORIZON WAS USED AND WHAT FOOTPRINT WAS APPLIED?

A. The simulation was performed for the future year of 2020. 2020 was believed to be sufficiently in the future that the SCT project may be in place by then or soon thereafter, yet not so far in the future as to make it unreasonably difficult to predict

transmission topology and other key inputs.

To model the benefits of the SCT project, it was necessary to represent both the ERCOT market and the Eastern Interconnect market. Both footprints were included in the simulation modeling. Therefore, for this 2020 analysis, a combined footprint, with a full 8,760-hour simulation, was used to represent the system.

Q20. PLEASE DESCRIBE THE SIMULATION TOOL USED FOR THE BENEFITS ANALYSIS.

A. LCG's proprietary simulation tool, UPLAN, was used in the analysis. UPLAN is an integrated generation and transmission modeling system. It simulates the behavior of the ERCOT and Eastern Interconnect electricity market and physical power system simultaneously in order to forecast the operation of the grid. To do this, UPLAN optimally commits and dispatches resources using security-constrained unit commitment and security-constrained economic dispatch, using protocols similar to those used by ERCOT when ERCOT runs its markets, similar to those used by SPP, and otherwise how it is expected that companies would operate if operating in an economically efficient manner. The UPLAN model has been used extensively by ERCOT and by many major market participants. ERCOT has licensed UPLAN since 2003, and its Regional Transmission Planning Group continues to use UPLAN for transmission planning and economic analysis.

Q21. WAS THE METHOD USED TO REPRESENT THE EASTERN INTERCONNECT THE SAME AS THAT EMPLOYED IN THE 2010 RPG ANALYSIS?

A. No. In 2010, it was not possible to simulate both markets simultaneously, because doing so would require computing power beyond what was available at the time. For that analysis, we employed a method that we created to emulate the interaction of the markets by developing respective market supply curves through iterative simulations. Those supply curves were then used to represent the Eastern Interconnect side of the SCT project in the ERCOT market simulations. However, for this current economic analysis, one combined model was run for both the ERCOT side and the Eastern Interconnect side of the SCT project. Improved computing power and computation methods developed at LCG made this possible. The Eastern Interconnect portion of the model was simplified for the most distant reaches of that market, for example, for parts of New York and Florida. A detailed list of the areas included in, and excluded from, the Eastern Interconnect portion of the model is provided in the appendix of the Report.

Q22. WHAT WERE THE SOURCES OF THE MAJOR ASSUMPTIONS FOR THE ERCOT PORTION OF THE COMBINED FOOTPRINT?

A. ERCOT's summer peak power flow case for 2020 from October 2015 (2015SSWG) was used as the transmission topography. ERCOT's 50-50 noncoincidental peak forecast developed by ERCOT in September 2014 was used, as were ERCOT's RTP economic case load profiles by weather zone, also developed in 2014. The 2014 load

forecast and profiles were the most current ERCOT forecasts available at the time the study was conducted. Generating unit additions were included from ERCOT's generation planning assumptions, based on ERCOT's Monthly Planning Report, which incorporates ERCOT's Planning Guide 6.9 requirements. Planned retirements and derates also were based on ERCOT's information. Since ERCOT does not offer a gas price forecast, an LCG gas price forecast was used, resulting in a 2020 ERCOT monthly average burner tip gas price of $3.12 per million British Thermal Units ("mmBTU").

Q23. WHAT WERE THE SOURCES OF THE MAJOR ASSUMPTIONS FOR THE EASTERN INTERCONNECT PORTION OF THE COMBINED FOOTPRINT?

A. A 2014-series Eastern Interconnection Reliability Assessment Group summer peak power flow case for 2020, developed in 2014, was used. Load forecasts were taken from the Southeastern Electric Reliability Council ("SERC") Electricity Supply and Demand database and from FERC Form 714 utility load forecast reports, as well as from the regional transmission operators in some cases. An LCG gas price forecast was also used for commodity and gas transportation costs. The Henry Hub average commodity gas price was $3.20/mmBTU for the Eastern Interconnect (with annual burner tip prices being $3.53/mmBTU on average).

Q24. CAN YOU SUMMARIZE ANY MAJOR DIFFERENCES IN THESE INPUT ASSUMPTIONS BETWEEN THE 2010 ANALYSIS AND YOUR 2015 ANALYSIS?

A. Yes. Most significantly, natural gas prices in ERCOT are much lower currently and are predicted to be lower in 2020, a 54% decrease relative to the gas price forecast in the 2010 study. Additionally, the 2010 analysis, which simulated a 2015 year, predicted much less renewable energy on the ERCOT system (36.7 terawatt hours ["TWh"] of wind production) than is now in place and much less than is forecast for 2020 by ERCOT (20.14 GW of wind capacity and 68.4 TWh of wind production). The SCT project itself also is different in the 2015 analysis than in the 2010 analysis; in 2010, the project was simulated as a 3,000-MW-capacity project, and now it is simulated as a 2,000-MW project (net of losses). Lastly, upgrades for several ERCOT transmission constraints in and around load areas have been completed or approved for completion before the 2020 simulation year and are included in the analysis.

Q25. DID THE BENEFITS ANALYSIS APPLY ANY TARIFF RATES, HURDLE, FRICTION OR OTHER CHARGES ASSOCIATED WITH FLOWS BETWEEN AREAS?

A. We applied the ERCOT postage stamp rate for off-peak exports, and adjusted that rate based on to, from and over ("TFO") tariff-based charges for on-peak exports, using rates as of late 2014. Differing rates were used in our analysis for the summer months of June through September than for the balance of the months, based on the

filed rates. (A similar method was employed in the 2010 analysis.) For our 2015 analysis those filed rates were adjusted for expected transmission revenue requirement increases between now and 2020. To arrive at the other ERCOT related exports, ancillary service price increases were tested through simulation, but not found to increase substantially by 2020. A breakdown of these charges associated with ERCOT exports is included as part of the technical details section of the Report. The resulting rates applied to ERCOT exports were $10.87 per megawatt hour ("MWh") for export flows during the months of June through September, and $9.28/MWh for export flows during the months of October through May.

For the Eastern Interconnect, wheeling-out charges were based upon utilities' open access transmission tariffs. For flows from SERC across the SCT project, a $5.237/MWh rate was applied.

The simulations performed included explicit treatment of dispatch areas and commitment areas. For example, dispatch and commitment are centralized for the Midcontinent Independent System Operator ("MISO") and SPP regions, but not for other non-RTO utilities in the Eastern Interconnect. Because commitment and dispatch decisions were modeled consistent with how business is conducted in each region, no "hurdle" or "friction" rates were applied to the transmission tariff wheeling out fees (e.g., to the SERC $5.237/MWh transmission tariff wheeling out fee).

Q26. PLEASE DESCRIBE THE SCT PROJECT REPRESENTATION IN THE MODEL.

A. The SCT project was modeled as a 2,000-MW, DC, bidirectional transmission line from the new Oncor Rusk substation in ERCOT to the Mississippi/Alabama 500-kilovolt ("kV") system in the SERC region. The line was modeled with a nominal 5% loss rate. That is, the line is designed to deliver 2,000 MWs to SERC from 2,100 MWs of exports from ERCOT, and vice versa.

Q27. PLEASE DESCRIBE WHAT SIMULATION CASES YOU EVALUATED.

A. Three cases were simulated for the analysis. The Base Case was intended to reflect the status quo conditions of the ERCOT and Eastern Interconnect markets in 2020 without the SCT project in place. This case reflected the load growth, transmission changes, and resource additions and retirements described above with respect to assumptions. In this case, the expected level of wind development resulted in 68.4 TWh of wind generation for the 2020 year. Two change cases were simulated, both of which included the SCT project interconnecting ERCOT and SERC. The "2020 SCT Only" change case used the same assumptions as the Base Case but included the SCT project. The "2020 SCT + 2000 MW Wind" case used Base Case assumptions, added the SCT project, and also incorporated 2,000 MWs of additional wind generation capacity in ERCOT. In this 2020 SCT + 2000 MW Wind case, the additional 2,000 MWs of wind was placed in the Panhandle region (900 MWs), at Caprock (195.5 MWs), along I-20 (426 MWs), and in South Texas (478.5 MWs).

These locations were based on interconnection applications filed by wind developers within ERCOT.

Q28. WHAT OUTPUT METRICS WERE EVALUATED FROM THE SIMULATIONS?

A. The evaluation focused on calculating ERCOT production-cost (or societal) benefits and consumer energy benefits. To this end, for each simulation, the cost of production and the cost of serving load was measured. The evaluation also collected information associated with location marginal prices at different ERCOT hubs and SCT line flows.

Q29. PLEASE DESCRIBE WHAT IS MEANT BY PRODUCTION COST SAVINGS AND HOW THIS BENEFIT IS CALCULATED.

A. Production-cost savings, also referred to as societal benefits, are a measure of savings to the system in the costs of producing the energy (e.g., fuel costs and variable operating and maintenance costs) that is needed to serve the needs of the system. In this case, the production costs of ERCOT were measured by accounting for each generator's costs of production and adjusting for the cost of net ERCOT imports (collectively referred to as production costs unless otherwise noted). The production cost of the change case of interest is then compared to the production cost of the Base Case to determine the production-cost savings or societal benefit.

Q30. PLEASE DESCRIBE WHAT IS MEANT BY CONSUMER ENERGY BENEFIT AND HOW THIS BENEFIT IS CALCULATED.

A. The consumer energy benefit reflects impacts on load-serving entities and ultimately on downstream customers. The cost to serve load is measured by multiplying the locational marginal price ("LMP") at each location by the quantity of energy at each node, and then summing these amounts over all the load nodes and all the hours. (In ERCOT the load pays the weighted average load zone price, and the zonal load times the zonal weighted average price is the same as the LMP times the energy at the zone's nodes.) The consumer energy benefit is the difference of this summed amount between a change case and the Base Case.

Q31. PLEASE DESCRIBE YOUR FINDINGS WITH RESPECT TO EXPECTED FLOWS ON SCT IN THE 2020 SCT ONLY CASE.

A. The simulations show that the SCT project would result in export flows out of ERCOT during the bulk of the hours. The year's hourly average net export flow over SCT was modeled to be 774 MWs/hour. In 160 hours of the simulation year, SCT project flows were in the direction of importing into ERCOT. In the simulation, the imports generally occurred in July and August, and occurred more so in the on-peak hours than in the off-peak hours. During such importing hours, the average level of imports was 312 MW/hour. The Report provides a graphical representation of the flows on the SCT project by month, and shows the range of hourly flows.

Q32. DO THE SCT FLOWS CHANGE SUBSTANTIALLY WITH THE CHANGE CASE THAT INCLUDES 2000 MWS OF ADDED WIND CAPACITY?

A. No. The flow characteristics on SCT are not significantly affected in the + 2000 MW Wind case. In that case, the average net export flow on the SCT project is 811 MWs/hour, as compared with the 774 MWs average net export flow in the SCT Only case. The wind flow characteristics of this case also are shown in the Report.

Q33. WHY DOES THE CASE WITH 2000 MWS OF EXTRA WIND CAPACITY NOT PRODUCE SIGNIFICANT CHANGES ON THE SCT FLOWS?

A. The simulations do not show a one-for-one increase of exports from ERCOT for each additional MW of wind produced. This primarily results from the fact that when an extra 2,000 MWs of wind are built on the ERCOT system, additional congestion is predicted to occur in ERCOT. This additional congestion raises the cost to deliver energy to the Eastern Interconnect and thereby adversely affects the economics of exporting ERCOT energy across the SCT project and to the adjacent markets.

Q34. DO THE FLOW RESULTS ON SCT DIFFER FROM THOSE FROM YOUR SIMULATIONS IN THE 2010 RPG BENEFITS EVALUATION, AND IF SO, WHAT EXPLANATION CAN YOU OFFER FOR THAT OUTCOME?

A. The flow results are substantially different in the 2015 analysis than in the analysis performed in 2010. In the 2010 analysis, the SCT project was shown to primarily import energy, importing on average approximately 450 MWs/hour. The differences

between the results derived in the 2015 analysis relative to the 2010 analysis are driven primarily by the relative "softening" of the ERCOT market, as compared to the Eastern Interconnect markets. In particular, current predictions of 2020 gas prices are much lower than were the predictions made in 2010 for 2015 study-year gas prices. Specifically, the gas price that was forecast for ERCOT is lower than that of the Eastern Interconnect, where the SCT project interconnects. Additionally, significantly more renewable buildout has occurred and is predicted to occur in ERCOT by 2020 relative to the renewable development that was foreseen when the analysis was performed in 2010, and this further suppresses ERCOT's prices in the 2015 analysis. In addition, certain transmission system upgrades are now being modeled because they have been completed or are expected to be installed, so there are fewer ERCOT price spikes in the 2015 simulations. These conditions, on net, result in ERCOT's energy being much less expensive in many hours than the energy in the Eastern Interconnect in this recent 2015 analysis. This, in turn, results in more production of efficient energy in ERCOT and fewer imports of energy from the Eastern Interconnect.

Q35. HOW ARE ERCOT'S LMPS AFFECTED BY THE SCT PROJECT AS SHOWN BY YOUR BENEFITS EVALUATION, AND HOW DOES THIS COMPARE TO THAT SHOWN IN THE 2010 ANALYSIS?

A. The current economic analysis shows a reduction in the ERCOT average LMP, due to SCT, of $0.42/MWh for the SCT Only scenario. The reduction measured in 2010 was $1.18/MWh.

Q36. DOES THE BENEFITS EVALUTION INDICATE THAT THE SCT PROJECT WILL RESULT IN PRODUCTION COST SAVINGS/SOCIETAL BENEFITS?

A. Yes, the analysis shows that the SCT project would produce an ERCOT production-cost savings, or societal benefit, of $173 million per year, as shown in the 2020 SCT Only scenario. The production-cost savings is expected to increase to $364 million per year under the 2020 SCT + 2000 MW Wind scenario.

Q37. DOES THE BENEFITS EVALUATION INDICATE THAT THE SCT PROJECT WILL ALSO RESULT IN CONSUMER BENEFITS?

A. Yes, consumer benefits in ERCOT are measured to be $162 million per year under the 2020 SCT Only scenario. The 2020 SCT + 2000 MW Wind scenario would result in measured ERCOT consumer energy benefits of $306 million per year.

Q38. HOW DO THESE MEASURED BENEFITS COMPARE TO THOSE REPORTED IN 2010?

A. The ERCOT consumer energy benefits forecast by this 2015 analysis are lower than reported in 2010 ($701 million), and the production-cost benefits are higher than those reported in 2010 ($73 million). This difference primarily results from the lower ERCOT LMPs used in the 2015 analysis relative to the LMPs in the 2010 analysis, and from the resulting differing flows on the SCT project path.

Q39. YOU PERFORMED THE ANALYSIS FOR A SINGLE YEAR. WHAT CAN YOU INFER FROM YOUR WORK ABOUT THE EXPECTED BENEFITS BEYOND 2020?

A. The analysis was performed for the single study year of 2020. The results suggest that there are significant production-cost savings afforded by interconnecting the ERCOT market with the Eastern Interconnect. Fundamental attributes of the system, such as transmission topology and generation buildout, would not be significantly different had we also modeled the 2021 study year, and similarly the 2022 study year. Thus, the study results for this "snapshot" 2020 study year could reasonably be extrapolated to reflect a multiyear study, recognizing that the further out in time one were to extrapolate, the less certain it would be that the 2020 study assumptions would reflect the future system configuration. Nevertheless, one would expect the production-cost benefits of adding the SCT project to remain positive in years beyond 2020.

Q40. WHERE THE STUDY SHOWS THAT THERE ARE NET PRODUCTION COST SAVINGS, INDICATIVE OF A REDUCTION OF CONGESTION ON NET, DOES THE STUDY SHOW WHETHER THE SCT PROJECT WOULD RESULT IN ANY LOCALIZED CONGESTION INCREASES ON ANY SPECIFIC CONSTRAINTS?

A. As part of the study, all the congestion was measured, as was the cost of redispatching the system to manage that congestion. The $173-million to $365-million annual production-cost savings reflect the fact that *overall,* the SCT project would result in a less constrained, more efficient generating solution within ERCOT. As one may expect, the changing flows with the SCT project in place would not result in lower congestion on every constraint within ERCOT. Rather, congestion would increase on some constraints and decrease on others, with a resulting net reduction in cost. Given the large number of interconnected constraints, it is not possible to convey in a short description which constraints would increase and which would decrease in congestion costs.

From a very general perspective, the SCT project would relieve some of the constraints in the south and in and around Houston, but cause more congestion for moving wind energy from west to east. (In the SCT + 2000 MW case, it is more complicated given that more wind is produced in several locations in ERCOT in that scenario.)

Also notable was the outcome that the SCT case scenarios did not result in any increase in hours with constraints that could not be managed economically through economic redispatch. This suggests that any constraints with increased

congestion as a result of the SCT project could be addressed through ERCOT's ordinary economic transmission planning process and would not pose a reliability concern.

Q41. YOUR RESULTS INDICATE THAT THERE ARE PRODUCTION COST SAVINGS AND CONSUMER BENEFITS; ARE THERE GENERATOR BENEFITS WITH THE SCT PROJECT IN PLACE?

A. This 2020 analysis indicates that there would be a small (< 4%) impact on ERCOT's producers' margin. Producer margin is the producer's revenues in excess of its costs, and a positive margin indicates a benefit to producers. In the SCT Only scenario, generator margin increases by $21 million (0.7%), suggesting that, in sum, generators would be better off with the SCT project in place. In the SCT + 2000 MW Wind case, the ERCOT generator margin is lower than in the Base Case by $107 million (a 3.5% reduction in generator margin). In this case, ERCOT generators produce more and sell more to the adjacent Eastern Interconnect market, but the additional wind reduces LMPs further.

Q42. HOW DO THE GENERATION LEVELS OF DIFFERENT GENERATORS CHANGE WITH THE SCT PROJECT IN PLACE IN YOUR ANALYSIS?

A. In the SCT Only scenario, the total production of most generation types is relatively unaffected (e.g., affected less than 1% up or down). The exceptions are that wind curtailment is lower, resulting in 6% higher total wind production. Solar production is

higher by a small amount (1%) in this scenario. The additional wind and solar production mostly accounts for the exports of energy over the SCT project; however, gas and coal production also increases to a small extent (each less than 1%), contributing slightly to the increased overall production in ERCOT with the SCT project in place. In the SCT + 2000 MW Wind scenario, wind displaces the generation of other resources to some extent. In this case, fossil production is lower than in the base case by 1% to 2%. The annual production by fuel type is shown for each study case in the Report.

Q43. ARE THERE OTHER EXPECTED BENEFITS OF THE SCT PROJECT AS REFLECTED IN THE ANALYSIS?

A. Yes. Additional revenues of approximately $65 million per year would accrue to the ERCOT ratepayers to offset other costs or transmission revenue requirements in the form of export related charges collected for SCT project flows during hours when there are export flows out of ERCOT over the SCT project. Additionally, although the study did not endeavor to quantify reliability benefits, and, similarly, there were no changes made to the operating reserve requirements in the study, it is likely that the SCT project would produce reliability benefits. The project would allow use of more geographically diverse generating sources. The project also would enable the adjacent markets to enter into additional emergency exchange agreements with one another.

Q44. DO YOU BELIEVE THERE ARE SIGNIFICANT MARKET IMPACTS THAT YOUR ANALYSIS NEGLECTED TO ADDRESS?

A. No. The analysis addresses other market charges, such as ancillary service charges and ERCOT overhead charges. I am not aware of categories of market impacts that were excluded that could significantly reduce the expected benefits of the SCT project.

Q45. IS IT POSSIBLE THAT FUTURE EXPORT-RELATED CHARGE RATES MAY BE HIGHER THAN YOU PREDICTED FOR THE STUDY?

A. Yes. Of course any of the parameters assumed in the study could increase or decrease relative to what was predicted when we started the study. With respect to transmission rates in particular, I understand that the PUCT staff has urged other ERCOT transmission service providers ("TSPs") to implement similar tariffs for charges associated with exports and I understand that staff believes all ERCOT TSPs should seek approval for such tariffs. These changing policies leave uncertainty with respect to what tariff rates will be in place.

Q46. CAN YOU PREDICT WHAT IMPACT HIGHER EXPORT CHARGE FEES MAY HAVE ON THE PREDICTED PRODUCTION COST SAVINGS ASSOCIATED WITH THE SCT PROJECT?

A. As indicated in the preceding question and answer, the wheeling assumptions established for the study were set based on then-filed rates. However, we did conduct