

**BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO**

* * * * *

RE: IN THE MATTER OF THE)
APPLICATION OF PUBLIC SERVICE)
COMPANY OF COLORADO FOR AN)
ORDER GRANTING A CERTIFICATE OF)
PUBLIC CONVENIENCE AND)
NECESSITY FOR DISTRIBUTION GRID) PROCEEDING NO. 16A-___E
ENHANCEMENTS, INCLUDING)
ADVANCED METERING AND)
INTEGRATED VOLT-VAR)
OPTIMIZATION INFRASTRUCTURE)

DIRECT TESTIMONY AND ATTACHMENTS OF ALICE K. JACKSON

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

August 2, 2016

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SUMMARY OF THE DIRECT TESTIMONY OF ALICE K. JACKSON

1 Ms. Alice K. Jackson is Regional Vice President, Rates and Regulatory
2 Affairs of Xcel Energy Services Inc. In this position, she is responsible for
3 providing leadership, direction, and technical expertise related to regulatory
4 processes and functions for Public Service Company of Colorado ("Public
5 Service" or "Company"), one of four utility operating company subsidiaries of
6 Xcel Energy Inc. Her duties include, among other things, the design and
7 implementation of Public Service's regulatory strategy and programs, and
8 directing and supervising Public Service's regulatory activities.

9 In her Direct Testimony, Ms. Jackson presents an overview of Public
10 Service's Application for a Certificate of Public Convenience and Necessity
11 ("CPCN") to implement Advanced Metering Infrastructure ("AMI"), Integrated

1 Volt-VAr Optimization (“IVVO”), and the components of the communications
2 network known as the Field Area Network (“FAN”) that are necessary to support
3 AMI and IVVO (collectively, the “CPCN Projects”). Ms. Jackson explains that
4 AMI includes advanced meters that will support greater customer energy usage
5 data and customer choice, more efficient outage management, and smart rate
6 design proposals. IVVO will act as a demand side management tool by which
7 the Company can better manage and reduce voltage levels on the system
8 without impacting customer energy choices. The FAN will provide a secure,
9 reliable communications network that will support the intelligent electric
10 distribution grid.

11 Ms. Jackson explains that the CPCN Projects are part of a broader effort
12 to advance the electric distribution grid through Public Service’s Advanced Grid
13 Intelligence and Security (“AGIS”) initiative, which also includes programs
14 implemented in the ordinary course of business. Ms. Jackson provides an
15 overview of the AGIS initiative, which was developed to achieve four key
16 objectives that she describes in her testimony: powering technology, which is
17 necessary for an intelligent grid and to support personal and home technologies
18 that are increasingly important to customers’ daily lives; empowering customer
19 choices regarding their energy usage; powering the economy by reducing the
20 impact of outages and supporting future grid and customer technologies; and
21 advancing demand side management (“DSM”) by supporting customer choice
22 while also regulating voltage without impacting customer activities. Ms. Jackson
23 also explains why this is the right time to undertake this effort, as it is necessary

1 to bring the Public Service electric distribution system in line with current
2 technologies, improve system management, support increasing distributed
3 energy resources, achieve increasingly stringent industry reliability objectives,
4 and provide customers with products and services they are coming to expect.

5 Ms. Jackson's testimony also (i) delineates between the AMI, IVVO, and
6 FAN components for which the Company seeks a CPCN and the AGIS work
7 Public Service is undertaking in the ordinary course of business; (ii) explains how
8 Public Service is satisfying the requirements of Colorado's CPCN statute and
9 rules, as well as addresses past Commission discussions of smart grid
10 programs, in this Application; and (iii) describes why the the CPCN Projects are
11 in the public interest, illustrating customers' interest, project cost assessments
12 and benchmarking, the cost-benefit analyses Public Service has undertaken for
13 the CPCN Projects, and the qualitative (unquantifiable) benefits the CPCN
14 Projects will support, including a better overall customer experience.

15 Finally, Ms. Jackson addresses Public Service's proposal to keep its
16 stakeholders informed of project status and accrued costs throughout
17 implementation of the CPCN Projects via regular reporting, potentially related
18 proceedings, and future cost recovery requests. Ms. Jackson underscores that
19 Public Service's goal is to provide transparency into the overall effort and to
20 support the future of Public Service's advanced electric distribution grid.

21 Overall, Ms. Jackson recommends approval of the CPCN Projects
22 Application, approval of the Company's CPCN Projects semiannual reporting and

1 outreach plan, and deferral of any cost recovery decisions to a future Public
2 Service rate case.

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Attachment AKJ-4	ICF Cost Per Meter Summary

GLOSSARY OF ACRONYMS AND DEFINED TERMS

Acronym/Defined Term	Meaning
ADMS	Advanced Distribution Management System
AGIS	Advanced Grid Intelligence and Security
AMI	Advanced Metering Infrastructure
AMR	Automated Meter Reading
ANSI	American National Standards Institute
BPL	Broadband over Power Line
C&I	Commercial and Industrial
CAIDI	Customer Average Interruption Duration Index
CBA	Cost-Benefit Analysis
CIS	Customer Information System
CMO	Customer Minutes Out
Commission	Colorado Public Utilities Commission
Company	Public Service Company of Colorado
CPCN	Certificate of Public Convenience and Necessity
CPCN Projects	AMI, IVVO, and the components of the FAN that support these components
CPE	Customer premise equipment
CRS	Customer Resource System
CSF	Cyber Security Framework
CVR	Conservation Voltage Reduction
DA	Distribution Automation
DDOS	Distributed Denial of Service
DER	Distributed Energy Resources
DOS	Denial-of-service
DR	Demand Response
DSM	Demand Side Management
DVO	Distribution Voltage Optimization
EPRI	Electric Power Research Institute
ERT	Encoder Receiver Transmitter
ESB	Enterprise Service Bus
FAN	Field Area Network
FLISR	Fault Locate Isolation System Restoration

Acronym/Defined Term	Meaning
FLP	Fault Location Prediction
GFCI	Ground Fault Circuit Interrupter
GIS	Geospatial Information System
HAN	Home Area Networks
ICE	Interruption Cost Estimation
IDS	Intrusion Detection System
IEEE	Institute of Electrical and Electronics
IPS	Internet Provider Security
IT	Information technology
IVR	Interactive Voice Response
IVVO	Integrated Volt-VAr Optimization
kVAr	Kilovolt-amperes reactive
kVArh	Reactive power
kW	Kilowatt
kWh	Kilowatt hours
LTC	Load Tap Changers
LTE	Long-Term Evolution
MDM	Meter Data Management
MitM	Man-in-the-Middle Attack
MPLS	Multiprotocol Label Switching
NCAR	National Center for Atmospheric Research
NOC	Network Operations Center
NPV	Net Present Value
O&M	Operations and Maintenance
OMS	Outage Management System
OT	Operational Technology
PTMP	Point-to-multipoint
Public Service	Public Service Company of Colorado
RF	Radio frequency
RFP	Request for Proposal
RFx	Request for Information and Pricing
RTU	Remote Terminal Units

Acronym/Defined Term	Meaning
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SCADA	Supervisory Control and Data Acquisition
SGCC	Smart Grid Consumer Collaborative
SGIG	Smart grid investment grants
SIEM	Security Incident and Event Management
SVC	Secondary static VAR compensators
TOU	Time-of-use
USEIA	United States Energy Information Administration
WACC	Weighted Average Costs of Capital
WAN	Wide Area Network
WiMAX	Worldwide Interoperability for Microwave Access
WiSUN	802.15.4g Standard
Xcel Energy Inc.	Xcel Energy
XES	Xcel Energy Services Inc.

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DIRECT TESTIMONY AND ATTACHMENTS OF ALICE K. JACKSON

1 I. **INTRODUCTION, QUALIFICATIONS, PURPOSE OF TESTIMONY,**
2 **RECOMMENDATIONS**

3 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

4 A. My name is Alice K. Jackson. My business address is 1800 Larimer Street, Suite
5 1400, Denver, Colorado 80202.

6 Q. BY WHOM ARE YOU EMPLOYED AND IN WHAT POSITION?

7 A. I am employed by Xcel Energy Services Inc. ("XES") as Regional Vice President,
8 Rates and Regulatory Affairs. XES is a wholly-owned subsidiary of Xcel Energy
9 Inc. ("Xcel Energy"), and provides an array of support services to Public Service
10 Company of Colorado ("Public Service" or "Company") and the other utility
11 operating company subsidiaries of Xcel Energy on a coordinated basis.

1 **Q. ON WHOSE BEHALF ARE YOU TESTIFYING IN THE PROCEEDING?**

2 A. I am testifying on behalf of Public Service.

3 **Q. PLEASE SUMMARIZE YOUR RESPONSIBILITIES AND QUALIFICATIONS.**

4 A. As the Regional Vice President of Rates and Regulatory Affairs, I am responsible
5 for providing leadership, direction, and technical expertise related to regulatory
6 processes and functions for Public Service. My duties include the design and
7 implementation of Public Service's regulatory strategy and programs, and
8 directing and supervising Public Service's regulatory activities, including
9 oversight of rate cases, administration of regulatory tariffs, rules and forms,
10 regulatory case direction and administration, compliance reporting, and complaint
11 response. I frequently testify in proceedings before the Colorado Public Utilities
12 Commission ("Commission") as the Company's policy witness. A description of
13 my qualifications, duties, and responsibilities is set forth after the conclusion of
14 my testimony in my Statement of Qualifications.

15 **Q. WHAT IS THE COMPANY REQUESTING IN THIS CASE?**

16 A. Public Service requests a Certificate of Public Convenience and Necessity
17 ("CPCN") for the implementation of the Company's proposed Advanced Metering
18 Infrastructure ("AMI") and Integrated Volt-VAr Optimization ("IVVO") programs, as
19 well as the components of the communications network (known as the Field Area
20 Network or ("FAN")) that are necessary to support AMI and IVVO (collectively,
21 the "CPCN Projects"). These programs are part of a broader effort to advance
22 the electric grid through Public Service's Advanced Grid Intelligence and Security
23 ("AGIS") initiative. The Company is undertaking certain components of that

1 initiative in the ordinary course of business without a CPCN. AGIS complements
2 Public Service's vision of an energy future that incorporates integrated renewable
3 resources, an advanced distribution grid, greater customer choice and self-
4 management of energy usage, and smart rate design proposals to support
5 energy goals and customer choice.

6 **Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?**

7 A. The purpose of my testimony is to provide an overview of the Company's request
8 for approval of the CPCN Projects, as well as to lay out the place of AMI, IVVO,
9 and the FAN in the Company's greater AGIS effort. I begin by describing what
10 AGIS is, and how it is critical to advancing the electric grid by incorporating
11 technical developments, offering greater energy choice, optimizing voltage on our
12 system, facilitating demand side management ("DMS"), and moving our economy
13 forward. I explain why this is the right time to undertake this effort on behalf of
14 Public Service customers, and provide an overview of our customers' desire for
15 the products, services, and information we can offer them once the AGIS
16 foundation is laid.

17 I then address the scope of the CPCN Projects themselves, and explain
18 what we are seeking in this case versus what additional work Public Service is
19 undertaking in the ordinary course of business. In particular, I delineate between
20 the larger AMI and IVVO programs, including portions of the FAN, for which the
21 Company seeks a CPCN as compared to other AGIS work. I also explain how
22 Public Service is satisfying the requirements of Colorado's CPCN statute and
23 rules in this Application.

1 Next, I describe why the particular programs we are supporting in this
2 CPCN are in the public interest. I outline the overall costs and benefits of the
3 programs, and introduce the cost benchmarking and cost-benefit analyses we
4 have undertaken. I explain that the benefits of AMI and IVVO are not limited to
5 quantifiable items; they will also improve our customers' overall experience and
6 help achieve broader energy goals.

7 Finally, I address how Public Service will keep its stakeholders informed of
8 our progress in implementing AMI and IVVO through regular reporting, potentially
9 related proceedings, and future cost recovery requests. I underscore that our
10 goal is to provide transparency into the overall effort and the future of our
11 advanced electric grid.

12 **Q. ARE OTHER COMPANY WITNESSES SUPPORTING THE CPCN PROJECTS**
13 **FILING?**

14 **A.** Yes. In addition to my Direct Testimony, seven Public Service witnesses are
15 also providing Direct Testimony and accompanying attachments. These
16 witnesses' respective topics are as follows:

Table AKJ-1-Direct Testimony Witnesses

Witness	Area of Testimony
John D. Lee, Senior Director Distribution Engineering	<ul style="list-style-type: none"> • Presents a technical strategy overview of AGIS, focusing on AMI, IVVO, and the associated FAN components, including alternatives considered.
Russell E. Borchardt, Director, Business Operations	<ul style="list-style-type: none"> • Describes Advanced Meter Infrastructure technology. • Presents the costs and benefits of AMI. • Presents the AMI deployment plan and timeline. • Explains that the Company’s AMI proposal is consistent with industry standards.
Chad S. Nickell, Manager, System Planning & Strategy	<ul style="list-style-type: none"> • Describes the following technologies: Advanced Distribution Management System (“ADMS”), IVVO (including secondary static VAr compensators), Fault Locate Isolation System Restoration (“FLISR”), and Fault Location Prediction (“FLP”). • Explains the implementation and timeline. • Presents the benefits and costs for IVVO. • Explains that the Company’s proposal is consistent with industry standards.
Wendall A. Reimer, Director, Telecommunications and Network Services	<ul style="list-style-type: none"> • Describes FAN technology. • Explains the interdependencies of FAN components with other proposed infrastructure and technologies. • Provides the costs and benefits of the FAN. • Presents the implementation and deployment plan. • Explains that the Company’s FAN proposal is consistent with industry standards.
David C. Harkness, CIO & SVP Business Systems	<ul style="list-style-type: none"> • Provides an overview of the IT integration for the AGIS initiative. • Explains the IT integration, including cost interdependencies and installation. • Describes the Company’s technological cyber security protocols for AGIS. • Explains the safety and dependability of the Company’s system.

Witness	Area of Testimony
Samuel J. Hancock, Manager, Regulatory Project Management	<ul style="list-style-type: none">• Presents and explains the Company's quantitative cost-benefit analysis.
Jennifer B. Wozniak, Director, Jurisdictional Communication	<ul style="list-style-type: none">• Presents the Company's advanced grid customer surveys, with a focus on AMI, and the Company's customer education plan.

1 **Q. ARE YOU SPONSORING ANY ATTACHMENTS AS PART OF YOUR DIRECT**
2 **TESTIMONY?**

3 A. Yes, I am sponsoring the following:

- 4 • Attachment AKJ-1: Our Energy Future Press Release
- 5 • Attachment AKJ-2: Matrix of Commission Comments and Directions
- 6 • Attachment AKJ-3: Utility-Scale Smart Meter Deployments: Building Block
7 of the Evolving Power Grid – IEI Report September 2014
- 8 • Attachment AKJ-4: ICF Cost Per Meter Summary

9 **Q. WHAT RECOMMENDATIONS ARE YOU MAKING IN YOUR TESTIMONY?**

10 A. I recommend that the Commission approve the Company's request for a CPCN
11 for the implementation of AMI and IVVO, as well as the components of the FAN
12 that are necessary to support AMI and IVVO, and associated proposals.
13 Specifically, I recommend that the Commission:

- 14 • Approve the Company's plan to implement AMI, IVVO, and the associated
15 FAN components; and
- 16 • Approve the Company's CPCN Projects semiannual reporting and
17 outreach plan, described in Section V of my Direct Testimony, by which

1 the Company will keep the Commission informed regarding project
2 implementation and accrued costs.

3 I note that the Company has not proposed a specific cost recovery
4 mechanism for these projects at this time, and believes that the cost recovery of
5 our investment can be addressed in a future Public Service rate case.

6

1 Advanced Meter Infrastructure (“AMI”), a Field Area Network (“FAN”), Intelligent
2 Field Devices, and the Geospatial Information System (“GIS”).¹

3 **Q. CAN YOU BRIEFLY DESCRIBE EACH OF THESE FOUNDATIONAL**
4 **COMPONENTS?**

5 A. Yes. These components include:

- 6 • **Advanced Distribution Management System:** ADMS will provide an
7 integrated operating and decision software and hardware support system
8 to assist control room, field personnel, and engineers with the monitoring,
9 control and optimization of the electric distribution system. It will manage
10 the complex interaction of Distributed Energy Resources (“DER”), outage
11 events, feeder switching operations, and the advanced applications and
12 field devices discussed below. ADMS gives access to real-time and near
13 real-time data to provide all information on operator console(s) at the
14 control center in an integrated manner, which means the different
15 operating systems and technologies, will communicate with and update
16 each other in the ADMS platform. ADMS is the fundamental platform that
17 enables each of the other AGIS components described below. ADMS is
18 discussed in more detail in the Direct Testimony of Company witness Mr.
19 Chad S. Nickell.

¹ In addition to the foundational programs, two recently approved Innovative Clean Technology battery test projects, Panasonic and Stapleton, are considered to be programs within the AGIS initiative because they were developed to test certain advanced grid functionalities. The details of these projects were addressed in the separate proceeding in which they were authorized by the Commission (Proceeding No. 15A-0847E).

- 1 • **Advanced Meter Infrastructure:** AMI meters are able to measure and
2 transmit voltage, current, and power quality data and can act as a “meter
3 as a sensor,” enabling near real-time monitoring between the meter and
4 ADMS. These meters provide information about customer usage and will
5 enhance our ability to send price signals to customers, allow for new rate
6 structures that will allow customers to manage their energy usage with
7 near real-time energy usage data available through a customer web
8 portal, identify outages without customer reporting, respond efficiently to
9 metering and usage issues, and allow remote service disconnects and
10 reconnects. AMI meters will replace existing Automated Meter Reading
11 (“AMR”) meters with more advanced technology to improve service and
12 reliability. AMI is discussed in more detail in the Direct Testimony of
13 Company witness Mr. Russell E. Borchardt.
- 14 • **Field Area Network:** The FAN is the communications network that will
15 enable communications between the communications infrastructure that
16 already exists at the Company’s substations, the ADMS, and the new
17 intelligent field devices associated with advanced applications as
18 described immediately below. The FAN applies to all aspects of AGIS, but
19 is designed and built according to the needs of various components, and
20 each has different communication network requirements. The FAN is
21 discussed in more detail in the Direct Testimony of Mr. Wendell A. Reimer.

- 1 • **Advanced Applications for Intelligent Field Devices:** The following
2 advanced applications and associated field devices will support a more
3 advanced grid:
- 4 ○ Integrated Volt-VAr Optimization (“IVVO”) is an application that
5 automates and optimizes the operation of the distribution
6 voltage regulating and VAr control devices to reduce electrical
7 losses, electrical demand, and energy consumption, and
8 provides increased distribution system injection capacity to host
9 DER.
 - 10 ○ Fault Location Isolation and Service Restoration (“FLISR”)
11 involves software and automated switching devices to decrease
12 the duration and number of customers affected by any individual
13 outage. These automated switching devices detect feeder
14 mainline faults, isolate the fault by opening section switches,
15 and restore power to unfaulted sections by closing tie switches
16 to adjacent feeders as necessary. FLISR reduces the
17 frequency and duration of customer outages.
 - 18 ○ Fault Location Prediction, or FLP, is a subset application of
19 FLISR that leverages sensor data from field devices to locate a
20 faulted section of a feeder line and reduce patrol times needed
21 to physically locate the fault.
 - 22 ○ IVVO and FLISR and the associated intelligent field devices are
23 discussed in more detail in the Direct Testimony of Mr. Nickell.

- 1 • **Geospatial Information System (“GIS”)**: Provides location information
2 about all physical assets that make up the electric distribution system.
3 The records also include specification information regarding the physical
4 assets, such as a distribution feeder’s size. ADMS will use the location
5 and specification information to maintain the as-operated electrical model
6 and advanced applications.

7 Underlying all of these programs are the information technology (“IT”)
8 support and cyber security protections necessary to operate a secure,
9 technologically-advanced grid in today’s world, as discussed by Company
10 witness Mr. David C. Harkness.

11 **Q. WHAT ARE THE KEY OBJECTIVES OF THE AGIS INITIATIVE?**

12 A. There are four key objectives of AGIS, which include:

- 13 • Powering technology;
14 • Empowering customer choice;
15 • Powering the economy; and
16 • Advancing demand side management.

17 **Q. HOW WILL AGIS POWER TECHNOLOGY?**

18 A. AGIS will power technology by implementing a more intelligent, automated, and
19 reactive electric grid. As described in more detail by Company witness Mr. John
20 D. Lee, the Company’s electric grid is based on manual technology that is
21 relatively opaque. In particular, the current system relies on mostly manual and
22 local control schemes to operate the distribution system. It does not offer insight
23 into feeders or the customer experience. When outages occur, the Company

1 typically must wait for customers to report the outage, and then utilize additional
2 manually collected customer information to determine the extent of the outage
3 and attempt to triangulate the cause. We cannot automatically or remotely
4 gather detailed information about faulty meters, and therefore rely on potentially
5 disruptive home visits to repair faulty or tampered-with meters. Just as
6 importantly, the system does not offer insight into customer usage, making it
7 more difficult to not only offer customer choice but to undertake relatively
8 fundamental tasks like recognizing when a premise has been vacated without
9 notice.

10 AGIS will allow the Company to both remedy the aging technology issue
11 and utilize advanced technologies to provide greater insight into substations,
12 feeders, lines, and ultimately customer locations. It supports better fault
13 detection through FLISR and FLP, more insight into customer energy use habits
14 through AMI, and better voltage and asset management through IVVO, AMI, and
15 the overall communication system.

16 Furthermore, AGIS will support Public Service's customers' use of
17 advanced technologies that allow customers to more efficiently manage
18 electricity usage, home appliances and devices, and distributed energy
19 resources.

20 **Q. HOW WILL AGIS EMPOWER CUSTOMER CHOICE AND POWER THE**
21 **ECONOMY?**

22 A. The concepts of empowering customer choice and the economy go hand in
23 hand. AGIS will support customers' ability to efficiently use limited dollars by

1 enabling them to monitor and impact their own costs based on their electricity
2 needs and wishes. As discussed in our Phase II filing (Proceeding No.
3 16AL-0048E), AMI is an important first step to employing time-of-use ("TOU")
4 rates or other price signaling that would enable customers and the utility to
5 observe and respond to individual customer usage patterns. Further, with better
6 electricity management and the capabilities that go along with AMI, such as the
7 opportunity for near real-time updates on usage, customers can choose which
8 electric devices (e.g., home management networks) and products (e.g., electric
9 vehicles) in which to invest, thereby further spurring economic development.

10 **Q. ARE THERE OTHER WAYS IN WHICH AMI IN PARTICULAR WILL POWER**
11 **THE ECONOMY?**

12 A. Yes. Advanced meters provide two-way information to the Company, rather than
13 simply sending and measuring electricity provided to the customer. With better
14 transparency into the electric grid at the customer level, Public Service will be
15 better able to identify where outages are occurring and how widespread their
16 impacts may be, thereby facilitating faster response and correction times. It is
17 difficult to quantify the impact of reduced outages on customers and the
18 economy, as they can result in problems from spoiled food to lost business
19 profits when a business cannot function. Each of these impacts, in turn, has an
20 effect on customers and on their input into the local economy. Company witness
21 Mr. Borchardt discusses the impact of AMI on outage efficiency and consumption
22 in more detail in his Direct Testimony.

1 **Q. ARE THERE OTHER WAYS IN WHICH IVVO WILL POWER THE ECONOMY?**

2 A. Yes. By regulating voltage on the system, Public Service can help to avoid
3 voltage problems that can interfere with the ways people work and live. As
4 Company witness Mr. Nickell discusses, typical symptoms of voltage problems
5 include stress on the grid, dimming or overly bright lights, overheating of
6 equipment, equipment failure on electronic devices, and protective equipment
7 (like circuit breakers) opening. A stronger, more intelligent, and more resilient
8 grid due to voltage optimization and variance control can contribute to fewer
9 interruptions in our customers' lives and work.

10 **Q. HOW WILL AGIS PROMOTE CONSERVATION AND DEMAND SIDE**
11 **MANAGEMENT?**

12 A. By allowing customers to see when and how they are using electricity and
13 support good energy choices, as well as by reducing unnecessary voltage on the
14 system without requiring changes to customer behavior, the components of AGIS
15 will operate to promote efficient customer energy usage and demand side
16 management. Company witnesses Mr. Lee, Mr. Borchardt, and Mr. Nickell
17 discuss these benefits in more detail.

18 **Q. CAN YOU ADDRESS MORE SPECIFICALLY HOW IVVO IMPROVES**
19 **DEMAND SIDE MANAGEMENT?**

20 A. Yes. By regulating voltage on the grid, IVVO reduces demand without ever
21 requiring action from the customer. IVVO is different from other DSM programs
22 in that the Company makes the investment on the utility side of the meter.
23 However, customers will directly benefit from IVVO because the voltage

1 management will enable their end-use devices to consume less energy without
2 the customer having taken any action or changed any use or behavior.

3 **Q. ARE AMI AND IVVO EXPECTED TO HELP PUBLIC SERVICE ACHIEVE**
4 **REGULATORY DEMAND SIDE MANAGEMENT AND ENERGY SAVINGS**
5 **GOALS?**

6 A. Yes. Anticipated demand reduction associated with these programs is expected
7 to help Public Service achieve demand side management and energy savings
8 goals. As with our LED Street Lighting program (Proceeding No. 15AL-0233E),
9 Public Service anticipates including the AMI and IVVO programs in future
10 biannual DSM plans, and counting energy savings associated with the CPCN
11 Projects towards its annual energy savings goal. While achieving that goal is a
12 necessary condition for the Company to realize any demand side management
13 incentive, the Company will not be including the net economic benefits realized
14 as a result of the CPCN Projects in calculating the level of the annual demand
15 side management incentive.

16 **Q. DOES AGIS ALSO FIT INTO PUBLIC SERVICE'S "OUR ENERGY FUTURE"**
17 **INITIATIVE?**

18 A. Yes. AGIS, and in particular the CPCN Projects, are one part of Public Service's
19 "Our Energy Future" initiative. Please see Attachment AKJ-1 for a press release
20 the Company issued informing our customers of the Our Energy Future
21 campaign. As discussed in my Direct Testimony in the Company's Phase II filing
22 (Proceeding No. 16AL-0048E), AGIS is the portion of the Our Energy Future
23 initiative that invests in grid technology necessary to facilitate opportunities to

1 reduce electricity consumption, work toward clean energy initiatives, and
2 implement rate design that facilitates energy efficiency and customer choice.
3 Therefore, while the AGIS plan provides the benefits discussed throughout this
4 filing in its own right, it is also necessary to achieve other aspects of Our Energy
5 Future.

6 Consistent with Public Service's broader efforts to improve Colorado's
7 energy future, Public Service has filed its Phase II rate design proposals while
8 also laying out opportunities for future rate design evolution; proposed a
9 Renewable Energy Plan to support solar growth and the Renewable Energy
10 Standard Adjustment; and assembled its Electric Resource Plan, to examine
11 future resource acquisition needs and options. These components of Our
12 Energy Future will offer ways to achieve expanded use of renewable energy
13 through consumer choice; add cost-saving wind and solar energy to Colorado's
14 system; and levy new technologies to empower customers to tailor their energy
15 consumption to specific parts of the day when energy is least expensive. AGIS is
16 necessary to advance the distribution grid, and also supports the broader plan to
17 bring Colorado electricity management into the future.

18 **Q. HOW DOES THIS CPCN APPLICATION FIT IN WITH THE OVERALL AGIS**
19 **EFFORT?**

20 A. As previously noted, this Application seeks approval of the AMI, IVVO, and
21 related FAN programs within the broader AGIS effort. While ADMS is the
22 functional platform on which the other components of AGIS operate, AMI and
23 IVVO account for roughly two-thirds of overall AGIS costs and are critical to our

1 broader customer choice and demand side management efforts. In addition, the
2 Commission's Decisions Nos. C10-1077 and C11-0406 (Proceeding No. 10I-
3 099EG) make clear that Public Service should submit an application to the
4 Commission before going forward with future "smart meter" programs. I support
5 the scope of our CPCN Projects request in more detail in the next section of this
6 Direct Testimony.

7

1 **III. SCOPE OF THE CPCN PROJECTS**

2 **A. CPCN Scope**

3 **Q. UNDER WHAT CIRCUMSTANCES IS A CPCN REQUIRED IN COLORADO?**

4 A. While I am not a lawyer, it is my understanding that Colorado Revised Statutes
5 Section 40-5-101 requires an electric utility to obtain from the Commission a
6 CPCN prior to “the construction of a new facility, plan, or system or the extension
7 of its facility, plant, or system.” However, Section 40-5-101 does not require an
8 electric utility to secure a CPCN for any “extensions within or to territory already
9 served by the corporation, as is necessary in the ordinary course of business.”
10 Commission Rule 3207(a) specifies that a utility is not required to obtain a CPCN
11 for construction or expansion of the distribution system, because it is deemed to
12 occur in the ordinary course of business.

13 **Q. ARE THE COMPONENTS OF THE AGIS INITIATIVE EXPANSIONS OF**
14 **DISTRIBUTION FACILITIES?**

15 A. Yes. As discussed above, the AGIS initiative will replace aging distribution
16 system infrastructure to provide better fault detection and customers with more
17 insights and control over their energy usage. At its core, the AGIS initiative is
18 comprised of quintessential, ordinary course of business, distribution facility
19 investments and improvements – new customer meters, software upgrades, and
20 improved communication equipment.

21

1 **Q. ARE THERE OTHER GUIDING PRINCIPLES THAT MAY AFFECT PUBLIC**
2 **SERVICE'S DETERMINATION OF WHEN A CPCN IS APPROPRIATE?**

3 A. Yes. While generally the Commission does not require a CPCN for expansion of
4 distribution facilities, in Decision No. C09-1446 (Proceeding No. 09AL-299E), the
5 Commission concluded that the Company was required to obtain a CPCN for the
6 SmartGridCity project prior to cost recovery because it was not a project in the
7 ordinary course of business. Like AGIS, SmartGridCity involved installation of
8 smart monitoring devices on distribution facilities, upgrading meters to AMI, and
9 enhancing the communications system to integrate the upgrades (Proceeding
10 No. 10A-124E). Notwithstanding that SmartGridCity was a distribution project,
11 the Commission found that the cost and magnitude of the SmartGridCity project,
12 the elaborate financing and intellectual property arrangements, and the
13 uniqueness of the project, including the innovative technologies being deployed
14 at that time, indicated that the project was not in the ordinary course of business.

15 Further, in the Commission's Investigation of the Issues related to Smart
16 Grid and Advanced Metering Technologies, in Decision No. C11-0406
17 (Proceeding No. 10I-099EG), the Commission concluded that an application
18 should be submitted for any future advanced metering programs. Although the
19 Commission deferred decisions on the nature of the application to a future
20 rulemaking, the Company understands it is required to apply for approval of
21 "smart meter" initiatives, which would include Public Service's proposed AMI
22 program.

1 In summary, the above-referenced Commission determinations, combined
2 with the scale of our proposed AMI and associated IVVO proposal, lead us to the
3 conclusion that we should apply for the CPCN Projects.

4 **Q. HAS THE COMPANY INCORPORATED LESSONS LEARNED FROM**
5 **SMARTGRIDCITY INTO AGIS PLANNING?**

6 A. Yes. SmartGridCity was a pilot project implemented during the early phases of
7 “smart meter” technology, designed to learn about how such technologies might
8 be implemented efficiently in the future. We incorporated lessons learned into
9 our current project plans. Company witness Mr. Lee compares the older
10 SmartGridCity technology to the AMI program Public Service proposes in this
11 CPCN.

12 Additionally, the SmartGridCity project was limited to the city of Boulder as
13 a pilot program. The Company used lessons learned during the SmartGridCity
14 project to shape the system-wide “Our Energy Future” strategy, and to develop
15 our current CPCN Projects reporting proposals, which are discussed in more
16 detail later in my Direct Testimony.

17 **Q. COULD YOU REVIEW WHAT PUBLIC SERVICE IS ASKING THE**
18 **COMMISSION TO APPROVE AS PART OF THE CPCN IN THIS**
19 **PROCEEDING?**

20 A. Yes. Public Service is asking the Commission to grant a Certificate of Public
21 Convenience and Necessity for the following:

- 22 • The Company’s implementation of AMI and the portions of the FAN that
23 are designated as necessary to support AMI, and

- 1 • IVVO, including the portions of the FAN that are designated as necessary
2 to support IVVO.

3 **Q. WHY IS PUBLIC SERVICE ASKING THE COMMISSION TO GRANT A CPCN**
4 **WITH RESPECT TO AMI AND IVVO, AND THEIR ASSOCIATED FAN**
5 **COMPONENTS?**

6 A. The AMI and IVVO portions of AGIS, combined with their relevant components of
7 the FAN and IT, are expected to cost approximately \$562 million (capital and
8 operations and maintenance (“O&M”), without escalation) and will involve
9 technologies that have been heavily tested elsewhere but are newer to Colorado.
10 While the majority of these costs pertain to AMI, the AMI and IVVO programs
11 obtain particular synergies by being implemented in tandem because the AMI
12 meters act as voltage sensors for IVVO as discussed in the Direct Testimony of
13 Company witness Mr. Lee. Further, the AMI meters (and their communications
14 modules) will make up over 90% of devices that communicate as part of the
15 FAN’s mesh network – the portion of the FAN included in this CPCN Projects –
16 as described by Company witness Mr. Reimer. Given the magnitude and
17 technological improvements of AMI and IVVO and the associated components of
18 the FAN, as well as the Commission’s guidance in the SmartGridCity proceeding,
19 Public Service determined that a CPCN request is likely appropriate for these
20 programs.

21 In addition, the CPCN process provides transparency into the Company’s
22 advance planning and decision-making, along with the potential for an ongoing
23 reporting and update structure. The Company submits the CPCN Projects

1 Application with respect to AMI and IVVO, as well as the associated portion of
2 the FAN, to allow the Commission the opportunity to determine that this project is
3 in the public interest prior to implementation.

4 **Q. WHAT COMPONENTS OF AGIS IS THE COMPANY NOT INCLUDING IN ITS**
5 **REQUEST FOR A CPCN?**

6 A. The Company is not requesting approval for the ADMS, FLISR, GIS, or the FAN
7 as it relates to the FLISR implementation. While all aspects of the AGIS initiative
8 are part of establishing the Company's vision for an integrated grid, components
9 such as ADMS, FLISR, and the FAN associated with FLISR are foundational to
10 operating the distribution grid. Both ADMS and FLISR are logical extensions of
11 work that utilities have traditionally performed and signify the continued use of
12 advancing technologies in a normal evolution of the business. In contrast, the
13 implementation of AMI and IVVO are less routine, as they will further support and
14 extend the capabilities of the integrated system. As a result, the Company is
15 providing information regarding the full AGIS initiative in an effort to be clear
16 about our overall vision, but is limiting our request in this Application to those
17 components of AGIS for which a CPCN is appropriate.

18 **B. Requirements for CPCN Application**

19 **Q. WHAT INFORMATION IS THE COMPANY REQUIRED TO PROVIDE PER**
20 **RULE 3102?**

21 A. It is my understanding that the Company must provide the information required
22 under 4 *Colorado Code of Regulations* Section 723-3:3102(b) (Rule 3102(b)),

1 either in the application or in identified exhibits. Overall, the required information
2 includes:

- 3 • Facts relied upon to show that the public convenience and necessity
4 require granting this Application;
- 5 • Description of the project, the need, estimated cost, and timeline;
- 6 • Maps; and
- 7 • Alternatives studied.

8 **Q. WHAT IS THE OVERALL SCOPE OF THE AMI AND IVVO PROGRAMS, AS**
9 **WELL AS THEIR ASSOCIATED COMPONENTS OF THE FAN?**

10 A, Public Service proposes to implement AMI and the associated components of the
11 FAN across its full Colorado electric service territory, with deployment occurring
12 over time between 2018 and 2021. While we considered limiting AMI
13 deployment, doing so would limit the benefits of the program to our overall
14 distribution grid and would not serve the customers who broadly favor greater
15 energy choice. In order to maximize visibility into the distribution grid, effectively
16 support demand side management, and enhance customers' ability to see and
17 control usage where possible, we anticipate implementing AMI programs for all
18 customer classes (approximately 1.4 - 1.5 million meters) over the course of the
19 implementation period. Company witness Mr. Borchardt describes the scope of
20 the AMI program in more detail in his Direct Testimony.

21 Public Service will deploy intelligent field devices to approximately 67% of
22 Public Service's customers by implementing IVVO on feeders within the Denver
23 metropolitan area. The customers in the Denver metropolitan area are served by

1 approximately 60% of the Company's feeders (or 472 feeder lines), which means
2 that the Company can provide the benefit of these technologies to approximately
3 67% of its customers by deploying the devices on only 60% of its system.
4 Further, because the customers in this area tend to live closer together, the
5 likelihood of needing non-standard equipment and the cost and complexity of
6 getting communications to devices are likely to be lower. Company witness Mr.
7 Nickell provides more detail about the Company's IVVO deployment plan in his
8 Direct Testimony.

9 **Q. WHY IS THE COMPANY LIMITING DEPLOYMENT OF AMI TO ELECTRIC**
10 **CUSTOMERS AT THIS TIME?**

11 A. There are several reasons why the Company is initially focusing on electric
12 customers. First, while we anticipate future implementation for our gas
13 customers, the Company is presently undertaking a pipeline investment project
14 to support customer safety that is consuming many of our gas resources in the
15 near future. Second, we are continuing to evaluate the relative costs and
16 benefits of AMI for gas customers, including any potential efficiencies related to
17 the overlap of Public Service's gas and electric service territories. We will keep
18 the Commission updated as these evaluations continue.

19 **Q. HOW IS THE COMPANY ESTABLISHING THE FACTS IT IS RELYING UPON**
20 **TO SHOW THAT THE CPCN SHOULD BE GRANTED, INCLUDING THE NEED**
21 **FOR AMI AND IVVO?**

22 A. I provide an overview of the facts supporting the CPCN Projects in my Direct
23 Testimony, with additional support provided in the Direct Testimony of Company

1 witness Mr. Lee. The facts supporting Public Service's Application for a CPCN
2 can also be found in the Application itself, and the supporting testimony and
3 schedules provided in this proceeding by each of the Public Services witnesses.

4 **Q. WHERE HAS THE COMPANY DESCRIBED AMI AND IVVO AND THE NEED**
5 **FOR THEM?**

6 A. The project is described in my testimony and the testimony of Company witness
7 Mr. Lee, with additional technical descriptions in the Direct Testimony of
8 Company witnesses Mr. Nickell (IVVO), Mr. Borchardt (AMI), Mr. Reimer (FAN),
9 and Mr. Harkness (IT and Cyber Security). Likewise, the need for the project is
10 described throughout each of these pieces of testimony.

11 **Q. WHAT IS THE ANTICIPATED COMBINED COST OF THE AMI AND IVVO**
12 **PROGRAMS?**

13 A. Public Service estimates the total capital and O&M cost is approximately \$562
14 million for both AMI and IVVO (and associated FAN and IT) components, to be
15 incurred between 2016 and 2021. While these projects are in the early phases of
16 planning and design given that the Commission has not yet confirmed the need
17 for the projects, these costs were identified on the basis of benchmarking,
18 internal expertise, responses to Public Service's Request for Information and
19 Pricing ("RFx"), and appropriate contingency. Further, these costs are offset by
20 benefits, such that we estimate benefit-to-cost ratios of approximately 0.89 for
21 AMI and 0.76 for IVVO, with a total quantitative benefit-to-cost ratio of 0.85.
22 These analyses do not reflect the additional unquantifiable benefits such as
23 customer satisfaction, improved power quality, or human health and safety,

1 which are further discussed by the individual technical witnesses and
2 summarized by Company witness Mr. Samuel J. Hancock.

3 **Q. WHAT IS THE ESTIMATED TIMELINE FOR AMI AND IVVO**
4 **IMPLEMENTATION?**

5 A. Company witness Mr. Lee includes the detailed construction project plan,
6 timeline, and overall cost description for the AGIS project. In general, Public
7 Service anticipates implementing AMI meters primarily between 2018 and 2021,
8 with planning occurring in 2016 and 2017 and program and change management
9 occurring through 2021. Similarly, Public Service anticipates implementing IVVO
10 primarily between 2017 and 2021, with planning in 2016 and program and
11 change management occurring through 2021. Overall maintenance will be
12 continuing through the life of the software and equipment.

13 **Q. IS THE COMPANY INCLUDING ANY MAPS AS PART OF ITS CPCN**
14 **PROJECTS?**

15 A. Company witness Mr. Lee provides maps illustrating the Company's electric
16 distribution divisions, as well as the anticipated areas and phases of deployment
17 of AMI, IVVO, and the FAN. These maps are provided to illustrate our
18 implementation plan graphically, and identify the customer service areas where
19 each of these technologies will be deployed as part of the AGIS initiative.

20 **Q. WHAT ALTERNATIVES TO AMI AND IVVO HAS THE COMPANY STUDIED?**

21 A. The Direct Testimony of Company witness Mr. Lee addresses alternatives
22 studied with respect to the overall AMI and IVVO programs, as well as
23 alternatives within the context of the broader AGIS effort. The Direct Testimony

1 of each of the four technical witnesses (Mr. Nickell, Mr. Borchardt, Mr. Reimer,
2 and Mr. Harkness) describes the more specific technical considerations and
3 alternatives explored in the development of the AMI, IVVO, FAN, and supporting
4 IT infrastructure and cyber security protections. Overall, as described in this
5 Direct Testimony, Public Service has concluded that AMI, IVVO, and the FAN are
6 the right platforms for our grid and our customers at this time.

7 **Q. HAS THE COMPANY ALSO ADDRESSED COMMISSION INPUT FROM PAST**
8 **SMART GRID PROCEEDINGS?**

9 A. Yes. Attachment AKJ-2 to my Direct Testimony provides a matrix of pertinent
10 Commission comments and directions from past Decisions regarding “smart grid”
11 matters. In some cases, the Commission anticipated conducting a rulemaking to
12 develop requirements for future applications. Since the specific rulemaking has
13 not yet occurred, the final impact of issues that were to be addressed through a
14 rulemaking is somewhat unclear. Separately, a great deal of additional
15 information about advanced metering technologies and deployments has
16 become available since these Decisions occurred, and we have incorporated
17 relevant information into our deployment plan as discussed in the CPCN Projects
18 Application and supporting testimony. We attempted to address each of the
19 Commission’s past considerations to the extent relevant, and Attachment AKJ-2
20 identifies which Company witness addresses each individual concept.

21

1 **Q. DOES THE COMPANY ANTICIPATE SEEKING COST RECOVERY FOR THE**
2 **CPCN PROJECTS AT SOME FUTURE TIME?**

3 A. Yes. We anticipate seeking recovery of the costs associated with AMI, IVVO,
4 and the related FAN components in a future cost recovery proceeding, such as
5 Public Service's next general rate case. Consistent with past practice, Public
6 Service's future request for cost recovery will likely address the capital and O&M
7 costs associated with planning for, installing, operating, and maintaining AMI,
8 IVVO, and the FAN, as well as the other components of AGIS implemented in the
9 ordinary course of business. In addition, we anticipate seeking recovery of the
10 unamortized depreciation associated with replacing older meters and associated
11 equipment currently on the Public Service system. Since Public Service will not
12 begin replacing these meters until 2018, it does not seek any cost recovery
13 determinations in this CPCN proceeding.

14

1 **IV. GRANTING THE CPCN IS IN THE PUBLIC INTEREST**

2 **Q. PLEASE SUMMARIZE WHY PUBLIC SERVICE BELIEVES GRANTING THIS**
3 **CPCN IS IN THE CUSTOMER INTEREST AT THIS TIME?**

4 A. As previously described, AMI and IVVO, as well as their associated components
5 of the FAN, are a centerpiece of a resilient energy future in Colorado. These
6 technologies are not new to the energy industry. In addition, Public Service's
7 Colorado customers are demanding greater control over their energy choices
8 and more information to facilitate those choices; such optionality, including but
9 not limited to near real-time access to energy usage information through a web
10 portal or smartphone application, is not possible without the AGIS initiative. By
11 deploying these programs now, Public Service can achieve greater customer
12 penetration earlier. And while DSM programs are still of value, the Company
13 cannot achieve the demand side management benefits specific to integrated volt-
14 VAr regulation without implementing the necessary IVVO technology.

15 Further, AMI and IVVO are necessary to update Public Service's
16 distribution system and support reliable grid function well into the future. As
17 Company witness Mr. Lee describes in his Direct Testimony, the Company has
18 set reasonable system average interruption duration index ("SAIDI") reliability
19 goals that cannot be met without improved grid technology. Finally, the costs of
20 the AMI and IVVO programs are reasonable, and are roughly in line with
21 quantifiable benefits. While many benefits cannot be quantified, both quantitative
22 and qualitative benefits are described throughout the Direct Testimony

1 supporting this CPCN Application and summarized by Company witness Mr.
2 Hancock.

3 **A. Customer Interest**

4 **Q. HAS PUBLIC SERVICE INVESTIGATED THE EXTENT OF CUSTOMER**
5 **INTEREST IN GRID ADVANCEMENT PROGRAMS SUCH AS AMI AND IVVO?**

6 A. Yes. As discussed in the Direct Testimony of Company witness Ms. Jennifer B.
7 Wozniak, the Company has conducted studies of customer interest in advanced
8 metering and the associated benefits. In a recent study, approximately 8 of 10
9 customers surveyed responded that the Company should provide advanced
10 meters to its customers, with roughly 6 of 10 respondents being highly favorable
11 toward advanced meters. While customers do not yet have a consistent or
12 thorough understanding of AMI, the majority of customers (82-86%) are focused
13 on fundamental benefits of AMI they do understand, including reliability,
14 economic, and environmental benefits. Customers are also interested in outage
15 alerts, energy management tools, high bill alerts, peak pricing/demand response,
16 and time-of-use ("TOU") rates. AMI, the FAN, and a more responsive energy
17 grid are critical components of providing these benefits and options to customers.
18 In order to capture the TOU data and the customer changes in demands and
19 patterns, existing meters need to be replaced with advanced meters that can
20 record and relay the data. Additionally, the infrastructure is needed to
21 communicate such data on a more real time basis.

22 Similarly, in a 2015 year-end customer engagement study by Customer
23 Insights, a majority of residential and business respondents were interested in

1 receiving proactive outage or other emergency alerts, incentives to reduce
2 consumption during peak usage periods, and TOU rates. These results are
3 indicative of additional customer information from Public Service's and other
4 entities' customer surveys, and illustrate that customers are interested in the type
5 of programs Public Service wants to provide.

6 **Q. WERE THESE RESULTS IN PART DEPENDENT ON THE COSTS OF SUCH**
7 **PROGRAMS?**

8 A. In many cases, certainly. Public Service understands that it is important to offer
9 these choices and options at a reasonable cost and with a sustainable rate
10 impact for customers. It will also be important to continue to educate customers
11 on the benefits of AMI and IVVO and why the associated costs are reasonable.
12 Company witness Ms. Wozniak discusses the Company's education plan in more
13 detail in her Direct Testimony.

14 **Q. HAS THE COMMISSION RECOGNIZED THAT CUSTOMER EDUCATION**
15 **WILL BE NEEDED?**

16 A. Yes. As part of this CPCN Application, Public Service addresses the levels of
17 customer interest and understanding of advanced grid concepts, and proposes a
18 robust customer education plan to address gaps in understanding and to support
19 the opportunities to achieve the benefits of AGIS. Company witness Ms.
20 Wozniak provides additional detail in her Direct Testimony that explains and
21 supports Public Service's customer surveys and education plans. She also
22 addresses how Public Service will evaluate the success of its customer
23 education.

1 **Q. DOES PUBLIC SERVICE PROPOSE AN “OPT-IN” APPROACH, WHERE AMI**
2 **WILL ONLY BE DEPLOYED TO CUSTOMERS WHO OPT IN, OR AN “OPT-**
3 **OUT” APPROACH WHERE CUSTOMERS MUST ACTIVELY CHOOSE NOT**
4 **TO PARTICIPATE?**

5 A. Public Service proposes an opt-out approach for several reasons. First, Public
6 Service can achieve the greatest benefits for Colorado customers by deploying
7 advanced meters – and associated TOU rates made possible by advanced
8 metering – consistently across our service territory. For example, it is important
9 to have a concentration of advanced meters to achieve the benefits of better
10 identifying outage locations and of making time-of-use or other conservation-
11 incentive rates widely available. It is also necessary to broadly deploy advanced
12 meters to capture the benefits of reduced home visits and fewer meter reading
13 costs.

14 Second, customers have not typically chosen to opt out even when given
15 the option to do so. As noted by a September 2014 Institute for Electric
16 Innovations *Utility-Scale Smart Meter Deployments* report,² in states where opt-
17 out programs are offered, “[t]he number of customers that have officially
18 requested to opt-out of a smart meter installation is extremely low.”

19 Third, as further noted in the IEI Report, “several states have implemented
20 policies that allow customers to opt out of smart meters, but, to exercise this
21 option, these customers typically pay an initial fee and a monthly opt-out fee.”

22 This approach, which Public Service also proposes as I discuss below, covers

² http://www.edisonfoundation.net/iei/Documents/IEI_SmartMeterUpdate_0914.pdf (“IEI Report”).

1 the cost of new, non-AMI meters, manual meter readings, manual connects and
2 disconnects and the like, while tending to further encourage customer
3 participation and discourage decisions to opt out.

4 With respect to possible time-of-use rates, Public Service likewise
5 anticipates an “opt-out” option that would be addressed through rate design
6 proceedings and implemented through tariff updates. Since Public Service has
7 not yet implemented advanced meters, it would be premature to propose specific
8 tariffs at this time.

9 **Q. WHAT PERCENTAGE OF CUSTOMERS DOES PUBLIC SERVICE ESTIMATE**
10 **WILL “OPT OUT,” GIVEN THE OPPORTUNITY?**

11 A. Based on reports of AMI implementations and information received from other
12 utilities who have implemented AMI, Public Service estimates that less than 0.5%
13 of Public Service customers will opt out of advanced metering. Company witness
14 Mr. Borchardt provides additional support for this assumption.

15 **Q. WHAT IMPACT DOES PUBLIC SERVICE ESTIMATE CUSTOMER OPT-OUTS**
16 **WILL HAVE ON ITS BENEFIT-TO-COST RATIO?**

17 A. Public Service does not anticipate opt-outs having any impact to the ratio of AMI
18 benefits to costs. Rather, as described by Company witness Mr. Borchardt,
19 Public Service proposes to have customers who opt-out of AMI installations bear
20 their own costs associated with installing digital meters without active wireless
21 capabilities, as well as the costs of more manual metering activities (such as
22 meter reading and maintenance). As such, there is no impact to a benefit-to-cost
23 ratio or to customers who do not opt out.

1 **Q. DOES THE COMPANY'S CUSTOMER EDUCATION PLAN INCORPORATE**
2 **EFFORTS TO HELP CUSTOMERS UNDERSTAND WHY THEY SHOULD NOT**
3 **OPT OUT OF AMI?**

4 A. Yes. Helping customers understand AMI, its direct benefits such as greater
5 information about and ability to control energy usage, and its indirect benefits
6 around greater service reliability, environmental advancement opportunities, and
7 economic savings from managing energy usage, is very important to the overall
8 success of the AMI program. We also anticipate that the customer education
9 plan will address customer questions about the pros and cons of opting out. Ms.
10 Wozniak discusses our customer education plan in more detail in her Direct
11 Testimony.

12 **B. Benchmarking**

13 **Q. DID PUBLIC SERVICE DO ANY INDEPENDENT ANALYSIS OF AMI OR IVVO**
14 **INSTALLATIONS BY OTHER UTILITIES?**

15 A. Yes. Company witnesses Messrs. Borchardt, Nickell, and Reimer address
16 industry information regarding AMI, IVVO, and associated FAN components,
17 respectively, in their Direct Testimony. In general, it is important to be clear that
18 the implementation of AMI and IVVO are not new, but rather have been the focus
19 of other utilities' efforts across the country.

20 **Q. CAN YOU PROVIDE SUPPORT FOR INSTALLATION OF AMI METERS IN**
21 **PARTICULAR?**

22 A. Yes. A nationwide need to upgrade the distribution grid, combined with
23 legislative incentives, have spurred investment in grid advancement initiatives. A

1 September 2014 report by the Institute for Electric Innovation provided as
2 Attachment AKJ-3 illustrates that by July 2014, more than 50 million AMI meters
3 had been installed nationwide. In Colorado alone, for example, Black Hills
4 Corporation/Colorado Electric deployed AMI system-wide, a meter data
5 management system, a customer web portal, and an outage management
6 system.³ And according to a 2014 release from Navigant Research, worldwide
7 smart meter shipments are expected to grow from 94 million annually in 2014 to
8 116 million in 2023.⁴

9 **Q. DID PUBLIC SERVICE DRAW FROM THE PAST DEPLOYMENTS OF AMI BY**
10 **OTHER UTILITIES TO HELP DEVELOP ESTIMATES OF THE LIKELY COSTS**
11 **OF AMI?**

12 A. Yes. Given the significant past deployment of AMI, Public Service was able to
13 undertake a Request for Information process to gather information and benefit
14 from other AMI implementations. Specifically, Public Service conducted a
15 Request for Information and Pricing to obtain data about the likely costs and
16 process to implement AMI. In addition, Public Service conducted its own
17 research. Company witness Mr. Borchardt describes the Company's process for
18 developing cost estimates for AMI in more detail in his Direct Testimony.

19

³ https://www.smartgrid.gov/files/BHCOE_Project_Description_-_Final.pdf.

⁴ <http://www.navigantresearch.com/newsroom/worldwide-shipments-of-smart-meters-are-expected-to-peak-at-116-million-units-annually-in-2023>.

1 **Q. HAVE OTHER UTILITIES ALSO BENCHMARKED TYPICAL PER-METER**
2 **COSTS OF AMI, INSTALLATION, AND ONGOING SUPPORT?**

3 A. Yes. In 2015, ConEdison benchmarked the cost per advanced meter for utilities
4 in varying locations of the United States, and for deployments of various scale.
5 We understand ConEdison's cost-per-meter range to include the meter,
6 communications, and installation, but not ongoing costs or program
7 management. On that basis, ConEdison's analysis showed that the approximate
8 cost for each meter ranges from \$186 to \$290, with deployment scales between
9 1.5 million and 5.4 million meters. Please see Attachment AKJ-4 for ConEdison's
10 analysis summary, provided by ICF International.

11 **Q. WHAT COST PER METER AND DEPLOYMENT SCALE IS PUBLIC SERVICE**
12 **PROJECTING FOR AMI?**

13 A. Public Service plans to implement approximately 1.5 million meters over the
14 2018-2021 deployment period at an average cost-per-meter of approximately
15 \$250, which includes the costs of the meter, communications, installation, and
16 contingency, but not escalation, administrative and engineering loaders, ongoing
17 costs, or project management costs. Excluding contingency costs results in an
18 average cost-per-meter of approximately \$194. Consequently, we estimate
19 Public Service's overall per meter cost is likely to be in the range of \$194 to
20 \$250. Company witness Mr. Borchardt presents additional information about the
21 bases for these costs. In the next section of my Direct Testimony, I introduce as
22 well our analysis of the costs and benefits of the AMI, IVVO, and FAN
23 components included in the CPCN Projects.

1 **C. Quantitative Cost-Benefit Analysis**

2 1. Overview of CBA

3 **Q. DID PUBLIC SERVICE UNDERTAKE A COST-BENEFIT ANALYSIS**
4 **ASSESSING THE QUANTITATIVE COSTS AND BENEFITS OF AMI AND**
5 **IVVO?**

6 A. Yes. Company witness Mr. Hancock details and supports the Company's cost-
7 benefit analyses, which were undertaken for AMI and the associated FAN
8 components, IVVO and the associated FAN components, and for AMI and IVVO
9 together. However, these analyses only compare quantifiable projected benefits,
10 such as O&M and capital expenditures savings. By definition, they do not
11 capture other benefits that cannot be quantified, such as customer satisfaction.

12 **Q. WHAT WAS THE COMPANY'S APPROACH TO UNDERTAKING THE COST-**
13 **BENEFIT ANALYSIS?**

14 A. Given that Public Service is in the early phases of project development,
15 consistent with not yet having received a CPCN, the Company determined it was
16 appropriate to take a conservative view of likely cost and benefit inputs. In other
17 words, Public Service attempted to take a reasonable approach that was not
18 likely to overstate benefits or understate costs.

19 **Q. DO THE RESULTS OF THE COST-BENEFIT ANALYSES SUPPORT**
20 **GRANTING THIS APPLICATION FOR A CPCN?**

21 A. Yes, especially considering the current lack of advancement and insight into our
22 grid as it presently exists. Mr. Hancock's analysis illustrates that AMI has an
23 approximate quantitative benefit-to-cost ratio of 0.89, and that IVVO has an

1 approximate quantitative benefit-to-cost ratio of 0.76. In other words, on a 2016
2 net present value (“NPV”) basis, the quantifiable costs of each program slightly
3 exceed the benefits that can be converted to dollar values. If it turns out that our
4 conservative assumptions were overly conservative, the benefit ratios would only
5 improve.

6 **Q. ARE CONTINGENCIES A COMPONENT OF THE COST-BENEFIT**
7 **ANALYSIS?**

8 A. Yes. The costs associated with AMI, IVVO, and the FAN installation, IT support
9 efforts, and ongoing operations include contingency amounts, which are detailed
10 further in the Direct Testimony of Company witnesses Messrs. Borchardt, Nickell,
11 Reimer, Harkness and Hancock’s Attachments REB-2; CSN-2; WAR-2 and
12 WAR-3; DCH-1 and DCH-2; and SJH-4, respectively. These contingencies were
13 designed to account for the further refinement of costs after detailed design and
14 engineering are complete, in the event the Commission determines these
15 programs are needed and in the public interest.

16 **Q. WHY DOES PUBLIC SERVICE BELIEVE THAT UTILIZING SUCH**
17 **CONTINGENCIES IS APPROPRIATE?**

18 A. While it is important to undertake initial planning, benchmarking, and research
19 before determining a project is needed, it would be imprudent to invest
20 substantial time in detailed design and engineering or to enter into significant
21 materials and installation contracts before regulators have determined that the
22 project is needed and in the public interest. Until design and engineering are
23 complete, substantial contingencies are necessary to account for the unknowns

1 that are likely to develop during those processes and through the installation and
2 operations phase. Once the need for AMI and IVVO have been determined and
3 Public Service moves into the design and contracting phases, the balance
4 between cost estimates and contingencies is expected to shift toward more firm
5 cost estimates.

6 **Q. DOES THE INCLUSION OF A CONTINGENCY AMOUNT IN A COST-BENEFIT**
7 **ANALYSIS OR INITIAL BUDGET MEAN 100% OF THE CONTINGENCIES**
8 **MUST BE CONSUMED THROUGH PROJECT IMPLEMENTATION?**

9 A. No, not at all. In this case Public Service worked to develop a conservative
10 budget to provide a fair view of potential costs and benefits. Public Service does
11 not anticipate using all of the contingencies, but cannot guarantee they will not be
12 needed until the projects are farther along. The actual costs of the projects will
13 be vetted in future rate case filings and/or other cost recovery petitions (should
14 they be needed), at which time the Commission can evaluate how the costs were
15 incurred. And to the extent Public Service does not utilize all of the
16 contingencies in order to realize the benefits of AMI and IVVO, the benefit-to-cost
17 ratio of these programs will only improve.

18 **Q. HOW WILL THE COMMISSION KNOW THAT CONTINGENCIES ARE BEING**
19 **USED WISELY, TO THE EXTENT THEY ARE UTILIZED?**

20 A. In Section V of my Direct Testimony, I outline the ongoing reporting Public
21 Service proposes to keep the Commission and other stakeholders fully apprised
22 of the progress, costs, and benefits of the AMI and IVVO programs. As a result,
23 stakeholders will have the opportunity to review the capital and O&M

1 expenditures throughout the implementation process. The key opportunity to
2 review costs will be afforded in future cost recovery proceedings. Routine
3 reporting, followed by robust cost recovery filings, will facilitate a transparent and
4 accountable process.

5 2. Purpose and Limitations of CBA

6 **Q. SHOULD THE DECISION WHETHER TO APPROVE OR DENY THIS**
7 **APPLICATION DEPEND SOLELY ON THE OUTCOME OF THE**
8 **QUANTITATIVE COST-BENEFIT ANALYSIS?**

9 A. No. That would be an overly-narrow perspective that does not take into account
10 the broader context of AMI and IVVO, the place of AGIS in Our Energy Future
11 initiative, or future opportunities that AMI and IVVO can create for customers.
12 Company witness Mr. Hancock discusses both the purpose and limitations of a
13 quantitative cost-benefit analysis in his Direct Testimony. More specifically, a
14 cost-benefit analysis can only capture that which can be quantified or measured.
15 Costs, by definition, can be quantified. Other benefits of a project, including
16 customer satisfaction, the secondary effects of lost productivity, business, or
17 consumables on customers due to electric outages, and human health and safety
18 are not fully quantifiable or quantifiable at all.

19 **Q. IS THE OUTCOME OF A COST-BENEFIT ANALYSIS THE STANDARD BY**
20 **WHICH OTHER RESOURCE ACQUISITIONS MUST BE JUDGED IN**
21 **COLORADO?**

22 A. No. Certainly balancing the costs and benefits of any given resource is an
23 important consideration, which we do not discount. However, it is not the only

1 consideration. Further, in some cases the Commission has valued resources on
2 the basis of whether they “can be acquired at a reasonable cost and rate impact,”
3 according to Colorado Rule 3602(c). This is the standard by which our resource
4 plans are evaluated. While this is not a resource plan proceeding and is not
5 driven by specific load and resources considerations, Public Service’s CPCN
6 Application and the supporting testimony illustrate that AMI and IVVO distribution
7 resources can be acquired at a reasonable cost and rate impact, serving multiple
8 customer and system needs, and are therefore in the public’s interest.

9 **Q. TO THE EXTENT THE COMMISSION UTILIZES THE COST-BENEFIT**
10 **ANALYSIS, ARE THERE OTHER POTENTIAL CONSIDERATIONS OR**
11 **INPUTS YOU WOULD ASK THE COMMISSION TO CONSIDER?**

12 A. Yes. One issue that will arise in this proceeding is the manner of accounting for
13 older distribution equipment to the extent it is not fully depreciated. In any given
14 year, Public Service must replace a number of existing meters for a variety of
15 reasons simply to enable functional metering at each customer’s property.
16 Therefore, Public Service anticipates that the balance on AMR meters will be
17 approximately \$72 million from the beginning of 2018, with an average of
18 approximately 12 years remaining on these meters’ estimated useful lives.
19 Although these AMR meters will not all have reached the end of their depreciable
20 lives, the technology associated with AMR meters is no longer current, is not
21 supported by some vendors, and does not afford the benefits of AMI. As a result,
22 it will be important to balance the goal of achieving reasonable cost levels with

1 the desire for those customers who receive the benefit of a particular asset to
2 pay its cost. There are multiple options for achieving this balance.

3 For purposes of this proceeding, Public Service assumes that cost
4 recovery for the remaining depreciation associated with these meters could occur
5 over 12 years beginning in 2018. This period roughly equates to the meters'
6 average useful lives and therefore has no impact on the CPCN Projects benefit-
7 to-cost ratio. Public Service recognizes that other recovery or amortization
8 periods could also be acceptable. A longer period would reduce customers'
9 annual costs and improve the cost-benefit analysis, while a shorter period would
10 better ensure customers who received the benefits of those meters are also
11 responsible for their cost.

12 **Q. IS PUBLIC SERVICE MAKING A PARTICULAR PROPOSAL IN THIS**
13 **PROCEEDING?**

14 A. No. As with overall cost recovery, we anticipate addressing the best means of
15 recovering the remaining depreciation expense associated with these meters in a
16 future proceeding. And since we do not anticipate implementing new AMI meters
17 until late 2018 at the earliest, there is no need to address the issue at this time.

18 **Q. WHAT DO YOU RECOMMEND IS THE PROPER PERSPECTIVE ON THE**
19 **COST-BENEFIT ANALYSIS?**

20 A. I recommend that the Commission review the cost-benefit analysis, but do so in
21 the broader context of the goals of the AMI and IVVO programs, the current
22 qualitative benefits they offer, and the opportunities for future customer benefits.

1 **D. Qualitative Benefits**

2 **Q. CAN YOU DESCRIBE SOME OF THE BENEFITS OF AMI AND IVVO THAT**
3 **ARE NOT CAPTURED BY THE CBA?**

4 A. Yes. As discussed by Company witness Mr. Hancock, there are benefits of the
5 AGIS initiative that, from a cost-benefit perspective, cannot be fully quantified
6 (such as customer satisfaction and empowerment) or which we believe are not
7 appropriately monetized (such as human safety).

8 **Q. WHY IS IT IMPORTANT FOR THESE QUALITATIVE BENEFITS TO BE**
9 **CONSIDERED AS PART OF THE EVALUATION OF THE CPCN PROJECTS**
10 **APPLICATION?**

11 A. From a policy perspective, the importance of the unquantifiable benefits of
12 advancing the distribution grid are difficult to overstate. Safety, reliability, and
13 customer satisfaction are key to our role as a public utility. A more automated,
14 transparent grid supports greater customer and employee safety, as discussed
15 by Company witness Mr. Borchardt. Similarly, Company witness Mr. Lee
16 explains that without the advanced technologies associated with the AGIS
17 initiative, the Company will not be able to keep up with industry trends regarding
18 reliability, as measured by SAIDI. Nor can the utility keep up with greater
19 customer demand for distributed energy resources without investing in the
20 advanced grid technologies necessary to support these resources. In addition,
21 giving customers choice and control over their energy usage by providing greater
22 data to customers; giving customers greater input into the types of energy they
23 use by supporting distributed energy resources; and empowering customers to

1 make good choices about their impact on the environment are important pieces
2 of both building customer satisfaction and managing electric demand.

3 **Q. HOW DOES CUSTOMER OPTIONALITY FURTHER SUPPORT PUBLIC**
4 **INTEREST IN GRANTING THIS CPCN?**

5 A. As noted earlier in my Direct Testimony, empowering customer choice is a key
6 driver of the AGIS initiative as a whole. Digital metering and technologies enable
7 new programs for customers that give them more power over their energy usage.
8 Some of these options, such as the opportunities to receive more regular
9 updates about their electricity usage and to tailor their electric usage to reduce
10 their electricity costs, are discussed above. But customer choice goes beyond
11 TOU rates or remote connect/disconnect options.

12 With AMI, Public Service has the option to implement budgeting tools and
13 high usage alerts that notify customers if they exceed certain thresholds; to
14 create internet portals that provide greater insight into energy consumption and
15 peak demand; and to develop mobile apps that allow near real-time information
16 access.

17 AMI will also support the two-way flow of energy, further supporting
18 customer investment in DER such as rooftop solar and potential energy storage
19 or battery options if they should choose to do so.

20

1 **Q. HAS PUBLIC SERVICE INCORPORATED ANY ASSUMPTIONS ABOUT**
2 **THESE FUTURE OPTIONALITIES INTO ITS ASSESSMENT OF AMI AND**
3 **IVVO?**

4 A. Yes. As noted in Public Service's Phase II filing, Public Service envisions
5 implementing a time-of-use rate, and has made a proposal accordingly. We
6 anticipate continuing discussion of those options in Public Service's rate design
7 proceedings. Likewise, the implementation of the advanced meters and
8 associated infrastructure provide an opportunity for customer web portals to
9 access energy usage data on a near real-time basis, and we anticipate building
10 such portals as part of the AGIS initiative. In addition, the implementation of AMI
11 will enable the Company to improve the performance of its existing Saver's
12 Switch program, which allows Public Service to shut off a voluntary participant's
13 air conditioning for short periods of time during high load hours. Estimated
14 anticipated reduced consumption associated with time-of-use rates, as well as
15 the impact of the improvements to Saver's Switch, are incorporated into Public
16 Service's CBA and are discussed in more detail by Company witness Mr.
17 Hancock.

18 **Q. HOW DO YOU RECOMMEND THAT THE COMMISSION EVALUATE**
19 **QUALITATIVE BENEFITS AND FUTURE CUSTOMER OPTIONS THAT**
20 **COULD NOT BE BUILT INTO A COST-BENEFIT ANALYSIS?**

21 A. We recognize that it is difficult to put a numeric value on future opportunity and
22 non-monetary benefits, and that evaluating these possibilities can be a
23 challenge. However, the trends in the utility industry and the efforts of other

1 states to advance their distribution grids, described in this testimony and in
2 industry-wide resources like the Department of Energy's SmartGrid.gov website,
3 verify the importance of bringing utilities' distribution grids into the future. Without
4 AGIS, Public Service will soon be behind in managing to customer standards,
5 supporting DER, employing current technologies, meeting reliability goals and
6 expectations, and fully capturing DSM opportunities. AGIS is therefore both a
7 fundamental part of Our Energy Future and a standalone requirement for a
8 robust and resilient distribution grid.

9

- 1 • A comparison of the total spend to the overall CPCN projected budget;
- 2 • A cost summary;
- 3 • Business plan overview of the previous year's progression of the CPCN
- 4 Projects; and
- 5 • Project milestones and overall project status (engineering updates,
- 6 equipment updates and construction update).

7 **Q. WHAT IS THE COMPANY TRYING TO ACCOMPLISH WITH THESE**

8 **REPORTS?**

9 A. It is the Company's intention to keep the Commission informed regarding all the

10 important aspects of the project. We understand that with a project this size and

11 with the length of the roll-out period, it is important to keep the Commission

12 regularly informed of project costs, the scope, project milestones, and status.

13 Further, including such information in regular reports to the Commission will aid

14 parties in their review of future AGIS cost recovery requests as discussed earlier

15 in my Direct Testimony.

16

1 **VI. REQUESTS OF THE COMMISSION AND CONCLUSION**

2 **Q. WHAT IS PUBLIC SERVICE REQUESTING OF THE COMMISSION IN THIS**
3 **PROCEEDING?**

4 A. Public Service requests that the Commission find that this CPCN Projects
5 Application is consistent with public convenience and necessity, and grant the
6 Application. Public Service further requests that the Commission approve our
7 future reporting proposals, leaving cost recovery determinations to a future cost
8 recovery proceeding.

9 **Q. DOES THIS CONCLUDE YOUR TESTIMONY?**

10 A. Yes, it does.

Statement of Qualifications

Alice K. Jackson

As the Regional Vice President of Rates and Regulatory Affairs, I am responsible for providing leadership, direction, and technical expertise related to regulatory processes and functions for Public Service Company of Colorado (“Public Service”). My duties include the design and implementation of Public Service’s regulatory strategy and programs, and directing and supervising Public Service’s regulatory activities, including oversight of rate case. Those duties include: administration of regulatory tariffs, rules, and forms; regulatory case direction and administration; compliance reporting; complaint response; and working with regulatory staffs and agencies.

I accepted the RVP position with Public Service in November 2013 after holding the same position in another Xcel Energy Inc. (“Xcel Energy”) subsidiary, Southwestern Public Service Company, for two and a half years. Prior to my employment with Xcel Energy, I had been employed in the energy industry for over 10 years. In 2001, I was employed by Enron Energy Services, where I provided software application design and support to a variety of departments within that company.

In December 2001, I began working as a contract employee for Oxy Services, Inc., a subsidiary of Occidental Petroleum Corporation (“Oxy”), and transitioned to permanent employee status in January 2002. I held positions of increasing responsibility as a software programmer supporting Occidental Energy Marketing, Inc., the trading organization within Oxy, where I designed, developed and implemented an application used by Oxy for the operations of their Retail Electric Provider (“REP”) in the Electric Reliability Council of Texas (“ERCOT”).

In June of 2004, I accepted a promotion to work for Occidental Energy Ventures Corp. ("OEVC") as Manager, Texas REP. In this position I was responsible for front office (procurement, monitoring, and regulatory), mid office (data processing and billing) and back office (accounting and reporting) operations of Oxy's wholly owned REP in the ERCOT region. In 2010, I became Director Energy for OEVC and was responsible for the regulatory activities of Oxy's facilities located within the New York Independent System Operator, the Southwest Power Pool ("SPP"), and ERCOT. My responsibilities for these jurisdictions included: (1) direction of Oxy's participation in utility cases at both state and federal levels; (2) direction and participation in federal initiatives impacting Oxy's business (e.g., FERC Notices of Proposed Rulemaking); (3) maintenance of regulatory filings required of Oxy's REP and generation assets at the state and federal level; (4) administration of Occidental Power Marketing, L.P. as a registered North American Electric Reliability Corporation Load Serving Entity in the SPP; and (5) evaluation of, and participation in, rule and protocol updates, revisions and additions before State Commissions, Regional Independent System Operators, and Regional Transmission Organizations ("RTOs"). In May 2011, I accepted a position with Xcel Energy Services Inc. ("XES") as Director, Regulatory Administration, and the position was transferred to SPS effective January 1, 2012. I was subsequently promoted to Regional Vice-President, Rates and Regulatory Affairs, and in that capacity I devote my time to regulatory issues in SPS's Texas, New Mexico, and FERC jurisdictions.

I graduated from Texas A&M University in 2001, receiving a Bachelor of Business Administration degree with a major in Information and Operations Management. I have testified before this Commission and the New Mexico Public

Regulation Commission and provided written testimony a number of times before the Public Utility Commission of Texas.