

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

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IN THE MATTER OF ADVICE LETTER)
NO. 1857-ELECTRIC OF PUBLIC)
SERVICE COMPANY OF COLORADO)
TO REVISE ITS COLORADO PUC NO.)
8-ELECTRIC TARIFF TO REVISE)
JURISDICTIONAL BASE RATE) PROCEEDING NO. 21AL-____E
REVENUES, IMPLEMENT NEW BASE)
RATES FOR ALL ELECTRIC RATE)
SCHEDULES, AND MAKE OTHER)
PROPOSED TARIFF CHANGES)
EFFECTIVE AUGUST 2, 2021)

DIRECT TESTIMONY AND ATTACHMENTS OF MICHAEL O. REMINGTON

ON

BEHALF OF

PUBLIC SERVICE COMPANY OF COLORADO

July 2, 2021

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GLOSSARY OF ACRONYMS AND DEFINED TERMS

<u>Acronym/Defined Term</u>	<u>Meaning</u>
2019 Electric Phase I	Proceeding No. 19AL-0268E
ADMS	Advanced Distribution Management System
AGIS	Advanced Grid Intelligence & Security
AGR	Advanced Grid Rider
AMI	Advanced Meter Infrastructure
Amended CPCN	Company-requested Amendment to AGIS CPCN in Proceeding No. 21A-0279E
API	Application Programming Interface
APT	Advanced Planning Tool
BESS	Battery Energy Storage System
BUD	Bentley OpenUtilities Designer
CalISO	California Independent System Operator
CFM	Corporate Financial Model
CIAM	Customer Identity and Access Management
CIP	Critical Infrastructure Protection
CJCS	Colorado Joint Communication System
Commission	Colorado Public Utilities Commission
CPCN	Certificate of Public Convenience and Necessity
CREV	Customer Revenue System
CRI	Community Resiliency Initiative
CRM	Customer Relationship Management
CRS	Customer Response System
CXT	Customer Experience Transformation

<u>Acronym/Defined Term</u>	<u>Meaning</u>
DEMS	Decentralized Energy Management System
DER	Distributed Energy Resources
EMS	Energy Management System
ENGO	Edge of Network Grid Optimization
EPRI	Electric Power Research Institute
ESB	Enterprise Service Bus
ESOMS	Electric Shift Operations Management System
FAN	Field Area Network
FERC	Federal Energy Regulatory Commission
FLISR	Fault Location Isolation and Service Restoration
FLP	Fault Location Protection
FTY	Future Test Year
GB CMD	Green Button Connect My Data
GE	General Electric
GEMS	Grid Edge Management
GIS	Geospatial Information System
GL	General Ledger
HAN	Home Area Network
HR	Human Resources
HTY	Historical Test Year
IEEE	Institute of Electrical and Electronics Engineers
IIB	IBM Integration Bus
IP	Internet Protocol
IT	Information Technology

<u>Acronym/Defined Term</u>	<u>Meaning</u>
IVR	Interactive Voice Response
IVVO	Integrated Volt-VAR Optimization
LMR	Motorola Land Mobile Radio
LTC	Load Tap Changer
LTE	Long Term Evolution
MDHA	Multi-Data Center High Availability
MDM	Meter Data Management
NCC	New Customer Connection
NERC	American Electric Reliability Council
NMS	Network Management System
NOC	Network Operations Center
O&M	Operations and Maintenance
OMS	Outage Management System
OpCos	Xcel Energy Operating Companies
OTA	Over The Air
PC	Personal Computer
PCI	Current Power Costs, Inc
PPA	Purchase Power Agreement
PTT	Productivity Through Technology
Public Service or the Company	Public Service Company of Colorado
RE-TOU	Residential Energy Time-of-Use
RFP	Request for Proposal
RIS	Regulatory Information System
SCADA	Supervisory Control and Data Acquisition

<u>Acronym/Defined Term</u>	<u>Meaning</u>
SMS	Sensor Management System
SVC	Static VAr Compensator
TAHA	Transmission Asset Health Analytics
TIG	Technology Investment Governance
TWR	Transmission Work Request
UI	Utilities International
VoIP	Voice over Internet Protocol
WAM	Work and Asset Management
WAN	Wide Area Network
WEIM	Western Energy Imbalance Market
WiMAX	Worldwide Interoperability for Microwave Access
WiSUN	Wireless Smart Utility Network
Xcel Energy	Xcel Energy Inc.
XES	Xcel Energy Services Inc.

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DIRECT TESTIMONY AND ATTACHMENTS OF MICHAEL O. REMINGTON

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

3 Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

4 A. My name is Michael O. Remington. My business address is 414 Nicollet Mall,
5 Minneapolis, Minnesota 55401.

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

7 A. I am employed by Xcel Energy Services Inc. ("XES"), the service company
8 subsidiary of Xcel Energy, as Business Systems Regulatory Director, Advanced
9 Grid. XES is a wholly-owned subsidiary of Xcel Energy Inc. ("Xcel Energy"), and
10 provides an array of support services to Public Service Company of Colorado
11 ("Public Service" or the "Company") and the other utility operating company
12 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. I am currently responsible for the regulatory aspects of Business Systems' role in
5 the Advanced Grid Intelligence and Security ("AGIS") initiative. I direct and
6 prepare testimony, supporting documents, and discovery responses related to
7 Business Systems in filings before the Colorado Public Utilities Commission
8 ("Commission") as well as for other Xcel Energy operating companies ("OpCos").

9 Prior to January 31, 2021, I was Director of IT Operations, responsible for
10 managing major incidents, monitoring Information Technology ("IT") infrastructure
11 and applications, disaster recovery planning, and managing several core IT service
12 management processes. In this Direct Testimony, I represent the Xcel Energy
13 Business Systems organization, which performs Xcel Energy's shared IT
14 functions. The key types of activities performed by Business Systems include all
15 enterprise application development and maintenance, management of IT
16 infrastructure, data center operations and architecture, and IT governance.
17 Business Systems provides IT services to Xcel Energy and the Xcel Energy
18 OpCos, including Public Service, primarily on a common platform, with costs
19 allocated to specific utilities and jurisdictions consistent with the Direct Testimony
20 of Company witnesses Mr. Ross L. Baumgarten, Ms. Laurie J. Wold, and Ms.
21 Deborah A. Blair. A description of my qualifications, duties, and responsibilities is
22 set forth in my Statement of Qualifications at the conclusion of my Direct
23 Testimony.

1 **Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY AND**
2 **ATTACHMENTS?**

3 A. The purpose of my Direct Testimony is to support the Business Systems capital
4 additions and operations and maintenance (“O&M”) expenses, including those for
5 the AGIS initiative that are allocated to Public Service retail electric and included
6 in the 2022 Future Test Year (“FTY”) cost of service that is presented by Company
7 witness Ms. Blair. The Company’s last electric rate case was Proceeding No.
8 19AL-0268E (the “2019 Electric Phase I”), in which a Current Test Year ending
9 August 31, 2019 was approved. I therefore provide support for capital additions
10 placed into service since the Company’s 2019 Electric Phase I, from September
11 1, 2019 through the year-end 2022 FTY. The Company’s Business Systems plant
12 additions since the 2019 Electric Phase I total \$579.4 million through 2022,
13 including \$452.1 million for non-AGIS capital and \$127.3 million for AGIS capital.
14 These non-AGIS capital additions are discussed in Section IV of my Direct
15 Testimony. Company witness Ms. Wold has calculated the monthly plant balances
16 to develop the plant-related roll forward, which is in turn used by Ms. Blair to
17 incorporate the 13-month average plant in service balances into the 2022 FTY cost
18 of service.

19 I also support the \$48.6 million in Business Systems’ O&M included in the
20 Company’s test year, while also supporting the O&M drivers for the FTY as
21 compared to the level of O&M currently in base rates approved in the 2019 Electric
22 Phase I. Business Systems’ O&M in this rate case is based on 2020 actual O&M,
23 except that investments in the AGIS initiative are based on forecasted O&M levels

1 for 2022, including \$40.1 million for non-AGIS O&M and \$8.6 million for AGIS
2 O&M. I discuss non-AGIS O&M in Section V of my Direct Testimony. Company
3 witnesses Mr. Steven P. Berman and Ms. Blair support the Company's overall FTY
4 development.

5 Additionally, in Section VI, I support the Company's request for capital and
6 O&M cost recovery for the AGIS initiative. Specifically, I explain and support the
7 Company's implementation of, and capital and O&M forecasts for, the Business
8 Systems components of the AGIS initiative to the extent relevant to this rate case.
9 In addition to my Direct Testimony, Company witness Mr. Chad S. Nickell provides
10 an overview of the AGIS initiative and supports the Distribution Business Area's
11 implementation of the AGIS projects. Additionally, Company witness Mr. Emmett
12 Romine discusses the AGIS initiative from a customer perspective, and Company
13 witness Mr. Steven P. Berman supports the Company's request to continue the
14 AGIS deferral that was established as part of the AGIS Certificate of Public
15 Convenience and Necessity ("CPCN") proceeding and continued through the
16 Company's 2019 Electric Phase I.

17 **Q. ARE YOU SPONSORING ANY ATTACHMENTS WITH YOUR DIRECT**
18 **TESTIMONY?**

19 A. Yes, I am sponsoring the following attachments:

- 20 • Attachment MOR-1: Business Systems Capital Additions 2019-2020;
- 21 • Attachment MOR-2: Business Systems Capital Additions 2021-2022;
- 22 • Attachment MOR-3: Business Systems 2020 Non-AGIS O&M Expenses
23 by Cost Element;

- 1 • Attachment MOR-4: Business Systems 2020 Non-AGIS O&M Expenses
2 by FERC Account;
- 3 • Attachment MOR-5: Business Systems Pending Demand;
- 4 • Attachment MOR-6: Business Systems AGIS O&M Expenses by Cost
5 Element for 2020-2022; and
- 6 • Attachment MOR-7: Business Systems AGIS O&M Expenses by FERC
7 Account for 2020-2022.

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

10 A. As part of approving the FTY cost of service developed by Ms. Blair, I recommend
11 that the Commission approve the 2019-2022 Business Systems AGIS and non-
12 AGIS capital additions, 2020 Business Systems O&M expenses, as well as the
13 2022 AGIS O&M expenses, which are included in the Company's 2022 FTY cost
14 of service presented in this rate case, and described below.

1 **II. BUSINESS SYSTEMS – BACKGROUND AND OVERVIEW**

2 **Q. PLEASE PROVIDE AN OVERVIEW OF THE BUSINESS SYSTEMS BUSINESS**
3 **AREA.**

4 A. Business Systems is Xcel Energy’s centralized IT organization, providing
5 technology services to support all aspects of the operations of the Xcel Energy
6 operating companies, including Public Service. While some IT projects are specific
7 to an individual operating company and/or to electric or gas jurisdictions, the
8 majority of Business Systems work is completed on an Xcel Energy-wide basis. In
9 this era, it is hard to identify an aspect of Xcel’s operations that Business Systems
10 does not support in some manner.

11 **Q. HAVE THERE BEEN ANY CHANGES TO BUSINESS SYSTEMS’ KEY**
12 **FUNCTIONS AND RESPONSIBILITIES SINCE THE 2019 ELECTRIC PHASE I?**

13 A. Yes. We have continued to invest in routine maintenance as well as projects to
14 address outstanding business needs, but we have also significantly enhanced our
15 focus on customer experience. Customer experience investments will continue to
16 be a focus for the next several years, as changing customer expectations are
17 requiring us to work to continuously improve and maximize the performance of the
18 tools serving customers (such as MyAccount, our builder’s call line, and other
19 interfaces and support). We are also continuing work on our AGIS initiative and
20 integrating customer programs to enhance the customer experience. Company
21 witness Mr. Romine discusses the overall customer experience efforts in more
22 detail, while I support Business Systems-specific capital additions and O&M.

1 **Q. ARE THERE ANY OTHER BUSINESS TRENDS THAT SHOULD BE**
2 **DISCUSSED BEFORE PROVIDING AN OVERVIEW OF KEY FUNCTIONS AND**
3 **RESPONSIBILITIES OF BUSINESS SYSTEMS?**

4 A. Yes, just briefly. As the technology landscape continues to evolve, cloud
5 computing is becoming a more common way for companies to provide IT services.
6 This presents unique decision-making requirements as we look to future IT
7 solutions, and can also present financial challenges because some cloud solutions
8 might be treated as O&M whereas the same solution would be capitalized when
9 owned by the Company. The utility financial and regulatory model does not work
10 as cleanly in an era when the line between a company-owned asset and a cloud
11 solution is blurred for technologies that otherwise serve the same function.

12 **Q. WHAT ARE THE POTENTIAL BENEFITS OF CLOUD COMPUTING?**

13 A. In some cases, there may be cost benefits associated with transitioning to cloud
14 computing because third-party service providers can offer pricing that is leveraged
15 across many customers since costs of operating and maintaining servers would
16 be shared among many parties utilizing cloud services. Additionally, cloud
17 computing benefits may also include having the most up-to-date technology
18 available, allowing for more seamless, regular upgrades that are less disruptive to
19 business operations, affording more scalability and flexibility as Company needs
20 change to meet Company and customer needs, and could bring increased
21 security.

1 **Q. HOW WILL THE COMPANY MAKE THE TRANSITION TO INCREASE**
2 **UTILIZATION OF CLOUD COMPUTING?**

3 A. The Company will need to continue to create a decision framework to identify when
4 leveraging cloud technology may improve business objectives, productivity, and
5 the customer experience.

6 **Q. WHAT IS THE FINANCIAL TREATMENT OF HOSTED SOLUTIONS?**

7 A. When capital policy requirements are met, the Company will capitalize a hosted
8 solution in a similar way as an on-premise solution. In other scenarios, the on-
9 premise storage is capital because the Company effectively takes ownership of the
10 hardware and/or code, while others are O&M when they do not meet the
11 Company's capitalization requirements. The general terms of the Company's
12 capitalization policy are discussed by Ms. Wold in her Direct Testimony.

13 **Q. PLEASE DESCRIBE BUSINESS SYSTEMS' KEY FUNCTIONS AND**
14 **RESPONSIBILITIES.**

15 A. The key services Business Systems provides include the following:

16 • *Foundational Technology Infrastructure:* Support for each employee's
17 hardware and software needs, including the provision and maintenance
18 of hardware such as computers, phones, and servers; maintaining and
19 updating operating systems; and providing sufficient data storage
20 capabilities. Business Systems also provides protection from
21 cybersecurity attacks, including but not limited to computer viruses.

22 *Systems Control:* Technology support to our Generation, Transmission,
23 and Distribution business areas to enable management and operation
24 of the electric and gas systems. One of the systems that we maintain is
25 the Outage Management System ("OMS"), which tracks customer
26 outages and dispatches repair crews to restore service. Business
27 Systems also supports the Supervisory Control and Data Acquisition
28 ("SCADA") system, which is used to monitor the health of the electric
29 and gas transmission and distribution systems.

- 1 • *Customer IT Support:* Hardware and software needed to facilitate
2 interactions with Public Service customers. These activities include
3 maintaining the Xcel Energy website that provides important information
4 to customers about outages, the status of their account, safety,
5 information required by our regulators, and Public Service operations.
6 Business Systems also maintains the Customer Resource System
7 (“CRS”), which is our customer information system, and which generates
8 billing statements to Public Service retail customers on a monthly basis.
9 Business Systems also supports the Interactive Voice Response
10 software that enables interaction with customers via telephone keypad
11 or speech recognition.
- 12 • *Corporate IT Support:* Business Systems provides IT support for
13 necessary corporate functions such as Human Resources and Financial
14 Management.

15 **Q. HOW DOES BUSINESS SYSTEMS SUPPORT THE FUNCTIONS DESCRIBED**
16 **ABOVE?**

17 A. Along with day-to-day work on the technology we have deployed, Business
18 Systems makes capital investments and incurs O&M expenses to support other
19 business areas and functions across Xcel Energy. I discuss these capital
20 investments and O&M expenses throughout the remainder of my Direct Testimony.

1 **III. BUSINESS SYSTEMS BUDGETING AND PLANNING**

2 **Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR DIRECT TESTIMONY?**

3 A. The purpose of this section of my Direct Testimony is to discuss Business Systems'
4 project development and management processes, along with its capital spending,
5 budgeting, and funding. I also provide an overview of the Company's customer
6 experience investments, a significant driver of Business Systems capital additions
7 since the Company's 2019 Electric Phase I.

8 **A. Overview of Capital Project Needs**

9 **Q. WHAT ARE THE PRIMARY DRIVERS OF BUSINESS SYSTEMS CAPITAL**
10 **ADDITIONS?**

11 A. The six key areas that drive Business Systems budget forecasts are:

- 12 • Addressing evolving **cybersecurity** threats and requirements;
- 13
- 14 • Replacing **aging technology**;
- 15
- 16 • **Enhancing capabilities** of our business and our ability to serve
17 customers;
- 18
- 19 • Advancing and modernizing the **customer experience**, including
20 updating systems through our Customer Experience Transformation
21 Programs;
- 22
- 23 • Responding to **emergent demands** for IT services and solutions; and
- 24
- 25 • Providing and supporting the IT components of the **AGIS** initiative, which
26 is a multi-year program that I describe separately in Section VI of my
27
- 28 • Direct Testimony.

1 **Q. GIVEN THESE BUSINESS DRIVERS, WHAT TYPES OF CAPITAL PROJECTS**
2 **DOES BUSINESS SYSTEMS UNDERTAKE?**

3 A. Business Systems capital additions include hardware (desktop and laptop
4 computers, servers, routers, phone systems, radio systems, microwave
5 communication systems, and network equipment), software (computer programs),
6 related technology infrastructure investments, and cybersecurity solutions that
7 support the Xcel Energy operating companies' business operations. Business
8 Systems investments within a utility company are just as essential as investments
9 in poles and wires, meters, and fleet. In today's world, very few large businesses
10 can function in a safe and reliable manner, or provide appropriate customer service
11 levels, without IT investments.

12 **Q. TO WHAT EXTENT ARE BUSINESS SYSTEMS' CAPITAL NEEDS READILY**
13 **PREDICTABLE?**

14 A. While Business Systems undertakes significant long-term planning, in other cases
15 Business Systems must react quickly to changing information technology risks and
16 needs. New cybersecurity risks and new technologies are emerging all the time,
17 requiring flexibility within Business Systems to respond to those risks and needs.
18 Given the nature of the issues Business Systems responds to and our capital
19 additions, our capital additions tend to vary from year to year.

20 **Q. PLEASE DESCRIBE CYBERSECURITY PROJECTS.**

21 A. Investments in cybersecurity ensure the availability, integrity, and confidentiality of
22 our IT systems, as well as compliance with legal and regulatory obligations. These
23 investments provide prevention, detection, containment, and repair services to

1 protect the Company from cyberattacks and to assist in recovery if such an attack
2 occurs. An example of a cybersecurity project is the Multi-factor Authentication
3 project, which implemented a multi-method, multi-level process for the
4 authentication of individuals and who attempt to access Xcel Energy's network, as
5 well as ensuring that the device used is compliant from a security perspective.

6 Cybersecurity does not include physical security investments, such as
7 property security. Physical security is part of Shared Corporate Services, and is
8 discussed by Mr. Adam R. Dietenberger.

9 **Q. PLEASE DESCRIBE AGING TECHNOLOGY PROJECTS.**

10 A. IT assets are no different from other physical assets, in that they are subject to
11 aging and (in this case, technical) obsolescence. A reasonably up-to-date
12 infrastructure is necessary for the Company to continue to meet current legal and
13 regulatory requirements, as well as the service expectations of Public Service's
14 customers. Business Systems seeks to maximize investments by harvesting the
15 value of existing systems prior to replacing them. However, there comes a time
16 when we must upgrade our aging systems due to business, reliability, or
17 compliance needs. Aging technology projects include routine and specific refresh
18 projects update older IT systems, hardware, and programs.

19 **Q. WHAT ARE ROUTINE REFRESH PROJECTS?**

20 A. Given the breadth and depth of the different equipment Xcel Energy utilizes and
21 manages, Business Systems refreshes smaller components of technology
22 infrastructure on regular cycles. We annually budget for these replacements as
23 routine refresh projects. An example of an aging technology routine refresh project

1 is the Annual Personal Computer (“PC”) Refresh, which replaces approximately
2 twenty percent of PCs annually as they reach the end of their service life.

3 **Q. WHAT ARE SPECIFIC REFRESH PROJECTS?**

4 A. Unlike routine refresh projects, which generally address smaller capital
5 replacements on a regular cycle or which are routinely needed, we also must
6 manage larger technology replacements for equipment that is nearing the end of
7 its useful life. Specific refresh projects are often managed over a longer term,
8 reoccur less frequently, and are significantly more complex than routine refresh
9 projects. An example of a specific refresh project was the multi-year Next
10 Generation Desktop initiative. This project involved moving desktop and mobile
11 computing devices throughout Xcel Energy to the most current operating system,
12 Windows 10, and to move from the Office 2010 suite of applications to Office 365.
13 The legacy operating system and application suite was near the end of its useful
14 life, and vendor support ended in January 2020.

15 **Q. PLEASE DESCRIBE PROJECTS THAT ENHANCE CAPABILITIES.**

16 A. Technology can offer the opportunity to improve productivity, enhance
17 communications between systems and between people, and use data more
18 efficiently. Business Systems is constantly evaluating new technologies and
19 helping business areas examine ways to increase efficiencies and enhance
20 communications between systems that benefit the Company and our customers.
21 An example of an enhancing capabilities project is the upgraded Electric Shift
22 Operations Management System. This software and associated business
23 processes prevent accidental startup of hazardous equipment while a worker is in

1 direct contact with the isolated equipment. The project enhances personal safety,
2 and aligns with industry standards to ensure that dangerous systems are properly
3 shut off and not able to re-start until the work on the isolated equipment is
4 complete, and that all workers involved are individually accounted for. This project
5 went in-service in early 2020.

6 **Q. HOW DO YOU DIFFERENTIATE BETWEEN THE ENHANCE CAPABILITIES**
7 **INVESTMENTS AND THE AGING TECHNOLOGY INVESTMENTS?**

8 A. As noted above, some of the investments overlap between categories. That said,
9 the projects in the aging technology category typically involve the replacement of
10 assets that were already in service, while the projects in the Enhance Capabilities
11 category typically involve implementing systems that are new applications or
12 application modules that add to business capability or efficiency. When
13 applications are upgraded, business judgment is necessary to determine which
14 categorization is most appropriate.

15 **Q. PLEASE DESCRIBE CUSTOMER EXPERIENCE PROJECTS.**

16 A. The customer experience refers to the Xcel Energy customer's direct interactions
17 with the Company, whether by digital platforms, through the call center, in person,
18 or otherwise. Managing that experience, requires both system tools and customer
19 interfaces that work for the customer, supporting their satisfaction with their service
20 and overall experience with the Company.

21 While all of Business Systems' work puts the customer front and center,
22 prior to 2019 it had been several years since we had invested significantly in
23 primary customer touch points and relationship management tools. In support of

1 the enterprise focus on enhancing customer experience, Xcel Energy launched a
2 specific Customer Experience Transformation (“CXT”) program in 2019 to help
3 create smarter and simpler experiences for employees and customers and created
4 a new category called customer enhancements. This multi-year effort is designed
5 to simplify Company technology, transform customer experiences, improve
6 customer satisfaction and employee engagement, and continue to drive more
7 efficient operations. CXT has been developed to work strategically on enhancing
8 digital channels, developing a data fabric model and migrating customer and
9 business data into the model, and designing, building, testing, and deploying the
10 foundational components to allow the first two to operate. More specifically, Xcel
11 Energy is utilizing more modern technologies that customers have come to expect
12 through experiences with other companies. This includes interactive websites,
13 account management options, and smart phone applications.

14 As more modern technologies become available for customers, it will be
15 necessary to simultaneously invest in new capabilities like data science, user
16 design, and development. Employees’ innovative thinking is being used to align
17 with our customers’ needs and expectations.

18 **Q. PLEASE DESCRIBE EMERGENT DEMAND PROJECTS.**

19 A. This category relates to projects that are typically in the early stages of planning.
20 The emergent demand category is an account created to ensure Business
21 Systems is able to meet the cybersecurity, aging technology, and efficiency needs
22 that inevitably emerge in a given year. Because of the ever-changing nature of
23 technology and emerging risks, it is not possible to identify in advance all

1 necessary projects that may arise or become critical in a given year. For example,
2 it is not always possible to predict what kind of security risk might be created by
3 hackers as technology continues to develop. In other situations, it may become
4 clear during detailed project development that additional benefits or long-term cost
5 savings could be captured by expanding the scope of the project.

6 The emergent demand category is used to fund important and unexpected
7 projects or changes in scope of previously-planned projects. Each year, funds are
8 allocated to the emergent demand category for these purposes. As the dollars are
9 spent, they are re-classified to the specific project for which the expense was
10 incurred. In this way, Business Systems' year-end cost summaries do not show
11 expenses allocated to emergent demand. Similarly, there would not be any actual
12 capital additions classified as emergent demand. That is, the emergent demand
13 funds are used for forecasted data only.

14 **Q. PLEASE DESCRIBE THE AGIS INITIATIVE AND BUSINESS SYSTEMS' ROLE**
15 **IN PROVIDING SUPPORT FOR AGIS IN THIS PROCEEDING.**

16 A. The foundational programs in the Company's AGIS initiative include: Advanced
17 Distribution Management System ("ADMS"); Advanced Meter Infrastructure
18 ("AMI"); the Field Area Network ("FAN"); Intelligent Field Devices that include Fault
19 Location Isolation and Service Restoration ("FLISR"); Integrated Volt-VAR
20 Optimization ("IVVO"); Fault Location Protection ("FLP"); and Geospatial
21 Information System ("GIS"). Each of these programs involves a coordinated
22 approach – i.e., planning, design, build, deployment and ongoing support from

1 Business Systems and Distribution. IT integration and cybersecurity protections
2 are needed to support these technologies.

3 Mr. Nickell provides an overview of the AGIS initiative and supports the
4 Company's overall technical strategy for AGIS and the Distribution Business
5 Area's AGIS implementation. I provide support for the IT integration necessary to
6 carry out the AGIS initiative, and discuss both capital and O&M in Section VI of my
7 Direct Testimony because AGIS is largely a Distribution initiative that is supported
8 by Business Systems, and is the subject of separate CPCN proceedings.
9 However, many of the same principles around budget development and
10 management that I discuss below also apply to the overall AGIS initiative.

11 **B. Business Systems Budget Development and Management**

12 **Q. HOW DOES BUSINESS SYSTEMS IMPLEMENT CAPITAL PROJECTS FOR**
13 **PUBLIC SERVICE?**

14 A. Although Business Systems implements some projects specific to individual
15 operating companies, including Public Service, it achieves efficiencies of scale by
16 performing most activities on a system-wide basis. Accordingly, many of the
17 Business Systems projects are planned and budgeted at the Xcel Energy level,
18 allocated or assigned to the appropriate operating companies, and implemented
19 throughout the different operating companies. When projects are developed and
20 implemented solely for Public Service or other individual operating companies, the
21 costs are directly assigned to that utility. In other cases, common projects are
22 allocated across Xcel Energy OpCos. Mr. Baumgarten supports the Company's
23 allocation of common capital costs to the Public Service Electric Department.

1 **Q. HOW DOES BUSINESS SYSTEMS DETERMINE WHEN AN EXISTING**
2 **APPLICATION OR SYSTEM NEEDS TO BE REPLACED OR UPGRADED?**

3 A. Business Systems works with each of the business areas and Operating
4 Companies to identify short- and long-term technology needs. The needs typically
5 are greater than the organization's ability to fund them, so Business Systems
6 partners with business leaders to evaluate and prioritize all proposed Business
7 Systems investments. Business Systems strives to maximize technology
8 investment value by maintaining existing systems until the risk and costs
9 associated with keeping these aging technologies in place outweigh the benefits.

10 **Q. PLEASE DESCRIBE THE PROCESS BUSINESS SYSTEMS USES TO**
11 **PREPARE ITS CAPITAL BUDGETS.**

12 A. Business Systems uses a Technology Investment Governance ("TIG") process to
13 evaluate all proposed Business Systems investments. The TIG process is the
14 Company's IT budget development, project prioritization, and project oversight
15 process, which helps to establish budgets that are reasonable and to manage our
16 capital expenditures accordingly. The TIG process helps ensure Company
17 budgets are reasonably reflective of the projects that will be placed in service
18 during the relevant year or years.

19 As part of the TIG process, key business and IT leaders are accountable
20 for managing demand intake, prioritization, and business outcomes of the IT
21 projects in their portfolios as they move from project inception towards in-service,
22 thereby ensuring that projects comply with IT portfolio and project management
23 requirements. TIG leadership is comprised of executive level and senior business

1 leaders in a partnership with IT leadership. Projects are reviewed so that scope
2 and costs are managed from inception through implementation. The TIG process
3 provides oversight of all IT projects during each phase of project lifecycles.

4 **Q. PLEASE GENERALLY DESCRIBE HOW BUSINESS SYSTEMS DEVELOPS**
5 **COST ESTIMATES FOR PROPOSED CAPITAL ADDITIONS.**

6 A. When a Business Systems project is in the initial stages of planning, we develop
7 cost and schedule estimates based on internal experience with similar
8 implementations. We then utilize a competitive bid process to ensure that Xcel
9 Energy receives quality service at a fair price, that business value is delivered
10 according to the agreed requirements, and that costs remain in line with the
11 approved budget.

12 **Q. HOW DOES BUSINESS SYSTEMS MANAGE PROJECT COSTS?**

13 A. After cost estimates are developed, all projects follow the TIG process requiring
14 reviews and approvals of the budget by Business Portfolio Owners, while the
15 portfolio level budgets are approved at the senior leader and executive levels.
16 After these approvals, projects are reviewed monthly to compare the monthly
17 budget to actual expenditures. Business Systems and the TIG leaders evaluate
18 deviations to determine whether costs are appropriate. In addition, Business
19 Systems develops action plans to mitigate variations in actual to budgeted
20 expenditures. These mitigation plans may either reduce or delay expenditures to
21 support the overall authorized budget. If authorized budget adjustments are
22 required, they are identified and approved through the TIG process.

1 **Q. DOES BUSINESS SYSTEMS MAINTAIN CONTINGENCY AMOUNTS FOR ALL**
2 **PROJECTS?**

3 A. No. For the most part, Business Systems does not include contingencies in its
4 project estimates and instead manages within its overall budget. However, the
5 Company does include contingency amounts for larger, particularly complex
6 projects, such as the AGIS initiative. The emergent demand discussion later in my
7 testimony explains how the Company manages project changes and unplanned
8 demand events.

9 **Q. HOW DO CAPITAL PROJECTS EXECUTED BY BUSINESS SYSTEMS**
10 **AFFECT THE PUBLIC SERVICE ELECTRIC JURISDICTION FROM A COST**
11 **ALLOCATION OR ASSIGNMENT PERSPECTIVE?**

12 A. Many of the Business Systems projects are planned and budgeted at the Xcel
13 Energy Services or operating company level, and implemented throughout our
14 system. Most projects benefit multiple jurisdictions – as when we implement new
15 software throughout Xcel Energy – and therefore must be allocated or assigned to
16 the appropriate operating companies.

17 In instances where a project is more fully dedicated to the Colorado
18 jurisdiction, a greater portion of the project costs may be assigned to Colorado. In
19 some cases where projects are dedicated wholly to Colorado, as with the Public
20 Service Microwave Mountain Range Refresh, those costs may be directly assigned
21 to Colorado. Capital additions in my testimony are stated at the Public Service
22 (Total Company) level, including electric and common projects but excluding any
23 gas-only projects. Overall, Xcel Energy cost allocations are discussed by

1 Company witness Mr. Baumgarten.

2 **C. Overview of 2019-2022 Capital Additions**

3 **Q. PLEASE DESCRIBE THE PRIMARY DRIVERS OF THE COMPANY'S**
4 **INVESTMENT IN BUSINESS SYSTEMS SINCE THE 2019 ELECTRIC PHASE I.**

5 A. There have been multiple areas driving Company investments. Investment in the
6 customer experience has increased as customer expectations in how they interact
7 with service providers have also increased, and has been a key driver. In today's
8 evolving technology market, utility customers' expectations are not set exclusively
9 by utility companies; rather, high expectations are being set by companies like
10 Google, Apple, and Amazon, who show customers what is possible and lead them
11 to expect responsive, integrated, and problem-solving interactions with their
12 service providers. Living in an era where customer's expectations are higher than
13 they have ever been, the Company must be prepared to meet our customer's
14 needs to remain a trusted provider of their energy services.

15 In addition to AGIS and the Company's focus on the customer experience,
16 our aging network infrastructure is a key driver of increased investment and
17 requires attention on an ongoing basis. Network connectivity is a critical
18 operational foundation required for the Company to provide a safe and reliable
19 product. Failure to replace aging network mechanisms would increase the risk of
20 component level failures resulting in systemic outages across service venues.

21 Specific Business Systems aging projects include replacement of aging
22 network, Next Gen projects, and Core HR, which are all discussed in the project
23 sections of this Direct Testimony. The Core HR project is an example of replacing

1 our aging HR software to simplify the footprint as well as setting up a modern
2 solution to the Company's HR needs. Future investment levels will depend on the
3 evolving needs of the Company and the emergence of technologies over time.

4 **Q. CAN YOU DEPICT THE TREND OF BUSINESS SYSTEMS CAPITAL**
5 **ADDITIONS AFFECTING PUBLIC SERVICE'S RATE BASE FROM 2019-2022?**

6 A. Yes. Table MOR-D-1 below depicts Public Service's non-AGIS Business Systems
7 capital additions (i.e., plant in service) trend from September 1, 2019 to December
8 31, 2022. Throughout my Direct Testimony, capital additions data from 2019 and
9 2020 represents actual costs, while 2021 capital additions include actual plant in
10 service for January 2021 and budgeted data for the remainder of 2021 and all of
11 2022.

12 Table MOR-D-1 illustrates capital additions, but it is important to note that
13 many technology projects are planned, developed, and implemented (placed into
14 service) over multiple years. As such, capital additions trend information will show
15 larger increases when more or larger projects are placed in service, rather than
16 when the expenditures are made.

17 **TABLE MOR-D-1:**
18 **Business Systems 2019-2022 Capital Additions – Non- AGIS**
19 **Public Service (Total Company)**
20 **(Dollars In Millions)**

<i>\$ in millions</i>	2019 Actuals	2020 Actuals	2021 Forecast¹	2022 Forecast
Total	\$ 52.4	\$ 79.3	\$ 174.8	\$ 145.6

¹ Throughout my testimony, 2021 capital additions include actuals from January and forecast for February through December.

1 The figures in Table MOR-D-1 are stated on a Total Company (Public
2 Service) basis, meaning that they include both electric utility-specific projects and
3 common electric/gas projects stated at the total Public Service level. Attachments
4 MOR-1 (2019-2020) and MOR-2 (2021-2022) also contain Business Systems
5 capital additions, including the AGIS-related Business Systems capital additions
6 discussed in Section VI of my Direct Testimony.

7 **Q. WHAT IS THE OVERALL IMPACT OF RECENT BUSINESS SYSTEMS**
8 **INVESTMENTS ON PUBLIC SERVICE’S COST OF PROVIDING UTILITY**
9 **SERVICE?**

10 A. Business Systems investments affecting Public Service’s electric business have
11 increased in recent years due to the need for greater focus on and attention to IT
12 needs within the Company and the customer experience. Our investment
13 evolution continues to see an upward trend in the technology investments needed
14 to keep pace with the emergence of cybersecurity issues as well as refreshing
15 aging technology and addressing changing customer expectations. These
16 investments are keeping the Company operating, protecting important data,
17 supporting customer service, and helping other areas effectively manage O&M to
18 reasonable levels.

1 **IV. BUSINESS SYSTEMS 2019-2022 CAPITAL ADDITIONS**

2 **Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR DIRECT TESTIMONY?**

3 A. The purpose of this section of my Direct Testimony is to describe the Business
4 Systems non-AGIS capital additions since the Company's 2019 Electric Phase I
5 through the 2022 FTY. Below I discuss the Company's 2019-2020 capital
6 additions, totaling \$131.7 million as shown in Attachment MOR-1. I also address
7 the Company's capital additions planned to be placed into service in in 2021-2022,
8 totaling \$320.3 million as shown in Attachment MOR-2. AGIS-related capital
9 additions are discussed separately in Section VI. In this section, I present 2019-
10 2022 capital additions by category for cybersecurity, aging technology, enhancing
11 capabilities, customer experience, and emergent demand.

12 **A. Cybersecurity**

13 **Q. WHAT TYPES OF CYBERSECURITY PROTECTION CAPITAL PROJECTS**
14 **HAS THE COMPANY PLACED IN SERVICE SINCE ITS 2019 ELECTRIC**
15 **PHASE I AND WILL PLACE IN SERVICE THROUGH THE 2022 FTY?**

16 Since its 2019 Electric Phase I and through the 2022 FTY, Public Service
17 will have placed \$29.9 million in cybersecurity-related capital additions into service.
18 Key cybersecurity projects from 2019 through 2022 are set forth in Table MOR-D-
19 2 below:

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**TABLE MOR-D-2:
 Public Service 2019-2022 Cybersecurity Capital Additions (Total Company)
 (Dollars In Millions)**

Cybersecurity Capital Additions	2019	2020	2021	2022
Cybersecurity Refresh	-	-	\$ 2.9	\$ 8.8
OT Shared Services	-	1.5	.4	1.5
SailPoint 2021	-	-	1.7	-
Email Advanced Threat Protection		1.5	.0	-
Enterprise Database Security Phase II	.2	.3	.6	-
Cybersecurity Data Lake	-	-	1.1	-
Host Intrusion Prevention for Servers	-	1.1	.0	-
Cybersecurity Small Project	2.5	2.5	3.4	-
Total Company	\$ 2.7	\$ 6.9	\$ 10.0	\$ 10.3
<i>Any differences between sum of individual category amounts and Total are due to rounding.</i>				

4 **Q. PLEASE DESCRIBE KEY BUSINESS SYSTEMS CAPITAL ADDITIONS**
 5 **PLACED IN SERVICE FROM SEPTEMBER 1, 2019 THROUGH DECEMBER 31,**
 6 **2022 TO ADDRESS EVOLVING CYBERSECURITY THREATS AND**
 7 **REQUIREMENTS.**

8 A. Below are descriptions of projects with capital additions over \$1 million that were
 9 or will be placed in-service during 2019-2022 to address evolving cybersecurity
 10 threats and requirements:

- 11 • *The Security Technology Refresh:* In 2021, these investments provide
 12 prevention, detection, containment, and corrective services to protect
 13 the company from security incidents, and assist in the recovery from any
 14 adverse events. These refreshes of technology help ensure continued

1 compliance with regulatory requirements for customer data and overall
2 corporate security objectives, while reducing business and customer
3 exposure to evolving cybersecurity risks and vulnerabilities. I describe
4 investments for 2022 below.

- 5 • *OT Shared Services*: Across 2019 through 2022, the OT Shared
6 Services project consists of investments in the operational technology
7 environment that are needed to support AGIS and operations
8 applications, such as substation, synchrophasor, and the Distributed
9 Energy Management System (“DEMS”). This project will reduce
10 operational technology and regulatory business risks for enterprise
11 strategic initiatives while providing value by supporting this environment
12 with shared services.

- 13 • *SailPoint 2021*: This project encompasses a major version upgrade of
14 SailPoint, which the Company utilizes to provide access security to
15 certain applications. Specifically, SailPoint is used to provide identity
16 and access governance to a limited number of applications and
17 associated platforms governed by North American Electric Reliability
18 Council (“NERC”) Critical Infrastructure Protection (“CIP”) and SOX
19 requirements. This upgrade will minimize compliance risk and will
20 integrate SailPoint with new programs.

- 21 • *Email Advanced Threat Protection*: This project upgraded existing and
22 implemented new security solutions for threat analysis and to defend
23 against malware or hacking-based attacks.

- 24 • *Enterprise Database Security Phase II*: This project is a multi-year effort
25 pursuant to a Business Systems security gap assessment to identify and
26 encrypt certain data in all Business Systems applications, in order to
27 ensure Company systems are in compliance with regulatory
28 requirements in addition to protecting such Company data from
29 cyberattack.

- 30 • *Cybersecurity Data Lake*: This project involves implementation of a
31 solution allowing users access to only the data they need (a data lake is
32 a repository of raw and unstructured data) and provides data analytics
33 for cybersecurity needs, including anticipation of cybersecurity events or
34 activities and the means to reach back with granular visibility to
35 aggregated past events. This project involves implementation of a
36 solution that provides users of data within a data lake with access to only
37 the data they are authorized to access. The solution also enables
38 analysis of the data from a cyber security perspective, including the
39 amount of sensitive data within the lake, who is accessing it, what tools

1 are being used to access it, anticipation/prevention of security events,
2 and forensic historical analysis of any events that occur.²

- 3 • *Host Intrusion Prevention for Servers:* This project involved the
4 installation of Host Intrusion and End-Point protection on servers and
5 workstations to protect Xcel Energy and its computer infrastructure
6 against unauthorized access to the computer environment.

7 **Q. PLEASE BRIEFLY DESCRIBE REFRESH CAPITAL ADDITIONS TO ADDRESS**
8 **CYBERSECURITY THREATS IN 2022.**

9 A. Other capital additions will be placed in service in 2022 and involve capital projects
10 that will enable the Company to continue to meet security objectives, including:

- 11 • *Firewall rule management lifecycle:* This project will replace the current
12 system that is at end-of-life and will result in an industry-leading firewall
13 hygiene program within the multi-vendor firewall environment at Xcel
14 Energy. The project will deploy a centrally-managed tool to provide an
15 end-to-end security view of firewall policies, rules, and configurations
16 that impact security.
- 17 • *Vulnerability scanning refresh project:* This project will ensure that the
18 Company's vulnerability scanning capabilities are in accordance with
19 Xcel Energy's security standards. Without this refresh, vulnerability
20 scanning capabilities become obsolete and the Company is at a higher
21 risk of data or control breach.
- 22 • *Data loss prevention project:* The deployment of a new data loss
23 prevention tool will ensure that data leaving the Company will comply
24 with security classification and encryption rules in addition to other data
25 loss prevention rules. This project will help prevent data loss and
26 security breaches and mitigate risk from a regulatory and legal
27 perspective.
- 28 • *PingFed Multi-Data Center High Availability ("MDHA") upgrade project:*
29 This project completes a major upgrade of the PingFed enterprise
30 platform and improves availability of this critical platform by enabling it
31 to be MDHA, which limits business risk in case one data center were not
32 available. This platform is critical from a security perspective and

² A data lake is a large repository of raw structured and unstructured data from varied sources. It is maintained for future analysis and use.

1 provides authentication and authorization for many critical applications
2 across Xcel Energy.

3 **Q. WHAT ARE CYBERSECURITY SMALL PROJECTS?**

4 A. These are projects that are under \$1 million in capital spend and are included in
5 Attachments MOR-1 and MOR-2 with the larger projects I describe above. Like
6 larger projects, these numerous, smaller projects are also necessary for the
7 Company to ensure the availability, integrity, and confidentiality of our IT systems,
8 compliance with legal and regulatory obligations, and otherwise protect the
9 Company from cyberattacks. These smaller projects include continued,
10 incremental upgrades to programs like SailPoint, smaller projects for data loss
11 prevention, risk assessment services and platforms, implementation of OT
12 monitoring resources, upgrades to spam filters, and other upgrades to our
13 cybersecurity systems.

14 **B. Aging Technology**

15 **Q. PLEASE DESCRIBE KEY BUSINESS SYSTEMS CAPITAL ADDITIONS**
16 **RELATED TO REPLACING AGING TECHNOLOGY SINCE THE COMPANY'S**
17 **2019 ELECTRIC PHASE I AND PLANNED THROUGH THE 2022 FTY.**

18 A. Since its 2019 Electric Phase I and through the 2022 FTY, capital additions total
19 \$254.6 million. Key aging technology projects from 2019 through 2022 are set
20 forth in Table MOR-D-3 below. Within the aging technology category, we further
21 divide projects into routine refreshes and specific individual refresh projects.

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**TABLE MOR-D-3:
 Public Service 2019-2022 Aging Technology Capital Additions (Total Company)
 (Dollars In Millions)**

Aging Technology Capital Additions	2019	2020	2021	2022
Annual Refresh	\$ 7.1	\$ 14.0	\$ 20.7	\$ 12.2
WAN PSCO	2.2	3.8	6.7	12.1
DEMS Upgrade AKA Dynamic EMS (DEMS) Environment Phase 4	-	-	-	21.8
ISO Interface & Settlement Replacement	-	-	-	13.2
DR Technology Refresh	-	-	5.3	4.9
Core HR Application (Payroll Benefits)	-	-	1.3	7.9
Mainframe Modernization	-	-	8.9	-
ESB Environment Refresh	8.4	.0	-	-
ITC-IT INFS Ref Valkyrie HW CO	-	7.8	(.3)	-
Technology License	1.4	2.2	2.3	1.5
Western Slope Backhaul	-	-	6.7	-
Next Generation Desktop	4.1	1.9	(.1)	-
PSCo Microwave Mountain Range Refresh	-	4.7	(.0)	-
Oracle Exadata Refresh	-	-	4.0	.0
Bentley OpenUtilities Designer (BUD) Upgrade	-	-	-	3.5
Emptoris Contract Management Replacement	-	-	2.9	-
Facility IT Investments	.2	.1	1.2	1.4
ServiceNow	-	-	2.7	-
NMS 2.X Upgrade Project	-	-	-	2.7
Teradata-Hadoop HW Purchase	-	-	2.5	-
10G Backhaul	2.5	.1	-	-

Tapeless Data Center	2.1	.0	-	-
Oracle Licenses	-	1.0	1.1	-
Kafka Data Streaming	-	-	1.7	-
IIB licenses - ESB testing	1.6	(.0)	-	-
Network Inventory and Planning Solution	1.4	.1	-	-
Motorola LMR Core Upgrade	-	-	1.5	-
VoIP Refresh	-	-	1.2	-
Video Conferencing Enablement	.7	.5		
F5 Renewal	-	-	1.2	-
TWR Replacement	-	-	1.2	-
Upgrade Corporate Financial Model (CFM)	-	-	1.0	-
Aging Technology Small Project	5.6	9.8	14.8	1.6
Total Company	\$ 37.2	\$ 46.1	\$ 88.6	\$ 82.7
<i>Any differences between sum of individual category amounts and Total are due to rounding.</i>				

1 **Q. HOW ARE ROUTINE REFRESH PROJECTS DEVELOPED?**

2 A. As I noted earlier in my Direct Testimony, routine refresh projects refer to those
 3 projects that relate to updating or refreshing day-to-day technology on a routine
 4 basis. Budgets to upgrade technology components on an aggregate level are
 5 based on the lifecycles outlined by various original equipment manufacturers.
 6 Equipment lifecycles can differ based on each category, but generally speaking
 7 most of our network, server and end user computing equipment are on an
 8 approximately five-year refresh lifecycle. Budgets are therefore based on
 9 refreshing approximately twenty percent of most equipment each year. The
 10 funding allocated within each specific group/year represents the aggregate of
 11 calculations to address two needs: (a) equipment replacement as outlined above;

1 and (b) net new incremental, or “business-as-usual,” growth. Routine refresh
 2 projects include the annual data storage project, the annual network refresh, the
 3 annual PC refresh, and the annual server refresh. I provide capital additions for
 4 these projects for 2019-2022 in Table MOR-D-4 below.

5 **TABLE MOR-D-4:**
 6 **Public Service 2019-2022 Annual Refresh Capital Additions (Total Company)**
 7 **(Dollars In Millions)**

Annual Refresh Capital Additions	2019	2020	2021	2022
Annual Network Refresh	2.8	2.4	2.6	1.6
Annual PC Refresh	.2	6.2	2.4	2.0
Annual Server Refresh	1.0	.7	6.2	5.3
Annual Storage Refresh	3.1	4.7	9.4	3.2
Total Company	7.1	14.0	20.7	12.2
<i>Any differences between sum of individual category amounts and Total are due to rounding.</i>				

8 **Q. PLEASE BRIEFLY DESCRIBE THE ANNUAL REFRESH PROJECTS.**

9 A. Below are descriptions of these annual refresh projects:

- 10 • *Annual Network Refresh:* The Annual Network Refresh project replaces
 11 network devices (switches, routers, radios, channel banks, and voice
 12 systems) due to aging technology, out-of-support equipment, security
 13 vulnerabilities, and to enable new required capabilities.
- 14 • *Annual PC Refresh:* The Annual PC Refresh project replaces aging
 15 desktop and laptop computers, as well as those that are lost or
 16 inoperable. This project also provides devices to new employees.
- 17 • *Annual Server Refresh:* The Annual Server Refresh project replaces
 18 aging servers prior to failure to support business growth and maintain
 19 reliability.
- 20 • *Annual Data Storage Refresh:* The Annual Data Storage project
 21 replaces data storage hardware that is no longer cost-effective to

1 support, or that presents significant risk to operations due to aging
2 components or lack of vendor support.

3 **Q. CAN YOU PROVIDE SOME EXAMPLES OF SPECIFIC REFRESH PROJECTS?**

4 A. Yes, the Wide Area Network (“WAN”) Public Service project, the DEMS Upgrade
5 Environment Phase 4 project, the ISO Interface & Settlement Replacement project,
6 the DR Technology Refresh project, the Core HR Application (Payroll Benefits)
7 project, Mainframe Modernization, enterprise service bus (“ESB”) Environment
8 Refresh, ITC-IT INFS Ref Valkyrie HW CO project, Technology License; and the
9 Western Slope Backhaul are examples of these projects.

10 **Q. WHAT IS THE WAN PUBLIC SERVICE PROJECT?**

11 A. This project includes the detail design, planning, installation and commissioning of
12 equipment that comprises an update of the Company’s corporate WAN across its
13 service territories. The WAN work includes network infrastructure investments to
14 support connection between the Company’s various locations and providing the
15 pathway to enable critical business services. Investments support communication
16 services for our business and substations, including the Supervisory Control and
17 Data Acquisition (“SCADA”) connectivity for monitoring and control of the grid. In
18 addition, enterprise services are delivered to enable end users to connect to
19 corporate applications like email, SAP (the General Ledger (“GL”) and Work and
20 Asset Management (“WAM”) systems), and internet access. Significant factors
21 driving project costs are the age of infrastructure being replaced and the difficult
22 terrain in certain areas where WAN work is taking place. The project focuses on
23 supporting communication assets to mitigate risk of wildfire from Company

1 operations, replacing analog circuits to improve connectivity (retirement of copper
2 circuits), relocating a leased microwave tower to better access, and redesigning
3 WAN connectivity.

4 **Q. WHAT IS THE DEMS UPGRADE (AKA DYNAMIC EMS) ENVIRONMENT**
5 **PHASE 4 PROJECT?**

6 A. DEMS is the Company's critical system for supporting transmission SCADA,
7 Generation, Generation Dispatch, Market Participation and Reliability
8 Coordination. The Public Service phase of this project is part of a five-year effort
9 to replace the Energy Management System ("EMS"), which is a critical technology
10 that is used for the monitoring and management of the bulk electric system by our
11 transmission system. The EMS interfaces with field devices that collect
12 information about the health of the bulk electric system. This real-time, two-way
13 communication provides Transmission and Distribution Operations the ability to
14 remotely control the flow of electricity during outage and maintenance periods,
15 which is a key driver of our ability to maintain efficient and reliable service to our
16 customers.

17 The DEMS project is primarily driven by a contractual agreement with
18 General Electric ("GE") to upgrade DEMS to a newer version within six years of
19 the executed contract. Without an upgrade, the Company's DEMS system will not
20 evolve with the GE product, which may impact the Company's ability to get vendor
21 support for any software system issues. Additionally, there is a known risk of
22 hardware failure due to equipment and overall infrastructure being at the end of its
23 life. The upgrade will also provide enhanced capability regarding the Transmission

1 Security Model to help reduce risk if/when field communications fail. The upgrade
2 also provides an improved security posture and will employ the Company's new
3 OT network and infrastructure.

4 The Factory Acceptance Testing has been completed and the issues
5 identified during that process have been resolved. We are working to ready the
6 new infrastructure and environments for deployment; once completed we will start
7 the work through site acceptance testing, parallel testing, and resiliency testing.
8 The first operating company is expected to go live at the end of 2021, with the
9 other operating companies, including Public Service, going live in 2022.

10 **Q. WHAT IS THE ISO INTERFACE & SETTLEMENT REPLACEMENT PROJECT?**

11 A. In general, Power Costs, Inc. ("PCI") software is used to facilitate transactions with
12 ISOs, among other uses. Current PCI software, however, limits the Company's
13 ability to participate in a market like the Western Energy Imbalance Market
14 ("WEIM") operated by the California Independent System Operator ("CalSo") or
15 the SPP Western Energy Imbalance System ("WEIS") (or other future markets).
16 Public Service and other utilities are currently evaluating whether to participate in
17 markets like these, while some have already committed. The rationale for
18 participation in these markets would be to save customers money while allowing
19 them to use more energy from wind and solar resources. Public Service intends
20 to participate with other utilities in a market like the CalISO WEIM or SPP WEIS.
21 In order to make the Company ready for this participation, this project will replace
22 the existing PCI system with a technology solution that will support dispatch and
23 transactions with markets like WEIM or WEIS, increase efficiencies to ISO

1 interface and settlement operations, increase processing speeds with real-time
2 market bidding process transactions, enable better asset optimization, and enable
3 a robust analysis and reporting function for settlement for all markets.

4 **Q. WHAT IS THE DR TECHNOLOGY REFRESH PROJECT?**

5 A. This project's goal is to mature the disaster recovery environment to keep it up to
6 date as Xcel Energy evolves its cloud environment. The scope includes replacing
7 aging Disaster Recovery hardware for VMware, Linux and Windows environments.

8 **Q. WHAT IS THE CORE HR APPLICATION (PAYROLL BENEFITS) PROJECT?**

9 A. This project will replace the multiple existing core Human Resources ("HR")
10 software systems and vendors at Xcel Energy – PeopleSoft, TIME, myHR, Talent
11 Management, Learning Management System, Workforce Planning, and Workforce
12 Analytics – with a single, integrated software solution that will be determined upon
13 finalizing the RFP for the project. These applications comprise the core human
14 resource system, provide payroll, benefits administration, workforce management,
15 experience layer, and job record tracking to employees and retirees of the
16 Company. The remaining components of the Core HR application are forecasted
17 to be complete in 2022, which include major components of recruiting, benefits,
18 talent management, time keeping, the employee portal and HR analytics.

19 **Q. WHAT IS THE MAINFRAME MODERNIZATION PROJECT?**

20 A. There are core applications running on a mainframe that was placed in service
21 over eight years ago and is now out of support. This project is to replace the
22 existing mainframe and Disaster Recovery with a solution that meets the needs of
23 Xcel Energy.

1 **Q. WHAT IS THE ESB ENVIRONMENT REFRESH PROJECT?**

2 A. This ESB project integrated a platform that provides fundamental interaction and
3 communication services between complex software applications. The project
4 upgraded the existing asset to ensure reliable data integrations.

5 **Q. WHAT IS THE ITC-IT INFS REF VALKYRIE HW CO PROJECT?**

6 A. This IT infrastructure refresh project involves replacing existing network
7 components, including local area network and WAN components that are
8 necessary to keep the network stable. This project will also enhance the network
9 system using new innovations that allow for increased bandwidth, reliability, and
10 redundancy for major service providers. This project will also enable cloud
11 strategies for deploying hosted platforms and will better support critical
12 applications. While the focus of this project is on the stability of the network
13 system itself, the WAN Public Service project discussed above focuses on
14 refreshing connections between locations and communication services.

15 **Q. WHAT IS THE TECHNOLOGY LICENSE PROJECT?**

16 A. This project provides annual software license support across enterprise
17 infrastructure and operations. Updating software licenses ensures that system
18 devices are running up-to-date licensed software, which decreases support costs
19 and increases the Company's cybersecurity profile.

20 **Q. WHAT IS THE WESTERN SLOPE BACKHAUL PROJECT?**

21 A. Xcel Energy, TriState, and WAPA used to share a network system through the
22 Colorado Joint Communication System ("CJCS") agreement; upon the dissolution
23 of the CJCS, the Public Service Western Slope SCADA data would be cut off from

1 our corporate systems. Xcel Energy's replacement for the shared CJCS network
2 will use a combination of leased fiber, internal fiber build, and microwave-based
3 transmission communication technologies.

4 **Q. PLEASE BRIEFLY DESCRIBE OTHER SPECIFIC REFRESH CAPITAL**
5 **ADDITIONS THAT WERE PLACED INTO SERVICE TO REPLACE AGING**
6 **TECHNOLOGY.**

7 A. Examples of other projects with capital additions over \$1 million being placed into
8 service since the end of the 2019 Electric Phase I through the 2022 FTY to replace
9 aging technology include:

- 10 • *Next Generation Desktop*: This purpose of this project is to move the
11 enterprise desktop computing devices to the most current standard
12 operating system, and standardize vendor support for maintenance and
13 defect resolution by ensuring overall stability and continuation of
14 patching practices, thereby minimizing security vulnerabilities. The
15 software upgrades enable greater business capabilities and efficiencies,
16 such as mobile and tablet technologies across our business.
- 17 • *PSCo Microwave Mountain Range Refresh*: This project replaced
18 Company microwave digital radio components in the northeast Denver
19 metro area network that are no longer supported by the vendor, as they
20 were past end-of-life. Replacement helps ensure continued reliability of
21 the network by remedying frequent remote terminal unit outages, meet
22 communication requirements, reduce safety concerns, and minimize
23 replacement costs. If not replaced on a cycle, there is an increasing risk
24 of failed systems impacting the availability, stability, and supportability
25 of our environment, which could cause loss of data and related business
26 functions.
- 27 • *Oracle Exadata Refresh*: This project will deploy a new Oracle Exadata
28 platform, which provides optimized functionality needed to run Oracle
29 databases, to replace the existing platform that is at end of life in 2021.
30 It will also upgrade databases to the supported Oracle updated version.
- 31 • *Bentley OpenUtilities Designer ("BUD") Upgrade*: This project will
32 replace the existing BUD, which is a distribution system design tool that
33 creates and manages distribution system assets for electric and gas

1 systems, and which is at end of life. The BUD will be replaced with the
2 GE Smallworld Design Manager system, which will ensure that the
3 system is completely upgraded, provide users with more design
4 capabilities, and enable the Company to maintain vendor support
5 allowing for lower cost enhancements in the future.

6 • *Emptoris Contract Management Replacement:* This project involves
7 replacing the hosted Emptoris application due to vendor IBM ending
8 support in 2020. Emptoris is the Supply Chain organization's application
9 for creating contracts with suppliers and sending requests for proposal
10 to suppliers.

11 • *Facility IT Investments:* New service centers or offices are built as
12 needed to support growing or expanding communities. Facility IT
13 investments represent the necessary IT network infrastructure needed
14 to connect these sites. This includes the construction of main
15 distribution frames, intermediate distribution frames, cabling to connect
16 workstations and phones, deployment of wireless access points, and the
17 installation of any routers, switches and/or firewalls to secure the site.

18 • *ServiceNow:* This project will facilitate IT service delivery, asset
19 management, and regulatory compliance, and is intended to lead to
20 higher IT customer service satisfaction by improving the Company's
21 ability to route information more effectively. The tool also facilitates the
22 adoption of the more efficient industry-standard processes upon which
23 the tool is based. Finally, the project will also help track performance in
24 these areas, in an effort to continually improve IT service delivery and
25 operations management.

26 • *NMS 2.X Upgrade:* The Outage Management System ("OMS") is the
27 enterprise solution for the electric trouble distribution control centers
28 outage event management. OMS is critical to outage restoration and
29 generally critical to the Company's operations. Business Systems and
30 Distribution Operations leadership has affirmed that the OMS, with its
31 mission critical role, must be on a vendor supported application version.
32 Oracle Network Management Software ("NMS") version 1.12, which is
33 the current version running at the Company, runs out of extended
34 support in December 2021. To ensure the OMS remains on a vendor
35 supported version, a project effort is needed to upgrade NMS from
36 application version 1.12 to NMS 2.x. This upgrade to a more recent
37 version of NMS will be a technical upgrade and will not include any
38 customizations or extensive reconfigurations.

39 • *Teradata-Hadoop HW Purchase:* This project will upgrade the current
40 end-of-life hardware that Teradata currently resides on. Teradata server

1 hardware warehouses company data vital to business needs and must
2 be upgraded.

3 • *10G Backhaul*: Xcel Energy's previous corporate communications
4 backbone had insufficient capacity for the increasing loads introduced
5 by the new WAM system. This project involved upgrading network
6 bandwidth to 10G to address capacity concerns.

7 • *Tapeless Data Center*: This project will protect company data and
8 security by enhancing back-up data recovery efforts. The project
9 upgraded and replaced the company's data-protection solution that was
10 outdated. A new solution is also more efficient by reducing local area
11 network traffic and back-up time by ninety percent.

12 • *Oracle Licenses*: This project will manage the number of Oracle licenses
13 needed to support the enterprise by renegotiating current licenses for an
14 additional term. This project will maintain licensing compliance for
15 database software and provide flexibility for additional Oracle
16 databases.

17 • *Kafka Data Streaming*: Kafka integrations include data streaming that
18 allows the Company to stream data in real-time from our source system
19 applications to make them available for analytics and application builds.
20 Examples are SAP and CRS to AWS-data lakes for analytics and
21 application builds.

22 • *IBM Integration Bus ("IIB") Licenses – ESB Testing*: is a licensing
23 purchase and install to allow secured data integrations between our
24 operation technology network and other IT systems.

25 • *Network Inventory and Planning Solution*: The project develops a central
26 repository for all network information that can house the inventory of all
27 network assets. This inventory will include wireless, fiber, site inventory,
28 WAN circuits, and hardware components and enable management of
29 these assets.

30 • *Motorola Land Mobile Radio ("LMR") Core Upgrade*: When there is no
31 cell phone coverage, the only means of communications for workers out
32 in the field is the LMR system, which is critical to the safety and
33 productivity of Xcel Energy's field personnel. This project will complete
34 all software and hardware updates to the current LMR system to remain
35 in support, which allows for patching, improved support from Motorola,
36 and proper adherence to security standards.

- 1 • *Voice over Internet Protocol (“VoIP”) Refresh*: This project will upgrade
2 Company technologies for the delivery of voice communications and
3 multimedia sessions over the Internet.
- 4 • *Video Conferencing Enablement*: This project implemented new
5 collaboration technology and standardized all conference rooms with a
6 small, medium, large, and bay configuration.
- 7 • *F5 Renewal*: The current F5 hardware is at end of life and the physical
8 appliances need to be replaced to remain in vendor support and to run
9 efficiently. The upgrade to new hardware allows the Company to
10 continue to focus on the delivery, security, performance, and availability
11 of web applications, as well as the availability of servers, data storage
12 devices, and other networking components.
- 13 • *Transmission Work Request (“TWR”) Replacement*: The two current
14 systems used for outage coordination, TWR and Operator Log, are at
15 end-of-life. This project will select and implement a single, integrated
16 replacement solution that supports current and future outage
17 coordination planning and performance needs.
- 18 • *Upgrade Corporate Financial Model (“CFM”)*: CFM is a module of the
19 Utilities International (“UI”) Planner platform and is utilized to generate
20 financial forecasts. The current version of CFM will no longer be
21 supported by UI in early 2021; this project will upgrade CFM to a new
22 version, which will make it consistent with UI’s other components. With
23 this upgrade, the Company will implement shared tables to more closely
24 tie the CFM to the Regulatory Information System (“RIS”). In addition,
25 the original CFM will be redesigned and updated. This project will also
26 add and implement UI’s PlannerDash and the Analytics Package. With
27 this project, there will be more consistent data between modules, which
28 will need less reconciliation effort and will have better analytics.

29 **Q. WHAT ARE THE AGING TECHNOLOGIES SMALL PROJECTS?**

- 30 A. Overall, as with cybersecurity small projects, these smaller projects are individually
31 under \$1 million in capital spend and are included in Attachments MOR-1 and
32 MOR-2 with the projects I describe above for aging technologies that are
33 individually over \$1 million. As with larger projects, these smaller projects will
34 enable the Company to keep its systems reasonably upgraded to continue to meet

1 business, reliability, or compliance needs. These smaller projects include projects
 2 like software upgrades for applications like Microsoft, Adobe, and Meridium asset
 3 performance management software, license renewals for applications not included
 4 in the overall technology license refreshes, as with Oracle Java, new technologies
 5 for generation, such as GE SmartSignal, updates to our Meter Reading Acquisition
 6 System, and other technology refreshes.

7 **C. Enhancing Capabilities**

8 **Q. PLEASE DESCRIBE KEY BUSINESS SYSTEMS CAPITAL ADDITIONS**
 9 **RELATED TO ENHANCING CAPABILITIES SINCE THE COMPANY’S 2019**
 10 **ELECTRIC PHASE I THROUGH THE 2022 FTY.**

11 **A.** Since its 2019 Electric Phase I and through the 2022 FTY, Public Service will have
 12 placed in service \$62.5 million in enhancing capabilities capital additions. Key
 13 enhancing capabilities projects from 2019 through 2022 are set forth in Table
 14 MOR-D-5 below:

15 **TABLE MOR-D-5:**
 16 **Public Service 2019-2022 Enhancing Capabilities Capital Additions (Total**
 17 **Company)**
 18 **(Dollars In Millions)**

Enhancing Capabilities Capital Additions	2019 Total	2020 Total	2021 Total	2022 Total
Digital Ops Factory	-	-	\$ 8.2	\$ 8.4
PTT Phase 3 (WAM)	6	.4	-	-
Enterprise Synchrophaser Expansion Project	-	-	4.6	-
Avaya Cloud Voice Deployment	-	-	4.2	-

Enhancing Capabilities	2019 Total	2020 Total	2021 Total	2022 Total
SAP Continuous Improvements	-	-	2.2	1.7
Transmission Asset Health Analytics	1.0	.0	2.0	-
CIP Substation Compliance Reporting Work Stream 2	-	-	2.8	-
Enterprise Operational Monitoring	2.4	.2	.0	-
ITC-Outage Employee Experience PSCo	-	-	2.3	-
eSOMS Project	2.2	.0	.0	-
Application Performance Monitoring	-	-	2.2	-
Unmanned Aircraft Systems Program	-	-	1.5	-
Enterprise Data Management Tool	-	-	1.2	-
MicroGrid	-	-	1.1	-
UI CREV and RIS with PlannerDash	-	-	1.0	-
Purchase Power Agreement Contract Management	-	-	1.0	-
Enhance Capabilities Small Projects	1	2.4	2.6	.0
Total Company	\$ 12.6	\$ 2.9	\$ 36.9	\$ 10.1
<i>Any differences between sum of individual category amounts and Total are due to rounding.</i>				

1 **Q. WHAT IS THE DIGITAL OPS FACTORY PROJECT?**

2 A. The Digital Factory is a cloud-based, modern data and analytics platform that will
3 enable the Company to make better use of available data to enhance both
4 customer journeys and core operational processes. This project will deliver a
5 secure multi-tenant cloud platform as a foundational engine for each of the
6 following capabilities: reusable data lake; common integrations; analytics
7 workbench; mobile platforms; dashboard framework, and artificial intelligence
8 models. Once the foundation is built the project examples include predictive
9 modeling, real time scheduling systems, operations work management, routing
10 and screen of data, work dashboards, and profiles.

11 **Q. WHAT IS THE PTT PHASE 3 (WAM) PROJECT?**

12 A. Through the Productivity Through Technology (or “PTT”) initiative, the Company
13 replaced its GL and modernized its WAM system. This project involves post-
14 implementation upgrades and patches to continue ensuring a stable and
15 consistent platform, which will increase innovation and contain the total cost of
16 ownership.

17 **Q. WHAT IS THE ENTERPRISE SYNCHROPHASER EXPANSION PROJECT?**

18 A. This project will allow the Company to expand the collection of Synchrophasor data
19 by installing Phasor Measurement Units and communication paths at various
20 Company facilities. (Synchrophasor measurements are real time measurements
21 to obtain useful information to operate the grid.) This expanded capability will
22 impact business areas for Bulk Electric System analysis, voltage stability analysis,
23 NERC event analysis requests, generation model validation, and will improve wind

1 farm response and voltage control. This project will reduce maintenance and
2 replacement costs of transmission devices and will reduce costs to validate
3 generator models as well as improve the operation of the Bulk Electric System
4 overall.

5 **Q. WHAT IS THE AVAYA CLOUD VOICE DEPLOYMENT PROJECT?**

6 A. This project will transition Public Service to an Internet Protocol (“IP”)-based voice
7 telephone system that will provide greater flexibility and enhanced user features
8 over the current system for both employees and customers. This new telephone
9 system will be cloud based, which will reduce on-premises IT infrastructure. It will
10 also modernize and improve telephone services by upgrading communications
11 features that will allow for better collaboration among employees, and will replace
12 and upgrade the Company’s existing voicemail system with Microsoft. The new
13 telephone system will also enhance our improved customer experience efforts, as
14 it will help deliver next generation customer contact center solutions. The current
15 voice systems at Public Service are past end of life and cannot be upgraded.

16 **Q. WHAT IS THE SAP CONTINUOUS IMPROVEMENTS PROJECT?**

17 A. In addition to the patches and related work for SAP to maintain a consistent
18 environment, continuous improvement and investment is needed to fully utilize the
19 benefits of having an enterprise application. An example of some of the
20 components for this upgrade project is the Batch Management Tool that SAP
21 supplied and released, which allows for increased traceability of inventory and
22 group management of inventory in Xcel Energy’s Energy Supply area. The Oracle
23 Database upgrade, which is the primary database for SAP, and SAP scheduler,

1 were also upgraded to improve scheduling to monitor and improve inefficiencies
2 to optimize resources.

3 **Q. WHAT IS THE TRANSMISSION ASSET HEALTH ANALYTICS (“TAHA”)**
4 **PROJECT?**

5 A. This project provides a TAHA system that combines different types of asset data
6 and capabilities to perform data mining, predictive modeling, and advanced
7 analysis that assists the Company with accurately maintaining and replacing
8 transmission assets.

9 **Q. WHAT IS THE CRITICAL INFRASTRUCTURE PROTECTION (CIP)**
10 **SUBSTATION COMPLIANCE REPORTING WORK STREAM 2 PROJECT?**

11 A. This project will replace complex, labor-intensive processes, with software
12 automation in order to better support the Company’s compliance with CIP
13 standards. In particular, it will provide software automation in the areas of asset
14 management, ports and services, security patch management, and daily
15 management, quarterly inventory review, and annual audit discovery. The project
16 also will reduce labor costs and travel time for Company employees and will
17 improve CIP-related processes as they become automated through document
18 automation and password automation of equipment, which is anticipated to
19 decrease reporting errors and improve compliance.

20 **Q. WHAT IS THE ENTERPRISE OPERATIONAL MONITORING PROJECT?**

21 A. The Company employs a suite of monitoring tools that are used enterprise-wide
22 that monitor critical infrastructure and alert to potential risks to business hardware
23 in order to prevent failures and mitigate security concerns. The project provides

1 and employs monitoring tools for hardware supporting critical applications such as
2 CRS, SAP, and other major application hardware.

3 **Q. WHAT IS THE OUTAGE EMPLOYEE EXPERIENCE PSCO PROJECT?**

4 A. This project enables operational enhancements that allows employees to more
5 efficiently to resolve customer requests. Examples include mobile solutions for
6 Xcel Energy's field workers responding to customer events. The Electric Outage
7 Restoration mobile application allows field employees to receive outage work
8 orders and manage them using a mobile app on their smartphone. The application
9 will make it easier for field employees to provide real-time outage status updates
10 during response and update estimated outage restoration times for customers.

11 **Q. WHAT IS THE ESOMS PROJECT?**

12 A. The ABB Hitachi Electronic Shift Operations Management System ("eSOMS") is
13 used across Xcel Energy for Lockout/Tagout, operator rounds, and narrative logs
14 and is deployed to nuclear plants, other generation plants and Gas engineering
15 and operations. This project updated the eSOMS software suite, improved
16 recoverability, and assured continued viability as a corporate asset.

17 **Q. WHAT IS THE APPLICATION PERFORMANCE MONITORING PROJECT?**

18 A. The Application Performance Monitoring project will ensure that software
19 applications perform in an expected manner and scope by measuring and
20 evaluating performance of an application and by isolating abnormalities or issues.
21 The project will reduce frequency and duration of application outages, improve
22 internal productivity and decrease time spent responding to issues, and improve
23 the end user experience across digital assets.

1 **Q. WHAT IS THE UNMANNED AIRCRAFT SYSTEMS PROGRAM?**

2 A. The project will create a managed drone environment that will allow the Company
3 to operate a fleet of drones across all business units, ensuring regulatory
4 compliance and appropriate flight planning, security of drone data, ability to ingest
5 data in to the network and visualize as well as analyze the data on an as-needed
6 basis for each business unit partner. The solution will mitigate the risk of drone
7 use, will enable and accelerate the use of drones across all business units, and
8 will lead to efficiency gains in operations while limiting the potential of injury risk
9 for what otherwise would have been manned activities.

10 **Q. WHAT IS THE ENTERPRISE DATA MANAGEMENT TOOL PROJECT?**

11 A. This project will implement a robust data management and governance solution
12 that will better and more efficiently manage data quality across business units. The
13 data governance initiative will increase productivity by using tools designed to
14 efficiently process workflow and monitor quality while also enabling incremental
15 controls and processes that are scalable and more cost-effective.

16 **Q. WHAT IS THE COMMUNITY RESILIENCY INITIATIVE PROJECT (ALSO
17 CALLED THE MICROGRID PROJECT)?**

18 A. The Community Resiliency Initiative Project (“CRI”) seeks to support communities
19 throughout Public Service’s service area by providing battery energy storage
20 system (“BESS”) enabled microgrids in key locations. The BESS systems will be
21 able to provide back-up power to critical infrastructure during outage events while
22 allowing for the energy storage asset to provide grid services during non-
23 emergency operation. The CRI was approved by the Commission in Proceeding

1 No. 19A-0225E. IT capital additions involve procurement of hardware, and the
2 design, build, and implementation of an integrated system that meets business and
3 security requirements.

4 **Q. WHAT IS THE UI'S CUSTOMER REVENUE SYSTEM ("CREV") AND RIS WITH**
5 **PLANNERDASH PROJECT?**

6 A. The project will provide forecasting and regression analysis, rate design, quality
7 bill checks, rate comparisons, and interval data analytics. PlannerDash is a tool
8 that sits on top of CREV and makes report writing, viewing, and analysis much
9 easier and user friendly. PlannerDash also significantly improves data entry
10 performance for users. The combination of CREV with PlannerDash gives us the
11 ability to have complex bill analysis by customer, class, or company at the users'
12 fingertips.

13 **Q. WHAT IS THE PURCHASE POWER AGREEMENT CONTRACT**
14 **MANAGEMENT PROJECT?**

15 A. The Purchase Power Agreement ("PPA") Management Project will create a current
16 technology solution with capabilities for contract end-to-end life cycle
17 management, including managing contract performance for PPAs and developing
18 processes and that will address Audit Services findings and recommendations.
19 The project will meet the audit recommendations provided and reduce duplicative
20 work and errors.

21 **Q. WHAT ARE ENHANCING CAPABILITIES SMALL PROJECTS?**

22 A. As in the cybersecurity and aging technologies categories, these smaller projects
23 are also included in Attachments MOR-1 and MOR-2 with the larger projects I

1 describe above. These smaller projects, like large projects, also enable the
2 Company to improve productivity, enhance communications between systems and
3 between people, and use data more efficiently. Examples of smaller enhancing
4 capabilities projects include an initiative to increase the resiliency of the Business
5 Systems area, updates to the Ansible IT automation platform, implementation of a
6 new thermal monitoring program for the Company's generation plants,
7 implementation of new integrated document management solutions, new software
8 for the Fleet area to manage all Fleet assets, and other projects to take advantage
9 of new capabilities and increase efficiencies.

10 **D. Customer Experience**

11 **Q. PLEASE DESCRIBE KEY BUSINESS SYSTEMS CAPITAL ADDITIONS**
12 **RELATED TO CUSTOMER EXPERIENCE SINCE THE COMPANY'S 2019**
13 **ELECTRIC PHASE I THROUGH THE 2022 FTY.**

14 **A.** Since its 2019 Electric Phase I and through the 2022 FTY, Public Service will have
15 placed in service \$87.1 million in customer experience capital additions. Key
16 customer experience projects from 2019 through 2022 are set forth in Table MOR-
17 D-6 below:

1
2
3
4

**TABLE MOR-D-6:
 Public Service 2019-2022 Customer Experience Capital Additions (Total
 Company)
 (Dollars In Millions)**

Customer Enhancements Capital Additions	2019	2020	2021	2022
Customer Relationship Management	-	-	\$ 4.6	-
Data Analytics and Automation	-	8.6	5.6	-
Digital Channel Platform	-	6.7	24.2	13.3
Platform Infrastructure and Technology Maintenance	-	6.8	4.5	-
Other	-	1.3	5.9	5.7
Total Company	\$ 0	\$ 23.4	\$ 44.7	\$ 19.0
<i>Any differences between sum of individual category amounts and Total are due to rounding.</i>				

- 5 **Q. WHAT IS THE COMPANY ACHIEVING THROUGH THE CXT PROGRAM?**
- 6 A. The CXT program is, ultimately, a series of foundational investments in platform
 7 infrastructure and data analytics and automation that are intended to improve the
 8 Company’s digital interfaces with customers. The Company’s work to improve the
 9 customer experience is divided into four project areas: (1) Digital Channel
 10 Platforms (including MyAccount, the Company’s website, Xcel Energy mobile
 11 applications, and new customers and real estate developers’ initial connections
 12 with the Company (Customer Connect); (2) the Customer Relationship
 13 Management (“CRM”) Platform (currently Salesforce); (3) Platform Infrastructure
 14 and Technology Maintenance; and (4) Data Analytics and Automation. The

1 individual projects by the categories identified in table MOR-D-6 above are
2 provided in Attachments MOR-1 and MOR-2.

3 **Q. WHAT IS THE DIGITAL CHANNEL PLATFORM PROJECT?**

4 A. This project will build out, enhance, and redesign several components of our
5 customers' digital interactions with the Company. This work includes enhancing
6 and modernizing Xcel Energy's customer-facing online digital platforms and
7 underlying technologies, MyAccount, our mobile application, and website,
8 www.xcelenergy.com. It also involves building out the New Customer Connections
9 channel and utilizing "Single Screen" technology. Certain digital channel platform
10 work, such as building out our Contact Center capabilities with Interactive Voice
11 Response ("IVR") technology continues into 2022.

12 **Q. CAN YOU DESCRIBE THE MYACCOUNT, XCELENERGY.COM, AND MOBILE
13 APPLICATION WORK IN MORE DETAIL?**

14 A. Yes. This work will provide a new digital presence for Public Service's customer
15 channels, improving optionality, providing more user-friendly interfaces, and
16 offering more capabilities for customer data management. As part of the
17 xcelenergy.com, mobile app, and MyAccount re-design and re-platform, Business
18 Systems will conduct a content, user experience, and visual design heuristic
19 assessment to identify pain points for the customer and optimize the experience
20 for each individual. In addition to the functions the customers have today, the re-
21 design will allow them to request additional services, see status of any requests,
22 and make appointments for any service issues. The MyAccount re-platform will
23 allow customers to set up their preferences, pay their bills or set up automatic

1 payment options, and receive information on their energy usage. The goal is to
2 share the same usage information a call center representative would see with the
3 customer he or she is assisting, to increase customers' options and to allow them
4 to interact with Xcel Energy in the manner they choose.

5 **Q. CAN YOU DESCRIBE THE OUTAGES AND NOTIFICATIONS WORK?**

6 A. Yes, I can. Outage work will create a new, multi-channel outage experience for
7 our customers that will display more accurate and timely outage information,
8 including supporting more accurate restoration information. When merged with
9 interval data from AMI meters, a new outage experience will be much more
10 personal and will give customers the information they want when they need it.

11 Notifications work will provide new capabilities within the CRM platform that
12 will allow the Company to provide more accurate and proactive customer event
13 notifications for billing and payments, outages, product sales, and other customer
14 journeys. A new notifications approach will reduce costs and create more
15 opportunities for communicating with customers. The capability will also enable
16 two-directional text, opening up a new channel for customers to pay their bills and
17 to work with an agent in the future.

18 **Q. PLEASE DESCRIBE THE NEW CUSTOMER CONNECTION WORK.**

19 A. Today, the New Customer Connection ("NCC") applies to trade partners and
20 Company customers who are building new construction and need to engage with
21 the utility for net-new electric and gas services. An online form can be utilized, but
22 will then need to be re-entered to begin the ordering process, with no ability to view
23 the status on any automated channels.

1 Building out the Customer Connect channel will provide a better experience
2 for builders, developers, and other larger Commercial & Industrial customers who
3 engage with Xcel Energy to request new, resumed, or stopped service.
4 Specifically, the customer interface will be revamped to provide better information
5 to customers about the phase or status of their line extension process, improve the
6 builders' call line, and improve the process for communicating with parties
7 engaged in that process.

8 These improvements will allow the Company to better partner with
9 developers, contractors and do-it-yourself homeowners as they manage their
10 projects from start to completion. They will be able to receive and give updates on
11 their projects in real time, giving them control and transparency to better plan their
12 business needs. Through account preferences, timely and accurate notifications
13 about status, as well as a flexible appointment capability, these enhancements will
14 provide Company employees, trade partners and homeowners with a more
15 seamless and collaborative experience.

16 **Q. PLEASE PROVIDE MORE INFORMATION ABOUT THE SINGLE SCREEN**
17 **PROGRAM.**

18 A. Currently, Company call center agents utilize numerous screens when
19 communicating with customers on the phone. Combining numerous screens into
20 one screen that contains all the information needed for customer service agents
21 will simplify the experience for employees and benefit customers who will receive
22 the information they need more quickly and efficiently. The "Single Screen" work,
23 or also referred to as Agent 360, will also be integrated with Artificial Intelligence

1 capabilities to help decipher what the inbound call is most likely about, and help
2 identify the most immediate fix to the issue. In addition, the single screen will show
3 the agent the current bill, history of payments, and payment plan options that are
4 tailored specifically to the caller. Finally, this screen will suggest support offerings
5 for the customer's home that can help save money or simplify their energy
6 experience.

7 **Q. PLEASE DESCRIBE THE CRM PLATFORM PROJECT.**

8 A. This project involves building out the existing Salesforce CRM tool and introducing
9 new modules to better understand and serve customers. The redesigned platform
10 will enable tracking of different relationships with customers, whether that is
11 commercial, residential, industrial or on a different basis. It will allow for real-time
12 business updates to mobile applications, automated updates to the customer
13 mobile application without requiring customers to manually update the application
14 itself, and updates to MyAccount with minimal development support, all supporting
15 improved customer and employee experiences.

16 For 2021, the CRM project also involves Customer Identity and Access
17 Management ("CIAM") work. CIAM work enabled a new single sign-in customer
18 access and identity management in support of MyAccount and Mobile App login
19 and other products and services (including third parties). The new customer login
20 will improve customer access to their accounts, allow single login for all services
21 offered by Xcel Energy and will enable continuous upgrades to our security.

22 Better CRM management will enable us to both identify previous searches
23 and efforts taken by Company employees on behalf of the customer, and support

1 a 360-degree view of existing customer location(s), energy applications, and
2 preferences, much of which will be available to the employee efficiently through
3 the Single Screen program. It will also provide insight into customer billing patterns
4 to allow us to serve customers better, by counseling and advising them on
5 conservation options, management tools, and other service options. It will also
6 give customers the ability to have information on our technicians when it is
7 necessary for them to visit the premise, including the technician's name and other
8 pertinent information and also the status of the technician's location and
9 approximate time he or she will arrive.

10 **Q. IS THE COMPANY CONTINUING TO USE SALESFORCE FOR ITS CRM**
11 **PLATFORM?**

12 A. Yes. Salesforce was selected through a platform selection process. We evaluated
13 several solutions with similar capabilities, and noting improvements to the platform,
14 ultimately chose to remain with Salesforce because it is the existing platform and
15 therefore offers efficiencies in integration, time to market, and planning that would
16 not be available by starting with a new solution altogether. This is a multi-year
17 project that was initiated in 2019, which also includes some post-implementation
18 and minor enhancement work.

19 **Q. PLEASE DESCRIBE THE CONTACT CENTER WORK (IVR).**

20 A. This program involves redesigning our IVR system for customers and is planned
21 to be placed in service in 2022 in several phases. This will assist customers to
22 better resolve their issues without having to speak to a call agent and make it easy
23 to interact with the IVR. Phase I is updating the IVR hardware to stabilize the

1 customer experience and provide a platform where we can build new experiences.
2 The upgraded IVR will connect more seamlessly to the customer data stack and
3 enable omni-channel experiences and add more customer functionality to the IVR.
4 Phase II is the addition of a natural language layer, which will be added to the IVR
5 in 2022, that adds voice functionality for customers, and they can speak to the IVR
6 and complete their task without using touch tones. It will also, if necessary, get to
7 a subject matter expert regarding their issue and resolve the issue more quickly.
8 This improvement will also reduce the number of times it is necessary for a
9 customer service agent to have to engage or reroute calls. This system will
10 contribute to the agent single screen success by passing more detailed information
11 to our agents, including reason for call and customer information so that agents do
12 not have to ask a customer again for information already provided. Natural
13 language is preferred by customers, provides for more efficient completion of
14 customer tasks, and increases customer call containment in the IVR system to limit
15 high-cost calls from being routed to the contact center if the IVR system would
16 otherwise be able to successfully handle customer calls to their satisfaction.

17 **Q. WHAT IS THE CUSTOMER RESPONSE SYSTEM (CRS) TECH STACK**
18 **UPGRADE?**

19 A. This project will provide certification and deployment of the various software
20 components necessary to maintain and upgrade stability, reliability, security,
21 resilience, and efficiency of the Customer Response System (“CRS”) application.
22 This type of effort happens approximately every three years, if not sooner,
23 depending on various technology drivers. The CRS Tech Stack represents the

1 various software components, that in concert enable the larger application to
2 perform daily service orders, the posting of daily payments, the processing of a
3 typical day's worth of meter reads, the calculating invoices and producing
4 statements, as well as the providing of customer service through agents, the
5 interactive voice response system, the Company's website www.xcelenergy.com,
6 and MyAccount. This upgrade will ensure that the CRS Tech Stack remains
7 supported by various vendors, receives necessary security patches, and remains
8 current with other major market components, such as AIX (UNIX operating
9 system), Java (programming language), Oracle (database management system),
10 WebLogic (web application server), and Genero (application server). This project
11 will also refresh storage and server infrastructure related to this technology.

12 **Q. PLEASE DESCRIBE THE PLATFORM INFRASTRUCTURE AND**
13 **TECHNOLOGY MAINTENANCE AND DATA ANALYTICS AND AUTOMATION**
14 **PROJECTS.**

15 A. Xcel Energy's technological architecture has become increasingly intertwined, with
16 core systems running at maximum capacity to support the need for emerging
17 capabilities. To relieve the pressure from these critical core systems, new data
18 layers will be added to aggregate key information and manage extra capabilities,
19 while providing flexibility and added capacity. To accomplish this, we are
20 developing an Application Programming Interface ("API"), which is a set of routines,
21 protocols, and tools for building software applications to ensure software
22 components can "talk" to each other. This infrastructure also includes operations
23 model connectivity and security, and data architecture and governance.

1 This work will allow the legacy applications to function in the manner they
2 were designed, eliminating significant current customization that is very costly to
3 maintain. . API work is being conducted in two phases. Phase 1 of the API and
4 data sets was the first set of the data and integrations that enables and provides
5 functionality for www.xcelenergy.com, and other applications specific to the NCC
6 and core www.xcelenergy.com experiences, including functionality regarding
7 automation and the cloud. The data work specifically provides a new platform and
8 set of tools that supports the management and quality of customer data under new
9 quality processes and data governance mechanisms. Phase 2 of API continues
10 the work of Phase 1 and brings additional data and integrations to
11 www.xcelenergy.com, MyAccount, mobile app, electric vehicles, and other
12 experiences. Improved data aggregation and storage will allow for more customer
13 functionality across digital channels. Functionality includes billing and payment,
14 product sign-ups, electric vehicle sales, AGIS integration, and general customer
15 service.

16 Data analytics capabilities will improve dramatically as a result of API layer
17 improvements enabling a new customer data grid that will serve as a single source
18 of information on our customers. Analytics teams will have access to more timely,
19 accurate and rich data to uncover deeper insights and trends to make improved
20 recommendations and deliver better customer service.

21 **Q. PLEASE FURTHER EXPLAIN HOW THESE PROJECTS ALSO DEVELOP**
22 **DATA ANALYTICS.**

1 A. Work under the Data Analytics and Automation project will add a Customer Data
2 Platform layer to the Company's technological architecture, which will act as a
3 central repository of data from the Company's core systems and third-party
4 vendors. It will also provide expedited consumption of data by other systems and
5 eliminate more legacy point-to-point interfaces. For the customers, the data layer
6 will be where the Company can store data in one location to use on all channels.
7 The data will be accessible from all channels to eliminate the need for redundant
8 input.

9 This work will also enable querying and running analysis and reporting on
10 information outside of our core applications, such as core ordering and billing
11 systems, which allows core applications to conduct only the transactions they were
12 designed to complete.

13 Additionally, this project will facilitate analytics to help understand customer
14 personas, preferences, and previous issues of our customers. This will help call
15 center agents assist incoming calls in an expedited fashion with all the information
16 they need, as previously noted with respect to the utility's digital interfaces.
17 Artificial Intelligence and Natural Language Understanding will be used in
18 conjunction with each other, and with data in the CRM, to simplify the customer
19 call experience and reroute the caller to the correct department. This will also help
20 gather all the required information, so that the right solution for the customer will
21 be more easily recognizable to the Company employee.

1 **Q. PLEASE DESCRIBE OTHER CAPITAL ADDITIONS FOR 2022.**

2 A. For 2022, the Company continues building out the CRM platform and introducing
3 new next-generation modules to better serve our customers. The redesigned
4 platform will enable us to track the different relationships with our customers,
5 whether that is commercial, residential, industrial or on a different basis, with a
6 goal of reducing O&M spend across high-cost channels and improve customer
7 satisfaction. Overall, these capital additions reflect continuation of the customer
8 experience projects from 2021. With a project of the size and scope of CRM, we
9 also need to budget for post-implementation enhancements that play a critical role
10 in supporting the overall CXT program.

11 **E. Emergent Demand**

12 **Q. PLEASE DESCRIBE KEY BUSINESS SYSTEMS CAPITAL ADDITIONS**
13 **RELATED TO EMERGENT DEMAND SINCE THE COMPANY'S 2019**
14 **ELECTRIC PHASE I THROUGH THE 2022 FTY.**

15 A. Emergent demand funds are budgeted for future years, and then – when the
16 dollars are used for specific projects – re-classified to the specific project for which
17 the expense was incurred. From 2019-2020, all emergent demand funds were
18 fully deployed to other projects (previously described in my Direct Testimony); as
19 a result, the actual emergent demand category funds have decreased to \$0 for
20 those years. Since 2021 is not yet over, there is an emergent demand balance in
21 the forecast for the remainder of 2021 (a credit, as I describe below). For 2022,
22 there is a forecasted amount. The following Table MOR-D-7 provides emergent
23 demand category funds since the Company's 2019 Electric Phase I, which reflects

1 emergent demand funds completely re-classified for 2019 and 2020 actuals and
2 budgeted and forecasted amounts for 2021 and 2022.

3 **TABLE MOR-D-7:**
4 **Public Service 2019-2022 Emergent Demand (Total Company)**
5 **(Dollars In Millions)**

Emergent Demand	2019 Total	2020 Total	2021 Total	2022 Total
Total	-	-	\$ (5.4)	\$ 23.4

6 **Q. WHY IS THE BUDGET FOR EMERGENT DEMAND IN 2021 A CREDIT?**

7 A. For 2021, the Business Systems budget has been over-allocated to other capital
8 project categories besides emergent demand, meaning that the 2021 emergent
9 demand is negative (a credit) so that the total 2021 capital budget does not exceed
10 the overall budget. This is occurring because the demand and need for IT solutions
11 to address aging technology, address cybersecurity, address customer
12 experience, and enhance our capabilities across the enterprise is so high, and
13 increasing. For the remainder of 2021, either additional dollars will be allocated to
14 Business Systems to allow all projects to go forward, or certain projects may be
15 delayed to a future year such that the need for a net credit in emergent demand
16 will reduce to zero. Either way, Business Systems will be implementing, at a
17 minimum, its overall capital budget.

18 **Q. ARE THERE ANY CAPITAL PROJECTS TO ADDRESS EMERGENT DEMAND**
19 **OR OTHER BUSINESS SYSTEMS NEEDS REMAINING IN THE 2022**
20 **BUSINESS SYSTEMS FORECAST?**

21 A. Yes. The emergent demand forecast for 2022 is \$23.4.

1 **Q. HOW DID THE COMPANY ESTABLISH THE EMERGENT DEMAND BUDGET**
2 **FOR 2022?**

3 A. The current budget is based on business priorities for the year, balanced by the
4 overall business area capital spending guidelines. In other words, the 2022
5 emergent demand budget represents the remaining capital available for IT projects
6 after accounting for the specific projects that were previously approved for
7 implementation. The Company has such a high demand for future IT solutions
8 that we have left a total approved portion of the Business Systems budget in
9 emergent demand to allow for full vetting of the sheer number and scope of project
10 needs.

11 **Q. CAN YOU PROVIDE INFORMATION ABOUT THE SCOPE OF THIS DEMAND**
12 **FOR IT PROJECTS FOR 2022?**

13 A. Yes. Attachment MOR-5 to my Direct Testimony includes the list of potential IT
14 projects that have been identified so far based on business area requests and
15 identified needs, and which Business Systems is vetting for possible approval or
16 exclusion (Business Systems Pending Demand). In addition, it is always possible
17 current projects will need to be advanced or delayed, depending on the emerging
18 needs of the business. The individual aging technology, customer experience,
19 cybersecurity, and enhancing capabilities projects that are identified in my Direct
20 Testimony for 2022 are those that have been approved and often require more
21 advance planning; in addition to these, we will need at least the remaining
22 emergent demand funds to meet a reasonable number of employee and customer
23 needs in 2022 and beyond.

1 **Q. HOW CAN THE COMMISSION BE CONFIDENT THE COMPANY WILL**
2 **MANAGE ITS BUSINESS SYSTEMS-RELATED PROJECTS INCLUDED IN THE**
3 **TEST YEAR TO ENSURE THE FINAL, ACTUAL COSTS ARE REASONABLE**
4 **AND PRUDENT?**

5 A. As discussed in my Direct Testimony, the Business Systems capital additions for
6 2022 presented in Attachment MOR-2 are reasonable and necessary to efficiently
7 manage business operations, protect Public Service and Xcel Energy data and
8 information, meet evolving regulatory and legal requirements, keep current with
9 technology, maintain the stability and reliability of the existing IT systems, and
10 provide the tools required to effectively and safely provide service to Public
11 Service's retail customers. The rigorous processes that are followed in evaluating,
12 selecting, and monitoring the execution and implementation of capital projects
13 ensure that the additions are reasonable and necessary and that the costs are
14 prudently incurred to provide safe and reliable service to Public Service's
15 customers.

1 **V. BUSINESS SYSTEMS O&M**

2 **Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR DIRECT TESTIMONY?**

3 A. This section of my Direct Testimony discusses Business Systems 2020 non-AGIS
4 O&M expenses, which the Company proposes to utilize as the primary basis for
5 establishing Business Systems O&M levels included in the 2022 FTY. I also
6 describe the drivers of O&M cost increases since the 2019 Electric Phase I, which
7 was based off a 2018 historic test year (“HTY”) for O&M purposes. As with capital
8 additions, AGIS O&M is discussed in Section VI of my Direct Testimony.

9 **Q. WHAT ARE THE TYPES OF COSTS THAT BUSINESS SYSTEMS INCURS FOR**
10 **O&M?**

11 A. I described above the various work that is performed by Business Systems. To
12 perform this work, Business Systems generally incurs O&M costs in seven
13 categories:

- 14 • *Application Development and Maintenance:* Costs associated with the
15 development, enhancement, maintenance, and consultation on new or
16 existing IT systems.
- 17 • *Software License and Maintenance:* Includes costs for maintenance
18 payments to software vendors pursuant to license agreements
19 associated with various software applications and desktop tools. These
20 fees must be paid to secure vendor support for troubleshooting, enabling
21 access to vendor patches, fixes, and version upgrades.
- 22 • *Labor:* Costs associated with all employees in the Business Systems
23 department.
- 24 • *Contract Labor/Consulting:* Consists of fees and expenses for
25 consultants or knowledge base experts that are not employees of Xcel
26 Energy.
- 27 • *Hardware Maintenance and Purchase:* Includes costs for maintenance
28 payments to hardware vendors pursuant to license agreements
29 associated with various storage, server and miscellaneous hardware.

1 These fees must be paid to secure vendor support for troubleshooting,
2 fixes and minor purchases.

3 • *Network Services:* Costs related to the maintenance of existing circuits,
4 phones, microwave and radio systems, and other IT communication
5 assets. Network activities provide operations and management of the
6 Company's internal and external data transmission requirements.

7 • *Other Categories:* Includes Employee Expenses; Mainframe; Donations,
8 Dues, and Fees; Shared Asset Allocation, outsourcing services not
9 included in the other categories, and other small purchases.

10 **Q. WHAT WERE BUSINESS SYSTEMS ACTUAL 2020 O&M COSTS?**

11 A. The Company's actual Business Systems O&M expenses for 2020 totaled \$48.6
12 million (including AGIS). Table MOR-D-8 below breaks down the amount of overall
13 O&M costs by the categories I discussed above, in addition to AGIS O&M,
14 discussed in Section VI. Attachments MOR-3 and MOR-4 provide an accounting
15 of these expenses by Cost Element and FERC account, respectively (AGIS O&M
16 accounting is provided in Attachments MOR-6 and MOR-7).

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**TABLE MOR-D-8:
Public Service 2020 Business Systems O&M (Total Electric)
(Dollars In Millions)**

2020 O&M (Dollars in Millions)	
Cost Category	Total
Application Development and Maintenance	6.9
Software License and Maintenance	16.4
Company Labor	8.9
Contract and Consulting	3.9
Hardware Maintenance and Purchase	1.5
Network Services	6.9
Other	2.3
Shared Assets*	(6.6)
AGIS**	8.6
Total Company Electric	\$ 48.6
<i>Any differences between sum of individual category amounts and Total are due to rounding.</i>	
* The shared asset credit related to AGIS AMI head-end software is reflected in the Shared Asset Total.	
** AGIS-related O&M expenses are discussed below in Section VI and shown by AGIS program in Table MOR-D-12.	

4 **Q. ARE THE \$48.6 MILLION IN 2020 O&M COSTS FOR BUSINESS SYSTEMS**
5 **YOU DESCRIBE ABOVE REFLECTED IN THE COST OF SERVICE**
6 **PRESENTED BY MS. BLAIR?**

7 A. Yes.

8 **Q. WHAT ARE THE MAJOR DRIVERS BETWEEN BUSINESS SYSTEMS' 2018**
9 **TEST YEAR COSTS USED IN THE 2019 ELECTRIC RATE CASE AND THE**
10 **2020 O&M COSTS THAT WILL BE REFLECTED IN THE 2022 FTY?**

11 A. The major drivers are shown in Table MOR-D-9 below.

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**TABLE MOR-D-9:
 Public Service Business Systems O&M Drivers (Total Electric)
 (Dollars In Millions)**

Drivers of O&M Expenses from 2018 HTY to 2022 FTY (Dollars in Millions)			
Driver	2018 HTY	Driver Amount	2020 Actuals
Total O&M (adjusted)	\$ 46.2		
Labor (Company and Outside Labor)		(1.2)	
Shared Assets		(5.9)	
Software License and Maintenance		2.7	
AGIS		6.4	
Other		0.4	
Total Electric	\$ 46.2	\$ 2.5	\$ 48.6

4 **Q. CAN YOU PROVIDE MORE INFORMATION REGARDING THE SPECIFIC**
 5 **DRIVERS SHOWN IN TABLE MOR-D-9?**

6 A. Yes. Several drivers explain the \$2.5 million O&M increase from the 2018 HTY to
 7 2020. First, network equipment shared asset costs decreased between 2018 and
 8 2020 by \$5.9 million. Shared asset costs occur when employees in two or more
 9 of Xcel Energy’s operating companies use or share an asset owned by another
 10 operating company, which is the case with certain network assets supported by
 11 Business Systems. Since the 2018 HTY, Public Service’s shared asset costs
 12 (recorded in Federal Energy Regulatory Commission (“FERC”) (Account 931 &
 13 902) have increased due to due to an increase in Advanced Metering
 14 Infrastructure AMI Head End and shared asset investment across jurisdictions.
 15 However, a large Public Service credit (recorded in FERC Account 922) offsets
 16 the shared costs resulting in an overall to net decrease of \$(5.9) million total shared

1 asset for Public Service Electric. The total shared asset includes \$(6.0) million of
2 credit from other OpCos for use of the AMI Head End asset.

3 Mr. Baumgarten and Ms. Wold address shared asset allocations in more
4 detail in their Direct Testimonies.

5 Second, Business Systems has experienced a \$2.7 million increase in
6 Software License and Maintenance costs, stemming overall from increasing costs
7 in the industry. Software License and Maintenance costs are driven by net new
8 projects and increased licensing costs are driven by users and upgrades. Finally,
9 maintenance and support must be updated to limit security vulnerabilities.

10 Third, Business Systems has experienced an increase of \$6.4 million in
11 O&M expenses in supporting AGIS implementation. AGIS O&M is included in
12 Attachments MOR-6 and MOR-7. Company witness Mr. Berman discusses the
13 Company's ongoing deferral of expenses related to the AGIS CPCN.

14 Finally, the Company has been increasing labor costs through insourcing
15 efforts, while at the same time decreasing contract labor costs through the past
16 few years in the areas of Distributed Systems Services, Network Services, and
17 Application, Development, and Maintenance. Salary increases attributed to annual
18 merit pay increases also contributed to the increase in 2020. However, the net
19 impact to Public Service's total Business Systems O&M has been a decrease of
20 \$1.2 million.

1 **Q. IS THE COMPANY'S 2020 BUSINESS SYSTEMS O&M A REASONABLE**
2 **BASIS ON WHICH TO ESTABLISH BUSINESS SYSTEMS O&M COSTS FOR**
3 **THE 2022 FTY?**

4 A. Yes. The Company's 2020 Business System's O&M costs are reasonably
5 representative of the Company's forecasted O&M costs for establishing the 2022
6 FTY. The 2020 O&M expense reflects the reasonableness of the previously-
7 approved 2018 O&M expense adjusted to reflect key drivers the Company has
8 been implementing to ensure safe and reliable service for our customers while
9 ensuring Business Systems supports utility operations and responds to ever-
10 changing technological needs.

1 **VI. AGIS**

2 **Q. WHAT IS THE PURPOSE OF THIS SECTION OF YOUR DIRECT TESTIMONY?**

3 A. In this section of my Direct Testimony, I provide detailed support for the recovery
4 of costs incurred by the Business Systems organization related to the AGIS
5 initiative, including capital additions placed into service since the Company's 2019
6 Electric Phase I, from September 1, 2019 through the year-end 2021 forecast, as
7 well as the planned capital additions and O&M costs forecasted for the 2022 FTY.

8 Several other Company witnesses provide Direct Testimony related to the
9 AGIS: Mr. Nickell provides an overview of Public Service's AGIS initiative,
10 including the Company's technical strategy; Mr. Romine provides testimony on
11 how AGIS implementation supports the Company's overall efforts to enhance the
12 customer experience; Mr. Berman supports the Company's request for continued
13 deferred accounting treatment for certain AGIS costs beyond the FTY; and Ms.
14 Blair supports the Company's cost of service and revenue requirement associated
15 with AGIS.

16 In the remainder of my Direct Testimony, I first provide an overview,
17 describing the role of Business Systems and the types of IT work Business
18 Systems is performing to carry out the AGIS initiative in the manner planned by
19 the Company. I also discuss Business Systems' IT capital and O&M forecasts for
20 the AGIS projects. In Sections B through F below, I discuss each component of
21 AGIS from a Business Systems (IT) perspective. I provide a description of each
22 component, the specific IT work necessary for implementation, and the
23 implementation schedules. I also provide support for the capital additions and

1 costs incurred since our 2019 Electric Phase I and discuss development of the
2 forecasts for the 2022 FTY capital additions and O&M costs. Where Business
3 Systems has primary responsibility for a program, I describe the development of
4 that program's forecast, and discuss the capital and O&M forecasts. Where the
5 Distribution Business Area has primary responsibility for the program's
6 implementation, I defer to Mr. Nickell.

7 **Q. HAS THE COMPANY PREVIOUSLY PROVIDED INFORMATION ON THE AGIS**
8 **INITIATIVES?**

9 A. Yes. The Company previously received a Certificate of Public Convenience and
10 Necessity ("CPCN") for certain components of the AGIS initiative in Proceeding
11 No. 16A-0588E, and further discussed other components in the Company's 2019
12 Electric Phase I rate case, Proceeding No. 19AL-0268E. As a result of the 2019
13 Electric Phase I, portions of AGIS costs have already been approved for recovery
14 through base rates. The Company also provided extensive information on AGIS in
15 Proceeding No. 20AL-0301E requesting approval to recover AGIS costs through
16 a new Advanced Grid Rider ("AGR"). The Company's request to establish an AGR
17 was dismissed; thus the applicable AGIS costs are included in the Company's rate
18 request in this case.

19 I also note that on June 15, 2021, in compliance with Commission
20 Decisions,³ the Company requested an amendment to the AGIS CPCN
21 ("Amended CPCN") in Proceeding No. 21A-0279E. Specifically, the Company

³Decision Nos. C21-0176 and C21-0177, both mailed March 19, 2021.

1 requested that the AGIS CPCN be amended to allow for the deployment and
2 utilization of the Distributed Intelligence (“DI”) capabilities that are embedded within
3 the AMI meters that are being installed pursuant to the initial AGIS CPCN. The
4 Company also requested that the Commission recognize the new industry
5 standard communication protocol between an advanced meter and a customer’s
6 HAN and that providing customers usage information over the Wi-Fi radio included
7 in the advanced meters is beneficial to customers. Further, the HAN
8 implementation plans discussed in my Direct Testimony reflect the Company’s
9 plans based on prior Commission decisions; however, during development of this
10 rate case application, the Commission issued a decision precluding the Company
11 from activating HAN capabilities prior to the completion of the Amended CPCN
12 proceeding. To the extent the schedule or Commission decisions in the Amended
13 CPCN proceeding alter the implementation of HAN capabilities described in my
14 Direct Testimony, the Company will make any necessary adjustments to the rate
15 case revenue requirements.

16 **Q. AT A HIGH LEVEL, WHAT INFORMATION DO YOU PROVIDE RELATED TO**
17 **IMPLEMENTATION OF THE AGIS INITIATIVE?**

18 A. I provide updated information for the foundational components of the AGIS
19 initiative, which include the Advanced Distribution Management System (“ADMS”),
20 including the Geospatial Information System (“GIS”); Advanced Metering
21 Infrastructure (“AMI”); the Field Area Network (“FAN”); Intelligent Field Devices that
22 include Integrated Volt-VAR Optimization (“IVVO”), Fault Location Isolation and

1 Service Restoration (“FLISR”), including Fault Location Prediction (“FLP”), and the
 2 Advanced Planning Tool (“APT”).⁴

3 **Q. CAN YOU SPECIFY HOW THE SUPPORT FOR AGIS PROJECTS IS DIVIDED**
 4 **BETWEEN YOUR IT TESTIMONY AND MR. NICKELL’S DISTRIBUTION**
 5 **TESTIMONY?**

6 A. Yes. Support for the AGIS components is divided as shown in Table MOR-D-10
 7 below.

TABLE MOR-D-10: AGIS Program Witness Support

AGIS Project	Component	Witness
ADMS	ADMS system and integration	Remington Direct, Section VI(B)
	GIS	Nickell Direct, Section III
AMI	IT Integration and AMI head-end application	Remington Direct, Section VI(C)
	Meters and deployment	Nickell Direct, Section IV
FAN	IT Integration and deployment	Remington Direct, Section VI(D)
	Installation of pole-mounted devices	Nickell Direct, Section V
IVVO	System development	Remington Direct, Section VI(E)
	Advanced application and field devices	Nickell Direct, Section VI
FLISR	Advanced application and field devices	Nickell Direct, Section VII
APT	System development	Remington Direct, Section VI(F)
	Advanced application	Nickell Direct, Section VIII

9 Both Mr. Nickell and I support costs related to both the CPCN Projects (AMI, IVVO,
 10 and the associated mesh network portion of the FAN), as well as the overall
 11 prudence of the non-CPCN projects (ADMS, FLISR, FLP, the non-CPCN portion
 12 of the FAN, and the APT). While the AGIS CPCN Settlement contemplated that
 13 full deployment of AMI would begin in 2020, the Company now anticipates that full

⁴ APT is included in the “other” budget category in the tables presented in my Direct Testimony.

1 deployment will begin in the summer of 2021, which will affect the timing of certain
2 Business Systems' capital additions and O&M expenditures, as I will discuss in
3 later sections of my Direct Testimony. Mr. Nickell discusses the revised AMI
4 implementation schedule in his Direct Testimony.

5 **A. Overview of Business Systems AGIS Work**

6 **i. Business Systems' Role in AGIS**

7 **Q. PLEASE DESCRIBE BUSINESS SYSTEMS' ROLE IN PROVIDING SUPPORT**
8 **FOR AGIS IN THIS PROCEEDING.**

9 A. The Company's AGIS initiative involves a coordinated approach – *i.e.*, planning,
10 design, build, deployment and ongoing support from Business Systems and
11 Distribution for each of the foundational components and their interactivity with
12 each other and other Company systems. Extensive IT integration is needed to
13 support these new technologies.

14 **Q. WHAT WORK HAS BUSINESS SYSTEMS ALREADY UNDERTAKEN IN**
15 **COLORADO WITH RESPECT TO THE AGIS INITIATIVE?**

16 A. As previously noted, the Company obtained a CPCN for the CPCN Projects in
17 2017. Before and after the CPCN was obtained, Business Systems has been
18 working toward implementation of the various components of the AGIS initiative.
19 Public Service has undertaken scoping, planning, design, RFP, and contracting
20 with respect to a number of the AGIS components.

21 Further, Public Service is already deploying and operating some
22 components and facets of the AGIS initiative. For example, the first deployment
23 phase of ADMS was placed in service in April 2019 with the second and final

1 deployment placed in service in the fourth quarter of 2020. Public Service has also
2 deployed approximately 13,000 meters installed to support IVVO as discussed by
3 Mr. Nickell, and is utilizing the FAN to support AMI and IVVO. Public Service is
4 utilizing the AMI interfaces to provide customers who have AMI meters with
5 valuable information on their energy use. In the coming years, the Company will
6 continue to deploy the FAN and AMI, continue to add capabilities and functionality
7 to AMI thru interfaces and customer systems to deliver more value to customers.

8 Public Service has also started to deploy FLISR and FLP devices on some
9 of the lower performing feeders within the service territory and those devices have
10 begun to be used to generate reliability benefits for customers. Indeed, Business
11 Systems has not placed any FLISR capital in service since the end of the test year
12 in the Company's 2019 Electric Phase I, and expects to incur only de minimis O&M
13 costs for FLISR. As such, I only discuss FLISR and FLP in relation to other AGIS
14 projects.

15 **Q. PLEASE INTRODUCE THE WORK THAT IS REQUIRED OF BUSINESS**
16 **SYSTEMS TO SUPPORT THE AGIS INITIATIVE.**

17 A. Overall, Business Systems is responsible for the IT integration of AGIS systems
18 and data with other back office applications existing at the Company. By IT
19 integration, I refer to the need to integrate the technical components of the AGIS
20 initiative with other Company applications to allow the efficient, timely, and secure
21 transfer of data between AGIS systems and other Company systems. The goal of
22 integration is to ensure new applications and data are able to communicate with

1 the Company's existing applications, so Public Service is able to use the data to
2 improve Company operations and provide a better customer experience.

3 For example, Business Systems is implementing the FAN that allows
4 intelligent field devices, ADMS, AMI, and other systems to connect and
5 communicate. From the AMI head-end, a combination of new or enhanced
6 interfaces will be built to transfer the data to other applications, such as ADMS, the
7 meter data management system, the billing and customer resource system, and
8 the asset inventory management system.

9 Overall, implementing AGIS will require the various interfaces to transfer
10 large volumes of data in a small amount of time. Public Service is also obtaining
11 significantly more data from the field devices than we have in the past. This
12 additional data will require additional space for storage and a data management
13 plan to ensure Public Service is keeping the necessary data only for as long as it
14 is needed. The new software, additional server hardware, and increase in quantity
15 of data stored will all need to be supported, which will require an increase in the
16 number of support staff.

17 **Q. CAN YOU DISCUSS FURTHER THE TYPES OF DATA PUBLIC SERVICE IS**
18 **RECEIVING FROM THE FIELD AND MANAGING AS A RESULT OF AGIS**
19 **IMPLEMENTATION?**

20 A. Yes. Related to AMI metering, Public Service is gaining the capability to obtain
21 data from meters many times a day – and will be able to provide this data to
22 customers on a daily basis (or more frequently) via the customer data web portal
23 or smartphone application. Not only will the AMI meters provide energy usage

1 data, they can also measure voltage, current, frequency, and power quality.
2 Additionally, these meters can detect outage events, restoration events,
3 tampering, energy theft events, and perform meter diagnostics. This is in contrast
4 to the current metering system that generally provides energy usage data once per
5 month for billing purposes.

6 In addition to the meter data, the advanced grid components FLISR and
7 IVVO will provide outage and voltage information that will be used for outage
8 response as well as for grid management and planning purposes.

9 To support the new data and processes, the Company will need to enhance
10 some software applications to accommodate new fields and increase the
11 applications' data storage capacity and processing.

12 **Q. TO WHAT EXTENT IS CYBERSECURITY INTEGRAL TO THE AGIS**
13 **INITIATIVE?**

14 A. Cybersecurity is a significant element of the AGIS initiative. First, devices in the
15 field must be protected. Consequently, unlike internal business technology, the
16 distribution components are out in the field and at customers' residences; devices
17 can only be hardened so much, and security must also rely on other controls.
18 Additionally, although even legacy distribution systems and meters are vulnerable
19 to physical tampering and disabling, adding a communications network enhances
20 the potential impact of a security compromise. In short, the endpoints and the
21 communications between them all require security protections.

1 **Q. WHAT IS BUSINESS SYSTEMS' ROLE WITH RESPECT TO CYBERSECURITY**
2 **FOR AGIS?**

3 A. It starts with identification and protection of all components of the intelligent grid,
4 both for the protection of customers and for the reliable and safe delivery of energy
5 to customers. Also included are detective controls at strategic locations to provide
6 early notification of suspicious behavior or anomalous activity. Further, the
7 Company plans, refines, and tests security controls and response processes to
8 react appropriately to threats to the intelligent grid. Security costs are therefore
9 included in the capital and O&M costs of each project.

10 **ii. Introduction to Business Systems' AGIS Costs**

11 **Q. WHAT TYPES OF IT CAPITAL COSTS IS BUSINESS SYSTEMS INCURRING**
12 **TO IMPLEMENT THE AGIS PROJECTS?**

13 A. Capital costs incurred by Business Systems include project implementation costs
14 related to software licensing, hardware (servers and network), and implementation
15 labor. Labor costs include requirement specification, design, application
16 configuration, screen display development, network security configuration, testing,
17 and implementation.

18 **Q. WHAT AGIS-RELATED IT CAPITAL COSTS ARE YOU SUPPORTING IN THIS**
19 **CASE?**

20 A. The Business Systems AGIS IT capital additions I am supporting in this rate case
21 are shown below in Table MOR-D-11. Capital additions through August 31, 2019
22 have been included in base rates through our 2019 Electric Phase I proceeding.

1
2
3
4

**TABLE MOR-D-11
 AGIS IT Capital Additions
 Public Service – Total Company**

AGIS Program (\$ in millions)	9/1/2019 through 12/31/2019 Actual	2020 Actual	2021 Forecast⁵	2022 Forecast	Total
ADMS	\$ 0.2	\$ 17.5	\$ 0.8	\$ 7.7	\$ 26.0
AMI	50.5	16.6	6.5	3.0	76.7
FAN	0.1	17.1	–	–	17.2
IVVO	3.5	–	–	–	3.5
FLISR	–	–	–	–	–
Other (including APT)	–	3.4	0.4	–	3.8
Total	\$ 54.3	\$ 54.5	\$ 7.8	\$ 10.7	\$ 127.3

Any differences between sum of individual category amounts and Total are due to rounding.

5 Total AGIS IT capital additions are also set forth in Attachments MOR-1 and MOR-
 6 2 to my Direct Testimony.

7 **Q. WHAT TYPES OF IT O&M COSTS ARE BUSINESS SYSTEMS INCURRING TO**
 8 **IMPLEMENT THE AGIS PROJECTS?**

9 A. The types of O&M costs Business Systems is incurring and expects to incur for
 10 AGIS include hardware support, data storage, annual software maintenance,
 11 external labor for software support, and application support, which includes
 12 ongoing testing, review of processes, application of security patches to respond to
 13 evolving threats. Internal labor is already accounted for in the Company's
 14 proposed revenue requirement and is not included in the 2022 AGIS-related O&M
 15 forecast.

⁵ Throughout the section of my testimony, the 2021 forecasts for both capital additions and O&M include actuals from January and forecasts for February through December.

1 **Q. WHAT ARE THE IT O&M COSTS INCURRED BY BUSINESS SYSTEMS FOR**
2 **AGIS IMPLEMENTATION THAT THE COMPANY SEEKS TO UTILIZE IN ITS**
3 **COST OF SERVICE IN THIS RATE CASE?**

4 A. Business Systems actual 2020, 2021 forecast (which includes actual costs through
5 January 2021), and forecasted 2022 AGIS O&M expenses are shown below in
6 Table MOR-D-12.⁶

7 **TABLE MOR-D-12**
8 **Business Systems AGIS O&M**
9 **Public Service Electric**

AGIS Program (\$ in millions)	2020 Actual	2021 Forecast	2022 Forecast
ADMS	\$ 2.6	\$ 3.1	\$ 4.0
AMI ⁷	3.4	7.4	6.6
FAN	1.6	0.8	1.2
IVVO	0.2	0.3	0.2
FLISR	–	0.1	0.3
Other (including APT)	0.9	0.6	0.6
Total	\$ 8.6	\$ 12.2	\$ 13.0

Any differences between sum of individual category amounts and Total are due to rounding.

10 Total AGIS IT O&M costs are also set forth in Attachment MOR-6 to my Direct
11 Testimony by cost element and in Attachment MOR-7 by FERC account.

12 **Q. ARE THE IT CAPITAL ADDITIONS AND O&M EXPENSES PRESENTED**
13 **ABOVE CONSISTENT WITH THE INFORMATION PROVIDED IN PUBLIC**
14 **SERVICE'S AGIS COMPLIANCE FILINGS IN PROCEEDING NO. 16A-0588E?**

⁶ Note the O&M costs presented in this testimony reflect both internal and external labor. The AGIS O&M adjustment for the 2022 FTY presented by Ms. Blair includes only incremental external labor. The internal AGIS labor is accounted for in the 2022 FTY along with all other internal Company labor.

⁷ The shared asset credit related to AMI head-end software is reflected in the Business Systems Shared Asset cost category, as noted in Table MOR-D-8 and discussed in Section V above.

1 A. Yes. The actual costs for 2019 and 2020 in the tables above are consistent with
2 the cost information filed by the Company its Annual Actuals Report in Proceeding
3 No. 16A-0588E, filed in May 2020 and May 2021, respectively.⁸ The Business
4 Systems forecast for 2021 is consistent with what was reported by Public Service
5 in the Grid CPCN 2021 Forecast Report filed in October 2020 in Proceeding No.
6 16A-0588E, but has been updated to reflect actuals through January 2021.

7 **Q. HOW IS THE COMPANY ADDRESSING COSTS BEYOND 2022 FOR AGIS,
8 RELEVANT TO THE DEFERRAL REQUEST YOU REFERENCED EARLIER?**

9 A. The Company is not proposing specific costs for recovery beyond 2022, but rather
10 a continuation of the deferral previously included in the AGIS CPCN Settlement
11 and approved by the Commission. The Company will continue to provide ongoing
12 reporting on the AGIS CPCN work through its annual filings, including available
13 cost data for years beyond 2022 as relevant. While my Direct Testimony does not
14 address the specific costs for deferral, I discuss the work that will continue beyond
15 the 2022 FTY. Mr. Berman provides the Company's request for deferral in his
16 Direct Testimony.

17 **Q. WHAT SORT OF GOVERNANCE IS IN PLACE TO ENSURE THE AGIS
18 PROJECTS ARE COST EFFECTIVE?**

19 A. Business Systems employs standard processes and procedures for selecting
20 technologies to be deployed in the Company's environment as well as the

⁸ The compliance reports submitted by the Company in Proceeding No. 16A-0588E relate only to the AGIS programs (of portions thereof) that were the subject of the CPCN and the AGIS CPCN Settlement in that proceeding. In addition, the compliance reports show expenditures, not capital additions. Accordingly, the cost information filed by the Company in its compliance reports in Proceeding No. 16A-0588E does not match Tables MOR-D-11 and MOR-D-12 above.

1 execution of large capital projects. These standard governance processes have
2 been, and will continue to be, utilized within the AGIS program. For product
3 selection, Business Systems uses thorough and methodical approaches when
4 undertaking to select programs and processes that the Company will implement,
5 such as undertaking competitive Request for Proposals (“RFP”) processes. As
6 applicable, the selection processes for the individual AGIS programs are described
7 individually in Sections B through F below.

8 **B. Advanced Distribution Management System**

9 **i. Overview of ADMS Integration**

10 **Q. WHAT IS THE ADMS?**

11 A. ADMS provides an integrated operating and decision software and hardware
12 support system to assist control room, field personnel, and engineers with the
13 monitoring, control, and optimization of the electric distribution system. It manages
14 the complex interaction of distributed energy resources (“DER”), outage events,
15 feeder switching operations, and advanced applications such as IVVO and FLISR.
16 ADMS gives access to real-time and near real-time data to provide all information
17 on an operator console(s) at the control center in an integrated manner, which
18 means the different operating systems and technologies will communicate with and
19 update each other in the ADMS platform.

20 **Q. WITH WHAT SYSTEMS IS ADMS INTEGRATED?**

21 A. ADMS is integrated with many systems and back-office applications to enable
22 more effective and efficient management of the distribution grid and enable the

1 capabilities to deliver benefits to the Company and its customers. Below is a list
2 of systems with which ADMS is integrated:

- 3 • *AMI*: ADMS integrates with AMI to improve load-flow calculation
4 accuracy and IVVO performance, and ADMS will benefit from improved
5 load profiles enabled by AMI interval data.
- 6 • *GE SmallWorld GIS*: Xcel Energy's GE SmallWorld GIS contains the
7 network model of Xcel Energy's distribution feeders. The GIS is part of
8 the ADMS project for AGIS implementation.
- 9 • *CRS*: Xcel Energy's CRS manages customer service and billing
10 processes. CRS provides customer information to the ADMS and is
11 used by Control Center personnel and ADMS applications.
- 12 • *DEMS SCADA*: ADMS integrates with the DEMS to facilitate grid
13 monitoring and control of substation devices.
- 14 • *Varentec Grid Edge Management System ("GEMS")*: The GEMS
15 software allows for management and control of the devices that enable
16 IVVO operation.
- 17 • *Aclara Sensor Management System ("SMS")*: The SMS software
18 provides control and reporting on sensors across the Company's
19 distribution to support FLISR operations.
- 20 • *Oracle NMS*: Oracle NMS is currently used to manage electric
21 distribution network outages and planned switching.
- 22 • *Weather Data Service*: Weather data is used to support load forecasting
23 and DER output modeling within the ADMS.
- 24 • *SailPoint*: SailPoint is Xcel Energy's Identity and Access Management
25 solution, which provides access review services and user provisioning.
- 26 • *SAP*: SAP is Xcel Energy's Enterprise Resource Planning system.
27 ADMS integrates with SAP to initiate work orders for equipment in
28 electric substations and on distribution feeders.

29 **Q. WHAT WORK DID BUSINESS SYSTEMS UNDERTAKE IN INTEGRATING THE**
30 **ADMS PROJECT?**

31 A. The specific functions of Business Systems related to ADMS include:

- 1 • The design of ADMS including software installation, configuration,
2 interfaces required with the ADMS and operational procedures impacted
3 by the system;
- 4 • Procurement and installation of all hardware components that run the
5 software, procurement of the ADMS software;
- 6 • Configuration of the software and hardware;
- 7 • Build and installation of any required interfaces;
- 8 • Design and integration of security into all aspects of the ADMS solution;
- 9 • Thorough unit, system, end-to-end and performance testing of the
10 ADMS solution;
- 11 • User Acceptance Testing with the Distribution business resources; and
- 12 • Establishment of a full ongoing support structure including process and
13 operational requirements.

14 **Q. WHAT WORK DID BUSINESS SYSTEMS UNDERTAKE WITH RESPECT TO**
15 **THE GIS PROJECT?**

16 A. Business Systems' role in the GIS aspects of AGIS was to partner with the
17 Distribution Business Area in the data collection effort, validate data accuracy, and
18 establish ongoing data collection/update processes. The costs associated with the
19 GIS data collection and validation are included in Distribution's costs. Software
20 integration, storage, and automated processes are included in Business Systems
21 integration costs. This cost allocation ensures that costs are appropriately applied
22 to either the creation of the data asset, with data itself being an asset associated

1 with the management of the distribution system, or to the implementation and
2 management of the supporting technology.

3 **Q. WAS BUSINESS SYSTEMS PRIMARILY RESPONSIBLE FOR DEVELOPING**
4 **THE FORECASTS FOR THE GIS WORK?**

5 A. No, Mr. Nickell provides the primary support for the forecasts for the GIS data work.
6 However, Business Systems partnered with Distribution to help develop this
7 forecast in some respects, including through the performance of a gap analysis
8 between what information is required by the ADMS and what is currently stored
9 and available in the Company's GIS data model; assessing the quality of data
10 currently held in the GIS and external sources; and determining if additional data
11 cleanup activities are required. As a result of this effort, a unit cost for each
12 required data element was derived by using the amount of assets in the GIS and
13 applying a data capture cost from each field inspection vendor. This information
14 was documented and managed via a formal RFP process. The GIS activities
15 undertaken by Distribution are discussed by Mr. Nickell.

16 **ii. ADMS Deployment Timeline**

17 **Q. PLEASE DESCRIBE THE WORK BUSINESS SYSTEMS HAS ALREADY**
18 **COMPLETED FOR ADMS IMPLEMENTATION.**

19 A. Business Systems completed the detailed design of ADMS in 2017. Business
20 Systems also conducted the installation, configuration, and initial testing of the
21 core components of the software solution and built the system interfaces.
22 Business Systems also engaged in data collection activities and formatted
23 substation and field data for system acceptance and testing, as well as built the

1 network model for substations and feeders to be used in system acceptance and
2 testing.

3 In 2018, Business Systems performed detailed unit, system, and end-to-
4 end testing of the ADMS solution as well as testing of all interfaces. Business
5 Systems continued data collection and formatting of all substation and field data
6 required for system acceptance and testing. Business Systems completed the
7 building of the network model and performed activities to prepare for ADMS to “go
8 live” and operational in 2019.

9 Business Systems’ first deployment of ADMS in the production environment
10 occurred in the second quarter of 2019. At that time, Business Systems deployed
11 the core ADMS applications, infrastructure, and relevant integrations (e.g., GIS,
12 CRS, Outage Management, Weather). In addition, Business Systems also
13 deployed an initial internal network model while Distribution deployed field devices
14 to begin realizing the benefit of IVVO functionality.

15 In the third quarter of 2019, Business Systems implemented the SAP
16 Integration with ADMS. At that time, Business Systems deployed the SAP
17 integration which provides the ability to send work notification requests initiated in
18 ADMS to SAP. In the fourth quarter of 2019, Business Systems deployed the
19 GEMS software to support IVVO, which is described later in the IVVO section.

20 In the fourth quarter of 2020, the Company completed a major deployment
21 of ADMS, activating the control center’s use of ADMS for management and control
22 of Public Service’s distribution system. Following the completion of this major

1 milestone in the fourth quarter of 2020, there are no additional major Business
2 Systems deliverables for initial implementation of ADMS for Public Service.

3 **iii. Business Systems' Capital Costs for ADMS**

4 **Q. WHAT ARE THE ADMS CAPITAL ADDITIONS FOR BUSINESS SYSTEMS**
5 **RELEVANT TO THIS RATE CASE?**

6 A. Table MOR-D-13 below provides Business Systems' capital additions for ADMS
7 and GIS for September 1, 2019 through the 2022 FTY.

8 **TABLE MOR-D-13**
9 **ADMS Business Systems – Capital Additions**
10 **(Total Company)**

AGIS Program (\$ in millions)	9/1/2019 through 12/31/2019 Actual	2020 Actual	2021 Forecast	2022 Forecast
ADMS	\$ 0.2	\$ 17.5	\$ 0.8	\$ 7.7

11 **Q. WAS BUSINESS SYSTEMS PRIMARILY RESPONSIBLE FOR DEVELOPING**
12 **THE CAPITAL FORECAST FOR ADMS?**

13 A. Yes, Business Systems is responsible for the hardware, software, and labor
14 associated with the design and build of the ADMS system and interfaces. Mr.
15 Nickell provides the primary discussion of Distribution's data collection efforts
16 associated with the GIS for use in the ADMS. I note that because ADMS was
17 developed as one software system that will be used by all of the Xcel Energy
18 operating companies, costs for ADMS are allocated to each operating company as
19 described by Company witness Ms. Laurie J. Wold.

1 **Q. WITH ADMS IMPLEMENTED FOR PUBLIC SERVICE IN 2020, WHAT IS**
2 **INCLUDED IN THE ADMS CAPITAL ADDITIONS IN 2021 AND 2022?**

3 A. After full implementation for Public Service in 2020, there were limited capital
4 additions in 2021. The forecasted \$7.7 million in capital additions in 2022 reflects
5 that ADMS is a system designed for all Xcel Energy's operating companies, and
6 includes revisions and upgrades allocated to Public Service as a result of ADMS
7 implementation in other jurisdictions. Each time ADMS is rolled out in another
8 jurisdiction, there are anticipated associated revisions and updates to the systems
9 that will benefit all customers.

10 **Q. WHAT ARE THE PRIMARY COMPONENTS OF BUSINESS SYSTEMS' ADMS**
11 **CAPITAL COSTS?**

12 A. There are three key components: (1) labor; (2) software; and (3) hardware.

13 **Q. PLEASE PROVIDE AN OVERVIEW OF THE PROCESS FOR DEVELOPING**
14 **THE BUSINESS SYSTEMS' ADMS CAPITAL BUDGET.**

15 The Company issued an RFP in 2015 to determine the most appropriate
16 distribution management system for the Company, selecting Schneider Electric for
17 the software as well as the systems integration work. After the ADMS vendor was
18 selected, a detailed project cost estimate was created from the pricing and contract
19 information as well as labor and hardware to support the overall ADMS project.
20 This effort was benchmarked and reviewed with other utilities and industry
21 research organizations such as EPRI. Upon completion of the detailed design, a

1 detailed implementation plan was developed and the ADMS project cost estimates
2 were updated.

3 **Q. HOW WAS THE LABOR PORTION OF THE ADMS COSTS DEVELOPED?**

4 A. The ADMS labor estimate was developed from a bottom-up forecast of all
5 resources required to complete the implementation phase. The estimates included
6 labor costs already incurred through the detail design phase along with estimates
7 to complete the implementation phase work. Labor components for the
8 implementation phase included external vendors (Schneider, General Electric and
9 Oracle), and contractors. Vendor cost estimates were based on contractual
10 agreements with each vendor. The contractor labor forecast was based on a roll-
11 up of all resources required, including estimated durations and rates for each.

12 **Q. HOW DID THE COMPANY DERIVE THE SOFTWARE PORTION OF BUSINESS
13 SYSTEMS' ADMS COSTS?**

14 A. The software portion of the ADMS costs consisted of a license agreement with the
15 ADMS vendor, Schneider, and various third-party (i.e., Microsoft, VMware,
16 InfoBlox and Leidos) infrastructure licenses. The Schneider license agreement
17 was a fixed cost and has been fully executed. The third-party software consists of
18 licenses for the operating systems, databases and security products to operate
19 and secure the ADMS system. The cost estimates were based on the number of
20 hardware environments, servers, and processors based on existing license
21 agreement costs with the third-party companies.

1 **Q. HOW DID THE COMPANY DERIVE THE HARDWARE PORTION OF BUSINESS**
2 **SYSTEMS' ADMS BUDGET?**

3 A. Detailed system processing requirements were gathered through the RFP process
4 as well as the contract process with the selected vendor for the ADMS system.
5 These detailed requirements were used by the project team and the Company's
6 infrastructure team, in conjunction with the ADMS vendor's technical experts, to
7 determine size, scale and costs for all aspects of the infrastructure needed to
8 adequately, securely and reliably operate the ADMS system for the Company. The
9 types of hardware required include processors, data storage, security
10 hardware/software, network devices such as firewalls and core switches, as well
11 as critical data center infrastructure including power, cooling and cabling.

12 **Q. DOES THE BUSINESS SYSTEMS' ADMS PROJECT FORECAST INCLUDE A**
13 **CONTINGENCY?**

14 A. No. The Company completed the final stages of implementing ADMS in 2020, and
15 forecasted capital expenditures for 2022 do not include any contingency.

16 **iv. Business Systems' O&M Costs for ADMS**

17 **Q. WHAT ARE THE ADMS O&M COSTS FOR BUSINESS SYSTEMS RELEVANT**
18 **TO THIS RATE CASE?**

19 A. Table MOR-D-14 below provides Business Systems' O&M expense for ADMS and
20 GIS for 2020 through the 2022 FTY.

TABLE MOR-D-14
ADMS Business Systems – O&M Expense
(Public Service Electric)

AGIS Program <i>(\$ in millions)</i>	2020 Actual	2021 Forecast	2022 Forecast
ADMS	\$ 2.6	\$ 3.1	\$ 4.0

Q. WHAT ARE THE PRIMARY COMPONENTS OF BUSINESS SYSTEMS' ADMS O&M COSTS?

A. The primary components of Business Systems' ADMS O&M costs include: (1) planning phase activities; and (2) support activities that will occur after ADMS is implemented, including contract labor, ongoing hardware and software maintenance and warranty.

Q. HOW DID BUSINESS SYSTEMS DERIVE THE ADMS O&M BUDGET?

A. The largest component of the ADMS O&M budget is support. The Company developed a support model to fulfill the new requirements of the ADMS operation. The Company analyzed specific needs for support of the ADMS components (e.g., application, infrastructure, network, integrations) to develop the initial support model. The Company then validated and refined based on comparisons to similar internal integrated operating and decision support systems. Finally, the Company validated and refined against industry benchmarks which were obtained from peer utilities.

1 **Q. WHY ARE BUSINESS SYSTEMS' ADMS COSTS REASONABLE FOR**
2 **CUSTOMERS TO SUPPORT?**

3 A. ADMS is the fundamental platform that manages each of the other AGIS programs.
4 ADMS will provide an integrated operating and decision software and hardware
5 support system to assist control room personnel, field personnel, and engineers
6 with the monitoring, control and optimization of the electric distribution system. For
7 ADMS to operate as intended, this software had to be integrated with a number of
8 existing systems as well as AMI. These integration costs are reasonable and
9 necessary expenses to enable the ADMS capabilities, which in turn provide the
10 customer benefits. Further, the Company underwent an extensive RFP process
11 to select an ADMS vendor. Finally, the initial budget for ADMS was developed
12 using information collected from other utilities, industry experts, consultants, and a
13 rigorous sourcing process.

14 **C. Advanced Metering Infrastructure**

15 **i. Overview of AMI IT Integration**

16 **Q. WHY DOES AMI REQUIRE IT INTEGRATION?**

17 A. AMI is a system of advanced meters, communications networks, and data
18 management systems that enable two-way communication between utilities'
19 business and operational data systems and meters enabling added benefits for
20 customers and the utilities. AMI meters are able to alert on specific operating
21 events, measure and transmit voltage, current, and power quality data and can act
22 as a "meter as a sensor," and for instance can provide near real-time monitoring
23 between the meter and ADMS. The AMI system must be integrated to other

1 enterprise systems of record to enable end-to-end business transactional
2 processing, and keep information timely, accurate and consistent in support of
3 those business processes. Since AMI consists of both software and hardware and
4 works with other Company systems, information technology integration is key to
5 the success of AMI.

6 **Q. WHAT APPLICATIONS ARE INTEGRATED WITH AMI?**

7 A. The following applications have been, or will be integrated so they can use AMI
8 data:

- 9 • *ADMS*: ADMS uses the AMI data to deliver automated grid capabilities,
10 such as IVVO and FLISR.
- 11 • *CRS*: The application AMI data to provides capabilities for customer
12 service, billing, service orders, and payments.
- 13 • *Meter Asset Lifecycle Management System*: Integration with AMI will
14 allow the Meter Asset Lifecycle Management System to remain as the
15 Company's primary source of location information and attributes for
16 metering devices.
- 17 • *Meter Data Lake*: This system is the repository and data distribution
18 point for all meter reading and event information from the AMI headend,
19 and MDM. The data lake also provides reporting and analytics against
20 this high volume, time-series data to support the AMI program.
- 21 • *Meter Data Management ("MDM")*: This system provides capabilities to
22 validate, edit, and estimate meter readings.
- 23 • *NMS*: The AMI meter events and functionality can be utilized to better
24 identify and manage service outages and restoration activity and
25 customer outage communications
- 26 • *Customer portal*: The customer portal (currently "My Account" on the
27 Xcel Energy website) is used by customers to obtain account
28 information, track energy usage, view billing history, pay bills, and sign
29 up for notifications. AMI data will be integrated with other customer
30 information at the customer portal, and customers will have the ability to
31 see more granular meter reading data than is currently available.

- 1 • *HAN*: A HAN is a customer's electronic data network of devices within
2 their premise. The AMI meters will be capable of providing data that will
3 be available to a customer's HAN. Mr. Nickell introduces the HAN
4 capabilities of the meter. While Business Systems is responsible for the
5 integration necessary to enable basic HAN functionality, Mr. Romine
6 discusses the Company's plans to implement HAN offerings and
7 programs for customers.⁹
- 8 • *Green Button Connect My Data ("GB CMD")*: The Company is
9 implementing a GB CMD system that will allow customers to download
10 or view information related to their energy usage and communicate that
11 information to third parties through the GB CMD communication portal.
12 While Business Systems is responsible for the integration necessary to
13 enable GB CMD functionality, Mr. Romine discusses the Company's
14 plans with respect to GB CMD offerings.
- 15 • *FAN*: The AMI meter's two-way communication module is a component
16 of the mesh network layer of the FAN, which is the component of the
17 FAN included in the CPCN Projects. The FAN is discussed in more
18 detail below in Section D.

19 **Q. CAN YOU PROVIDE ADDITIONAL INFORMATION REGARDING THE**
20 **SPECIFIC FUNCTIONS BUSINESS SYSTEMS PROVIDES FOR AMI?**

21 A. Yes. To support AGIS implementation and integration of AMI projects with other
22 Company systems, Business Systems is charged with:

- 23 1. Managing/Coordinating the delivery of incremental technology services
24 releases;
- 25 2. Blueprinting the technology requirements for all technology delivered in
26 the AMI project to support the customer and business objectives;
- 27 3. Leading the design of the overall system and components mentioned
28 above;
- 29 4. Procurement and installation of all hardware components that will run
30 the software;

⁹ As discussed at the beginning of Section VI, HAN implementation will be consistent with any forthcoming Commission decision(s) in Proceeding No. 21A-0279E, and the Company will make any corresponding adjustments to the revenue requirements in this case as necessary.

- 1 5. Procurement or construction of the software;
 - 2 6. Configuration of the software and hardware;
 - 3 7. Designing, procuring and installation of the necessary hardware and
4 software referred to as the “head-end” application that reads the meters
5 and other field devices in the AMI solution and monitors and manages
6 the network and attached devices. The head-end application will also
7 be used by the other Xcel Energy operating companies when they
8 deploy AMI meters subject to any necessary regulatory approvals;¹⁰
 - 9 8. Building and installation of any required interfaces throughout all
10 applications involved in the AMI solution including ADMS, CRS, Meter
11 Asset Lifecycle Management System, Meter Data Lake, MDM, NMS,
12 Portals/Mobile Applications, and HAN;
 - 13 9. Designing and integration of security into all aspects of the AMI solution;
 - 14 10. Thorough unit, system, regression, and end-to-end testing of the AMI
15 solution;
 - 16 11. User Acceptance Testing with Distribution, Customer Care and
17 Customer Solutions business resources;
 - 18 12. Deployment of technology releases for the AMI project in coordination
19 with other enterprise technology services; and
 - 20 13. Establishment of a full ongoing support structure including process and
21 operational requirements.
- 22 Most importantly, Business Systems is implementing new AMI head-end
23 software. The AMI head-end software has been installed and configured to run on
24 new server hardware. From the AMI head-end, interfaces have been built, and
25 continue to be built, to transfer the data to other Company applications and
26 systems.

¹⁰ Full AMI meter deployment is scheduled to commence in 2021 and continue through 2024 for Northern States Power Company, a Minnesota corporation.

1 **Q. HAS THE COMPANY UPDATED ANY OF ITS PLANS FOR THESE AMI-**
2 **RELATED SYSTEMS SINCE THE CPCN WAS APPROVED?**

3 A. Yes, in addition to normal planning and refinements as the Company has moved
4 through RFP and system design processes, the Company has identified three
5 updates: First, Xcel Energy has identified the need to replace its MDM, as the
6 existing system has reached the end of its life and will not support enterprise-wide
7 AMI as initially expected. Second, as Mr. Nickell discusses, the Company has re-
8 aligned its meter deployment schedule in light of the need to identify a new meter
9 vendor able to provide emerging meter capabilities. Third, emerging technologies
10 in relation to the HAN have prompted Public Service to revise its plans to better
11 serve customers. While Mr. Nickell discusses the meter deployment schedule, I
12 discuss the Business Systems implications and MDM changes in my Direct
13 Testimony. Mr. Romine discusses details related to HAN in his Direct Testimony.¹¹

14 **Q. PLEASE EXPLAIN WHY THE COMPANY NEEDED TO UPDATE THE MDM**
15 **SYSTEM TO ACCOMMODATE AMI?**

16 A. AMI will significantly increase the number of meters and amount of data loaded to
17 the MDM, and Public Service will need to upgrade the currently deployed software
18 solutions for managing the meter inventory and configurations. This MDM system
19 update was anticipated as part of the implementation of AMI. However, in 2019
20 Xcel Energy completed an evaluation of the current MDM system application and
21 infrastructure and determined that an entirely new software solution is needed to

¹¹ See Footnote 8.

1 fulfill the requirements for AMI. The current MDM system application is
2 approaching end of life and does not have the capacity and security elements
3 required to support AMI, including the performance and technical capabilities
4 needed for the enterprise-wide deployment of AMI meters. A new MDM solution
5 will be utilized enterprise-wide across Xcel Energy operating companies. The
6 Company recently implemented the new MDM and integrations to process the
7 initial deployment of 13,000 AMI meters, and is finalizing the full scope of MDM
8 work and total costs, as well as determining the operating company allocations.
9 Ultimately, the MDM solution will support the security, functionality, scalability, and
10 performance requirements of AMI meter data management.

11 **ii. AMI Deployment Timeline**

12 **Q. CAN YOU PROVIDE AN OVERVIEW OF THE TIMELINE TO IMPLEMENT AND**
13 **INTEGRATE AMI WITH THE COMPANY'S EXISTING SYSTEMS?**

14 A. The Company plans to deploy approximately 1.6 million AMI meters in Colorado
15 from 2021 to 2024. The deployment of the IT components of the AMI project
16 through the 2022 FTY are set forth in specific Releases as shown in Table MOR-
17 D-15. Each of these Releases will provide the necessary functionality to the AMI
18 meters.

1

**TABLE MOR-D-15
 Forecasted AMI Project Milestones¹²**

YEAR	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2019 Complete	AMI Head-end Deployment in production without interfaces	AMI Head-end Deployment in production with interfaces	AMI Release 1: Software in production. Test of sample meters prior to installation of 13,000 meters in the field to support IVVO	Completed deployment of 13,000 meters to support IVVO
2020 Complete				AMI Release 2: Interfaces code in production
2021	AMI Release 3: Functions deployed to support mass AMI deployment		Begin deployment of 395,000 AMI meters	Complete deployment of 395,000 AMI meters AMI Release 3: Interfaces code in production
2022	Begin deployment of 534,000 AMI meters	AMI Release 4: Functions deployed to support additional AMI operations and reporting		Complete deployment of 534,000 AMI meters AMI Release 4: interfaces in production

2 As new system releases are brought on-line, the overall level of functionality
 3 of the system increases, including customer applications. The functionality
 4 associated with each Release is shown in Table MOR-D-16 below.

¹² See, e.g., AGIS CPCN Settlement at 15. See also the request for an amendment to the AGIS CPCN in Proceeding No. 21A-0279E addressing the updated meter deployment schedule.

1

**TABLE MOR-D-16
 Release Functionality by Year**

2019¹³ (Release 1)	2020¹⁴ (Release 2)	2021 (Release 3)	2022 (Release 4)
Head-end live with interfaces	MDM – Installation and Integration	395,000 AMI meters installed	534,000 AMI meters installed
13,000 meters installed to support IVVO	Reporting	My Account/Mobile – customer access to usage information	Analytics – non-theft use cases
Billing of 13,000 meters	Meter Installation Vendor (MIV) Integration	Analytics – additional use case	Non-critical reporting – data warehouse
Event processing		Remote connect/disconnect	My Account/Mobile – customer on-demand
Over The Air (“OTA”) meter - basic configuration		Expanded events processing capability	Outage event integration
		<i>HAN¹⁵</i>	
		<i>Green Button Connect My Data</i>	
		<i>Real-time Customer Care data access</i>	
		<i>Expanded over the air programming and configuration use cases</i>	
		<i>Interval Billing</i>	

2 I walk through each of these Releases in more detail below.

3 **Q. HOW DOES THIS TIMELINE COMPARE TO THE TIMELINES SET FORTH IN**
 4 **THE AGIS CPCN SETTLEMENT?**

5 A. As noted above and described by Mr. Nickell, the Company has re-aligned its AMI
 6 meter deployment schedule. The Business Systems’ technology delivery was
 7 therefore re-sequenced to support, and align to, the new Company meter
 8 deployment schedule. This included support for the 13,000 IVVO bellwether

¹³ Projects completed at the end of 2019.

¹⁴ Projects completed at the end of 2020.

¹⁵ See Footnote 8.

1 meters deployed in 2019 and support for the full AMI meter deployment that will
2 commence in 2021. The re-sequence focused on Business Systems' work in three
3 categories: 1) functions required in advance of full AMI meter deployment, 2)
4 functions required at the time full AMI meter deployment begins, and 3) functions
5 that can be delivered during full AMI meter deployment.

6 **Q. WHAT BUSINESS SYSTEMS WORK HAS BEEN COMPLETED SINCE THE**
7 **COMPANY'S 2019 ELECTRIC PHASE I RATE CASE?**

8 A. The largest facet of Business Systems' work completed in 2019 for the AGIS
9 initiative was completion of the deployment of the AMI head-end software, which
10 has been installed and configured to run on new server hardware. From the AMI
11 head-end, interfaces have been built to transfer the data to other applications, such
12 as the billing and customer service system. This integration work allows the
13 Company's existing infrastructure to "speak with" the new infrastructure being
14 implemented pursuant to the AGIS initiative.

15 In 2019, Business Systems completed work on the integration, testing, and
16 deployment for the AMI head-end software to support reading, monitoring, and
17 controlling the AMI meters. All required initial interfaces for communications and
18 billing support have been validated to be able to enter the Meter Validation Test
19 Phase of the initial 30 test meters. The successful 2019 deployments for Release
20 1 also provided the baseline functionality required for all releases and software
21 solution capabilities in 2020 and 2021. There has been a series of subsequent
22 software releases during 2020 and 2021. These align to deliver the functionality
23 listed in Table MOR-D-16 above.

1 **Q. WHAT OTHER WORK WAS COMPLETED BY BUSINESS SYSTEMS IN 2019**
2 **TO SUPPORT AMI?**

3 A. Business Systems completed the work and implemented the functionalities
4 described below in 2019. The bullet points below further itemize how the 2019
5 accomplishments tie into future milestones (see Release descriptions from Table
6 MOR-D-16 above):

- 7
- 8 • Meter Data Management (MDM) - (Release 2): The selection of the
9 MDM was completed in the fourth quarter of 2019. The selection
10 process involved numerous architectural options, before coming to the
11 most logical and cost-efficient conclusion for the AGIS initiative and the
12 Company's customers.
 - 13 • Interval Billing functionality - (Release 3): Release 3 will be the first
14 Release to feature Interval Billing capability. Up to this point, billing has
15 been performed with Register Billing capability. Interval Billing provides
16 more flexibility and control for the customer billing options. This
17 capability was originally scheduled to be delivered during 2020 at the
18 same time the mass meter deployment commenced. Since the mass
19 meter deployment start has been adjusted to 2021, the capability will be
20 delivered in 2021. Beginning with AMI meters deployed in 2021, the
21 AMI meters will be programmed to record the time blocks proposed in
22 the Residential Energy Time-of-Use ("RE-TOU") proceeding
23 (Proceeding No. 19AL-0687E) for which the Company entered into a
24 Settlement Agreement with all parties on June 11, 2020. AMI meters
25 will be programmed with the new RE-TOU rates.
 - 26 • Meter Installation Vendor (MIV) Integration - (Release 2): Contract
27 negotiations for the mass deployment MIV for the Company were
28 completed in the third quarter of 2019. Integration of Company and MIV
29 systems will allow the MIV to receive installation orders from the
30 Company, complete the orders using their field tools, and send the
31 results of the order to the Company.
 - 32 • Reporting: Reporting is an ongoing requirement throughout all the
33 Releases. A select subset of reports based on business requirements
34 will be identified and delivered in each Release.
 - 35 • OTA - (Release 3): Meter programming, updates to network equipment,
and firmware updates to field device capability will be delivered in 2021.

1 OTA meter capability currently uses a manual process to update meters.
2 Beginning in 2021, the OTA meter programming will be updated to
3 automated functionality. This capability was originally scheduled to be
4 delivered during 2020 at the same time the mass meter deployment
5 commenced. Since the mass meter deployment start has been adjusted
6 to 2021, the capability will be delivered in 2021.

7 • Customer Care - (Release 3): Real-time data access for the Company's
8 customers and employees will be delivered in 2021. Currently,
9 customers with interval data meters can access their data up through
10 midnight the previous day through My Account. In the Fall of 2021,
11 customers will be able to access near real-time data through My
12 Account. This capability was originally scheduled to be delivered during
13 2020 at the same time the mass meter deployment commenced. Since
14 the mass meter deployment start has been adjusted to 2021, the
15 capability will be delivered in 2021.

16 • My Account - (Release 3): The capability to deliver meter usage
17 information to our customers, in accordance with Section III, H of the
18 AGIS CPCN Settlement, will be delivered in 2021. This capability was
19 originally scheduled to be delivered during 2020 at the same time the
20 mass meter deployment commenced. Since the mass meter
21 deployment start has been adjusted to 2021, the capability will be
22 delivered in 2021 as customers receive their AMI meter.

23 • HAN – (Release 3): The capability to deliver HAN functionality to our
24 customers, in accordance with Section III.G of the AGIS Settlement
25 Agreement, was resequenced to be delivered in 2021. This capability
26 was originally scheduled to be delivered during 2020 at the same time
27 the mass meter deployment commenced. Because the mass meter
28 deployment start has been adjusted to 2021, the HAN capability had
29 been resequenced for delivery in 2021.¹⁶

30 **Q. WHAT WORK WAS COMPLETED BY BUSINESS SYSTEMS IN 2020 TO**
31 **SUPPORT AMI?**

32 A. In 2020, Business Systems implemented AMI meter data management, reporting,
33 and meter installation vendor (“MIV”) integrations as part of Release 2 of
34 technology services: The new meter data management system was constructed

¹⁶ See Footnote 8.

1 and integrated into the Company's customer, meter, and billing processes utilized
2 for energy services for the new AMI meters. Integration of Company and MIV
3 systems allow the MIV to receive installation orders from the Company, complete
4 the orders using their field tools, and send the results of the order to the Company.
5 The integrations of the new meter data management system and meter installation
6 vendor with other supporting enterprise systems are essential to keep information
7 timely, accurate, and consistent in support of business processes. Beyond these
8 major components of Release 2, there were numerous reports delivered that will
9 allow Company to track and manage logistics supporting the AMI meter
10 deployment.

11 **Q. GOING FORWARD, WHAT WORK WILL BUSINESS SYSTEMS UNDERTAKE**
12 **THROUGH THE 2022 FTY?**

13 A. Business Systems will work with Distribution and other Business Areas to deliver
14 the technology services to support the remaining AMI functions that are noted
15 within the Release descriptions from Table MOR-D-16 above. These additional
16 AMI functions are:

- 17 • Analytics – Additional Use Case - (Release 3): While complete
18 requirements are yet to be defined, some data utilized within this use
19 case are correlation and comparisons of specific event types, energy
20 usage levels and patterns, data abnormalities, and expected meter
21 communications.
- 22 • Remote Connect/Disconnect - (Release 3): While complete
23 requirements are yet to be defined, the AMI technology will be integrated
24 into Public Service processes to enable timelier connection or
25 disconnection of service at the customer's convenience. As noted
26 above, Public Service is not requesting any change to its current
27 connection and disconnection processes as part of this proceeding.

- 1 • Expanded Event Processing - (Release 3): While complete
2 requirements are yet to be defined, the general area of delivery will be
3 integrating and automating required actions based on the receipt of
4 certain types of meter events. There are hundreds of event types that
5 AMI meters can generate, many of which require analysis and action in
6 business processes. Example broad categories of events include
7 import/export, metrology, configuration, status, communication, and
8 health.
- 9 • HAN - (Release 3): The current AMI meter communication protocol
10 allows HAN devices that are Institute of Electrical and Electronics
11 Engineers (“IEEE”) 2030.5 compliant (which includes Smart Energy
12 Profile 2.0) to connect to the meter and the Company is in the process
13 of reviewing other options with Itron for connecting HAN devices to the
14 AMI meters. For devices that are compliant with the meter
15 communication protocol, there is a two-step process that will involve
16 customers submitting an activation request for their HAN devices and
17 the Company processing that request and activating the NIC within the
18 AMI meter to communicate with the customer’s HAN device.¹⁷
- 19 • Green Button Connect My Data (Release 3): The Company’s customer
20 web portal will include the ability for all customers to access their energy
21 usage data and provide that data to third parties.
- 22 • Analytics – non-theft use cases - (Release 4): While complete
23 requirements are yet to be defined, these use cases are intended to
24 support AMI and grid operations. As such, this analysis will be guided
25 to improve power quality, improve customer satisfaction, reduce meter
26 reading costs, support field meter services, and support distribution
27 systems management.
- 28 • Non-critical reporting – data warehouse - (Release 4): Reporting is an
29 ongoing requirement to be identified and delivered in each Release. For
30 example, Public Service will be able to deliver reports that summarize
31 data from the AMI infrastructure to monitor and improve operations,
32 trending, reliability, and efficiency.

33 **iii. Business Systems’ Capital Costs for AMI**

34 **Q. WHAT ARE THE AMI CAPITAL ADDITIONS FOR BUSINESS SYSTEMS**
35 **RELEVANT TO THIS RATE CASE?**

¹⁷ See Footnote 8.

1 A. Table MOR-D-17 below provides Business Systems' capital additions for AMI for
2 September 1, 2019 through the 2022 FTY.

3 **TABLE MOR-D-17**
4 **AMI Business Systems – Capital Additions**
5 **(Total Company)**

AGIS Program (\$ in millions)	9/1/2019 through 12/31/2019 Actual	2020 Actual	2021 Forecast	2022 Forecast
AMI	50.5	16.6	6.5	3.0

6 **Q. WAS BUSINESS SYSTEMS PRIMARILY RESPONSIBLE FOR DEVELOPING**
7 **THE FORECAST FOR AMI?**

8 A. Yes, in part. Business Systems is responsible for developing the forecasts for the
9 AMI head-end application and integration. Therefore, I describe the forecast
10 development process for these aspects in more detail in my Direct Testimony. Mr.
11 Nickell addresses the forecast for the meters themselves.

12 **Q. WHAT ARE THE PRIMARY COMPONENTS OF THE AMI CAPITAL COSTS**
13 **FOR BUSINESS SYSTEMS?**

14 A. Business Systems' AMI capital costs three key components: (1) hardware, (2)
15 software, and (3) labor.

16 **Q. WHAT HARDWARE IS NEEDED FOR BUSINESS SYSTEMS TO IMPLEMENT**
17 **AMI?**

18 A. The additional hardware necessary for AMI implementation consists of computing
19 components used for data processing and storage to support AMI services across
20 all environments that are used in the software lifecycle of a particular service.
21 Examples of environments that may be applicable to a service are production,

1 disaster recovery, development, testing, and quality assurance. The functions that
2 were analyzed within the hardware cost estimates are to support outage event
3 processing, security, the head-end application, meter data management software,
4 Customer Care support, reporting, database and operational storage, middleware,
5 and field deployment. In other words, due to the increased volume of data from
6 the AMI meters and processes necessary to use that data in a meaningful way for
7 our customers and the Company, additional servers with computing and storage
8 capabilities will be needed.

9 **Q. HOW DID BUSINESS SYSTEMS DERIVE THE HARDWARE PORTION OF THE**
10 **AMI IT FORECAST?**

11 A. Xcel Energy has standards for all hardware that is deployed in our data centers.
12 These standards define hardware for which the Company has industry
13 benchmarked, negotiated pricing. The cost estimates were then derived utilizing
14 the hardware requirements of the applications(s) and applying standard pricing.

15 **Q. HOW DID BUSINESS SYSTEMS DEVELOP THE SOFTWARE PORTION OF**
16 **THE AMI IT FORECAST?**

17 A. The initial estimates were derived utilizing pricing gained from industry
18 benchmarks and reviewed with other utilities and industry research organizations
19 such as Electric Power Research Institute (“EPRI”). These benchmarks drove the
20 negotiations with the software vendors selected through RFP processes from
21 which final cost estimates were created. The software portion of the AMI head-
22 end forecast includes a detailed list of software components provided and offered
23 from the vendor. The RFP process identified these specific software components

1 and included those that are required (mandatory) and those that are optional.

2 These estimates are reviewed and refined throughout the lifecycle of the project.

3 The RFP processes resulted in selection of the following software vendors:

- 4 • AMI head-end software (Itron);¹⁸
- 5 • Wireless Smart Utility Network (“WiSUN”) mesh solution (Itron);
- 6 • Overall testing of the AGIS program (Accenture); and
- 7 • MDM software (Itron’s MDM product: Itron Enterprise Edition).¹⁹

8 **Q. HOW DID THE COMPANY DERIVE THE LABOR PORTION OF THE AMI IT**
9 **FORECAST?**

10 A. It is expected that the selected vendors will provide the majority of the labor
11 required to deliver the AMI project. The initial estimates were derived utilizing
12 pricing gained from industry benchmarks and reviewed with other utilities and
13 industry research organizations such as EPRI. These benchmarks drove the
14 negotiations with the selected vendor(s) and final estimates were created.

15 **Q. ARE THERE CURRENT BUSINESS SYSTEMS CONTINGENCIES FOR AMI?**

16 A. Business Systems’ capital forecast for AMI does not include any contingency
17 amounts through the 2022 FTY; however, beyond 2022, there are certain
18 contingency amounts include in the AMI budget.

¹⁸ For both the AMI head-end software and WiSUN mesh solution, the RFP process resulted in the selection of Silver Spring Networks, which was subsequently acquired by Itron, Inc. in 2018.

¹⁹ The MDM software vendor was selected as a result of an RFI process.

1 **iv. Business Systems' O&M Costs for AMI**

2 **Q. WHAT ARE THE AMI O&M COSTS FOR BUSINESS SYSTEMS RELEVANT TO**
3 **THIS RATE CASE?**

4 A. Table MOR-D-18 below provides Business Systems' O&M expense for AMI for
5 2020 through the 2022 FTY. As shown, as additional AMI meters are deployed
6 starting in 2021, there is a corresponding increase in the associated Business
7 Systems' O&M expenses related to supporting these additional meters. For
8 instance, additional AMI meters require additional software licenses to operate
9 associated software.

10 **TABLE MOR-D-18**
11 **AMI Business Systems – O&M Expense**
12 **(Public Service Electric)**

AGIS Program (\$ in millions)	2020 Actual	2021 Forecast	2022 Forecast
AMI	3.4	7.4	6.6

13 **Q. WHAT ARE THE PRIMARY COMPONENTS OF BUSINESS SYSTEMS' AMI**
14 **O&M FORECAST?**

15 A. The primary components of Business Systems AMI O&M costs include: (1)
16 planning phase activities, including scope definition and solution selection (for
17 example, the AMI RFP and vendor selection); and (2) support activities that will
18 occur after AMI is implemented, including contractor labor, maintenance, and
19 warranty. In other words, these cost forecasts encompass the incremental work
20 related to hardware and software maintenance, licensing, and the other work
21 described above to support the increased data storage and processing related to
22 AMI implementation.

1 **Q. HOW DID BUSINESS SYSTEMS DEVELOP ITS O&M FORECAST FOR AMI?**

2 A. The AMI O&M forecast was developed based on industry benchmarking
3 information as well as the Company's previous experience with similar system
4 implementations and support models.

5 **Q. IN SUMMARY, WHY ARE BUSINESS SYSTEMS' AMI COSTS REASONABLE**
6 **FOR CUSTOMERS TO SUPPORT?**

7 A. AMI is a foundational component of AGIS. As discussed above, AGIS is a long-
8 term strategic initiative to transform our electrical distribution system to enhance
9 security, efficiency, and reliability, to safely integrate more DERs, including those
10 that are customer owned, and to enable improved customer products and services.
11 The IT components described above are necessary to implement AMI and the AMI
12 IT forecast is reasonable in enabling technologies that improve customer products
13 and services.

14 **D. The Field Area Network**

15 **i. Overview of FAN IT Integration**

16 **Q. WHAT IS THE FAN?**

17 A. The FAN will be a resilient wireless communications network that will provide
18 connectivity and enable two-way communications between the existing
19 infrastructure and new and planned field devices up-to and including the customer
20 meter.

21 **Q. WHY DOES THE FAN REQUIRE IT INTEGRATION?**

22 A. The FAN is the communications network that will enable communications between
23 the communications infrastructure that already exists at the Company, the ADMS

1 and AMI software systems, the new AMI meters and the new intelligent field
2 devices associated with advanced applications, including IVVO and FLISR. The
3 FAN will provide benefits to all AGIS projects, but is designed and built according
4 to the needs of various specific components, and each has different
5 communication network requirements.

6 **Q. HOW WILL THE FAN CONNECT TO THE COMPANY'S EXISTING**
7 **INFRASTRUCTURE?**

8 A. The FAN will be connected to Public Service's pre-existing WAN. Public Service's
9 WAN is a communications network primarily composed of private optical ground
10 wire fiber and a collection of routers, switches, and private microwave
11 communications that are supplemented by leased circuits from a variety of carriers
12 as well as satellite backup facilities. The WAN provides high-speed, two-way
13 communications capabilities and connectivity in a secure and reliable manner
14 between Public Service's data centers, offices locations, service centers,
15 generating stations, and substations.

16 The data centers are the locations that house the Company's servers and
17 data storage. The data centers will also house the advanced applications
18 associated with AGIS (such as ADMS and AMI, and the sub-applications, including
19 IVVO, FLISR, FLP, and GIS).

20 The WAN also provides primary and backup communication capabilities to
21 key facilities in Public Service's areas of operation. The WAN is monitored at all
22 times by the Network Operations Center ("NOC").

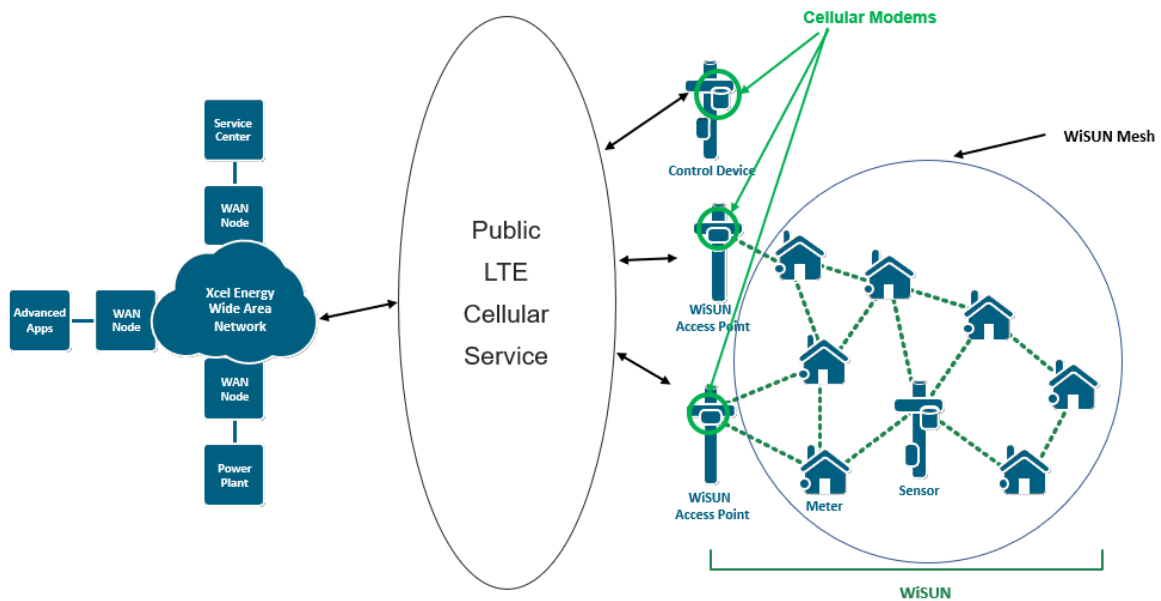
1 **Q. WHAT ARE THE COMPONENTS OF THE FAN?**

2 A. The FAN will consist of two separate wireless technologies: (a) a lower-speed
3 WiSUN mesh network, and (b) a high-speed wireless network to connect the
4 WiSUN mesh network to the WAN. Initially, including in the CPCN and subsequent
5 reports, the Company proposed to accomplish the high-speed wireless network by
6 the deployment of the Worldwide Interoperability for Microwave Access (“WiMAX”)
7 network. Later in my Direct Testimony, I explain how FCC rule changes effective
8 in 2020 necessitated a change in network technology.

9 **Q. CAN YOU PROVIDE A REVIEW THE INFRASTRUCTURE AND DEVICES THAT**
10 **WILL BE INTEGRATED WITH THE WISUN MESH PORTION OF THE FAN?**

11 A. Yes. The core infrastructure for the WiSUN mesh network will consist of two main
12 device types: (1) access points, linking the Company’s endpoint devices that are
13 enabled with wireless communication modules with the rest of the Company’s
14 communications network; and (2) repeaters, extending range to fill in coverage
15 gaps where devices would be otherwise unable to communicate. Other devices
16 that will participate in the mesh include AMI meters and intelligent field devices
17 such as FLISR and IVVO field devices, that have built-in mesh radios. The mesh
18 network allows multiple devices to connect with each other, which provides
19 multiple potential communication routes ensuring a robust communications
20 network. Figure MOR-D-1 below illustrates the integration of the WiSUN mesh
21 network with the infrastructure and devices described above.

FIGURE MOR-D-1: WiSUN Mesh Network Infrastructure Integration



1 **Q. WHAT APPLICATIONS WILL BE INTEGRATED WITH THE FAN?**

2 A. For the FAN to function as described above, both AMI and ADMS will require IT
3 integration with the FAN.

4 **Q. WHAT WORK IS BUSINESS SYSTEMS UNDERTAKING TO IMPLEMENT THE**
5 **FAN PROJECT?**

6 A. The specific functions Business Systems provides for FAN implementation
7 include:

8 1. Leading the design of the network systems;

9 2. Configuration of the software and hardware;

10 3. Designing and integrating security into all aspects of the FAN solution;

11 4. Thorough unit, system and end-to-end testing of the FAN solution;

12 5. User Acceptance Testing with the Distribution, Customer Care and
13 Customer Solutions business resources; and

14 6. Establishment of a full ongoing support structure including process and
15 operational requirements.

1 **ii. FAN Deployment Timeline**

2 **Q. CAN YOU PROVIDE AN OVERVIEW OF HOW THE WISUN WILL BE**
 3 **IMPLEMENTED AND INTEGRATED?**

4 A. Yes. The WiSUN network implementation includes the planning and studies to
 5 ensure the devices are located at specific locations (usually distribution poles) to
 6 ensure network reliability and optimum operation of the network when fully
 7 deployed. The devices are then installed at specified locations in the planning and
 8 design by field crews. Once devices are installed, they are tested and recognized
 9 by the NOC to ensure they are operating as expected.

10 Implementation of WiSUN is expected to be completed in 2024. To date,
 11 Designs, Surveys, and Installations have been completed for Releases 1 and 2.
 12 Release 3 Design is also complete, and Surveys and Installations have begun.

13 Table MOR-D-19 below provides a schedule of significant WiSUN
 14 milestones organized by year for 2020 through 2024.

15 **TABLE MOR-D-19: WiSUN Release Projected Timeline**

YEAR	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2020	Started WiSUN Installation for Release 2	Complete WiSUN Installation for Release 2	Complete WiSUN Design for Release 3	Start WiSUN Installation for Release 3
	Complete WiSUN Surveys for Release 3		Complete WiSUN Surveys for Release 4	Complete WiSUN Design for Release 4
2021	Complete WiSUN Installation for Release 3	Start WiSUN Installation for Release 4	Complete Network Optimization for Release 1	
2022			Complete WiSUN Installation for Release 4	
2023-2024	Continuation of WiSUN installation for all future Meter installations			

1 **Q. PLEASE DESCRIBE THE WORK BUSINESS SYSTEMS HAS ALREADY**
2 **UNDERTAKEN TO SUPPORT THE IMPLEMENTATION OF FAN.**

3 A. Phase I of the WiSUN implementation was the design phase. In 2017, the
4 Company completed its RFP for a WiSUN design vendor and in December of
5 2017, WiSUN devices were selected. The WiSUN devices are located on the
6 Company's distribution poles or pad-mounted equipment to have effective
7 communication coverage with end-devices.

8 The Company engaged in 119 site surveys in 2019 as part of Phase II of
9 the WiSUN FAN implementation. The Company is inspecting each location
10 identified in the design phase and has been evaluating the potential to install a
11 WiSUN device. These inspections confirm that the Company can receive the
12 appropriate signal anticipated in the design phase at the height and location on the
13 pole where the WiSUN device is planned to be located. In instances where the
14 Company cannot add a WiSUN device to the existing pole, a new location is
15 evaluated. This work will be ongoing at a pace of approximately 300 surveys per
16 year through 2024.

17 Installation began in second quarter 2019 as part of Phase III of the WiSUN
18 implementation and will continue through 2024 to support AMI deployments. In
19 2021, the Company is performing the first Network Optimization (a process where
20 the network is tested and tuned to ensure optimal performance) for the WiSUN
21 network supporting IVVO. Network Optimization will occur throughout the project
22 as AMI deployments complete.

1 **Q. CAN YOU EXPLAIN THE CHANGES IN FCC REGULATIONS AND THE**
2 **IMPACT ON WIMAX?**

3 A. Yes. The FCC ruled that effective April 2020, the use of a network spectrum
4 (frequency) called Citizen Band Radio Spectrum was going to be controlled by
5 third parties to minimize congestion and interference, particularly for U.S. Coast
6 Guard and Navy, which also use this spectrum for operations. This is the spectrum
7 that Xcel Energy chose to use in 2014 for deployment of the WiMAX technology
8 as a part of the FAN. The FCC ruling that impacted the spectrum used with WiMAX
9 not only made using that frequency more expensive to operate (with high O&M
10 service fees to the third parties mentioned), but also fast-tracked the WiMAX
11 technology to extinction because the cost to network vendors to upgrade to meet
12 FCC rules was cost-prohibitive with WiMAX. This requirement has driven U.S.
13 vendors to abandon support of the WiMAX product in July of 2019, thus forcing the
14 Company to look for alternative technology in lieu of WiMAX.

15 **Q. PLEASE DESCRIBE THE TECHNOLOGY REPLACING WIMAX TO TRANSMIT**
16 **DATA BETWEEN THE WISUN MESH AND WAN.**

17 A. In 2020, Xcel Energy moved to public Long Term Evolution (“LTE”) cellular data
18 technology to support continued connectivity to the WiSUN network, and away
19 from WiMAX. This solution is a proven technology in use by other utilities with
20 similar needs and will ensure the Company meets its commitments to our
21 customers and the State of Colorado. Public LTE cellular service will not be
22 available in certain areas. Those areas will be covered by an appropriate
23 alternative technology such as microwave or fiber communications.

1 **Q. IS XCEL ENERGY EVALUATING EVOLVING NETWORK TECHNOLOGIES**
2 **OTHER THAN PUBLIC LTE FOR THE MESH TO WAN COMMUNICATION?**

A. Yes. Xcel Energy is currently analyzing the potential for a long-term, general-purpose private network solution, including options such as private LTE, fiber, microwave, or potentially a hybrid of two or more these technologies.

3 **Q. WHAT ARE THE POTENTIAL IMPACTS TO THE AGIS FAN BUDGET OF**
4 **IMPLEMENTING A SOLUTION OTHER THAN WiMAX?**

5 A. There is no impact on the CPCN Projects. The WiSUN mesh network is being
6 deployed the same as it was always planned. The cellular modems being
7 deployed are the functional equivalent of the devices used for WiMAX.
8 Additionally, at this time the Business Systems' budgets attributed to the WiMAX
9 portion of the FAN have been moved to future years (beyond the scope of this rate
10 case) while a determination is made on the long-term strategy, and are not part of
11 the Company's request to continue the AGIS deferral.²⁰ Public Service will bring
12 forward any cost recovery filings in the future, when more information is available
13 and the issue becomes ripe.

14 **iii. Business Systems' Capital Costs for FAN**

15 **Q. WHAT ARE THE FAN CAPITAL ADDITIONS FOR BUSINESS SYSTEMS**
16 **RELEVANT TO THIS RATE CASE?**

17 A. Table MOR-D-20 below provides Business Systems' capital additions for the FAN
18 for September 1, 2019 through the 2022 FTY.

²⁰ Company witness Ms. Wold addresses WiMAX costs incurred before the Company was forced to abandon the technology and why it is appropriate to include those prior investments in the cost of service in this case.

1
2
3
TABLE MOR-D-20
FAN Business Systems – Capital Additions
(Total Company)

AGIS Program (\$ in millions)	9/1/2019 through 12/31/2019 Actual	2020 Actual	2021 Forecast	2022 Forecast
FAN	0.1	17.1	–	–

4 **Q. WAS BUSINESS SYSTEMS PRIMARILY RESPONSIBLE FOR DEVELOPING**
5 **THE FORECASTS FOR THE FAN?**

6 A. Yes. Business Systems was responsible for developing the forecast for both the
7 WiSUN and the point-to-point components of the FAN. As noted above, Mr. Nickell
8 discusses the costs associated with Distribution's procurement and installation of
9 the pole-mounted FAN devices.

10 **Q. PLEASE PROVIDE AN OVERVIEW OF THE PROCESS FOR DEVELOPING**
11 **THE WISUN FORECAST.**

12 A. Business Systems continues to employ standard processes and procedures for
13 selecting technologies to be deployed in the Company's environment, as well as
14 the execution of large capital projects, as follows:

- 15
- 16 • *Product Selection:* The Company awarded a contract for the WiSUN mesh network in 2017; and
 - 17 • *Project and Initiative Governance:* The AGIS initiative's formal project
18 governance processes are incorporated into the FAN project.
19

1 **Q. WHAT ARE THE PRIMARY COMPONENTS OF THE FAN IT CAPITAL**
2 **FORECAST?**

3 A. The FAN forecast has two key components: (1) labor; and (2) hardware. As noted
4 above, Mr. Nickell discusses the costs associated with Distribution's participation
5 in the procurement and installation of pole-mounted FAN devices.

6 **Q. HOW DID THE COMPANY DERIVE THE LABOR PORTION OF THE FAN**
7 **FORECAST?**

8 A. The labor costs were derived utilizing pricing gained from industry benchmarks and
9 reviewed with other utilities and industry research organizations such as EPRI.
10 These costs were also analyzed and reviewed as the result of the limited
11 deployment of the FAN that tested out the technology, the deployment process,
12 monitoring and performance. As each stage of the FAN deployment is conducted,
13 the labor costs and estimates are reviewed on a per-site basis and forward-looking
14 estimates are refined. These costs will be reviewed and refined throughout the
15 lifecycle of the project. Labor cost types include installation labor, RF design,
16 configuration and testing, planning engineering, project management, and network
17 services.

18 **Q. HOW DID THE COMPANY DERIVE THE HARDWARE PORTION OF THE FAN**
19 **FORECAST?**

20 A. Xcel Energy has standards for all hardware that is deployed in the field. These
21 standards define hardware for which the Company has industry benchmarked,

1 negotiated pricing. In addition, Xcel Energy issued an RFP for hardware, and
2 awarded the work for the WiSUN primary vendor in 2017.

3 **Q. DOES THE BUSINESS SYSTEMS' CAPITAL FORECAST FOR FAN STILL**
4 **INCLUDE CONTINGENCY?**

5 A. Business Systems' capital forecast for FAN does not include any contingency
6 amounts through the 2022 FTY; however, beyond 2022, there are certain
7 contingency amounts include in the FAN budget.

8 **iv. Business Systems' O&M Costs for FAN**

9 **Q. WHAT ARE THE FAN O&M COSTS FOR BUSINESS SYSTEMS RELEVANT TO**
10 **THIS RATE CASE?**

11 A. Table MOR-D-21 below provides a summary of Business Systems' O&M expense
12 for the FAN for 2020 through the 2022 FTY.

13 **TABLE MOR-D-21**
14 **FAN Business Systems – O&M Expense**
15 **(Public Service Electric)**

AGIS Program (\$ in millions)	2020 Actual	2021 Forecast	2022 Forecast
FAN	1.6	0.8	1.2

16 **Q. WHAT ARE THE PRIMARY COMPONENTS OF BUSINESS SYSTEMS' FAN**
17 **O&M FORECAST?**

18 A. The primary components of Business Systems' FAN O&M forecast include
19 ongoing field support for devices deployed, hardware maintenance (patches and
20 firmware upgrades), technical support for the network, and NOC support for
21 monitoring the network.

1 **Q. HOW DID BUSINESS SYSTEMS DERIVE THE FAN O&M FORECAST?**

2 A. Public Service used existing data from other network installations of a similar
3 nature as well as input from our FAN vendor and information gathered from other
4 utilities and industry organization such as EPRI.

5 **Q. IN SUMMARY, WHY ARE BUSINESS SYSTEMS' FAN COSTS REASONABLE**
6 **FOR CUSTOMERS TO SUPPORT?**

7 A. The FAN is a foundational component of AGIS, which is a long-term strategic
8 initiative to transform our electrical distribution system to enhance security,
9 efficiency, and reliability, to safely integrate more DERs, including those that are
10 customer owned, and to enable improved customer products and services. The
11 FAN will provide communications between the advanced grid devices, including
12 the AMI meters, enabling business operations efficiencies, and a better customer
13 experience to empower informed energy decisions. The IT components described
14 above are necessary to implement AMI, and the AMI IT forecast is reasonable in
15 enabling technologies that improve customer products and services.

16 **E. Integrated Volt-Var Optimization**

17 **i. Overview of IVVO Integration**

18 **Q. WHAT IS IVVO AND WHY IS IT INTEGRATION NEEDED FOR**
19 **IMPLEMENTATION OF IVVO?**

20 A. IVVO, which was approved by the Commission as part of the AGIS CPCN
21 Settlement, is an advanced application that automates and optimizes the operation
22 of the distribution voltage regulating devices located on distribution feeders. IVVO
23 allows Public Service to more efficiently and accurately maintain proper voltage

1 levels throughout the system, thereby reducing energy usage without any action
2 by customers. The advanced application IVVO relies on accurate power flow
3 calculations to determine the power flow at points on the grid where sensor
4 information does not exist. As such, it requires integration with the ADMS core
5 applications and other critical systems to provide its intended benefits to the
6 Company's customers.

7 IVVO is on a five-year deployment schedule that began in late 2017.
8 Currently, Distribution is working on installing additional voltage control devices
9 and enabling IVVO on more feeders. Additional detail on the IVVO rollout is
10 documented in Mr. Nickell's Direct Testimony.

11 **Q. WHAT WORK IS BUSINESS SYSTEMS RESPONSIBLE FOR WITH RESPECT**
12 **TO THE IVVO?**

13 A. Business Systems has responsibility to complete the following tasks in support of
14 the implementation of IVVO:

- 15 • Lead the design of the system components;
- 16 • Configuration of the required software and hardware;
- 17 • Building and installation of any required interfaces;
- 18 • Designing and integrating security into all aspects of IVVO;
- 19 • Thorough unit, system, and end-to-end testing;
- 20 • User Acceptance Testing with the Distribution business resources.

21 Business Systems will support this IVVO implementation by adding and
22 conditioning field devices within ADMS to support IVVO functionality and will
23 perform testing to support the expansion of IVVO. Business Systems also

1 implemented the GEMS software for the secondary static VAr compensator
2 (“SVC”) devices that are part of the IVVO implementation and will complete IT
3 integration of the IVVO advanced sub-application with ADMS.

4 **Q. PLEASE DESCRIBE THE GEMS SOFTWARE THE COMPANY HAS**
5 **SELECTED TO SUPPORT THE IVVO FIELD DEVICES.**

6 A. The GEMS software was included in the package from the vendor supplying the
7 SVC devices. As discussed in Mr. Nickell’s Direct Testimony, the Company
8 selected Varentec’s Edge of Network Grid Optimization (“ENGO”) unit as the
9 winning bidder for the SVC devices. The GEMS software to manage and control
10 the SVC devices was included in the package. Business Systems will deploy the
11 GEMS software for management and control of the ENGO SVC devices. The
12 Company will host the server in-house for the Public Service IVVO deployment.

13 **ii. IVVO Deployment Timeline**

14 **Q. WHAT WORK ON IVVO HAS BEEN COMPLETED TO DATE BY BUSINESS**
15 **SYSTEMS?**

16 A. The IVVO advanced application was initially enabled at one transformer area in
17 April 2019, and enablement occurred at five additional transformers through the
18 end of 2019. To support this functionality, the installed IVVO field devices were
19 integrated into ADMS and are controlled by the IVVO application.

20 In 2019, the Company continued with the deployment of IVVO-enabling
21 devices, including capacitors, SVCs, and Load Tap Changer (“LTC”) controllers.
22 The initial deployment of 13,000 AMI meters necessary to support IVVO bellwether
23 functionality were installed by year-end 2019. The 13,000 AMI meter deployment

1 created the necessary mesh communication network and enabled approximately
2 200 residential meters as bellwether meters, allowing the near real-time voltage
3 insights from these meters to flow into ADMS.

4 In the fourth quarter of 2019, the Company deployed the GEMS software.
5 This deployment provided the ability to manage ENGO field devices and receive
6 voltage information. ENGO field devices provide voltage regulation which supports
7 IVVO functionality.

8 During 2020, the Company implemented integration between AMI and
9 ADMS and refined IVVO settings and objectives. The deployment of the
10 integration with the AMI head-end system facilitated the ability to receive voltage
11 information from the IVVO bellwether AMI meters to support IVVO functionality,
12 load flow, and state estimation.

13 Beginning in the third quarter of 2020, the Company started using the
14 bellwether functionality to provide additional insights to the ADMS using the
15 installed AMI meters as described above. The primary functionality of this initial
16 deployment of bellwether meters is providing voltage at desirable locations on the
17 feeder. The Company also continued to remove legacy devices and reprogram
18 compatible devices.

19 The Company also completed the integration of GEMS with ADMS in the
20 third quarter of 2020, which allows the IVVO SVC units to provide real-time
21 monitoring and control to ADMS.

1 **Q. IS THERE ANY ADDITIONAL WORK PLANNED FOR IVVO BEYOND 2020?**

2 A. No, not for Business Systems. As noted by Mr. Nickell, Distribution will continue
3 to deploy IVVO devices into 2023.

4 **iii. Business Systems' IVVO Capital Costs**

5 **Q. WHAT ARE THE IVVO CAPITAL ADDITIONS FOR BUSINESS SYSTEMS**
6 **RELEVANT TO THIS RATE CASE?**

7 A. Table MOR-D-22 below provides Business Systems' capital additions for IVVO for
8 September 1, 2019 through the 2022 FTY. As discussed above and shown in the
9 table, there are no capital additions forecasted for Business Systems in 2021 or
10 2022.²¹

11 **TABLE MOR-D-22**
12 **IVVO Business Systems – Capital Additions**
13 **(Total Company)**

AGIS Program (\$ in millions)	9/1/2019 through 12/31/2019 Actual	2020 Actual	2021 Forecast	2022 Forecast
IVVO	3.5	–	–	–

14 **Q. WAS BUSINESS SYSTEMS PRIMARILY RESPONSIBLE FOR DEVELOPING**
15 **THE FORECASTS FOR IVVO?**

16 A. No. However, Business Systems was responsible for developing the forecast for
17 the GEMS software and for managing the integration of the IVVO advanced sub-
18 application with ADMS. Mr. Nickell provides a discussion of the cost forecast

²¹ Beyond 2022, the Business Systems IVVO budget includes a contingency for additional hardware or software that may be needed as additional IVVO devices are deployed by Distribution in this time frame.

1 process with respect to the IVVO advanced application and its related
2 components.

3 **Q. WHAT ARE THE PRIMARY COMPONENTS OF BUSINESS SYSTEMS' IVVO**
4 **CAPITAL COSTS?**

5 A. The IVVO capital costs include: (1) hardware; (2) software; and (3) labor.

6 **Q. WHAT HARDWARE IS NEEDED TO COMPLETE THE IVVO**
7 **IMPLEMENTATION BY BUSINESS SYSTEMS?**

8 A. The additional hardware necessary for implementation consists of computing
9 components used for data processing and storage to support IVVO services.
10 Additional servers are needed due to the increased volume of data and processes
11 necessary to implement IVVO capabilities.

12 **Q. HOW DID THE COMPANY DERIVE THE HARDWARE PORTION OF THE IVVO**
13 **FORECAST?**

14 A. Xcel Energy has standards for all hardware that is deployed in our data centers.
15 These standards define hardware for which the Company has industry
16 benchmarked, negotiated pricing. Based on these standards, the hardware
17 estimates were derived utilizing the hardware requirements of the applications and
18 applying standard pricing.

19 **Q. HOW DID THE COMPANY DEVELOP THE COST FORECAST FOR IVVO**
20 **SOFTWARE COSTS?**

21 A. Pricing for the IVVO software is provided in the contract with Varentec, selected
22 through the RFP process noted above. Pricing is consistent with industry
23 benchmarks and our review with other utilities and industry research organizations

1 such as EPRI. These benchmarks drove the negotiations with the selected
 2 vendor. Varentec provided budgetary quotes for their ENGO device licensing
 3 based on a cloud-based approach and an in-house server-based approach. The
 4 in-house approach was used to develop cost estimates, consistent with the
 5 Company’s security requirements.

6 **Q. HOW DID BUSINESS SYSTEMS DEVELOP THE FORECAST FOR THE**
 7 **CAPITAL LABOR COSTS?**

8 A. This forecast includes both internal and external labor. External labor costs are
 9 based on the contract pricing described above. The internal labor forecast is
 10 based on our experience and work that has already been completed for IVVO
 11 implementation.

12 **iv. Business Systems’ O&M Costs for IVVO**

13 **Q. WHAT ARE THE IVVO O&M COSTS FOR BUSINESS SYSTEMS RELEVANT**
 14 **TO THIS RATE CASE?**

15 A. Table MOR-D-23 below provides of Business Systems’ O&M expense for IVVO
 16 for 2020 through the 2022 FTY.

17 **TABLE MOR-D-23**
 18 **IVVO Business Systems – O&M Expense**
 19 **(Public Service Electric)**

AGIS Program (\$ in millions)	2020 Actual	2021 Forecast	2022 Forecast
IVVO	0.2	0.3	0.2

1 **Q. WHAT ARE THE PRIMARY COMPONENTS OF BUSINESS SYSTEMS' O&M**
2 **COSTS FOR IVVO?**

3 A. The primary components of Business Systems' IVVO O&M costs include ongoing
4 hardware support, data storage, annual software maintenance, application
5 support, and labor for software support.

6 **Q. HOW DID BUSINESS SYSTEMS DERIVE ITS IVVO O&M FORECAST?**

7 A. The IVVO O&M forecast was developed based on vendor quotes, existing internal
8 support team estimates of the work required, and industry benchmarking
9 information. Each AGIS component has an IT team responsible for project
10 delivery. Public Service's forecasts for labor costs related to IVVO are based on
11 estimates from previous experience with similar systems implementations and
12 support models.

13 **Q. IN SUMMARY, WHY ARE BUSINESS SYSTEMS' IVVO COSTS REASONABLE**
14 **FOR CUSTOMERS TO SUPPORT?**

15 A. As discussed by Mr. Nickell, IVVO automates and optimizes the operation of the
16 distribution voltage regulating and VAR control devices to in turn, reduce electrical
17 losses, electrical demand, and energy consumption. Fundamentally, IVVO is a
18 demand-side management tool that does not require any behavioral changes from
19 customers. In addition, by automating and improving voltage management and
20 power quality, IVVO provides increased capacity to host DER. The Business
21 Systems work will provide for the implementation of IVVO and integration with the
22 advanced grid technologies, enabling these benefits for our customers and the

1 system. The Business Systems IVVO forecast is reasonable based on the details
2 provided above.

3 **F. Advanced Planning Tool**

4 **i. Overview of APT**

5 **Q. WHAT IS THE APT?**

6 A. The APT a forecasting and planning software that enables Public Service to
7 implement more efficient distribution planning, enhanced load forecasting
8 capabilities, and better integration with the Company's other planning efforts. The
9 Company has implemented a cloud-based APT that provides a load forecasting
10 capability to its Distribution team. The software is called LoadSeer.

11 LoadSeer provides the Company with a spatial load forecasting software
12 tool designed specifically for transmission and distribution planners who face
13 increasingly complex grid decisions caused by emerging micro-grid technologies,
14 extreme weather events, and new economic activity. This software replaced a
15 current end-of-life Distribution Asset Analysis tool which was no longer under
16 standard support. Distribution Asset Analysis also runs on outdated SQL Server
17 2008 which is also no longer under standard support.

18 **Q. WHAT WAS BUSINESS SYSTEMS' ROLE IN IMPLEMENTING APT?**

19 A. Business Systems was responsible for the deployment of this software tool.
20 LoadSeer is a Software as a Service product, which leveraged support from the
21 vendor for the Integral Analytics specifically for the hosting, management, and
22 operation of the software itself. User administration and management of data

1 feeds from Xcel Energy systems to this new tool will be managed under Xcel
2 Energy's existing contracted third-party application support model.

3 **Q. HAS APT BEEN DEPLOYED?**

4 A. Yes. The APT software was available for use by Public Service in December 2020.

5 **ii. Business Systems' APT Capital Costs**

6 **Q. WHAT ARE THE BUSINESS SYSTEMS CAPITAL COSTS FOR APT**
7 **RELEVANT TO THIS RATE CASE?**

8 A. Table MOR-D-24 below provides Business Systems' capital additions for APT for
9 September 1, 2019 through the 2022 FTY. As shown, APT was implemented in
10 2020, with limited capital additions in 2021.

11 **TABLE MOR-D-24**
APT Business Systems – Capital Additions
(Total Company)

AGIS Program (\$ in millions)	9/1/2019 through 12/31/2019 Actual	2020 Actual	2021 Forecast	2022 Forecast
Other (including APT)	–	3.4	0.4	–

12 **Q. WHAT ARE THE PRIMARY COMPONENTS OF THE BUSINESS SYSTEMS'**
13 **CAPITAL COSTS TO IMPLEMENT APT?**

14 A. The capital costs have two key components: (1) software; and (2) labor.

15 **Q. HOW DID THE COMPANY DEVELOP THE ESTIMATE FOR THESE COST?**

16 A. The costs for the APT software are provided in the contract with the software
17 vendor. I note that there is only one vendor for the LoadSeer software. External
18 labor costs were based on the contract pricing. The internal labor forecast was
19 based on our experience and work in deploying other similar software.

1 **iii. Business Systems' O&M Costs for APT**

2 **Q. WHAT BUSINESS SYSTEMS O&M COSTS FOR APT ARE RELEVANT TO**
3 **THIS RATE CASE?**

4 A. Table MOR-D-25 below provides Business Systems' O&M expense for APT for
5 2020 through 2022. The O&M expenses for Business Systems for APT after the
6 software was deployed in 2020 relate to software maintenance and licensing.

7 **TABLE MOR-D-25**
8 **APT Business Systems – O&M Expense**
9 **(Public Service Electric)**

AGIS Program (<i>\$ in millions</i>)	2020 Actual	2021 Forecast	2022 Forecast
Other (including APT)	0.9	0.6	0.6

10 **Q. WHY ARE BUSINESS SYSTEMS' APT COSTS REASONABLE FOR**
11 **CUSTOMERS TO SUPPORT?**

12 A. The APT enables Public Service to better understand the conditions of the
13 distribution system at a more detailed level and aid in the development of load
14 forecasts and distribution plans. This tool will be particularly helpful as DER and
15 EV adoption rates increase and require more granular and complex load
16 forecasting to maintain the reliability and stability of the distribution system.

17 **Q. WHAT DO YOU CONCLUDE FROM THIS DISCUSSION OF THE OVERALL**
18 **AGIS INITIATIVE AND ASSOCIATED COST RECOVERY REQUESTS IN THIS**
19 **PROCEEDING?**

20 A. AGIS implementation will transform grid operations and monitoring capabilities to
21 enhance the customer experience, enable the design of new and expanded

1 programs and rates for customers, promote energy efficiency and demand
2 reductions, and enhance the Company's system planning capabilities to allow for
3 increased distributed energy resources on the system. Business Systems
4 provides support for integrating each AGIS component to enable implementation
5 and maximize the benefits and value for customers. Based on the support
6 provided in my Direct Testimony and the robust project governance structure,
7 Business Systems' AGIS costs, including the 2022 FTY forecasts, are reasonable
8 for customers to support.

- 1 **VII. RECOMMENDATIONS AND CONCLUSION**
- 2 **Q. PLEASE SUMMARIZE YOUR RECOMMENDATIONS**
- 3 A. In summary, as part of approving the cost of service developed by Ms. Blair, I
- 4 recommend the Commission approve the 2019-2022 Business Systems capital
- 5 additions and 2020 Business Systems O&M expenses, as well as the 2022 O&M
- 6 expenses for the AGIS initiative, which are included in the Company's 2022 FTY
- 7 cost of service presented in this rate case, and as described above.
- 8 **Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?**
- 9 A. Yes, it does.

Statement of Qualifications

Michael O. Remington

Michael O. Remington is the Business Systems Regulatory Director, Advanced Grid, for Xcel Energy Services Inc. Michael is responsible for the regulatory aspects of the XES Business Systems role in the AGIS program. He directs and prepares testimony, supporting documents, and discovery responses related to Business Systems in filings on behalf of XES and its operating company affiliates, including Public Service Company of Colorado.

Michael has 24 years of experience in the field of IT, with 12 of those years in a management role. He joined Xcel Energy in July 2008, after almost eight years at IBM Global Services where he filled IT roles under contract for Xcel Energy. Michael began his career at Xcel Energy as a Senior Manager of IT Service Management and served in that position continuously for 11 years. His team was responsible for the administration of core IT service management processes, as well as compliance with several IT-related North American Electric Reliability Corporation regulatory standards. From October 2013 to January 2015, Michael served on temporary assignment in the XES General Counsel organization where he practiced law on behalf of Xcel Energy. In July 2019, Michael was promoted to Director of IT Operations, and in January 2021, he assumed the role of Business Systems Regulatory Director, Advanced Grid, his current position.

Michael graduated from the University of Minnesota where he earned a Bachelor of Arts degree in Political Science. He earned a Juris Doctor degree from Mitchell Hamline School of Law.

BEFORE THE PUBLIC UTILITIES COMMISSION
OF THE STATE OF COLORADO

* * * * *

IN THE MATTER OF ADVICE LETTER)
NO. 1857-ELECTRIC OF PUBLIC)
SERVICE COMPANY OF COLORADO)
TO REVISE ITS COLORADO PUC NO.)
8-ELECTRIC TARIFF TO REVISE)
JURISDICTIONAL BASE RATE) PROCEEDING NO. 21AL-____E
REVENUES, IMPLEMENT NEW BASE)
RATES FOR ALL ELECTRIC RATE)
SCHEDULES, AND MAKE OTHER)
PROPOSED TARIFF CHANGES)
EFFECTIVE AUGUST 2, 2021)

AFFIDAVIT OF MICHAEL O. REMINGTON
ON BEHALF OF
PUBLIC SERVICE COMPANY OF COLORADO

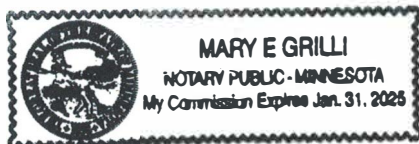
I, Michael O. Remington, being duly sworn, state that the Direct Testimony and attachments were prepared by me or under my supervision, control, and direction; that the Direct Testimony and attachments are true and correct to the best of my information, knowledge and belief; and that I would give the same testimony orally and would present the same attachments if asked under oath.

Dated in Woodbury, MN, this 23 day of June 2021.



Michael O. Remington
Business Systems Regulatory Director,
Advanced Grid

Subscribed and sworn to before me this 23rd day of June 2021.


Notary Public

My Commission expires Jan 31, 2025