PST Advisory Group – PUC Workshop

April 9, 2019

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Agenda

01	Welcome, Introductions, and PST Advisory Group Overview
02	Energy Storage Subcommittee
03	Electric Transportation Subcommittee
04	Grid Modernization Plan / Advanced Metering Functionality Subcommittee
05	Input from other PST Advisory Group Members
06	Additional Discussion

01

Welcome

Introductions

PST Advisory Group Overview

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PST Advisory Group goals

Mission: The mission of the PST Advisory Group shall be to review at a high level progress on the delivery of all PST components of the MRP (Grid Modernization, AMF, time-varying rates, Electric Transportation, Storage, and Performance Incentive Mechanisms) and to provide guidance, and prioritization to support successful delivery of the components as a holistic suite

Goal: Create an Advisory Group that promotes transparency, openness, and the opportunity for meaningful stakeholder engagement

Members shall include the Division, OER, and representatives of the following interests: environment, clean energy industry or businesses, low income, non-regulated power producers, community groups, and additional members as the Company, the Division, and OER may agree

PST Advisory Group composition by organization

Organizations
National Grid (NGRID)
Energy and Environmental Economics (E3) – Supporting NGRID*
Division of Public Utilities and Carriers (DPUC)
Regulatory Assistance Project (RAP) – Supporting DPUC
Synapse – Supporting DPUC
Office of Energy Resources (OER)
Northeast Clean Energy Council (NECEC)
Center for Justice for the Wiley Center
Conservation Law Foundation (CLF)
Acadia Center
Green Energy Consumers Alliance
Vote Solar
The Energy Council of Rhode Island (TEC RI)
Direct Energy (Retail Electric Suppliers Association)
City of Providence
Washington County Regional Planning Commission

* To provide additional expertise and a national knowledge base, the Company has contracted with Energy and Environmental Economics, Inc. (E3) to assist with the stakeholder engagement process and AMF/GMP filings

02

Energy Storage Subcommittee

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Rhode Island PST Storage – BTM Update

Up to 250kW-2hr Behind the Meter (BTM) ESS

Key Updates:

- 02/20/19 – RFP Released for bids
- 03/11/19 – Final date to submit questions
- 04/19/19 – RFP responses due
- 05/10/19 – Notification of accepted proposal

Rhode Island PST Storage – FTM Update

Approximately 500kW-3hr Front of the Meter (FTM) ESS

- Two (2) potential locations proposed:
  - Option A
    - High penetration of renewables
    - Potential for generation smoothing & hosting capacity
  - Option B
    - Heavy loaded feeder
    - Potential for peak load shifting and Volt/Var optimization

Rhode Island PST Storage – FTM Update

Schedule Update:

- 4/08/2019 – RFP shared with PST Advisory Group
- 4/22/2019 – Webinar for suggestions/feedback
- 4/26/2019 – RFP submitted to PUC
- 5/27/2019 – RFP available for bids
- 7/22/2019 – RFP responses due
- 8/22/2019 – Notification to bidder of acceptance

03

Electric Transportation Subcommittee

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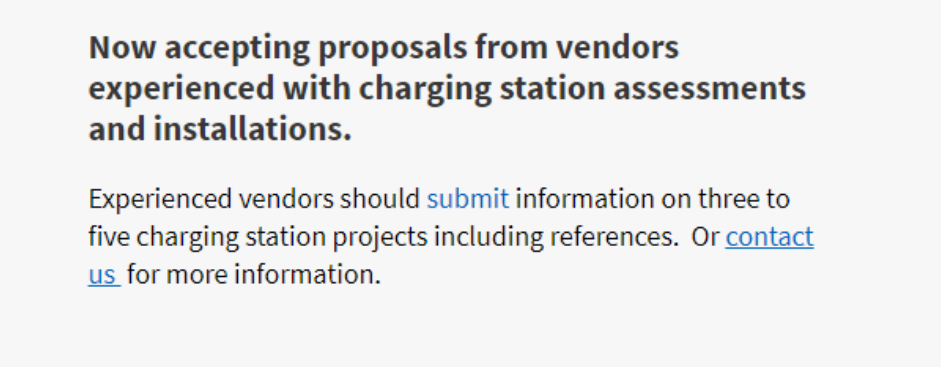
Charging Station Demonstration Program

Customers are moving forward

- Four applications approved (18 ports)
- Six applications (estimated 50 ports) in development

Learnings and Focus

- Sales cycle can consist of site host education and budgeting, development of station use policies, and staffing
- Continue to raise awareness among potential site hosts
- Continue outreach to equipment distributors and vendors
- Targeted verticals including property management companies, supermarkets (DCFC stations), gas/convenience stores (DCFC), government facilities in coordination with OER



ET Programs

Fleet Advisory Services

- Vendor selected to provide studies
- Three of 12 participants engaged

Discount Pilot for DCFC Station Accounts

- Credits being processed on monthly basis for one site with DCFC stations
- Second site in development
- Continued outreach for “larger scale” DCFC sites but also focusing on installations at supermarkets and convenience stores

Off-Peak Charging Rebate Pilot

- Vendor selected to administer pilot
- Program messaging and customer outreach ready to go
- Company recruitment period (April-August) and then introduce price signals (August 2019-August 2021)

Electric Transportation Initiative Evaluation

Purpose: Evaluate each element of the electric transportation initiative on an annual basis, and share learnings with stakeholders and industry participants.

- Developed Scope of Work for the RFP
- Issued RFP for bids in March
- Bids are expected 4th week of April

Timeline:

Milestones	Dates
Develop Scope of Work for RFP	Mar 2019
Procure Third Party Contractor	May/Jun 2019
Year 1 - Annual Evaluation Report	Not later than 31 Oct 2019
Year 2 - Annual Evaluation Report	Not later than 31 Oct 2020
Year 3 - Annual Evaluation Report	Not later than 31 Oct 2021

The Annual Evaluation Report will include, at a minimum, the information provided in the Amended Settlement Agreement

Electric Transportation and Charging Program Marketing

Objectives and Strategy:

- Raise program awareness to generate leads
- Q4 2018: Highlight "open for business" and promote programs
- 2019: Launch additional strategies including events, email campaigns, and targeted segment webinars.

	Charging Demonstration Program	Discount Pilot for DCFC Accounts	Fleet Advisory Services
Web Page www.ngrid.com/ri-evcharging	Application Eligible Equipment List Program Flyer	Application	Pre-Qualification Form
Email Campaigns	✓	✓	✓
Events	✓	✓	✓
EVSE Vendor Outreach Campaigns	✓		
Company Sales/Jurisdiction Teams	✓	✓	✓

Off Peak Charging Rebate Pilot

Objectives and Strategy:

- Multi-channel strategy to raise awareness of the program
- Prioritize hyper targeted campaign focused on verified EV drivers

Tactic	Targeting
National Grid Landing Page	• Prospective participants
Customer Call Center	• RI customers who have set up new service when it is noted they have EVs
Email and Direct Mail	• Prospective participants through internal customer lists and external partner lists
Partnerships	• EV Dealer Outreach, Green Energy Consumer Alliance, OER including Drive Green Participants
Social Media	• EV Facebook forums and EV groups

04

GMP/AMF Subcommittee

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Outline

- Subcommittee Status
- Integration of GMP and AMF
  - Scenarios
  - Functionalities
  - Preliminary solution set
- BCA Approach
  - Alignment with Docket 4600 Framework
  - Initial BCA methodologies
  - Proposed Time-Varying Rates (TVR) approach
- Risk Management

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PUC agenda item(s) addressed in this section:

a. Address what the subcommittee has done to date and where the subcommittee sees itself going in future.

f. Presentation on how the group is approaching the elements of the GMP as set forth in the Amended Settlement (see Section 15(c) of the Amended Settlement).

g. Presentation on how the group is approaching the elements of the AMF business case the PUC required in the rate case (see Section 16(b)(iv) of the Amended Settlement)

Current Schedule for RI Collaboration

PST Advisory AMF & GMP Subcommittee Meeting Schedule

Stakeholder Collaboration (i.e., Subcommittee meetings and discussions)

PST Workshop with RI PUC – *April 9*

Obtain Feedback and Seek Alignment on Proposals and Approaches*

Review Initial Proposals

Review Final Proposals

June 7, 2019
Targeted AMF Filing Date

- GMP filing to follow shortly after AMF

Nov 27
- Re-casted Schedule
- GMP: Current State and Future Scenarios
- AMF: Original BCA Overview
- AMF: Meter Taxonomy/Scenarios
- PST Storage Update

Jan 31
- **PST Advisory Quarterly Meeting**
- GMP: Grid Modernization Options
- AMF: TVP Rate Design
- AMF: Follow-up on Customer Engagement

Mar 28
- AMF: Initial Proposal and Updated BCA
- GMP: BCA Methodology
- GMP: Initial Implementation Plan and Roadmaps

Apr 25
- **PST Advisory Quarterly Meeting**
- Refined Proposal and Updated BCA (AMF & GMP)
- GMP: Refined Implementation Plan and Roadmaps

Dec 13
- GMP: Impacts / Opportunities
- AMF: Customer Value Streams
- AMF: Customer Data Access, Privacy, Governance, & Sharing

Feb 14
- Docket 4600 Alignment for AMF and GMP
- AMF: BCA Benefit Categories

Apr 18
- AMF: BCA Deep Dive session

Jan 10
- GMP: Functionalities / Technologies
- GMP: BCA Overview / Issues
- AMF: Customer Engagement Overview
- AMF: Follow-up on Customer Data Access, Privacy, Governance, & Sharing

Feb 27
- GMP: Proposed Solution Set
- AMF: BCA Cost Categories
- GMP & AMF: Alignment with ASA Requirements

Initial Scheduled Meetings (to meet original 2/1 filing date)

Additional PST Advisory Subcommittee Meeting

AMF – Advanced Metering Functionality
GMP – Grid Modernization Plan
TVP – Time-Varying Pricing
BCA – Benefit-Cost Analysis

*Additional Stakeholder meetings occurred on 9/21/18 (AMF Collaborative Plan w/ DPUC and OER); 10/11/18 (Alternative Business Models w/ DPUC and OER); 10/26/18 (AMF Collaborative Kick-Off w/ Subcommittee); and 11/16/18 (Pilot Learnings w/ Subcommittee)

The Subcommittee continues to check progress against the terms of the Amended Settlement Agreement

Updated AMF Business Case and Grid Mod Plan Requirements (per the Amended Settlement Agreement)	Subcommittee Input / Direction / Decisions
Transparent, updated benefit cost analysis that fully incorporates the Docket 4600 framework	Alignment that every Docket 4600 category will be addressed either quantitatively (to the extent practical) or qualitatively in the filing. Pending discussion over BCA presentation and categories that will be limited to qualitative discussion in the filing.
Investigation of alternative business models and ownership models	An assessment prepared for the Company by Accenture (that supports the Company's initial proposal) was shared with PST stakeholders. Stakeholders and Company continue to discuss as it pertains to sub-priorities.
Identification of the critically linked parts of grid modernization and AMF	Alignment that AMF is a substantive component of grid modernization. AMF supports both grid-facing and customer-facing functionalities and benefits; coordination of approach and BCA methodology.
A plan and explanation of how the selected investments and implementation plan address risks of redundancy or obsolescence.	Agreement for Company to include Future State Scenarios discussion in a Risk Assessment section. Commonalities in the Future State Scenarios and Issues should be used to justify the core Grid Mod Solution set.

A series of tables in Appendix B document the ongoing progress to date on each AMF and GMP requirement listed in the ASA

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PUC agenda item(s) addressed in this section:

b. Was the approach of the parties to start with the conclusion that Advanced Metering Functionality is needed and working the Grid Modernization Plan into Advanced Metering Functionality or was the approach to start with development of a Grid Modernization Plan and determine whether and how Advanced Metering Functionality might be included?

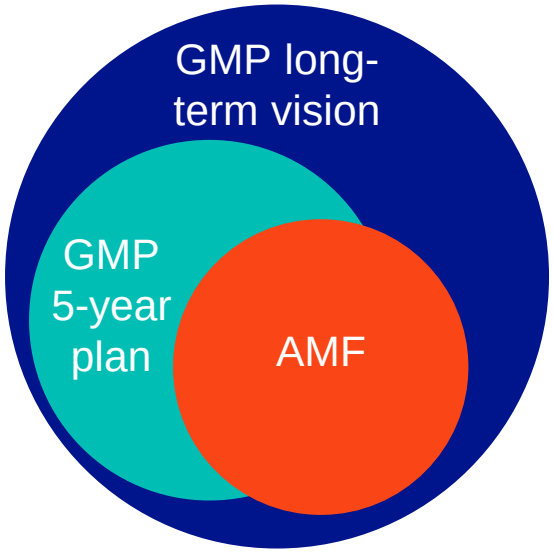
i. What were the agreed premise(s) upon which to start for each proposal?

c. What are we trying to achieve and is AMF needed to get us there?

e. Has the GMP subcommittee considered microgrids as part of its discussions?

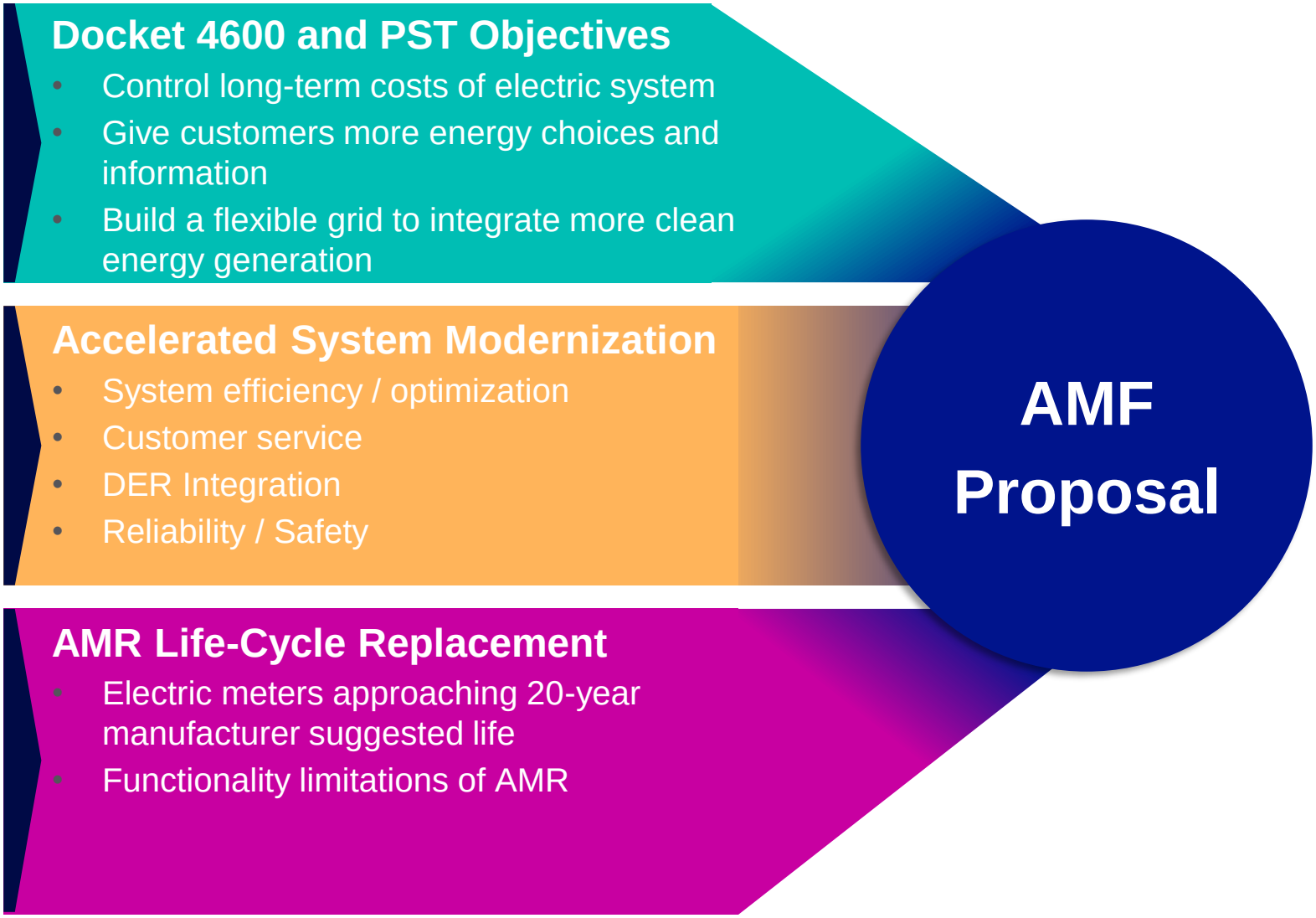
AMF and Grid Modernization are heavily interrelated

- Together the AMF and GMP filings will present a unified vision
  - The GMP filing includes a benefit cost analysis and presents a long-term vision of the grid
    - *AMF is one such investment that provides benefits to both customers and the grid*
  - The AMF filing includes a benefit cost analysis and details the deployment/activation process (bill impacts, infrastructure, customer engagement, etc.)
    - *The vision presented in the GMP drives assumptions in the AMF that help to justify the investment*

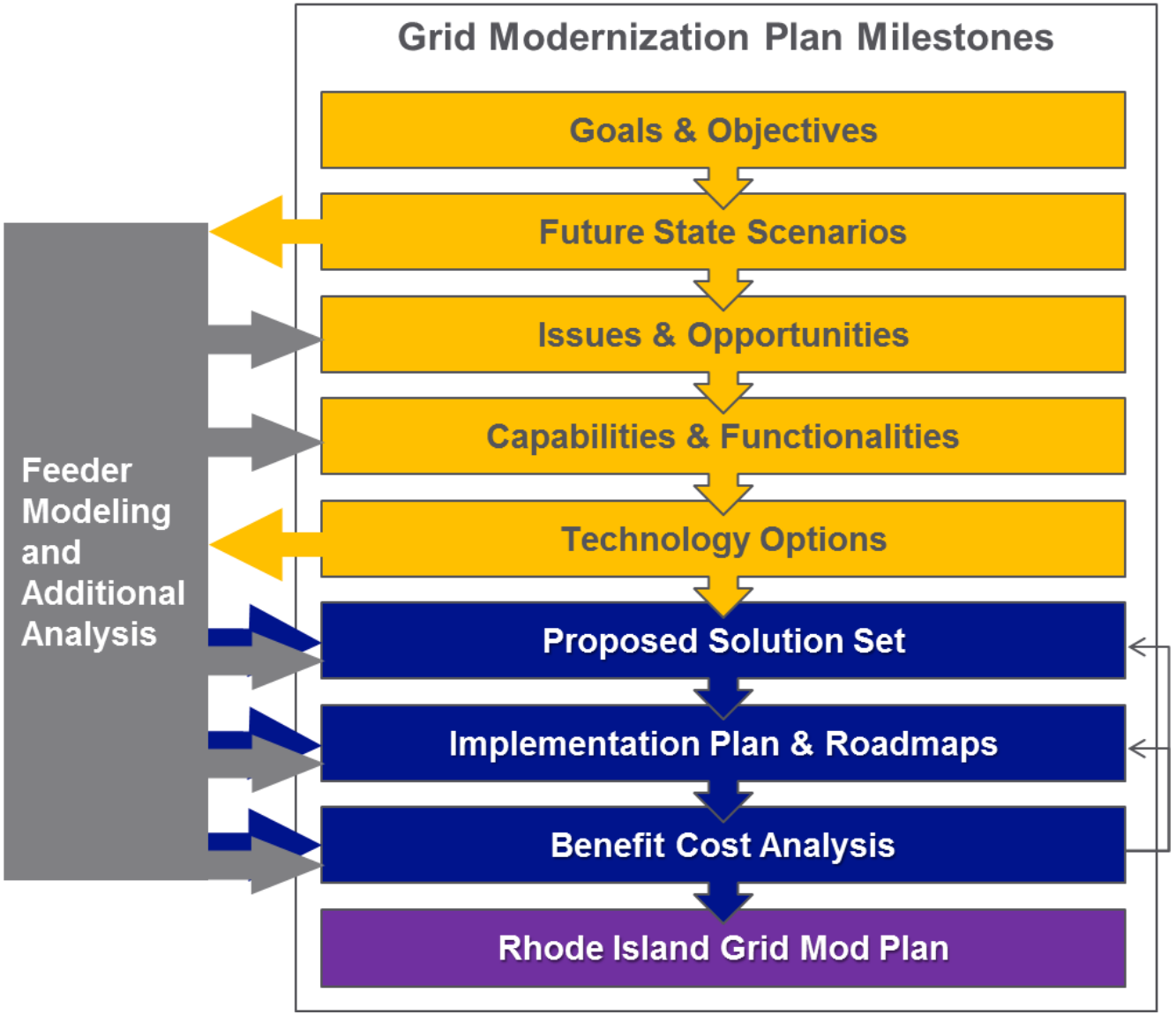


- A **roadmap** links the filings and shows how more benefits become available over time
  - Grid-side benefits are increased with AMF due to the ability to shift load via TVR, better manage loads (e.g., DR, smart interfaces/platforms), and conduct more efficient planning and operations with granular AMF load data

AMF Proposal Drivers



Grid Modernization Plan Approach

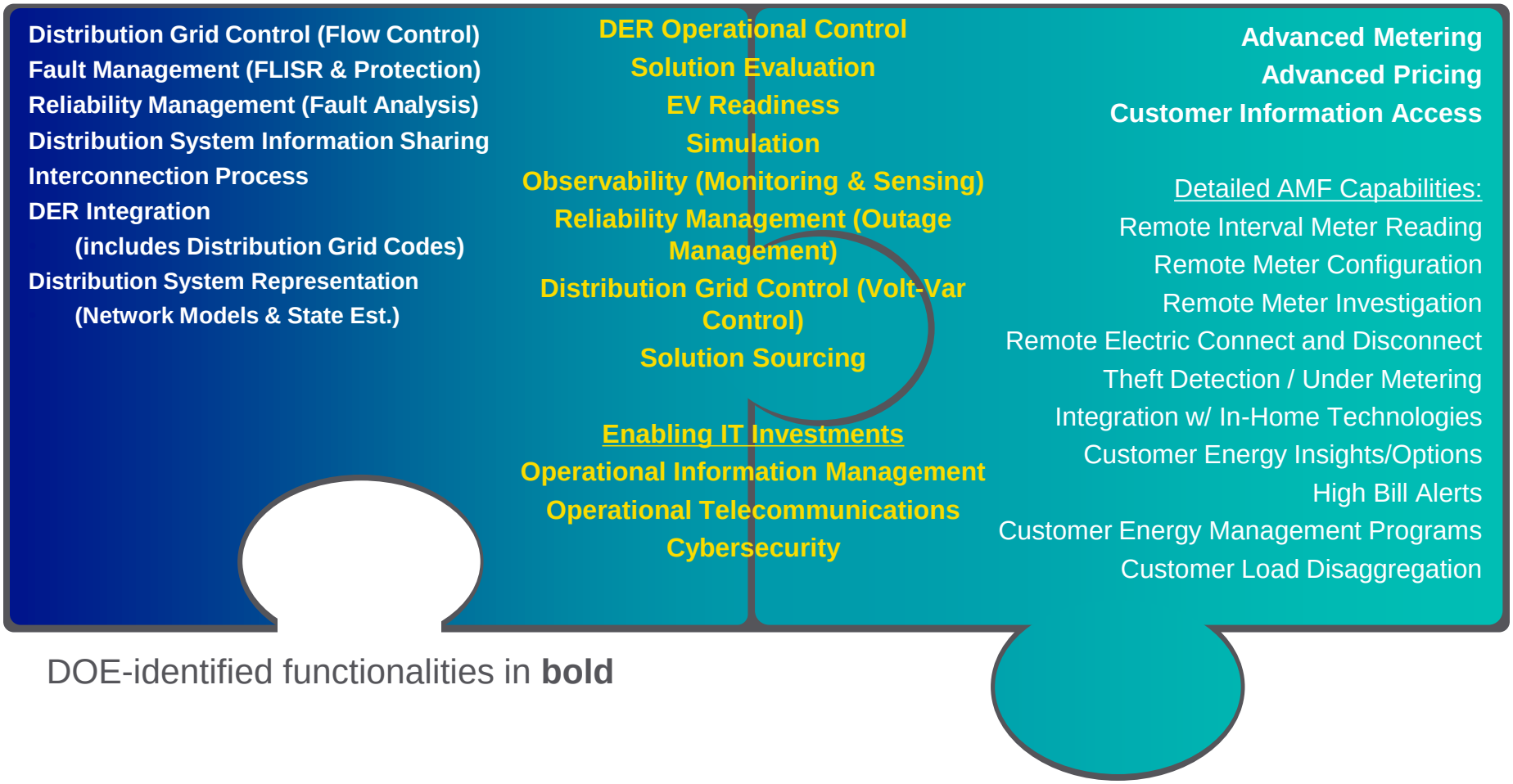


Future State Scenarios

Forecast Assumption	2030 Scenario	GMP Application
Historical Distribution Planning	**Business As Usual** - <40% GHG* reduction - Conservative "business as usual" adoption of renewables, EV** & EHP***	- Included in Sensitivity and Risk Analysis - Considered in 5-Year Implementation Plan and 10-Year Roadmap
Grid Modernization Planning	**Balanced 40x30** - 40% GHG reduction - Significant increase in adoption of renewable generation, EV & EHP to meet 40x30 GHG goal	- Basis for BCA Analysis - Basis for 5-Year Implementation Plan and 10-Year Roadmap - Sensitivity on varying levels of electrification vs. renewables
	High GHG Reduction - >40% GHG reduction - More substantial increase in adoption of renewable generation, EV & EHP to meet more aggressive GHG goal	- Included in Sensitivity and Risk Analysis - Considered in 5-Year Implementation Plan and 10-Year Roadmap

*Greenhouse Gas Emissions **Electric Vehicle ***Electric Heat Pump

GMP and AMF Functional Interdependencies



DOE-identified functionalities in **bold**

Ongoing Functionality Assessment of Alternative Metering Solutions

	AMF Functionality/Use Case	Complete Metering Solutions				Complementary Customer and Grid Technologies**		
		Current AMR	Targeted Enhanced AMR (for opt-in TVR)	Targeted AMF*	Full AMF	End User Solutions***	Transformer-Level Sensor	Pole-Top Reader
Customer-facing	Remote Interval Meter Reading	○	○	●	●	○	○	○
	Remote Meter Configuration	○	○	●	●	○	○	○
	Remote Meter Investigation	○	○	●	●	○	○	○
	Remote Electric Connect and Disconnect	○	○	●	●	○	○	○
	Theft Detection / Under Metering	◐	◐	●	●	○	○	○
	Integration w/ In-Home Technologies	○	○	●	●	●	○	○
	Grid Edge Computing Applications	○	○	●	●	○	○	○
	Customer Energy Insights/Options	◐	◐	●	●	◐	○	◐
	High Bill Alerts	○	○	●	●	◐	○	◐
	Customer Energy Management Programs	○	○	●	●	◐	○	◔
	Customer Load Disaggregation	○	○	●	●	●	○	○
	Near Real Time Customer Data Access	○	○	●	●	◔	○	◔
	Time Varying Rates - Customer & DER	○	◔	●	●	○	○	○
Grid-facing	Volt-Var Control	○	○	◔	●	○	●	●
	Reliability Management	○	○	◔	●	○	●	●
	DER Operational Control	○	○	◔	●	○	○	○
	Meter Data for Planning & Operations	○	○	◔	●	○	○	○

*Harvey Balls for Targeted AMF indicate functionality enabled for customers who adopt AMF technology, not the entire customer population

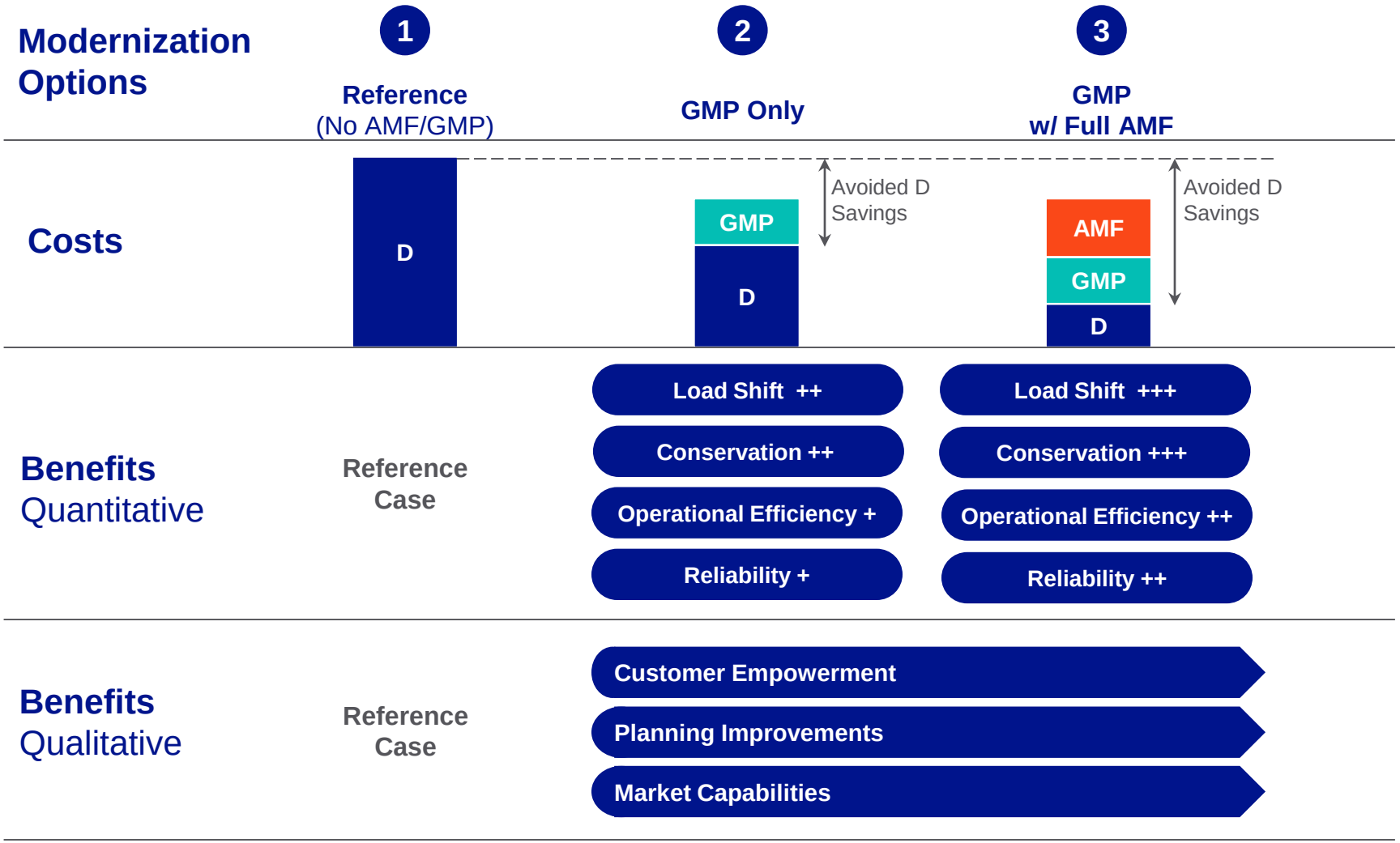
**Assumes integration with utility platform services

***Includes combinations of High-resolution Home Sensors (e.g., Sense) with In-home Technology Packages (e.g., Nest, Alexa, etc.)

Grid Mod Initial Solution Set Elements

- Core Grid Modernization Investments
  - Feeder Monitoring Sensors
  - System Data Portal
  - ADMS & DSCADA
  - Operational Data Management
  - Telecommunications
  - Cyber Services Portfolio
  - Reverse Power Flow Protection (3V0)
  - Advanced VVO/CVR
- Advanced Metering Functionality (AMF)
- Distributed Energy Resource Management System (DERMS)
  - Smart Inverters (Customer Owned)
- Advanced Reliability Solutions
  - Remote Fault Indicators w/ SCADA
  - Advanced Protection Systems
  - Fault Location, Isolation, and Service Restoration (FLISR)
- Customer Programs
  - Green Button Connect (GBC)
  - Customer Energy Management Platform
  - Energy Storage (Customer Owned)
  - EV Infrastructure Plan & Charging Incentives
  - Interconnection Online Application Portal
- NWA Evaluation and Sourcing
  - Area & Interconnection Studies, Advanced NWA Evaluation Tools
  - NWA & DR Programs, Auctions/Pay for Performance, Utility Ownership, Microgrids
- Regulatory/Pricing Changes
  - Time Varying Rates (TVR)
  - Flexible Interconnection (IC) Requirements

GMP/AMF BCA Conceptual Framework



Outline

PUC agenda item(s) addressed in this section:

h. Presentation on how the group is approaching the benefit/cost analysis, with particular focus on the Docket No. 4600-A Guidance Document and Benefit Cost Framework.

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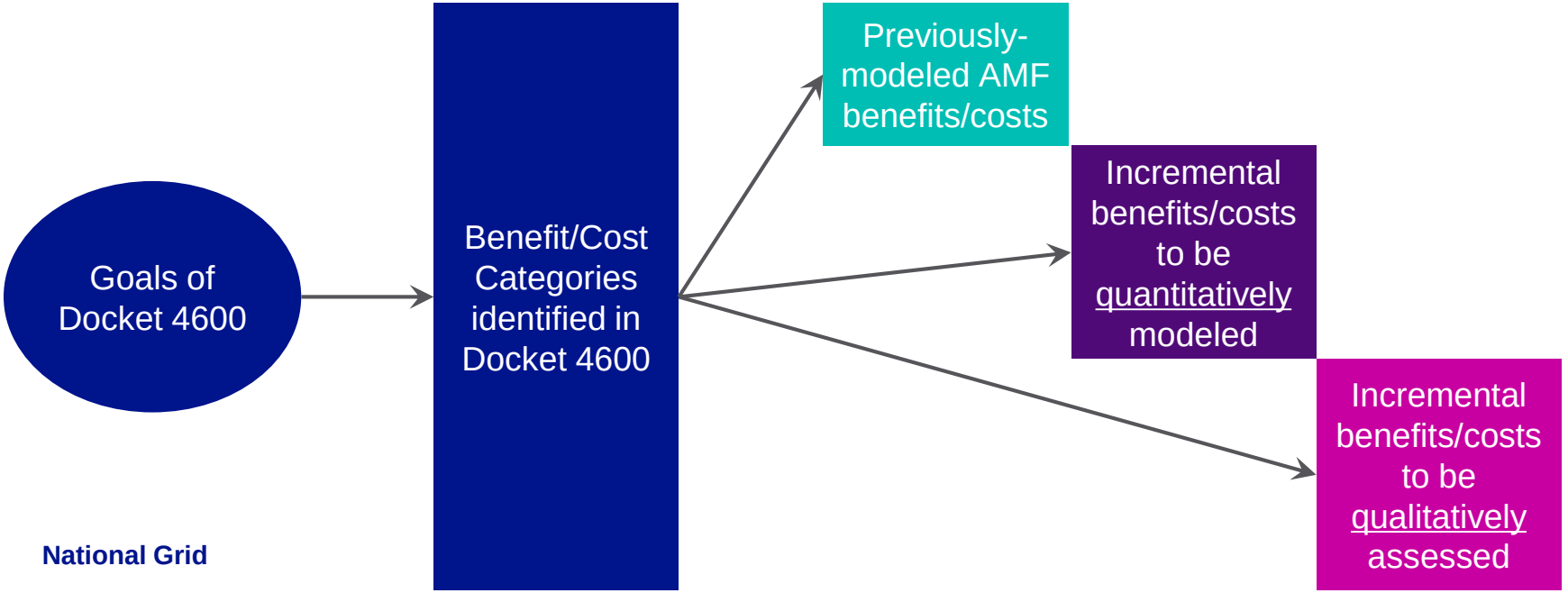
A review of filings in other jurisdictions reveals Rhode Island's leadership in development of a unique and rigorous *AMF & GMP* BCA methodology

Increasing level of complexity →

Utility – State	AMF Least Cost Best Fit	GMP Least Cost Best Fit	AMF Full BCA	GMP Full BCA
Hawaiian Electric (HECO) – HI	X	X		
Southern California Edison (SCE) – CA		X		
Public Service Electric and Gas Company (PSE&G) – NJ			X	
Orange and Rockland (ORU) – NY			X	
Xcel Power – MN			X	
Duke Energy (DEC) – NC			X	
Dominion Power – VA	X	X		
Dayton Power & Light (DP&L) – OH			X	X
National Grid – MA			X (combined)	
National Grid – NY		X	X	
National Grid – RI			X	X

Benefit cost analysis must align with Docket 4600 Framework

- Docket 4600 provides a framework to evaluate potential investments and quantify the costs and benefits of those investments. It must be applied to all incremental programs, including AMF and the Grid Mod Plan.
- Is it critical to ensure that customers capture all the benefits provided by various programs and technologies, but also needs to balance that with affordable implementation costs for customers.
- This assessment has been presented to the PST Advisory Group and discussed on multiple occasions (distinct session on 2/14/19); additional discussions and analysis continue



Summary of initial BCA methodologies

- **4600 Framework is the foundation of the GMP and AMF BCA and defines areas of focus for costs and benefits**
  - GMP and AMF BCAs will be consistent in input values and calculations
  - GMP BCA will reflect costs and benefits of investments that overlap with AMF implementation window (2040 based on AMF expected equipment life of about 20 years)
- **BCAs compare costs and benefits of a future distribution system that can support PST and Resilient Rhode Island Act goals (e.g., 40x30)**
  - Reference case models traditional transmission and distribution solutions, but initial results indicate that traditional investments alone cannot meet 40x30 goals
  - GMP cases (GMP-only and GMP+AMF) model grid modernization solutions plus a smaller amount of traditional solutions investments to achieve 40x30 goals
- **AMF BCA quantifies several sensitivities to capture regulatory and behavioral uncertainties**
  - RI-only / RI+NY deployment
  - Opt-out / opt-in TVR enrollment
  - High / low customer response to price signals
  - Inclusion of new benefit/cost categories based on robust analysis/application of Docket 4600 (stacking of benefits to stimulate further discussion from all parties)
- **BCAs quantify costs and benefits to the greatest extent possible using accepted sources**
  - AESC 2018
  - DOE Interruption Cost Estimate (ICE) model
  - Company equipment and labor estimates
  - Updated deployment costs based on comprehensive procurement effort
  - Items not quantified will be discussed qualitatively

Time-Varying Rates (TVR) approach within the AMF filing

- Retail rate reform and TVR are critical in facilitating the state's climate goals, including increased electrification in the heating and transportation sectors
- The June 2019 AMF filing **will not request approval of a TVR design,** but rather puts forward a spectrum of potential TVR designs
  - Specifics of future rate design (including proposed tariffs) will be determined in the Company's next rate case and/or in a separate TVR docket (at the PUC's discretion)

- For the purposes of developing the business case, **the Company will present benefits from an illustrative/example TOU/CPP supply rate** with quantitative sensitivities around opt-in vs. opt-out and customer response to the TVR design
  - Other rate designs will be discussed qualitatively, including potential delivery structures

Illustrative spectrum of TVR options

TOU – Time of Use	RTP – Real-Time Pricing
CPP – Critical Peak Pricing	ICAP – Installed Capacity

Outline

PUC agenda item(s) addressed in this section:

d. Is the group addressing the risks if something goes badly?

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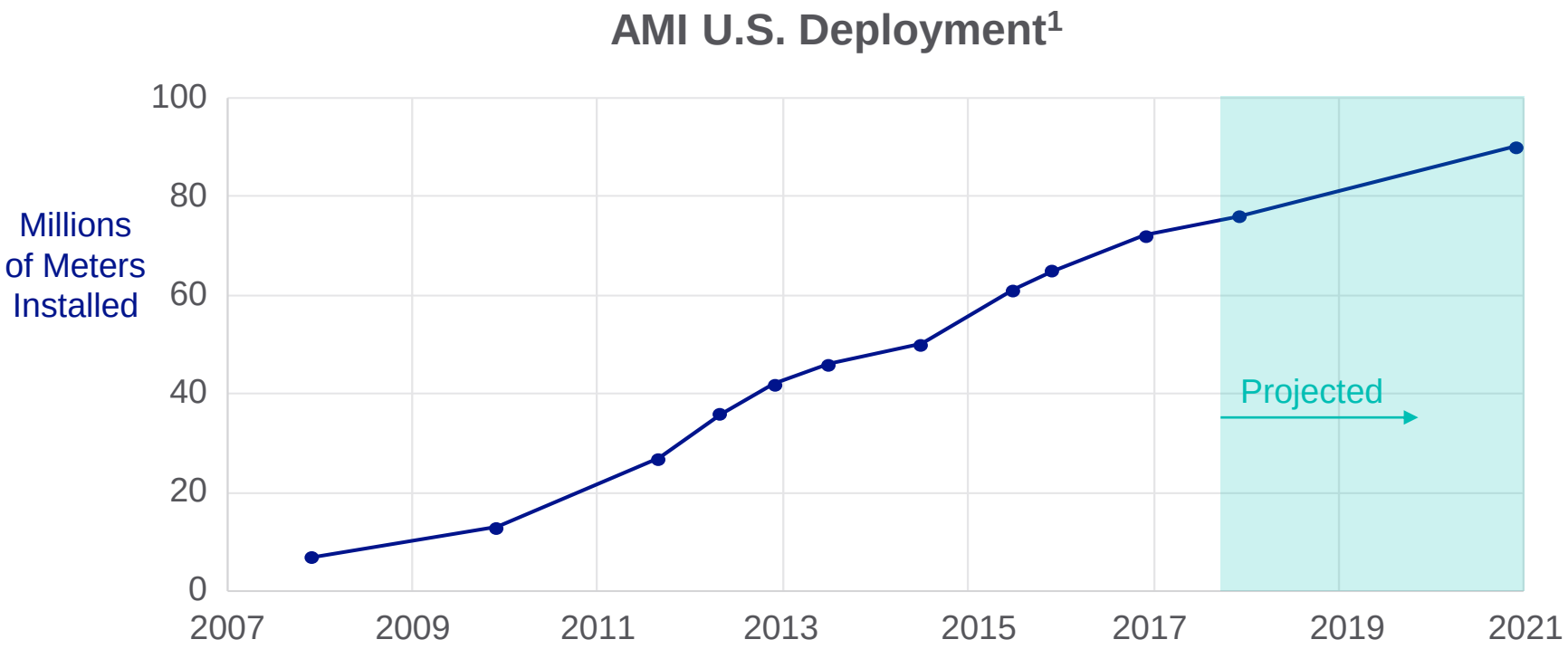
The GMP and AMF proposals will take a multifaceted approach to risk management

- Development of a long-term integrated GMP & AMF roadmap aligning the timing and cost of new functionalities with system and customer needs
  - 5-Year Grid Modernization Implementation Plan will invest in core enabling functionalities common to all future state scenarios evaluated (e.g. AMF)
  - Proposals include refreshes of key technologies to stay current and proactive
- Consideration of alternative metering solutions
- Development of a comprehensive customer engagement plan to support any type of AMF deployment and the envisioned set of benefits, including TVR
- Inclusion of a robust benefits analysis and a BCA sensitivity analysis
- Cost estimate refinement through a Request for Solution (RFS) solicitation for the major components of the AMF solution: electric meters, gas modules, field area network equipment, back-office systems, and related professional services
- Development of a robust governance structure for implementation

AMF Deployment Maturity

- **AMF has been deployed in the U.S. for more than 10 years**
- **78.9 million advanced meters were deployed in the U.S. by the end of 2017, representing approximately 60% of the metering market (ahead of forecast)**



- **The Company's proposal is to deploy the *most mature and advanced metering technology* (e.g., computing power/distributed grid-edge intelligence) – building on past technologies, deployments, and best practices from across the country**

[1] Derived from IEI Report, Electric Company Smart Meter Deployments: Foundation for A Smart Grid (issued December 2017)

05

Input from Other PST Advisory Group Members

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06

Appendix

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Appendix A:
Acronym List

Acronyms

- ADMS = Advanced Distribution Management System
- AMF = Advanced Meter Functionality
- AMI = Advanced Meter Infrastructure
- AMR = Automatic Meter Reading
- ASA = Amended Settlement Agreement
- ASHP = Air Source Heat Pump
- BAU = Business as Usual
- BCA = Benefit Cost Analysis
- C&I = Commercial and Industrial
- CEMP = Customer Energy Management Platform
- CEP = Customer Engagement Plan
- CGR = Connected Grid Router
- CO2 = Carbon Dioxide
- CPP = Critical Peak Pricing
- D = Distribution
- DCFC = Direct Current Fast Charging
- DER = Distributed Energy Resource
- DERMS = Distributed Energy Resource Management System
- DG = Distributed Generation
- DLM = Dynamic Load Management
- DPAM = Distribution Planning & Asset Management
- DPL = Dayton Power and Light
- DR = Demand Response
- DRIPE = Demand Reduction Induced Price Effect
- DSCADA = Distributed Supervisory Control and Data Acquisition
- EC4 = Executive Climate Change Coordinating Council
- EE = Energy Efficiency
- EDI = Electronic Data Interchange
- EHP = Electric Heat Pump
- EIA = Energy Information Administration
- EPO = Energy Profiler Online
- ESB = Enterprise Service Bus
- EV = Electric Vehicle
- FAN = Field Area Network
- FLISR = Fault Location Isolation and Service Restoration
- GBC = Green Button Connect
- GBD = Green Button Download my data
- GHG = Greenhouse Gas
- GIS = Geographical Information Systems
- GMP = Grid Modernization Plan
- HAN = Home Area Network
- HCA = Hosting Capacity Analysis
- HVAC = Heating, Ventilation, and Air Conditioning
- ICAP = Installed Capacity
- ICE = Interruption Cost Estimate
- IoT = Internet of Things
- ISA = Interconnection Service Agreement
- IT = Information Technology
- LDV = Light Duty Vehicle
- LVA = Locational Value Analysis
- MA = Massachusetts
- MDM = Meter Data Management
- MV/LV = Medium Voltage/Low Voltage
- NMPC = Niagara Mohawk Power Corporation
- NPP = Non-Regulated Power Producer
- NY = New York
- NWA = Non-Wires Alternative
- OMS = Outage Management Systems
- PBR = Performance-Based Regulation
- PI Historian = Plant Information Historian
- PIM = Performance Incentive Mechanism
- PLC = Power-Line Communication
- PSE&G = Public Service Electric & Gas
- PSR = Platform Service Revenue
- PST = Power Sector Transformation
- PUC = Public Utilities Commission
- PV = Photovoltaic
- REC = Renewable Energy Credit
- REV = Reforming the Energy Vision
- RF = Radio Frequencies
- RGGI = Regional Greenhouse Gas Initiative
- RI = Rhode Island
- RMD = Residential Methane Detector
- RTP = Real Time Pricing
- RTU = Remote Terminal Unit
- SaaS = Software as a System
- SCT = Societal Cost Test
- SME = Subject Matter Expert
- ToC = Table of Contents
- TOU = Time Of Use
- TVR = Time Varying Rate
- VDER = Value of Distributed Energy Resources
- VMT = Vehicle Miles Traveled
- VPP = Variable Peak Pricing
- VVO/CVR = Volt-Var Optimization/Conservation Voltage Reduction
- WACC = Weighted Average Cost of Capital

Appendix B:
Mapping of ASA Requirements to Subcommittee Feedback (*ongoing* – as of 4/9/19)

AMF Stakeholder Input and the Amended Settlement Agreement (1 of 5)

Updated AMF Business Case Requirements	Subcommittee Input / Direction / Decisions
A refined and updated AMF business plan, benefit-cost analysis (BCA), and a detailed customer engagement plan	Updated AMF BCA results shared at March 28 PST subcommittee meeting, to be refined for April 25
An updated AMF deployment schedule with a BCA (using the Societal Cost Test) for different meter deployment periods	Agreement that co-deployment with NY should be targeted in the event that the NY filing is approved
Revenue requirement for AMF deployment	Alignment that the revenue requirement should include treatment of unrecovered AMR costs
Deployment proposals, a proposal for cost recovery of AMF, and any activities associated with implementation of AMF	To be covered at April 25th PST subcommittee meeting
A proposal to allocate AMF costs among rate classifications	Feedback that it is important to see impacts by rate class (e.g., largest C&I customers who already have interval metering in place) Feedback to give additional thought to temporal alignment of benefits realization with cost allocation for gas customers

AMF Stakeholder Input and the Amended Settlement Agreement (2 of 5)

Updated AMF Business Case Requirements	Subcommittee Input / Direction / Decisions
Assumptions upon which a proposal to develop time varying rates will be based	Alignment that: • The filing will not request approval of a TVR design but will discuss a spectrum of potential TVR designs • For the purposes of developing the business case, the Company will present benefits from an illustrative/example TOU/CPP supply rate, with other rate designs discussed qualitatively and with quantitative sensitivities around response to the TVR design • TVR on delivery rates maximizes ability to send efficient price signals (though views on method diverge)
A Data Governance Plan regarding timely customer, NPP, and third-party access to system and customer data, … in place and billing quality customer data … with the proper privacy and security protections	Feedback that Company should, in addition to explaining current and future data governance practices, address considerations in data governance that are unique to AMF. Elements to appear in Customer Engagement Plan, but will have dedicated chapter within filing.
Updated costs for AMF deployment based on information gained from a procurement effort	Covered at March 28th PST subcommittee meeting.

AMF Stakeholder Input and the Amended Settlement Agreement (3 of 5)

Updated AMF Business Case Requirements	Subcommittee Input / Direction / Decisions
Transparent, updated benefit cost analysis that fully incorporates the Docket 4600 framework	Alignment that every Docket 4600 category will be addressed either quantitatively (to the extent practical) or qualitatively in the filing. Quantified categories excluded from the Company's base BCA will appear in an appendix.
Investigation of alternative business models and ownership models	An assessment prepared for the Company by Accenture (that supports the Company's initial proposal) was shared with PST stakeholders. Stakeholders continue to discuss as it pertains to sub-priorities.
Analysis of data latency	Feedback that filing should address AMF use cases and latency requirements for each.
Deployment details	Alignment that Customer Engagement Plan needs to address behavioral science and income-eligible customer experience Feedback that proactive engagement with key community stakeholders is vital, and that a "customer bill of rights" could be developed to set proper expectations and protections for customers

AMF Stakeholder Input and the Amended Settlement Agreement (4 of 5)

Updated AMF Business Case Requirements	Subcommittee Input / Direction / Decisions
Role of non-regulated power producers, including articles to share customer information and customer engagement	Agreement that NPPs should be required to maintain same data privacy standards maintained by NGrid Agreement that Green Button Connect functionality will give customers easy ability to share their data NPP's are likely to offer TVR based on research of other jurisdictions
Ownership model for assets and telecom	An assessment prepared for the Company by Accenture (that supports the Company's initial proposal) was shared with PST stakeholders. Stakeholders continue to discuss as it pertains to sub-priorities.
Detailed AMF functionalities, how Rhode Island will achieve those functionalities, and a timeline for when those functionalities will be available	Functionalities roadmap introduced at March 28th PST subcommittee meeting and to be revisited on April 25th
Identification of the most cost effective way to achieve the functionalities, and how the functionalities align to the policy objectives	Feedback that filing should address alternates to AMF in order to show that AMF is more cost-effective solution to policy objectives
Explanation of whether the realization of those functionalities will require additional future work and costs over 20 years	Functionalities roadmap introduced at March 28th PST subcommittee meeting and to be revisited on April 25th
Identification of whether the AMF solution would allow for proper net metering according to the tariff	Agreement that Company will address directly in the filing

AMF Stakeholder Input and the Amended Settlement Agreement (5 of 5)

Updated AMF Business Case Requirements	Subcommittee Input / Direction / Decisions
Identification of what functionalities the AMF will achieve that are part of the grid modernization plan and which are in addition to the Grid Modernization Plan	Functionalities roadmap introduced at March 28th PST subcommittee meeting and to be revisited on April 25th
Identification of which functionalities are dependent on a full-scale roll out instead of a targeted roll out	Functionalities roadmap introduced at March 28th PST subcommittee meeting and to be revisited on April 25th
Business cased based on both a Rhode Island-only scenario and a Rhode Island/New York scenario	Agreement that both scenarios need to be presented in filing
A business case based on the length (duration) of meter deployment	Agreement on proposed 18-month meter deployment following 2-year systems and process development phase
Identification of the critically linked parts of grid modernization and AMF	Alignment that AMF is a substantive component of grid modernization AMF supports both grid-facing and customer-facing functionalities and benefits; coordination of approach and BCA methodology
Identification of whether the AMF solution would allow for proper net metering according to the tariff	Agreement that Company will address directly in the filing

GMP Stakeholder Input and the Amended Settlement Agreement (1 of 3)

Grid Modernization Requirements	Subcommittee Input / Direction / Decisions
Objectives for the electric grid to advance the Goals for the Energy System and Rate Design Principles, and potential visibility requirements of the benefit-cost framework in Docket 4600 Guidance Document;	Alignment to include additional 4600 Goals related to customer benefits Alignment to incorporate AMF and customer benefits into one table in the final report Agreement to utilize all 4600 categories for costs and benefits
Explanation of the role of currently active programs;	Agreement that Company will include discussion of likely future dockets for currently active programs
A description of how the GMP, in particular the distribution planning components, addresses the relationship between electrification of heating and transportation and energy efficiency to allow for the furtherance of overall reduced peak demand while also encouraging electrification of heating and transportation;	Company will coordinate with EV, EE, and other customer facing programs to ensure consistency of 2030 assumptions
Functionalities to achieve [the] objectives;	Agreement to map objectives to functionalities
Review of options for candidate technologies to deliver those functionalities;	Company has provided draft set of options for stakeholder review. To be discussed further at April 25th PST subcommittee meetings

GMP Stakeholder Input and the Amended Settlement Agreement (2 of 3)

Grid Modernization Requirements	Subcommittee Input / Direction / Decisions
Identification of the possible communications solutions that address current and future needs and support a wide array of potential grid modernization programs and activities;	An assessment prepared for the Company by Accenture (that supports the Company's initial proposal) was shared with PST stakeholders. Stakeholders continue to discuss as it pertains to sub-priorities.
Full assessment of the various initiatives being contemplated, including an explanation and evaluation of how the initiatives link to each other. The assessment will consider short and long-term initiatives to include active and future programs.	Company will discuss with stakeholders the selection process.
A plan and explanation for the integration and leveraging of customer-side technologies and resources in the near and long-term;	Company will coordinate with EV, EE, and other customer-facing programs
Transparent, updated benefit cost analyses that fully incorporate the Docket 4600 framework;	Alignment that every Docket 4600 category will be addressed either quantitatively (to the extent practical) or qualitatively in the filing. Pending discussion over BCA presentation and categories that will be limited to qualitative discussion in the filing.

GMP Stakeholder Input and the Amended Settlement Agreement (3 of 3)

Grid Modernization Requirements	Subcommittee Input / Direction / Decisions
A plan and explanation of how the selected investments and implementation plan address risks of redundancy or obsolescence.	Company to include Future State Scenarios discussion in a Risk Assessment section. Commonalities in the Future State Scenarios and Issues should be used to justify the core Grid Mod Solution set.
Implementation plans outlining the details and technologies over a five-year horizon plus an outline of how this plan aligns with the longer term (i.e., a ten year roadmap). The GMP will provide a roadmap of potential investments beyond the term of the current multi-rate plan (MRP); requests to fund those investments will be included as part of a general rate case, MRP, or ISR Plan filings.	Agreement that roadmaps can help illustrate investment risk mitigation strategies
An implementation plan that provides a detailed explanation of the prioritization, sequencing, and pace of investments;	Introduced to stakeholders at March 28th PST subcommittee meeting and to be revisited on April 25th
Investments and technology deployments planned through the end of any proposed AMF implementation; and	Company will develop a Grid Modernization Roadmap out to 2030 – Introduced at March 28th PST subcommittee meeting and to be revisited on April 25th
Explanation of congruency with grid modernization activities in New York and Massachusetts;	Company will address directly in the filing.

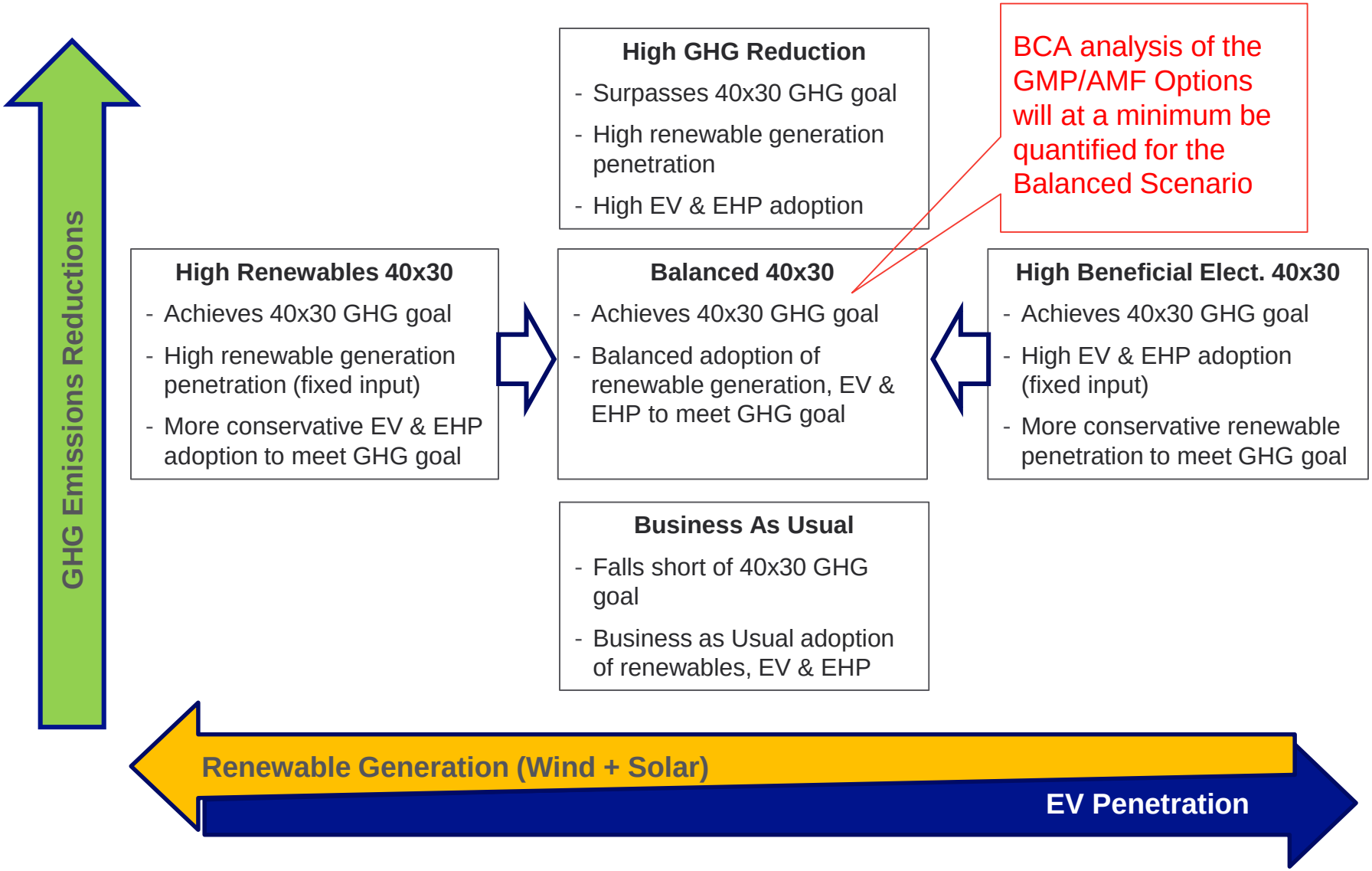
Appendix C:
Grid Modernization Details

Future State Modeling Approach

- **Step 1) Scenarios Development**
  - Develop DER scenarios that can achieve the CO2 emissions goal based on Statewide Annual Energy (kWh/yr) and Emissions (MMT CO2/yr) Assessment
  - Start with EIA statewide energy and CO2 emissions data (1990 through 2016)
  - Make assumptions for statewide Solar, Wind, EV, and EHP penetration in 2030
- **Step 2) Electric Demand (kW) Forecast**
  - Develop a statewide hourly load forecast using results from Step 1 and statewide hourly baseload and DER load profiles
  - Start with National Grid and NE ISO load data and projections (2016 through 2030)
  - Make assumptions for statewide hourly DER load profiles - Solar, Wind (onshore and offshore), EV charging (Level 2 vs. DCFC, workplace vs. home), and EHP
  - Make assumptions for statewide hourly baseload, EV charging, and EHP load profiles under a TVR case
- **Step 3) Top Down (Statewide) and Bottom Up (Feeder Level) Impact Analysis**
  - Evaluate the potential impact (e.g., thermal, voltage) the 2030 Electric Demand Forecast in Step 2 has on the distribution system in RI
  - Bottom Up Analysis starts with representative feeder models in CYME
  - Make assumptions for feeder-specific hourly DER load profiles - Solar (distributed and central), Wind (onshore), EV charging (Level 2 vs. DCFC, workplace vs. home), and EHP
  - Make assumptions for feeder-specific hourly baseload, EV charging, and EHP load profiles under a TVR case

EV = Electric Vehicle
EHP = Electric Heat Pump
DCFC = Direct Current (DC) Fast Charging

Scenarios Development – Overview



Updated GMP Functionalities: Major Focus Areas

Distribution System Planning	Distribution Grid Operations	Distribution Market Operations
Distribution System Information Sharing	Distribution Grid Control (Flow Control)	Advanced Pricing
Interconnection Process*	Distribution Grid Control (Volt-Var Control)	Solution Evaluation
DER Integration (includes Distribution Grid Codes)*	Fault Management (FLISR & Protection)	Solution Sourcing*
EV Readiness*	Observability (Monitoring & Sensing)	Customer Information Access (Data & Portal)*
Short and Long-term Demand and DER Forecasting	Advanced Metering	Market Participation Rules
Short-term Distribution Planning	Reliability Management (Outage Management)	Market Settlement
Long-term Distribution Planning	Reliability Management (Fault Analysis)	DER Aggregation to Distribution and/or Wholesale Market
Power Flow Analysis	DER Operational Control	Market Information Sharing
Estimation of Distribution Capital Upgrades	Operational Information Management	Market Oversight
Locational Value Analysis	Operational Telecommunications	Measurement & Verification
Integrated Resources Transmission and Distribution Planning	Cybersecurity	Confirmation and Clearing
Multiple Forecast Scenario-based Planning	Distribution System Representation (Network Model & State Estimation)*	Billing
Reliability and Resilience Criteria	Simulation*	Solutions Portfolio Optimization
Interconnection Studies	Power Quality Management	Programs
Hosting Capacity Analysis	Operational Forecasting	Dynamic Notification
Analytics	Microgrid Management	Market Security and Cybersecurity
	Threat Assessment and Remediation	
	Physical Security	
	Asset Optimization	
	Outage Management	
	Distribution to Transmission Operational Coordination	
	Distribution to Customer/ Aggregator Coordination	

LEGEND

Major Focus areas that are driving the RI GMP and will be key elements of the final report

* New Major Functionalities

Preliminary Grid Mod Solutions: Overview

Functional Area	Functionality	Selected Solutions (Preliminary)
System Planning	Distribution System Information Sharing	System Data Portal
	Interconnection Process	Interconnection Online Application Portal (NGRID nCAP)
	DER Integration (includes Distribution Grid Codes)	New DG Interconnection (IC) Requirements (NGRID ESB756, Flexible IC Standards)
	EV Readiness	System Data Portal, EV Infrastructure Plan
Grid Operations	Distribution Grid Control (Flow Control)	ADMS & DSCADA
	Distribution Grid Control (Volt-Var Control)	Advanced VVO/CVR
	Fault Management (FLISR & Protection)	Advanced Protection Systems, FLISR
	Observability (Monitoring & Sensing)	AMF and/or Feeder Monitoring Sensors
	Advanced Metering	AMF
	Reliability Management (Outage Management)	ADMS-based OMS w/ or w/o AMF
	Reliability Management (Fault Analysis)	ADMS-based Fault Location, Remote Fault Indicators w/ SCADA
	DER Operational Control	Distributed Energy Resource Management System (DERMS)
		Smart Inverters (Customer Owned)
		Energy Storage (Customer and Company Owned)
		Reverse Power Flow Protection (e.g., 3V0)
	Operational Information Management	Enterprise Service Bus (ESB)
		PI Historian
		Data Lake
		Advanced Analytics
	Operational Telecommunications	Field Area Network (FAN), Backhaul and Telecommunications Management Systems
	Cybersecurity	Appropriate Cyber Services Portfolio
	D-System Representation (Network Models & State Est.)	Network Data Model
	Simulation	ADMS - State Estimator
Market Operations	Advanced Pricing	Time Varying Rates (TVR)
	Solution Evaluation	Area & Interconnection Studies, Advanced NWA Evaluation Tools
	Solution Sourcing	NWA & DR Programs, Auctions/Pay for Performance, Utility Ownership
	Customer Information Access (Data and Portal)	Green Button Connect (GBC), Customer Energy Management Portal

Appendix D:
AMF and GMP Filings: Deliverables Sharing Schedule w/ Subcommittee

Deliverables Sharing Schedule (AMF)

Deliverable	Date to Share #1	Feedback Deadline #1	Date to Share #2	Feedback Deadline #2
AMF BCA Model Deep Dive	Thu 4/18 (Melrose St. & WebEx)	Fri 4/26	N/A	N/A
Customer Engagement Plan	Tues 4/9	Tues 4/23	Fri 5/3	Fri 5/10
TVR Proposal	Tues 4/16	Tues 4/30	Fri 5/10	Fri 5/17
Data Governance Plan (e.g. Access, Sharing and Privacy)	TBD – awaiting DPUC feedback			Fri 5/17
Revenue Requirement and Cost Recovery Proposal	Updates shared during 4/25 Milestone Meeting (follow-up if needed)			
Bill Impact Analysis	Updates shared during 4/25 Milestone Meeting (follow-up if needed)			
Cost Allocation (among rate classifications) Proposal	Updates shared during 4/25 Milestone Meeting (follow-up if needed)			
Business Case	Tues 5/7	Fri 5/17	N/A	N/A

Deliverables Sharing Schedule (GMP)

Deliverable	Date to Share	Feedback Deadline
Feeder Modeling Deep Dive	Targeting week of 4/15 or 4/22	Fri 4/26
BCA Results – Draft	4/25 (PST Meeting)	Fri 5/24
BCA Results – Model Deep Dive	Targeting week of 5/6 or 5/13	Fri 5/24
RI GMP Report – Draft	Mon 5/20	Fri 5/31