Bonneville
POWER ADMINISTRATION

INTEGRATED PROGRAM REVIEW
Grid Modernization

June 20, 2018

AGENDA

Time	Topic	Speaker
9:00 – 9:10	Welcome, safety moment, introductions	Steve Kerns *Director of Grid Modernization*
9:10-9:40	Overview of the Grid Modernization Program and Link to the Agency Strategic Plan	Joel Cook, *Senior Vice President, Power Services* Richard Shaheen, *Senior Vice President, Transmission Services*
9:40– 10:30	Grid Modernization Project Focus Areas	Vice Presidents
10:30– 11:00	Completed Grid Modernization Projects	Vice Presidents
11:00 – 11:30	Question and answer session	Steve Kerns *Director of Grid Modernization*

Objectives of this Presentation

- Convey the importance of Grid Modernization and its relationship with BPA's Strategy.
- Discuss the Grid Modernization Roadmap and the objectives of the Grid Modernization projects.
- Provide information on progress made so far.

Overview of the Grid Modernization Program and Link to the Agency Strategic Plan

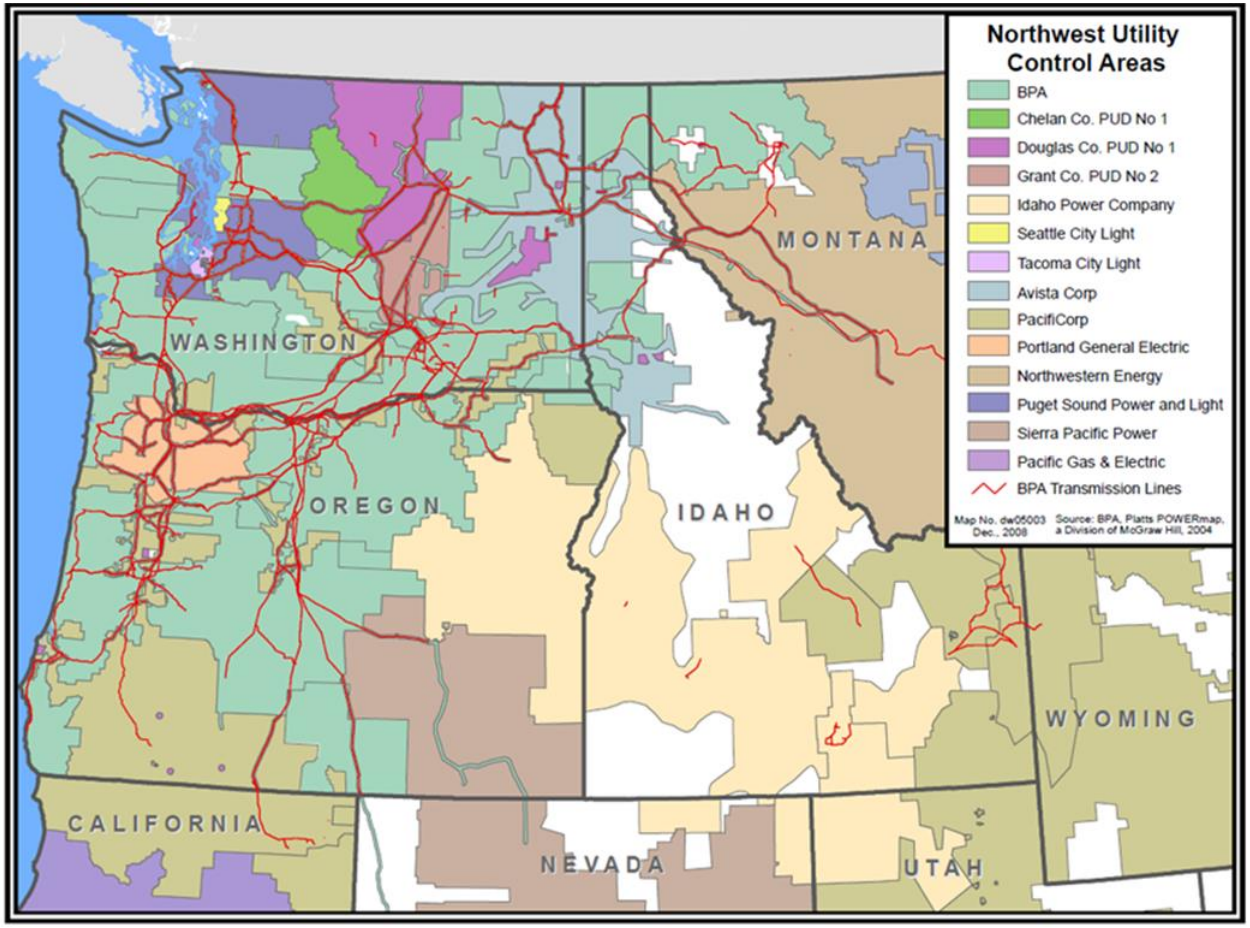
Presenters:

Joel Cook
Senior Vice President Power Services

Richard Shaheen
Senior Vice President Transmission Services

Bonneville's Uniquely Valuable Role

- The Bonneville Power Administration is an engine of the Pacific Northwest's economic prosperity and environmental sustainability.



Strategic Plan Calls for Grid Modernization

- Bonneville released the 2018-2023 Strategic Plan in January.
- The strategic plan describes the actions Bonneville will take over the next several years to deliver on its public responsibilities through a commercially successful business.
- Modernizing federal power and transmission system operations and supporting technology is a key agency strategic objective.

www.bpa.gov/StrategicPlan/Pages/Strategic-Plan.aspx

Strategic Plan Provides Direction for Grid Modernization

- Meet customer needs more efficiently and responsively (Strategic Goal 4).
- Reduce future costs, including need for new generation and transmission resources (Strategic Goals 1 – 4).
- Create new opportunities for all market participants (Strategic Goal 2).

Grid Modernization

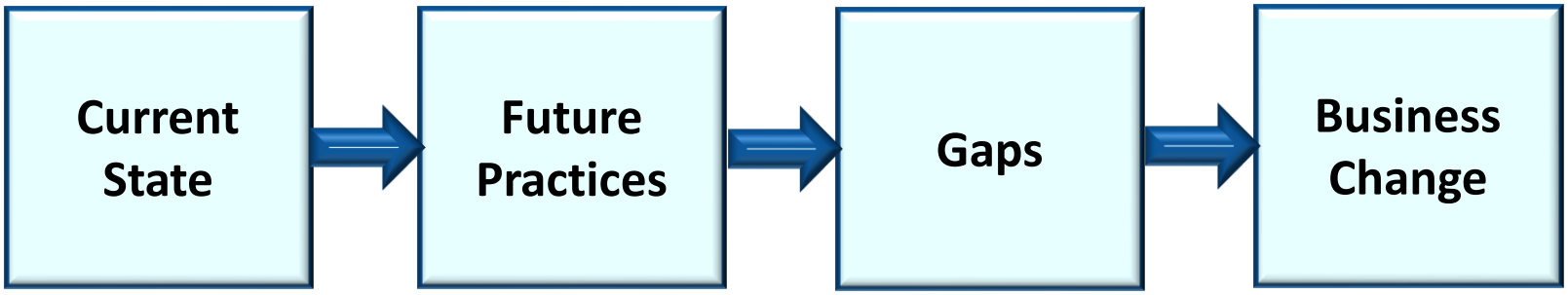
- Continued investments into grid modernization are necessary to bring systems, processes and skills up-to-date.

- Grid modernization projects will better position BPA to make more informed choices about:
  - Reliability coordination.
  - Day-ahead market enhancements.
  - BPA tariff strategy.
  - Potential market participation in the future.

- Programmatic investments will:
  - Support a more reliable, flexible and efficient system.
  - Reduce future costs.
  - Enable new opportunities for market participants.

Grid Modernization

- In January 2017, BPA started a project to develop a roadmap to modernize Commercial Operations in both Transmission and Power.



- Future practices were identified and represented a combination of BPA specific and standard industry business practices intended to modernize BPAs commercial operations and inform future decisions.

Grid Modernization Examples of Gaps to Resolve

Functional Process	Summary Gap Description
Constraint Management	• Evaluate and allocate constraints closer to real-time
Reserve Management	• Establish quantities and unit assignments closer to real-time
Metering	• Manage uncertainty and increase granularity
Information Delivery	• Address customized processes, aging software and hardware
Outage Coordination	• Standardize and automate outage submission, tracking and coordination of generation and transmission assets

Grid Modernization Roadmap

- Gap analyses and scope of business changes informed the grid modernization roadmap and were:
  - Guided by BPA's Strategic Plan.
  - Built upon the foundation of all earlier work.
  - Based on BPA's view of the changing marketplace.
  - Informed by industry peers.
  - Developed in conjunction with a respected industry expert and EIM integrator.

Grid Modernization Project Focus Areas

Presenters:

Michelle Cathcart

Suzanne Cooper

Michelle Manary

Pete Raschio

Jeff Cook

Operational Modernizations

- Improve reserve obligation calculation and deployment.
- Improve efficiency and coordination:
  - For generation planning and coordination with the Corps and Bureau.
  - Comprehensive, efficient and integrated outage management.
  - Consistent network modeling data and exchange of models.
  - Management and mitigation of operational constraints.
- Enhance control center data, visualization and situational awareness.
- Enable options for market participation.
- Preserve Bonneville's flexibility to continue evaluating RC service providers.

Commercial Modernizations

- Optimize the commercial availability of the grid.
- Enable options for market participation.
- Enable shorter scheduling and dispatching intervals.
- Enhance comprehensive trading and risk management toolset.
- Provide a more sustainable, integrated long-term transmission planning processes.
- Enhance short-term ATC calculation, consistent with products and policies.
- Align Business Practices with changes to transmission products.
- Enhance settlement capabilities.

EIM Implementation

- Implement tariff, policy, rate and business practice changes consistent with market participation.
- Develop ability to submit base schedules, bid curves and other data required by the EIM.
- Enable automated generator dispatches consistent with market awards.
- Manage EIM settlements with the CAISO and subsequently with BPA load and generation customers.
- Develop EIM specific training to ensure staff are able to accurately and efficiently carry out EIM roles.

Mission Critical IT Improvements

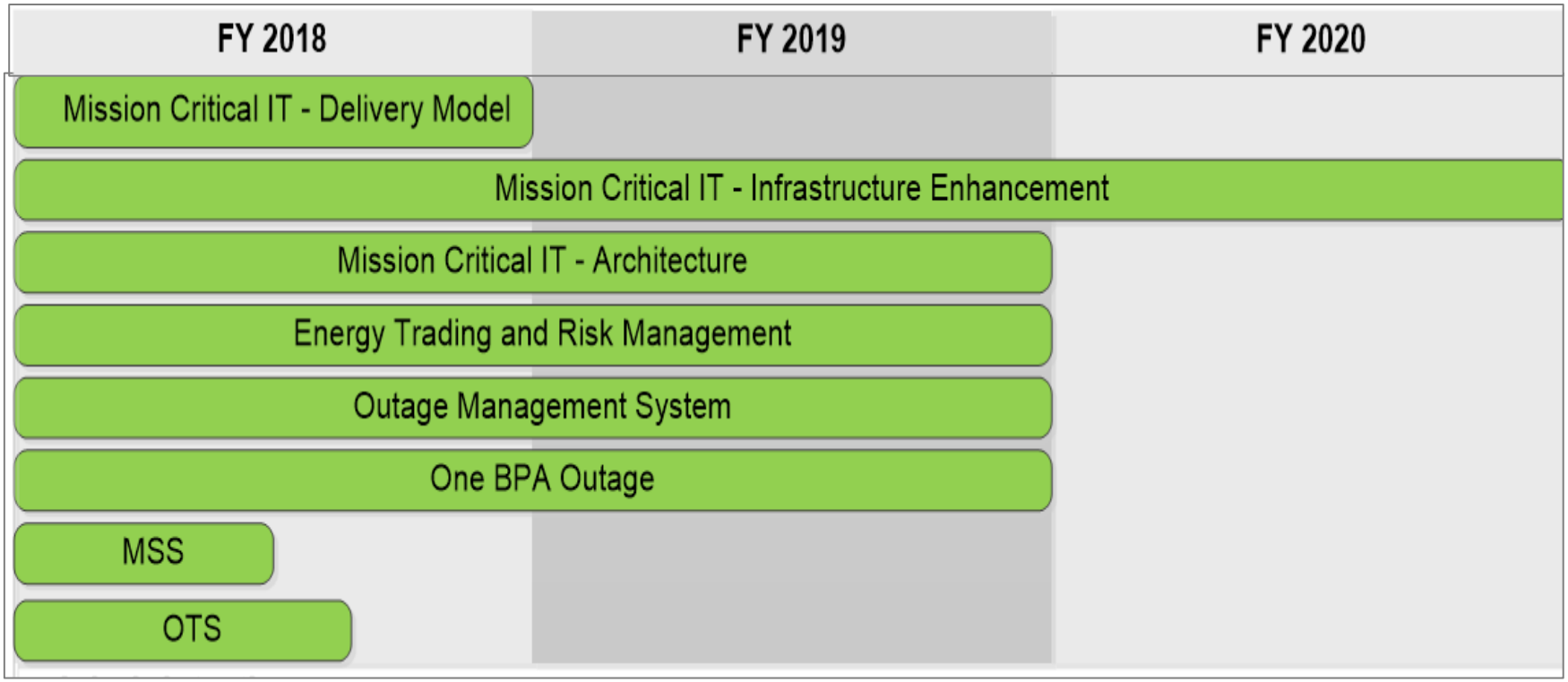
- Develop foundational capability that allows for delivery of the suite of Grid Modernization projects.
- Establish a modern, consistent and structured architecture.
- Enable robust operational reliability.
- Consolidate IT infrastructure.
- Provide capability to virtualize environments.
- Modernize the IT network.
- Standardize delivery of IT services.
- Improve capabilities to enable systematic data driven analysis.

Improvements to Core Business

- Improve consistency and coordination of visibility and controls.
- Enable and enhance structured and systematic training program.
- Improve forecasting of load & renewable generation.
- Modernize analytical capability.
- Modernize settlements systems and processes.

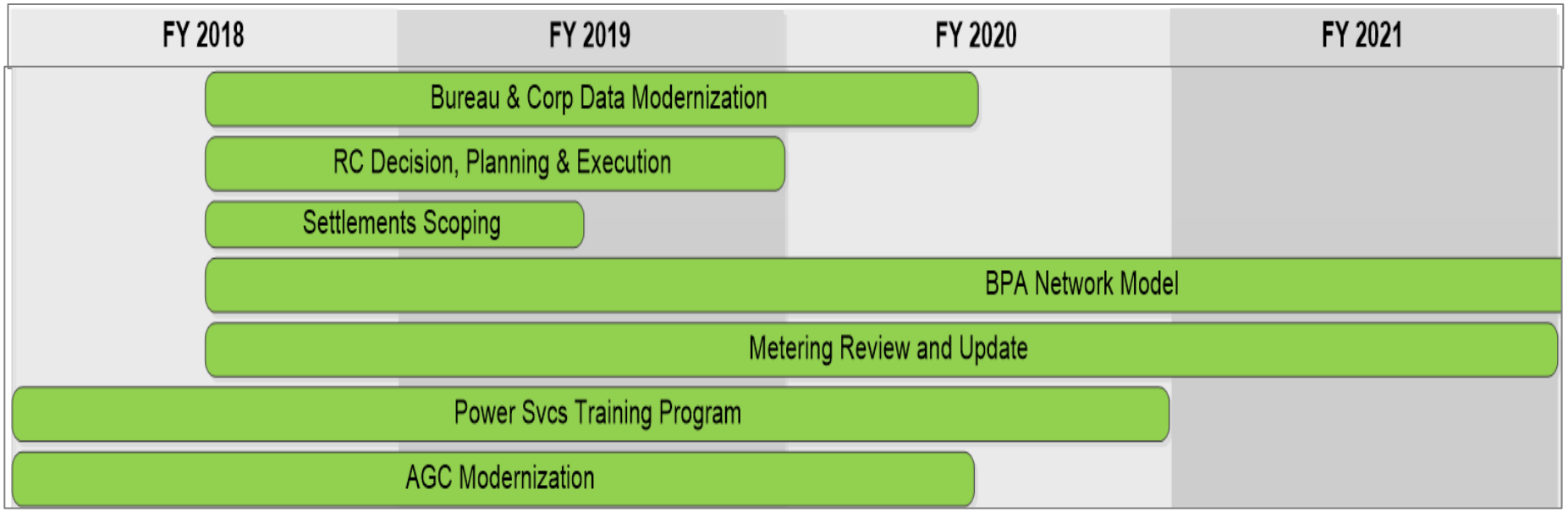
Completed and In-flight Projects

- BPA is currently mobilizing to advance multiple grid modernization projects.



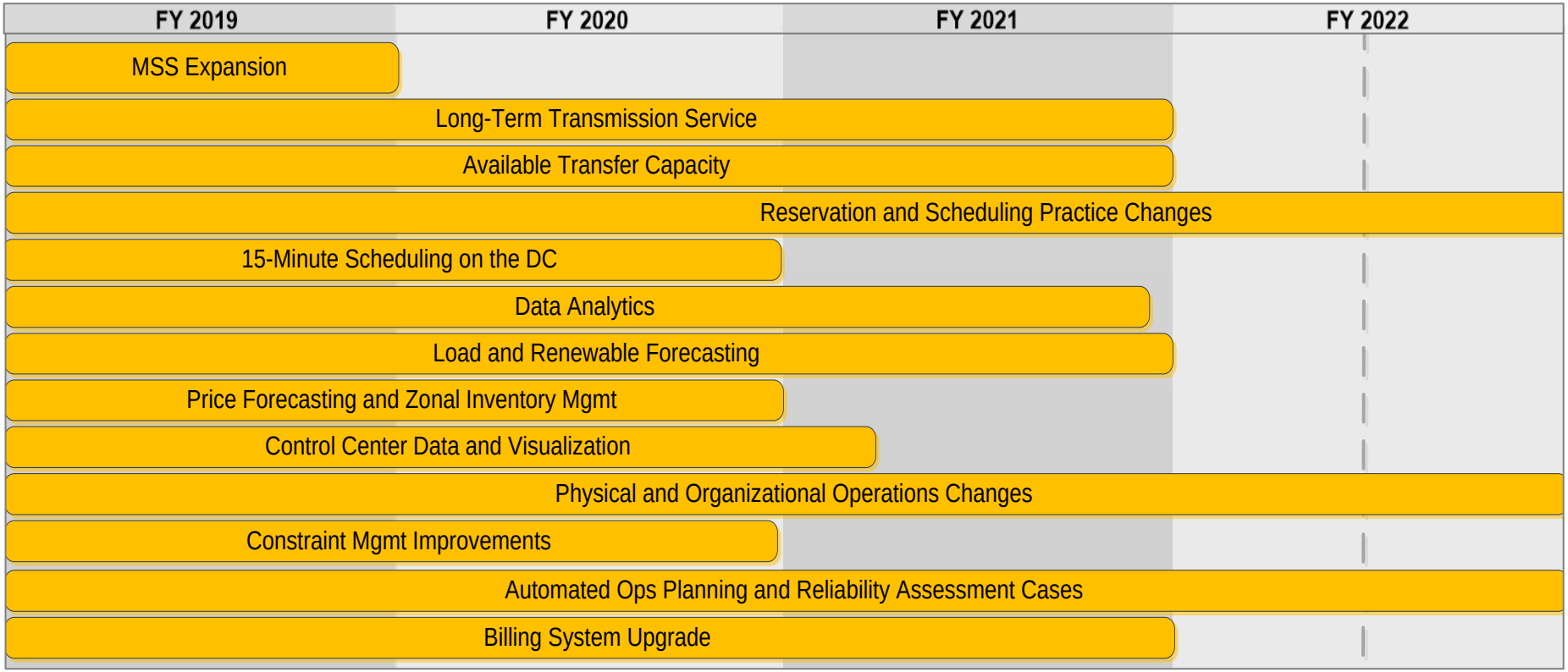
Completed and In-flight Projects

- Projects are underway with important elements extending into the 2020-2021 rate period.
- The pace of these projects is accelerating.



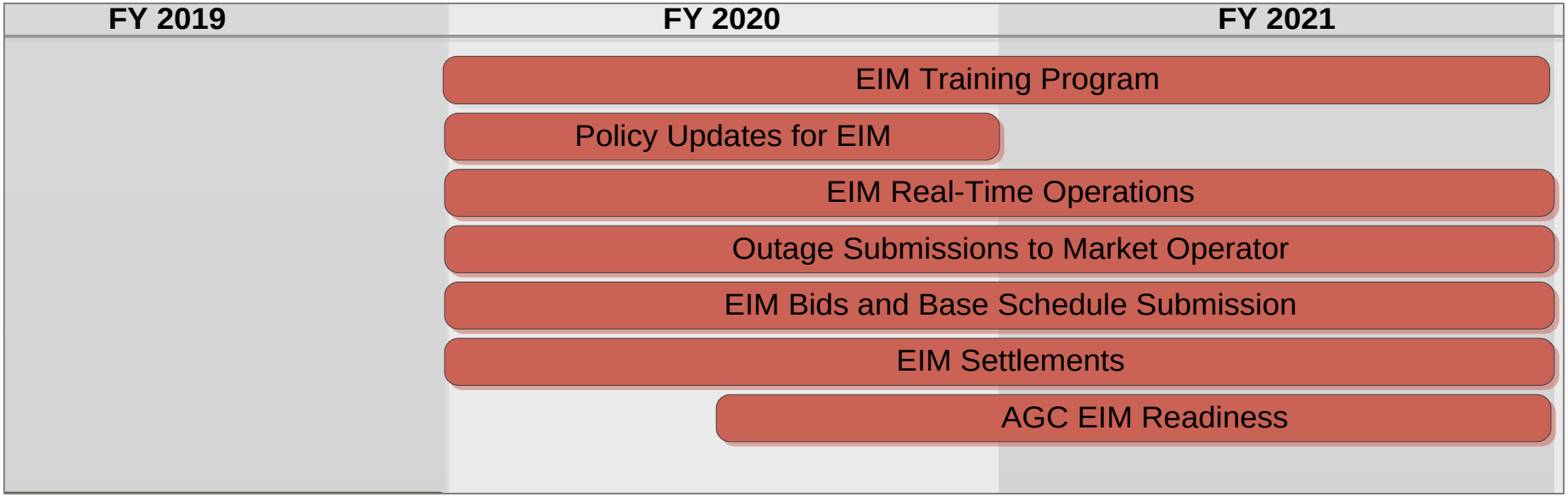
Future Projects

- Further modernization efforts are planned for FY 2019-2021 with the bulk of the work and investment occurring in the 2020-2021 rate period.



Future Projects

- The FY 2020-2021 include projects specifically focused on EIM.
- If BPA chooses not to participate in the EIM, these projects will not be pursued.



Grid Modernization FY 2020-2021 Funding

- Expense:
  - Spending levels held flat, relative to FY 2018 and FY 2019.
  - Incremental expenses will be managed within the $25M per rate period level.

- Capital:
  - Spending levels will be absorbed into existing capital program levels.

- Allocation between Power & Transmission:
  - Consistent with the FY 2018-FY 2019 allocation of 65% to Transmission and 35% to Power.

Completed Grid Modernization Projects

Presenters:

Suzanne Cooper

Steve Kerns

Marketing and Settlements System

- Description:
  - Replace the system that Power Services uses to bid and settle with the California ISO with a new system better suited to fit the current and future business needs.
- Objectives:
  - Enhanced and improved bidding capability
  - Meet settlement needs of markets.
  - Ability to handle settlements complexity.
  - Improved handling of settlement validation.
- Business Benefits:
  - Increase net secondary revenue.
  - FTE time savings.
  - Enhanced data access.
  - Ability to better perform shadow settlements for preference load in EIM participating BAs.

Outage Tracking System

- Description: System for planning and tracking FCRPS outages for use by BPA, the Corps and Bureau.

- Objectives:
  - Repeatable outage management process.
  - Corps/Bureau integration.
  - Sustainable IT architecture.
  - Scenario analysis.
  - Systems integration.
  - Auditability.
  - Data Visualization.
  - Performance indicators.

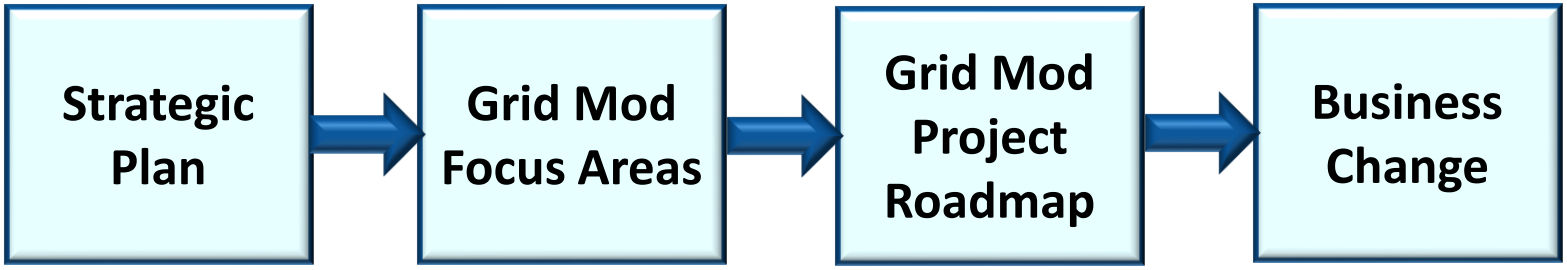
- Business Benefits:
  - Efficient management of FCRPS generating capacity.
  - Improved situational awareness.
  - Savings from operational efficiencies.
  - Improved cross-agency coordination and planning.

Bringing it all Together

- Grid Modernization will be a multi-year program that will touch many aspects of BPA's business as well as our customers and Federal partners.

- Will ensure long-term success and viability for the region through programmatic investments.

- Customers will be kept up-to-date on progress:
  - QBR
  - BPA's Grid Modernization website (to be launched this Summer)



QUESTION AND ANSWER

FINANCIAL DISCLOSURE

This information was publicly available on June 18, 2018, and contains information not sourced directly from BPA financial statements.