BONNEVILLE POWER ADMINISTRATION

Integrated Program Review 2

Commercial Operations workshop

February 16, 2017
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Overview

Focus for today:

- Vision and KSI focus areas.
- Review FY18-19 cost scenarios and evolution.
- Risk of the status quo.
- Program and project efforts and connections to risks.
- Long-term planning roadmap and customer engagement

Commercial Operations

The Commercial Operations KSI will ensure that BPA is fully enabled with the core functionality required to successfully manage and participate in a regional electric grid.

- **We will provide value by:**
  - Preserving the value of our federal assets.
  - Improving reliability through increased system transparency.
  - Leveraging geographic diversity of generating resources and energy demand.
  - Optimizing utilization of the Federal Columbia River Power System to reduce costs and increase revenues.

- **We will develop core operational infrastructure in three central focus areas:**
  - Market access.
  - Products and services.
  - Inventory management.

Market access

BPA will continue to take a leadership role in the development of emerging markets from both the participant, transmission provider and governance perspectives. We will actively seek access to key emerging markets to meet operational objectives, optimize surplus power sales revenues and provide alternatives in the event bilateral liquidity decreases.

Products and services

BPA will develop new and revisit current product offerings to ensure they respond to customer load demands, reflect the appropriate risks and respond to a changing marketplace.

Inventory management

BPA will develop the tools, systems and processes required to gather and analyze the large amounts of data necessary to optimize our systems for both the short and long-term, and to determine the potential benefits of a One-BPA approach to integrated planning and inventory optimization.

Evolution to a roadmap

- **2012 – First SCED internal assessment**
  - Based on BPA's understanding of SPP EIS (e.g. generic EIM/SCED).
  - Extensive cross agency engagement.
- **2014 – Second SCED internal assessment**
  - Built upon first internal assessment.
  - Based on BPA's understanding of the NWPP SCED.
- **2015 – Post SCED assessment**
  - Built upon previous assessments.
  - Look at investments that maximize value absent joining a SCED.
- **2017 – Long-term roadmap (in progress)**
  - Built upon the foundation of all earlier work.
  - Based on BPA's view of the changing marketplace.
  - Informed by a respected industry expert and EIM integrator.

FY18 – 19 annual average costs

($millions, annual average)	BP-16	Initial IPR	IPR Closeout	IPR 2 Proposal
Commercial Operations	0	25	20	13-14
Transfer to Transmission				(1.5)
Commercial Operations				11.5-12.5

*In IPR, $1.5M for staffing was assumed to be working on Comm Ops projects and was budgeted for under the Comm Ops program. As the program has evolved and we have learned more about the work ahead, we don't anticipate this staff will charge directly into the Comm Ops program but will be providing support to Comm Ops along with other Transmission functions. This budget is being moved to Transmission to cover the staff mentioned.

Scenario A – Foundational and Modernize

Additional incremental expense - $11.5 million (annual average)

Scenario B – Scenario A plus EIM Optionality

Additional incremental expense - $12.5 million (annual average)

Evolution of FY18-19 cost estimates

- Since the IPR close-out, BPA has continued to review the FY18-19 cost estimates by refining the list of candidate commercial operations projects, listed on slides 11 – 18, that include:
  - High-level project purpose and benefit statements.
  - Preliminary planning cost estimates.
  - Categorization (foundational and modernize, EIM optionality).
- Each project was evaluated and FY18-19 costs were refined based upon the following factors:
  - Point estimate of project cost within the cost range shown in the tables.
  - Estimated percentage of existing staff expected to work on the project.
  - Estimated FY18-19 execution percentages for each project.
  - Estimated FY18-19 incremental costs based on the above.
- Two planning scenarios were developed:
  - Scenario A: Foundational and modernize improvements.
  - Scenario B: Scenario A plus EIM optionality.

Risks of status quo

ID	Risks of status quo to BPA	Impact of status quo to customer
1	Continued conservatism in ATC and SOL calculations.	Unnecessary curtailments and restrictions on ATC available for purchase.
2	Continued conservatism in variable transfer limits.	Continued restrictions on market transfers.
3	Continued and increased lack of visibility and controls of the impacts of market dispatches on the BPA transmission system.	Continued restrictions on market transfers. Uncertainty in impact to customer use of their rights.
4	Potential decrease in long-term transmission renewals as other market options materialize.	Upward pressure on long-term transmission service rates.
5	Lost opportunity for revenues from new products to support EIM access.	Upward pressure on rates.

Risks of status quo

ID	Risks of status quo to BPA	Impact of status quo to customer
6	Inaccurate energy settlement due to aging metering infrastructure on federal resources.	Inability to align rate design with costs due to aging metering infrastructure on federal resources.
7	Conservatism in regulation capacity maintained.	Unrealized surplus capacity sales.
8	Potential decrease in bilateral trading as reliance on markets increases.	Upward rate pressure.
9	Inefficient re-dispatch of regional resources as transmission congestion increases.	Locating generation or demand response capacity investments in the wrong location.
10	Inability to participate in emerging markets as products and opportunities arise.	Lack of incentive for capacity investments. Upward rate pressure.
11	Missing or obsolete technology preventing modern business practices.	Slow time to fulfill requests due to manual processes.

Program projects

- Projects are divided into three categories:
  - Efforts approved for FY18-19.
  - Candidate foundational and modernize projects.
  - Candidate EIM optionality projects.
- Candidate projects listed in slides 12 – 18 are representative of work to be performed.
- Foundational projects that require significant upfront work will be prioritized to start in FY18, examples include:
  - Operational data re-architecture (slide 12).
  - BPA and CAISO coordinated transmission agreement implementation (slide 13).
  - Products, services and inventory development (slide 14).
- The long-term roadmap will provide a prioritized and sequenced set of recommended business change and technology projects.

Efforts approved for FY 18 - 19

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate
Program Management	BPA staff and contractors responsible for supporting the development of program projects (pre-proposal, proposal, project) tracking deliverables and ensuring work is completed within budget and on time.	ALL	$2m - $4m
Marketing and Settlements System Project	Replace the failing ISO bidding and settlement platforms, enable efficient EIM settlements for transfer load and surplus sales and add marketing data analysis capabilities.	5, 10, 11	$2m - $4m
Generation Outage Tracking System Project	Improves communication and coordination between FCRPS entities, increasing reliability. Aids in coordinating maintenance schedules and transmission limitations in accordance with increasing daily activity. Enhances BPA's ability to comply with NERC reporting requirements and thus reduces risk of fines.	5, 7, 10, 11	$2m - $4m

Candidate foundational and modernization projects

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
Operational Data Re-architecture	Purpose: Develop a data architecture with proper governance that is accessible across the agency. Benefit: Increase flexibility and access to data from core business systems.	1, 2, 3, 5, 9, 11	$2m-$4m	Pre-Proposal
Operational Network Modeling Coordination and Enhancements	Purpose: Improve BPA's network model systems and processes to ensure accuracy and consistency across the agency and region. Benefits: Improve reliability, consistency and efficiency of network model systems and processes within BPA and among WECC transmission providers.	3, 10	$1m -$2m	Pre-Proposal
Transmission Modeling Strategy	Purpose: Develop a roadmap and implementation plan that envisions BPA using consistent and reliable power flow and dynamic models which enable better planning, operational, and commercial decision making. Benefits: Improved efficiency and accuracy of BPA's system modeling capabilities.	1 ,2, 10, 11	$1m– 2m	Pre-Proposal

Candidate foundational and modernization projects (continued)

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
BPA and CAISO Coordinated Transmission Agreement Implementation Project	Purpose: Implement tools and data exchanges for more effective congestion management practices, controls and visualizations. Benefits: Precise, effective and price informed congestion management of EIM flows on BPA flowgates.	1, 2, 3, 11	$2m-$4m	Pre-Proposal
Operational State Awareness Tools	Purpose: Enhance situational awareness of system conditions for BPA operators. Benefits: Increase real time transparency of system flows and other constraints for more accurate and measured response to system conditions.	1, 2, 3, 5, 11	$2m-$4m	Pre-Proposal
System Operating Limits Calculation Enhancements	Purpose: Create operating limits that are informed by real time and forecasted data. Benefit: The transmission system in studied state more often. More timely and proactive information, more accurate curtailments and increase confidence in ATC values.	1, 11	$1m-$2m	Pre-Proposal

Candidate foundational and modernization projects (continued)

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
Products, Services and Inventory Development	Purpose: BPA transmission products and services align with market conditions, regulatory obligations and price signals for system expansion and usage. BPA establishes risk metrics relative to inventory and study assumptions for transmission ATC calculations. Benefits: BPA's infrastructure investment would be fully utilized providing rate stability and greater customer satisfaction. It would also send proper price signals to future participants who request transmission expansion for their future needs. Inventory would be made available consistent with sound utility practices and regulatory obligations.	1, 2, 5, 11	$5m-$10m	Pre-Proposal
One BPA Outage Management	Purpose: Outage needs are coordinated as far in advance as possible and managed to specific criteria to allow them to proceed with continual assessment and communication of certainty, providing maximum value to BPA safety, planning and operations. Benefits: Fewer outage moves, more effective sequencing of work, increased efficiency, better program execution (more work done, under budget), improved collaboration (business line integration), more lead time to manage risk and improved outage duration accuracy.	1, 11	$2m-$4m	Pre-Proposal

Candidate foundational and modernization projects (continued)

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
End Use Load Research Project	Purpose: Update end-use load shape data for residential and commercial buildings. Benefits: End-use load data provides input data that is critical to understanding the future loads and impacts on BPA's system. It also provides information needed to target demand-side solutions to solve transmission and power needs.	11	$1m-$2m	Pre-Proposal
Enhanced Forecasting Tools Project	Purpose: Improve load forecasting including conservation impacts, wind forecasting, solar forecasting and hydrological expectations. May also expand forecasting to additional adjoining. Benefits: More accurate modeling of load, wind error, solar error and hydro expectations allow BPA to better manage uncertainty in river and transmission system operations. Better forecasting of market opportunities enables BPA capitalize and increase secondary revenue.	1, 2, 3, 5, 7, 9, 10	$500k-1m	Pre-Proposal
DTC Calculation Improvements	Purpose: Develop methods and tools to calculate real-time dynamic transfer capabilities and commercial variable transfer limits. Benefits: Improved reliability and potential improved commercial access to dynamic transfer capabilities.	1, 2 ,3 ,5	$500k-$1m	Pre-Proposal

Candidate foundational and modernization projects (continued)

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
Data Science and Analytics	Purpose: Build data reservoirs with supporting analytical tools, techniques, visualizations and pipelines that make big data more accessible and meaningful. Benefits: More efficient analysis of commercial and operations information, more timely data informed decision making, lower technology costs, reliable data storage, scalable compute resources, reduced maintenance overhead, improved ability to deliver its products to customers and increased workforce productivity for all variety of data practitioners.	1, 2, 3, 5, 7, 9, 10, 11	$1m-$2m	Pre-Proposal
Enhancements to Scheduling and Curtailment tools	Purpose: BPA's scheduling and curtailment systems and processes are standardized, consistent with industry best practices and designed to manage increasing volume and complexity in response to changing industry requirements. Benefit: Standard systems are more robust, able to efficiently adjust to changing requirements and improve ability to deliver products to customers. Systems are consistent between scheduling and operations and manual processes are limited.	1, 3, 5	$500k-1m	Pre-Proposal

Candidate EIM optionality projects

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
Benefit Analysis Studies	Purpose: Estimate the qualitative and quantitative benefits of market opportunities. Benefits: Decisions on how to engage with the markets are informed by analytics.	ALL	$500k-$1m	Pre-Proposal
New Markets Engagement Project	Purpose: Engage with the EIM and potential Western ISO to ensure BPA's positions are included in stakeholder processes. Benefits: BPA is in the best position to meet preference customer loads, maximize power and transmission revenues to anticipate any necessary systems and process changes that result from market evolution.	4, 5, 6, 8, 9, 10	$500k-1m	Pre-Proposal
Additional EMS and AGC functionality	Purpose: Develop tactical EMS and AGC changes to support increased interaction with the EIM. Benefits: Ability to support automated implementation of directions from the EIM.	2, 3, 5, 7, 10, 11	$500k-$1m	Pre-Proposal
Additional Applications for Market Participation	Purpose: BPA will need the tools and applications necessary to engage with emerging markets. Benefits: As opportunities for additional participation in the emerging markets arise, BPA will be able to capitalize on those opportunities.	5, 10	$2m-5m	Pre-Proposal

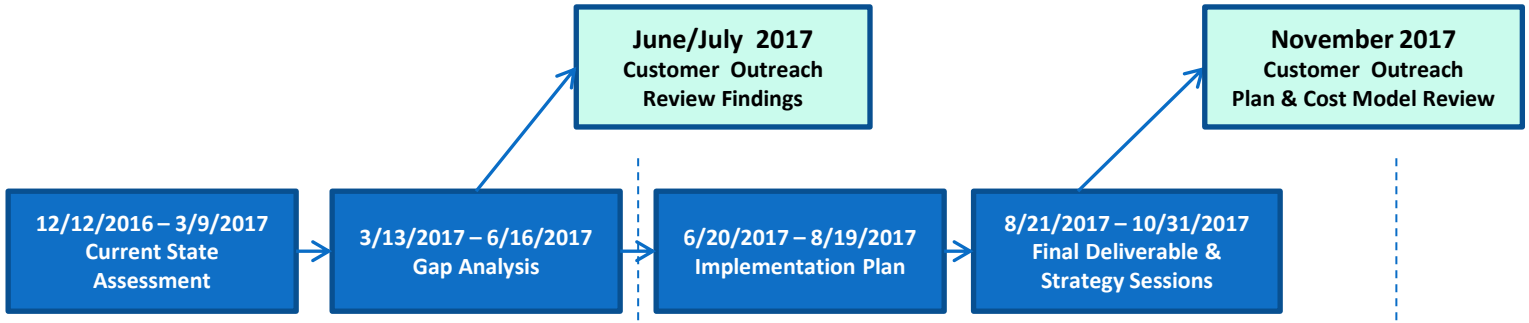
Candidate EIM optionality projects (cont.)

Project Name	Purpose and Benefit	Risk ID's	Cost Estimate	Phase
Enhanced Data Management, Analytics and Integration	Purpose: Create centralized data management capabilities. Benefit: BPA is able to accommodate increased volume and frequency of data and provide quality analytics capabilities.	ALL	$2m-$5m	Pre-Proposal
Training and Change Management for modified business functions	Purpose: Equip BPA staff to operate safely and reliably in a rapidly changing environment. Benefits: Staff has the knowledge and equipment necessary to execute BPA's future business model.	ALL	$500k-$1m	Pre-Proposal

Long-term planning roadmap

- BPA has started an engagement with Utilicast for the development of a long-term commercial operations roadmap. This effort will complete in October 2017.
- The roadmap will outline a path for BPA to modernize the foundational business activities enabling operation and interaction with the emerging markets.
- The roadmap will recommend use of industry best practices and the technology systems that enforce those best practices.
- The final phase of the roadmap will identify the business and technology changes needed to inform a decision to join the EIM.
- Develop a cost model for the implementation plan that includes the foundational and modernize recommend efforts, EIM optionality and joining the EIM.

Roadmap and customer engagement



- Evaluate BPA's current state (functional and IT) and benchmark against industry best practices.
- Perform a gap analysis of current state to best practices.

- Develop and refine long-term roadmap recommendations.
- Deliver a cost model to close gaps in current practices (foundational and modernize) and EIM optionality.

Proposed customer quarterly reporting

- Use the Quarterly Business Review meetings as the venue to report on the commercial operations program costs, projects and status.

- QBR briefing intent:
  - Provide transparency into the commercial operations program planned and actual spending.
  - Present program and project information in a structure similar to that of the fed hydro and other capital programs.
  - Report on specific project status, scope, schedule, budget, actuals, business transformation and expected benefits.
  - Provide a in-depth briefing of all COSC approved projects, focusing on the business case and expected benefits and outcomes.

Contact Us

Comments:

Participants can submit comments on BPA's IPR 2 proposed levels during a public comment period which opens Feb. 15 and closes March 13, 2017. Comments can be submitted:

- Online: www.bpa.gov/comment.
- By mail: BPA, P.O. Box 14428, Portland, OR 97293.
- By email: BPAFinance@BPA.gov.

Please send questions to BPAFinance@BPA.gov.

Financial Disclosure

- This information was made publicly available on Feb.10, 2017, and contains information not sourced directly from BPA financial statements.

Appendix Materials

Selected slides from the Dec. 9, 2016 webinar

Market access

BPA will continue to take a leadership role in the development of emerging markets from both the participant, transmission provider and governance perspectives. We will actively seek access to key emerging markets to meet operational objectives, optimize surplus power sales revenues and provide alternatives in the event bilateral liquidity decreases.

Power

BPA will evaluate the products and services we offer and look for opportunities to improve and expand them to meet growing customer and market access needs.

BPA will evaluate and balance the system enhancements needed to accomplish these objectives against the short and long-term benefits we expect to yield.

In the case of General Transfer Agreement Loads, we will work to ensure market rules allow BPA physical service access to manage our load service obligations using existing generation and transmission infrastructure.

Transmission

As power markets continue to evolve, and as BPA works to enable market access, we recognize that the risk profile of the BPA transmission system is likely to change. Historical flow forecasts, analyses, and long-term load growth expectations will need to be revisited. BPA capitalizes on opportunities that arise from market changes to improve reliability and commercial value.

Developing the tools and resources to be agile in a changing marketplace is essential for BPA to operate a competitive, reliable, modernized transmission grid.

Products and services

BPA will develop new and revisit current product offerings to ensure they respond to customer load demands, reflect the appropriate risks and respond to a changing marketplace.

Power

BPA will explore generation products to aid transmission congestion management that we believe will become more valuable with time.

New surplus power products or services will focus on the premium product that BPA's flexible low carbon hydro resources are uniquely capable of providing.

BPA will offer distinct products for those load serving entities and system operators throughout the West struggling to manage the increasing ramping need that comes with variable generation.

Given the planning needs of the FCRPS, in addition to short-notice flexible capacity products, BPA will offer day-ahead or similar products to maximize access to hydro flexibility.

Transmission

BPA will find opportunities to provide the transmission services and related business practices necessary for entities desiring access to emerging markets, while maintaining its commitment to reliable load service.

We will evaluate existing products to determine potential enhancements or retirements, based on customer needs and market demands.

Inventory management

BPA will develop the tools, systems and processes required to gather and analyze the large amounts of data necessary to optimize our systems for both the short and long-term, and to determine the potential benefits of a One-BPA approach to integrated planning and inventory optimization.

Power

BPA's ability to forecast available inventory over several time horizons (e.g., hours, days, weeks, months), will enable the trading floor to maximize net secondary revenue while meeting BPA's non-power obligations and market demands.

BPA will establish updated processes and analysis, while incorporating products that provide new and desired services, while addressing the impact on existing products.

Transmission

BPA's methodology will reflect a transparent, repeatable process, and will result in more robust inventory by more accurately identifying transmission margins while maintaining the necessary reliability and service levels for load service.

BPA will develop the tools necessary to ensure accurate assessment and management of available transmission inventory prior to real-time flow as well as in the long-term planning horizon.

Project Planning Process

- A rigorous business case development process is in place to determine return on investment and project approval.
- Proposed projects will be prioritized based on gap analysis results and alignment with future state outcomes.

- Summary of Request
- Business Justification
- High Level Costs
- Articulate Business Change

Business Line
- Sponsor Team
- Stakeholder Analysis
- Business Transformation Assessments
- Business Case
- Benefits/Value
- Scope Defined
- Compliance Defined

Technical Team
- Solution Analysis
- Cost Estimate

Business Line
- Business Transformation Assessments
- Provide Subject Matter Expertise
- Requirements
- Design
- Testing
- Build/Implement/Deploy
- Training
- Project Management

FY 2017 Budget: $8 million

Approved work to date: $4.5 million

Potential projects: $ 3.5 million‡

Program Management and Support - $1.1m

BPA staff and contractors to design and execute processes and practices required to deliver on the commercial operations vision.

Utilicast Consulting Services- $1.7m

Assist BPA to define clear performance goals and indicators, review the current state and in-flight work, identify and recommend best business practices, recommend technology approaches and initiate a gap analysis.

Approved Projects – $1.7m

Marketing and Settlements System Project – $400K

Replace the failing ISO bidding and settlement platforms, enable efficient EIM settlements for transfer load and surplus sales, and add marketing data analysis capabilities.

Generation Outage Tracking System Project – $400k

Improves communication and coordination between FCRPS entities, increasing reliability. Aids in coordinating maintenance schedules and transmission limitations in accordance with increasing daily activity. Enhances BPA's ability to comply with NERC reporting requirements and thus reduces risk of fines.

EIM Monitoring and Controls– $600k

Ensure that EIM use of transmission is proportional to EIM holders rights and leverage EIM market information to provide enhanced visualization and improved controls for dispatch.

Transmission Current State Assessment – $300k

Document the current state of technology systems for transmission commercial operations with a focus on data integration.

‡ Potential projects will follow a rigorous business case development and approval process to ensure measureable and successful outcomes are achieved in alignment with the Commercial Operations direction.