Transmission Operations & Maintenance

Enterprise Process Improvement Project

Summary Findings and Recommendations

August 1, 2006

KEMA

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Preface

This report addresses six challenges that figure prominently in the future success of Transmission Operations and Maintenance:

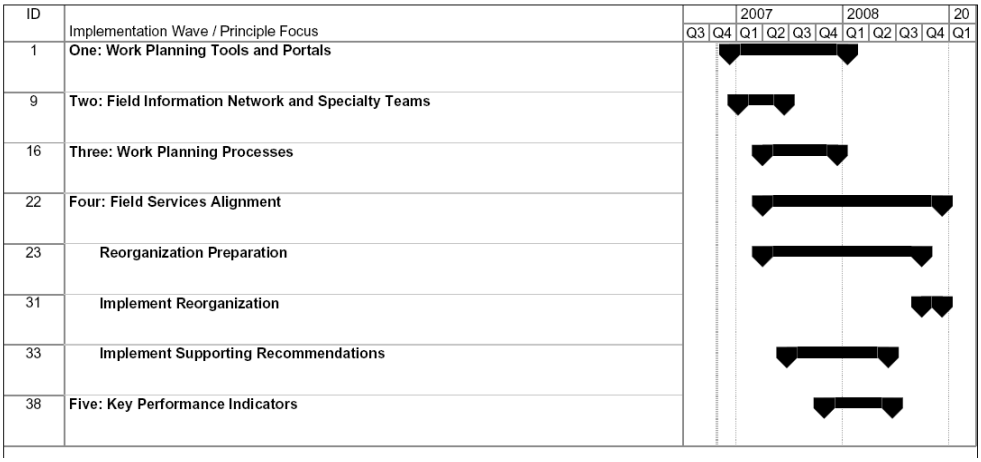
- Aging workforce with up to two-thirds of certain non-supervisory craft employees eligible to retire
- Decentralized resource allocation
- Inadequate data management and reporting
- Declining available transmission system capacity
- Increasing regulatory oversight
- Mounting demand for cost containment

The recommendations in this report support six goals that address these challenges:

- Goal One: Effectively respond to the impacts of BPA's aging workforce
- Goal Two: Promote a system-wide perspective for allocation of maintenance resources
- Goal Three: Facilitate data-driven decision making
- Goal Four: Improve transmission system capacity availability and reliability
- Goal Five: Provide timely and efficient response to regulatory initiatives
- Goal Six: Facilitate logical and sustainable cost controls

These recommendations are estimated to produce a net financial benefit of $24.8M within the next five years and an annual recurring benefit of $9M in future time periods. If approved, the recommendations will be implemented in five waves, as illustrated in figure 1.

Figure 1



Summary Report Purpose and Outline

The O&M EPIP team has completed the initial steps of the transformational redesign of the Transmission Field Services (TF) processes and the organization to support them. Beginning with the Current State Assessment, twenty (20) review sub-teams consisting of 110 subject matter experts from across the organization expended considerable effort to research and identify 183 opportunities to improve core O&M business process effectiveness and efficiencies. These opportunities were further analyzed by six (6) sub-teams in the Future State phase, which subsequently resulted in 24 specific and focused recommendations that are submitted to BPA management for Solution Refinement and Implementation. The culmination of these studies and projected benefits of the recommended solutions is the subject of this report.

This summary report is structured into six sections that outline the primary drivers to the recommended changes, as well as the intended beneficial outcomes of these changes. Specific discussion categories include:

- O&M EPIP Business Drivers
- O&M EPIP Purpose and Scope
- Future State Recommendations: How O&M Will Be Improved
- Business Benefits and Implementation Costs
- Major Implementation Steps
- Metrics for Success

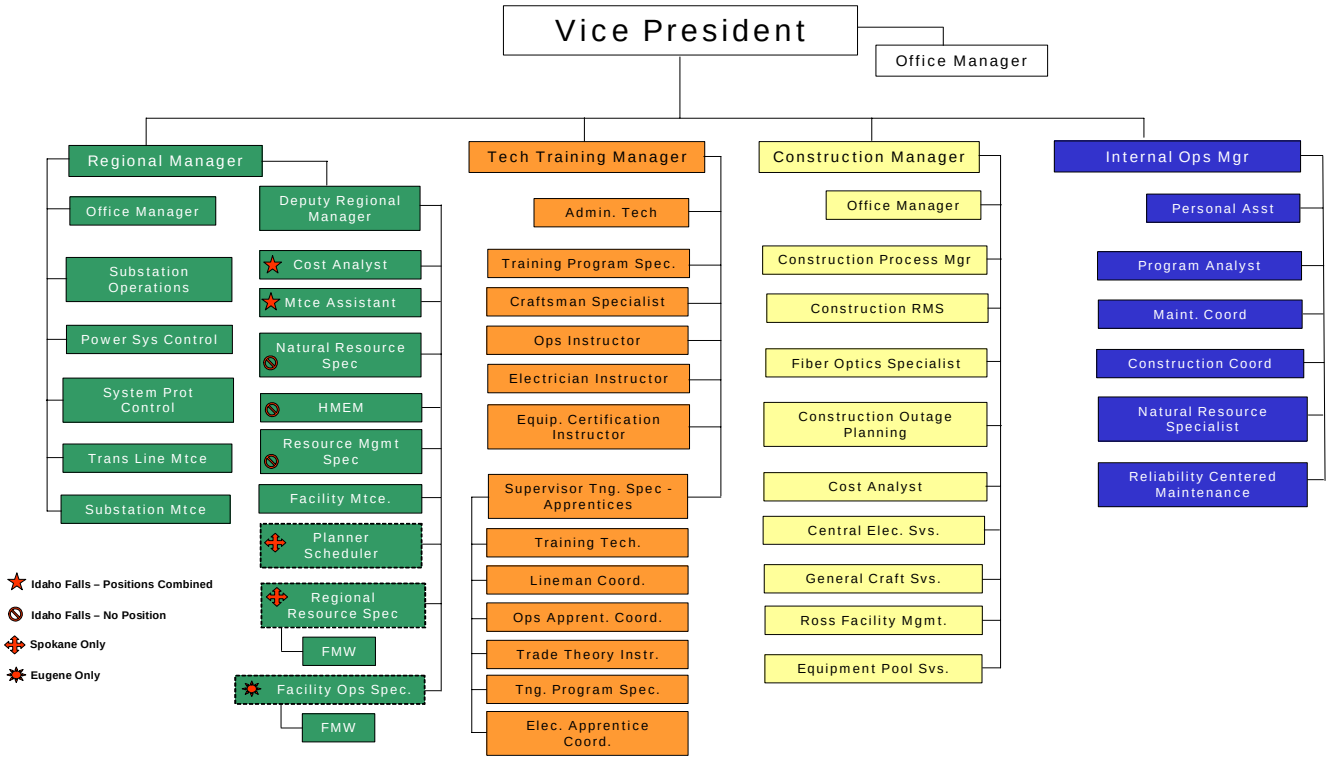
In addition, there are supplemental materials in the appendix that provide greater detail. Each sub-team has also provided a detailed report, which is available for further review.

Understanding the Six Challenges

The Transmission O&M function is organized in seven regions: Spokane, Idaho Falls, Redmond, Eugene, Walla Walla, Olympia and Snohomish. Each region identifies, plans and delivers maintenance services employing various, and frequently different, work methods, resources, management tools and prioritization criteria. Each is similarly organized and staffed to accomplish their respective operating and maintenance accountabilities. The TF organization, headquartered in Vancouver, provides overall management and support assistance. Figure 2 shows the current state organization.

Figure 2

Current Transmission Field Organization



The O&M function, and specifically the Transmission Field Services (TF) organization, has made a number of substantial improvements over the past 13 years in operations and maintenance business practices. These improvements have resulted in the current organizational structure, which has served BPA well over the past several years; however, there are significant challenges on the horizon.

As stewards of the Federal Columbia River Transmission System (FCRTS), the TF organization must continuously challenge itself to enhance system performance through improved maintenance operations as the Region's requirements for the transmission system evolve. These improvements help meet increasing customer expectations for cost containment or reduction, while maintaining acceptable levels of reliability and customer service.

The observations and analyses of the O&M EPIP team can be summarized into six major current business conditions that need to be addressed through implementation activities, to assure the continued safe, reliable and cost-effective operation of the transmission delivery system. These primary drivers are:

- Aging work force
- Local versus system-wide resource allocations
- Inadequate data management and reporting
- Declining available transmission system capacity
- Increasing regulatory oversight
- BPA's management continues to focus on holding cost to the lowest level consistent with safe, reliable operations.

A central tenet of these business conditions is the very clear conclusion that overall TF must adopt a business model that is more innovative and rigorous, in particular addressing how it plans and executes the business of transmission system maintenance.

A summary of the business conditions (and, ultimately, the goals for performance improvement) driving the need for change in the current approaches to O&M business processes follows:

- ***Aging Work Force*** – The knowledge base of TF employees and, in particular, that of the operations and maintenance business processes, will be impacted by the loss of experienced and skilled BPA employees through increasing levels of attrition over the next few years. Current estimates indicate that up to two-thirds of selected craft and supervisory ranks may be lost to optional retirement by FY 2009. Demographics for TF craft positions are shown in figures 3 and 4. The loss of such valuable labor assets necessitates a rigorous program to find innovative and effective ways to capture their experience and important knowledge. This need is directly addressed through a number of specific recommendations. The aging work force issue also requires that BPA find new models for succession planning in a labor environment characterized by decreasing availability of qualified candidates.

Figure 3

TF Demographics: Projected Optional Retirements (by FY09)

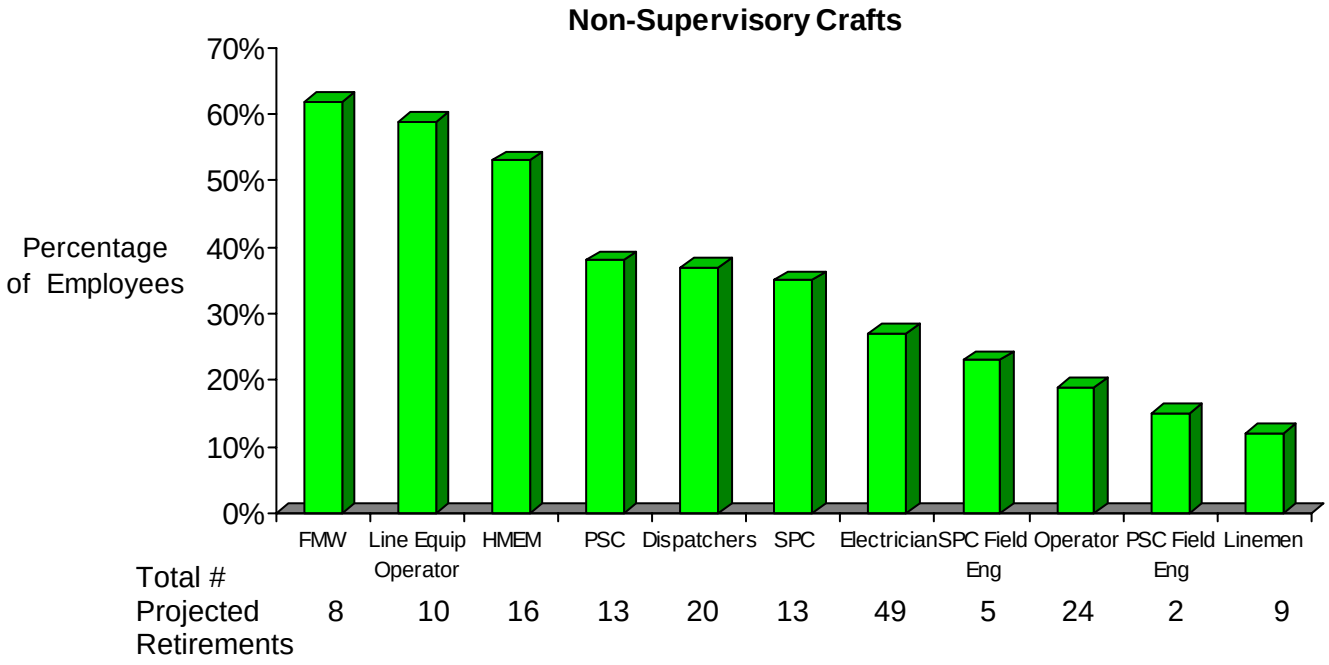
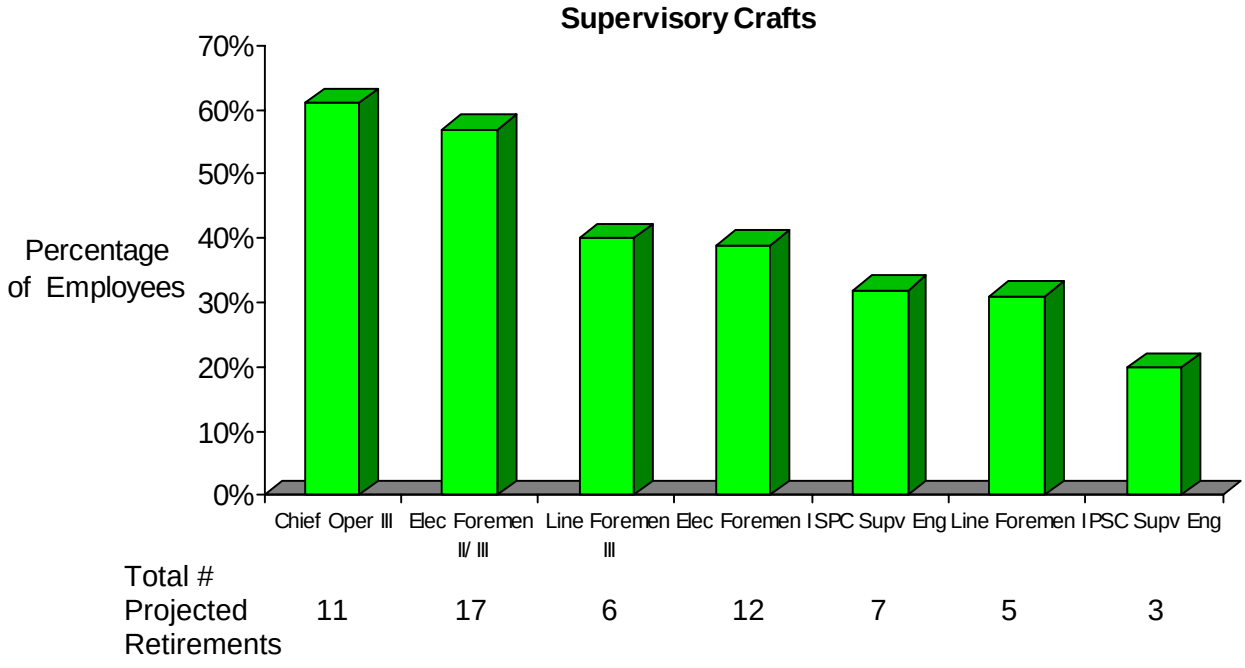


Figure 4

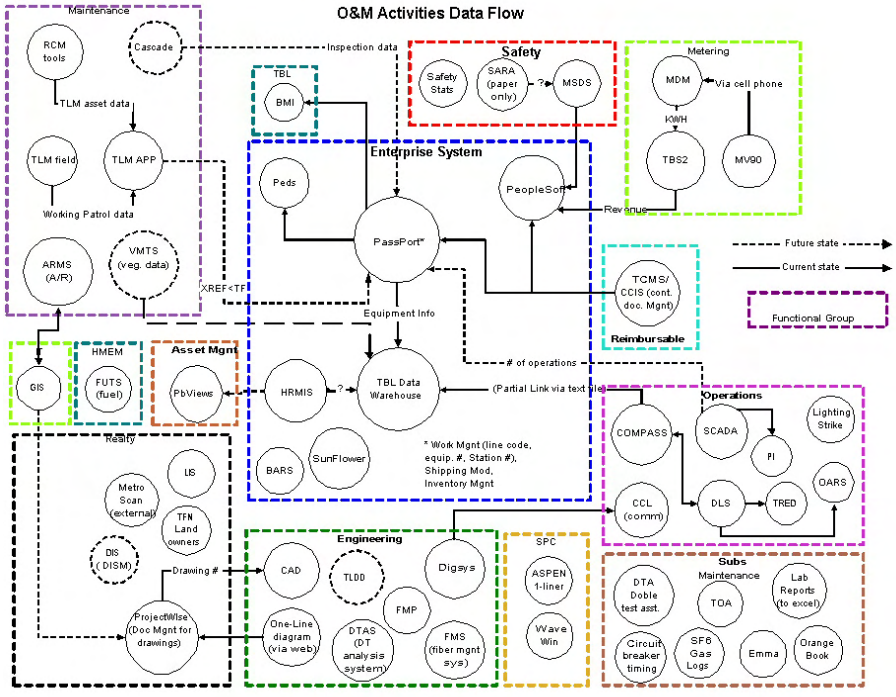
TF Demographics: Projected Optional Retirements (by FY09)



- ***Local versus system-wide resource allocations*** - The transmission network is one large integrated system, whose operation and maintenance must be considered from a holistic perspective when allocating finite maintenance resources. That is, maintenance resources should be planned, scheduled and allocated on a system priority basis as opposed to today's regional allocation formula. Today, there is no formal mechanism that assures the needs of the overall network are given a higher priority over that of a particular region. In effect, there are seven different approaches to priority setting and work management, optimal for a region as opposed to optimal for the system as a whole. For example, it is not uncommon for one region to schedule a line outage to perform its maintenance, followed by another region scheduling an outage on the same line to perform their work. This can lead to greater outage frequency and duration.

- ***Inadequate data management and reporting*** - The advanced age of vital transmission physical assets is causing rising repair and replacement costs. In addition, the aging is increasing the potential for electric system component failure and thus greater possibility of lost revenue and reduced customer satisfaction. The exact fiscal and reliability impact of aging is not fully quantifiable today, due to a lack of cost and reliability data on which to conduct rigorous condition/ repair/ replacement analyses. Improving data management and asset management would create an opportunity to better understand asset health and to anticipate when corrective actions may be needed and therefore avoid unplanned outages. Currently, most O&M databases and analytical tools are inadequately structured and interconnected to support the needed continual condition assessment of the transmission delivery system components, as shown in figure 5. Generally, data is not consistently accessible or up to date.

Figure 5



- ***Declining available transmission system capacity*** – BPA's total transmission system loading has grown at 4.6% annually for the past three years, partly due to 1.5% annual increase in control area load growth[3] and the remainder due to system throughput. This growth, along with external pressures to contain/reduce costs, has resulted in decreased available capacity and increased system congestion. Operating the system close to capacity increases wear and increases pressure to reduce the frequency and duration of planned outages. This has the overall effect of driving up O&M costs and degrading system reliability. Addressing this situation necessitates having a well structured and comprehensive resource planning process.

- ***Increasing regulatory oversight*** - Increased regulatory oversight requires well-developed and executed managerial controls to assure required information is accurate and timely. New regulatory oversight is expected, particularly with respect to reliability standards. In addition, there are proposed NERC standards for increased vegetation management requirements and a corresponding expected significant increase to the O&M budget. The future state design will have to accommodate current and anticipated regulatory requirements. All other things being equal, the impact of these new O&M regulations is expected to create additional workload.

- ***Mounting demand for cost containment/reduction*** – System growth will result in increasing levels of maintenance as new assets are added to the transmission delivery system. Performing this additional work without additional FTEs requires increased productivity levels.

Figure 6

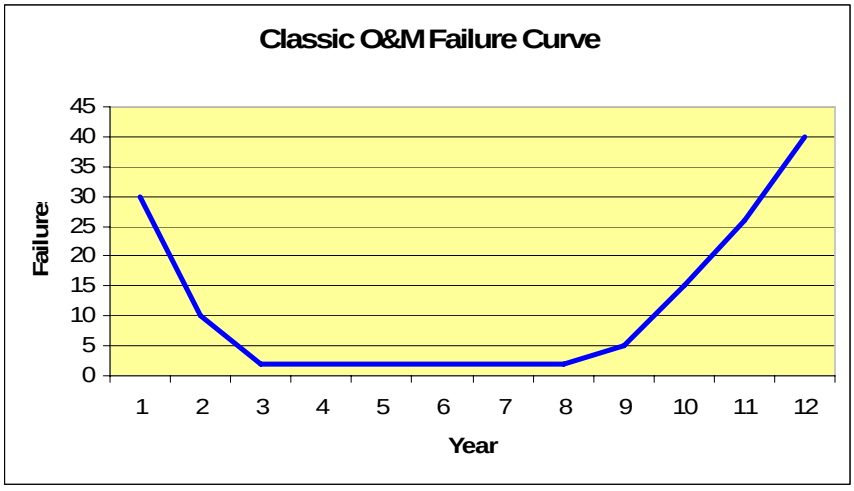


Figure 6 plots frequency of failure against age of a piece of equipment. The figure shown is illustrative for large utility equipment. Each type of equipment has its own unique curve which will be impacted by load, environment and maintenance. The horizontal scale represents years in service for a piece of equipment. The vertical axis shows the failure rate for that same piece of equipment. The curve indicates there are three major cycles a piece of equipment goes through during its in-service life.

[3] "Control Area Load Growth" pertains to the generation that is matched to the load in BPA's service territory.

- The elevated area under the curve at the left represents premature failure that is a consequence of poor design standards, poor vendor quality control, damage in transportation or poor installation practices. These types of failures, although rare, occur within a relatively short time after installation. Hence, the rate of failures rapidly declines in the first three years of operation.
- The flat portion of the curve represents the equipment operating as expected with normal preventative maintenance and operating conditions. When Asset Management is fully deployed, the tools used should enable O&M to determine where on the life-cycle of the curve a piece of equipment is positioned and whether it will be possible to detect the onset of the final phase of an expected exponential increase in its failure rate.
- Toward the end of its useful life, the problems and failures associated with a piece of equipment increase rapidly. The shape of the curve is driven by environment, maintenance frequency, the fault duty the equipment has experienced in service, and how the equipment is operated, as well as the unique characteristics of the individual component.

In the current state, the condition of assets is generally both untracked and unknowable due to lack of data and the tools to analyze that data. What is known is that a lot of equipment has been in service for a long time. This suggests that a workload increase driven by rising failure rates is likely on the horizon. Recent experience with the spacer dampers on 500kV lines is one example of this phenomenon. The Asset Registry and condition reporting processes being implemented by BPA are expected to ultimately provide the data and tools needed to more accurately define life-cycle characteristics relative to this illustrative curve, and the associated workload for all key equipment.

2007-2011 Agency Strategy Execution - Underlying these six business drivers, the Agency has established specific strategic objectives for the five-year period commencing in FY 2007, as detailed in the BPA Flight Plan in Appendix C. These important goals will challenge TF to seek innovative ways to manage limited resources. Success of the Agency's plan requires the effective execution of Transmission's programs aimed at assuring cost effective allocation of resources, high levels of resource productivity, capacity and reliability, customer service, and safe operations.

These major business conditions are creating significant challenges for the TF organization. They must be addressed if the Agency is expected to continue to provide safe and reliable energy to its customers. The O&M EPIP teams have constructed a comprehensive set of recommendations and an implementation strategy to address these critical business conditions, as outlined in the subsequent sections of this report.

O&M EPIP Purpose and Scope

The purpose of the Transmission O&M EPIP initiative is to optimize O&M operations while ensuring safe and reliable operation of the transmission system. This EPIP primarily focuses on the Transmission Field Services (TF) organization. To achieve this purpose, a number of guiding principles were identified:

- Create an efficient, self-regulating process for effectively managing O&M so that BPA's stated reliability targets can be met or surpassed, while containing costs.
- Identify opportunities for improvement and implement these improvements satisfactorily across the BPA and keep them consistent with Asset Management, PDB, Supply Chain and other EPIP initiatives.
- Provide a structure which supports a system-wide perspective and creates an environment which allows the new processes to succeed.
- Implement a program that facilitates sustainable benefits over the long-term.

The detailed assessment of current approaches to asset management, and in particular operations and maintenance processes, revealed opportunities for improvement consistent with the Agency's 2007-2011 objectives.

Given the significant scope of the O&M organization, the EPIP efforts were divided into multiple, but highly-coordinated sub-teams for detailed analysis and review. During the Future State phase, six sub-teams were chartered with reviewing identified opportunities from the Current State phase and identifying potential areas for subsequent recommendation. These six sub-teams had specific charters, as shown in figure 7.

Figure 7

Sub-Team	Name	Future State Charter
A	O&M Roles	Identify, evaluate and recommend changes to roles, responsibilities, and structure of the O&M function that will increase efficiency of transmission system O&M
B	Processes and Practices	Recommend processes and practices for which we can effectively and efficiently maintain our transmission system, and manage the maintenance programs
C	TF Functional Design	Identify process and attendant structural changes that will improve the efficiency and effective management of Operations and Maintenance (O&M) activities, while seeking to reduce overall costs
D	Work Planning	Recommend methods and processes that will add to the efficient and effective management of all operations, maintenance, and construction work activities and resources
E	ROW Management	Recommend sustainable process improvements that enhance the effectiveness and efficiency of the Vegetation and Access Management Program
F	Data-Driven Performance	Recommend improvements in data stewardship, automation (new and enhancements), training/process changes, and key performance indicators

The O&M EPIP is one of several Agency-wide initiatives working in parallel to transform BPA's core business processes. Implementation of strategic recommendations from other EPIP teams will directly or indirectly impact, or be influenced by, opportunities identified in the O&M EPIP. As the O&M sub-teams progressed through the first four phases of the EPIP process, a number of key areas were identified for coordination, whether it is via informed or active involvement. In some cases, identified opportunities were either deferred to other EPIP initiatives, or participation was sought from other EPIP or BPA staff (e.g., IT) on the O&M Future State sub-teams.

The O&M EPIP has coordinated with the following EPIP efforts:

- Plan, Design and Build (PDB)
- Asset Management
- Information Technology
- Supply Chain

The extent and details of these coordination activities is further outlined in the following sub-sections.

Plan, Design, and Build EPIP

There was extensive coordination with the PDB EPIP during the future state definition. The primary area of overlap between the PDB and O&M EPIP projects is in the area of work planning and scheduling. A representative from the PDB team regularly attended meetings of the O&M Work Planning sub-team.

This representative did a thorough job of expressing PDB issues and concerns in documenting the planner/scheduler position and in the work planning tool. Members of the PDB team have also reviewed and commented on working copies of the Work Planning sub-team's final report.

The other area of interest to the PDB team is the GIS component of the Transmission Corridor Data Portal. PDB has identified integration with GIS as one of its projects. PDB and the Data-Driven Performance sub-team reviewed the scope and business case of the Transmission Corridor Data Portal to determine if any areas of overlap exist. None were identified.

Coordination on both of these topics continues. The PDB team has requested that the leads for these two sub-teams brief the PDB parent team. One briefing has occurred; the other is being scheduled.

Asset Management

BPA's transmission business is asset-intensive and necessitates extensive attention to on-going maintenance to enhance significant infrastructure investments. The Asset Management EPIP specifically identified the need for the Agency to embrace specific goals related to asset management including:

- Implementing a process that can demonstrate to ourselves and our stakeholders/ customers that BPA has a transparent, repeatable process for effectively managing the physical assets of the FCRTS
- Ensuring that asset-related decisions advance strategic goals
- Making better decisions
- Using resources efficiently
- Improving communications

In striving to achieve these related goals, the Agency has adopted the findings and action plans of the Asset Management EPIP study, and is currently in implementation. Specifically, BPA has embraced an industry-leading model of Asset Management that separates the functions of Asset Ownership, Asset Management and Asset Operations into distinct, but highly interconnected competencies. The Agency's approach to focusing on Asset Management is depicted in the Asset Management EPIP Executive Summary of December 13, 2005.

Over the last several months, BPA has been working to redefine the role of the "Asset Owner" through work on the Asset Management EPIP. The O&M EPIP is intended to further flesh out the role of the "Asset Operator" or "Frontline Execution" as defined by the Agency-adopted methodology.

Information Technology EPIP

The IT organization (J) representation to O&M was key to the completion of the Data-Driven Performance sub-team. A J representative actively participated in this sub-team providing insight into J processes and keeping IT informed of the sub-team's progress. This coordination also helped facilitate IT's review of the sub-team's financial analysis for the three recommendations that involve implementing new software solutions and interfaces, and one dealing with the network infrastructure. As a result of this review, a number of modifications were made to the financial estimates.

Supply Chain EPIP

Items identified in the O&M Field Inventory sub-team during the Current State phase were referred to the Supply Chain EPIP for further review. The ROW Management sub-team also worked with the Supply Chain EPIP to confirm the feasibility and benefits of potential changes in the vegetation contracting practices. The ROW sub-team and the Supply Chain EPIP reviewed the joint participation in a pilot program for future vegetation service contracts.

The O&M EPIP team identified "opportunities" from the Current State report that were being addressed to varying degrees by the Supply Chain Management (SCM) EPIP. The SCM EPIP was notified of these opportunities and they have been incorporated into their existing recommendations, therefore alleviating the need for these opportunities to be investigated in the O&M EPIP Future State Design process. These opportunities include:

- Field Inventory Prioritization: Increase the emphasis on/priority of field inventory management throughout the Agency – Push responsibility and accountability for field inventory down into the Field Service organization.

- Training: Improve or institute training in BES and Inventory Management among Field personnel in order to improve the efficiency of field inventory processes, including ordering, transferring, returning, and tracking materials.

- Stocking Policies: Assess and improve stocking policies with respect to field inventory in order to ensure that the right material is in the right place at the right time.

- Assess and improve/expand the existing definitions of inventory, emergency inventory, EMS, and emergency spare parts – Clear definitions that delineate exactly what material is included in each would provide clarity to better manage inventory resources.

- Identify centralized support personnel for specific field inventory questions and issues.

- Evaluate economics/feasibility of using vendor-managed and/or vendor-held inventories.

- Assess the materials that are in inventory at the Ross Warehouse that the field can purchase commercially using P-cards.

- Improve online catalog search and online pictures of materials – The catalog descriptions in BES are either inadequate or do not describe the item as employees in the field would. If there were pictures available, individuals would have a visual of the item to determine a match for their needs, without having to rely on descriptions. Some field personnel may spend hours looking for an item.

- Address BES functionality shortcomings:
  - The BES system only notifies a requestor when an item has been ordered, but not when the item has been received or shipped from the vendor.
  - BES does not allow the creation of reorder points at the individual field warehouse level.

- Improve communications around when equipment is retired, or identified as obsolete.

- Investigate the use of formal tracking technology in the field – Radio Frequency Identification (RFID) or bar-coding for field inventory.

- Address and improve salvage item policies and processes, including the capability for Districts to receive credit for returns and the capabilities in the Investment Recovery Center (IRC) to effectively salvage materials. Current policies and processes create a mindset where field personnel see no advantage to returning any salvaged material that might be used anytime in the future.

- Develop a method for tracking currently untracked inventory that will enable visibility across the BPA system for these materials.

- Investigate the possibility of using non-field personnel to track and manage field inventory, in order to reduce the costs and time associated with using foremen in the field to manage field inventory.

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The SCM EPIP, having just begun the implementation phase, will be seeking TF field personnel participation on several sub-teams in order to get the field viewpoint with regards to implementation of these opportunities.

Future State Recommendations: How O&M Will Be Improved

The O&M EPIP sub-teams developed twenty-four (24) recommendations which when taken collectively, will result in a fundamental change in the way TF plans and executes system maintenance. The new business model suggested by these improvement opportunities stresses development of innovative business practices and rigorous application of management principles. Consistent with the main business drivers identified in the O&M EPIP Business Drivers section, the O&M EPIP has six primary goals that drive the Future State recommendations:

- **Goal One: Effectively respond to the impacts of BPA's aging workforce**
- **Goal Two: Promote a system-wide perspective for allocation of maintenance resources**
- **Goal Three: Facilitate data-driven decision making**
- **Goal Four: Improve transmission system capacity availability and reliability**
- **Goal Five: Provide timely and efficient response to regulatory initiatives**
- **Goal Six: Facilitate logical and sustainable cost controls**

A complete listing of the sub-team recommendations and their alignment with each of these primary Future State goals is provided in figure 8.

Figure 8

	Recommendation	Respond to the Aging Workforce Impacts	Promote System-Wide Resource Allocations	Facilitate Data-Driven Decision Making	Improve Trans-mission System Capacity	Provide Timely & Efficient Regulatory Responses	Facilitate Logical & Sustain-able Cost Controls
1	Refine and enhance the workload methodology				X		
2	Develop a structure for guiding work sourcing decisions						X
3	Expand the use of the Field Information Network (FIN)						X
4	Introduce O&M knowledge into capital planning, design, & replacement projects						X
5	Integrate wireless installation and maintenance into the TF program						X
6	Formalize the O&M planning and evaluation process				X	X	
7	Optimize the number of diagnostic services for special equipment						X
8	Develop a dedicated fiber splicing team	X					X
9	Establish a power transformer specialty team	X					X
10	Align TF to refocus on system priorities and place management closer to the field forces and customers		X			X	
11	Extend the use of equipment pooling: Internal Operations		X				
12	Create a centralized work planning & evaluation organization: Internal Opns		X				
13	Adopt a formal work planning policy				X		
14	Create a planner/scheduler function				X		
15	Install a work planning tool				X		
16	Centralize the vegetation and access road programs				X		
17	Redesign the vegetation mgmt. program contract process						X
18	Formalize the process for access road rights and recordation	X					
19	Install a substation and microwave data portal	X		X			
20	Install a transmission corridor data portal	X		X			
21	Institute a formal process for data stewardship			X			
22	Provide useful KPIs to all TF mgmt. levels			X		X	
23	Form a joint Field-IT Team			X			
24	Enhance fixed connectivity		X				

Goal One: Effectively respond to the impacts of BPA's aging workforce

Many maintenance decisions are made by long-term employees who possess in-depth knowledge and experience, including understanding of undocumented geographic area and specific equipment characteristics. Many of these employees are eligible for retirement and significantly more will soon be eligible. Current estimates indicate that up to two-thirds of selected craft and supervisory ranks may be lost to retirement by FY 2009. For this reason, "knowledge loss" has been identified as a great risk and concern for the Agency as a whole, and specifically for the electric system maintenance program.

TF and Human Resources have worked together to meet O&M human capital needs. They are finding this challenging because:

- Recent high school graduates are increasingly selecting other lines of work.
- Apprentices take four years to become fully productive. Attrition does occur and, in some selected crafts, accelerates during this period.
- Competition for the few candidates that are both willing and able is fierce, particularly in certain geographic locations.

Effective Knowledge Management (KM) is at the heart of several recommendations designed to mitigate this problem. Knowledge Management in this case means capturing information that resides only in the minds and files of retirement-eligible employees, as well as information stored in TF's mostly unconnected data systems. A key KM objective is to ultimately make that knowledge available to all appropriate employees. Several of the recommendations below are in support of this goal.

Over the years, BPA has implemented the use of Specialty Teams to focus on specific tasks or activities and build more in-depth skills and experience. As part of the EPIP recommendations, an appropriate use of Specialty Teams is also included. In prior instances, it has been shown that these Specialty Teams have also served to reduce the impact of turnover in several important ways:

- Specialty teams leverage scarce skill sets and facilitate the transfer of knowledge and skill to the next generation of craftspeople.
- Specialty teams reduce the training burden because specialty skills need to be developed in a smaller number of people.
    - These skills need not be taught to all new apprentices, thereby shortening the training time for them.

  - Annual refresher training in specialties such as fiber splicing becomes unnecessary because specialists use these skills all the time.
  - Advances in technology also need only be taught to a small group of specialists.

- Specialists are less likely to make mistakes because they will be selected for their skill in a specialty area and will have the benefit of daily use and refinement of those skills.

Recommendations That Support This Goal:

- ***Formalize the process for access road rights and recordation:*** Informal negotiated and undocumented property access agreements are prevalent today, because many regional employees and property owners enjoy personal and long-term trust relationships. Employee turnover and changes in property ownership are expected to create costly and difficult access problems where the specific access agreements have not been adequately documented and recorded. A new position is proposed to be created to address this issue. A Manager of Vegetation and Access will be tasked with documenting and recording all access agreements (informal and legal) and making sure they are readily available to field personnel prior to seeking access. This information will be ideally captured in the TLM and GIS programs. As a result, we would expect unnecessary work to be minimized, crew productivity improved, maintenance delays avoided, and improved relations with some Agency constituencies.

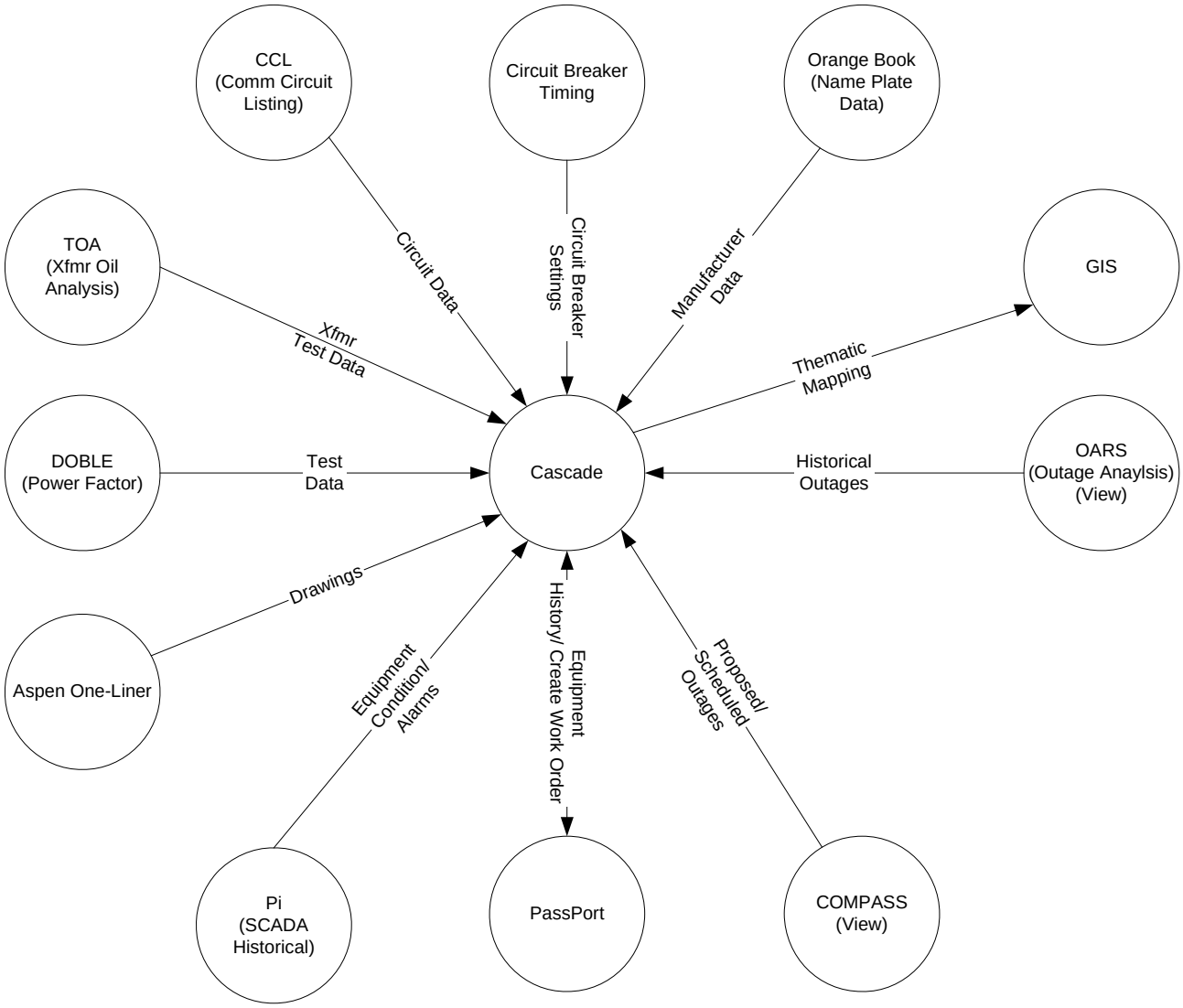
- ***Install a substation and microwave data portal:*** The large number of separate information systems and equipment databases (see Appendix F: O&M Data and Information Systems) makes it difficult to determine the asset health of substation and microwave equipment (as shown in figure 9). Insufficient integration among these systems often makes the tasks of inputting data, and extracting information from, these tools too cumbersome and time consuming for efficient and effective decision-making. Multiple data entries/extractions are required, creating a disincentive to use the system. As a result, not all information critical to system maintenance is being captured nor used when needed. A system solution is proposed to address the integration of the various databases and systems by extending the existing Cascade-based platform, to extend and leverage BPA's current implementation of this software tool. This solution provides the ability to interface the relevant databases that would permit a single point of entry for office and field users. This includes application and databases used by the SUB, PSC, SPC, TLM, FA and NEP crafts. Users will be able to enter and access asset health information for equipment from a single application. Figure 9 is a representation of this portal.

Other recommendations that support this goal. Details on P38

- ***Establish a power transformer specialty team***
- ***Develop a dedicated fiber splicing team***

Figure 9

Substation and Microwave Data Portal



- ***Install a transmission corridor portal:*** A situation exists with transmission line equipment data access similar to that of the previously discussed substation and microwave data portal issue. Currently, transmission line equipment performance and maintenance history data resides in separate, non-electronically integrated information systems as illustrated in Figure 10. As a result, it is difficult to determine the asset health of transmission system equipment, often leading to untimely and insufficient information to guide preventative maintenance planning and decisions. Inputting and extracting data is cumbersome and time consuming because multiple steps are required to interface with each system separately. The difficulty working with disparate systems is a disincentive for the user community, in particular to capture asset conditions and maintenance activities. The EPIP team proposes a GIS-based platform to integrate the separate databases which can be integrated with Cascade. This permits a single point of entry for office and field users to access transmission corridor information.

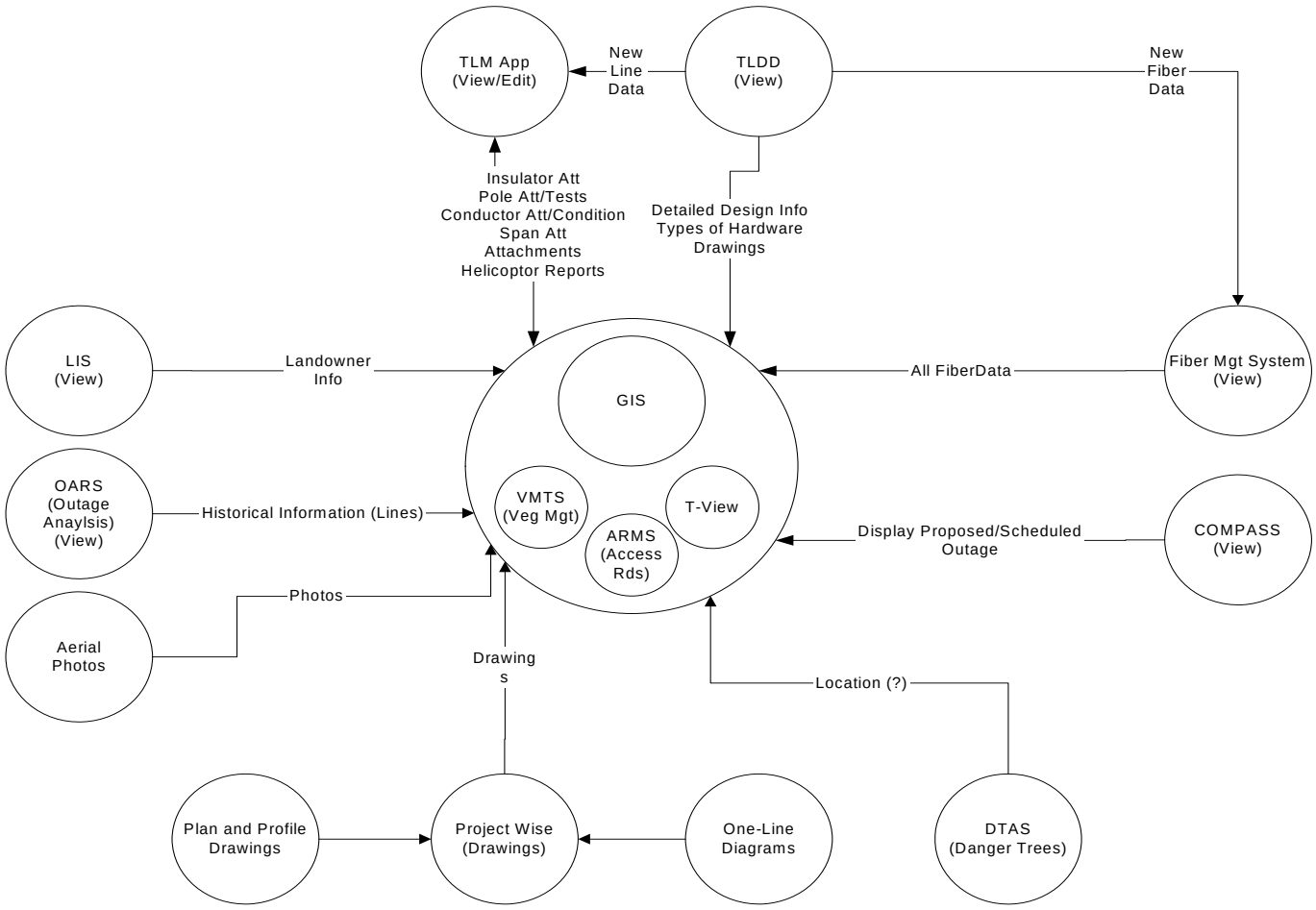
  The proposed inventory of the available information will include (but not be limited to):

  - Equipment characteristics/attributes (e.g., structures, conductors, insulators, appurtenances),
  - Right-of-way agreements,
  - Access road information,
  - Property access points,
  - Landowner information,
  - Cultural resources,
  - Endangered species habitat,
  - Fiber optics asset locations and attributes,
  - PCS supporting data,
  - Outage plans and schedules, and
  - Other important information.

  Users would ideally be able to enter and access asset health for equipment from a single application. Figure 10 is a representation of this portal.

Figure 10

Transmission Corridor Portal



Goal Two: Promote a system-wide perspective for allocation of maintenance resources

The current decentralized approach to O&M resource allocation and maintenance was the leading practice when it was instituted by BPA. The industry is migrating away from this approach as technological advances enable decision making and priority setting in a way that optimizes the system as a whole. The redesigned process will represent collaboration between field and headquarters personnel. The field will be the primary source of information about asset health conditions and will be the initiators of corrective maintenance activities. Headquarters personnel will be informed by the Asset Strategy and Asset Category plans as they prepare schedules and plans for preventive maintenance. The result, when executed, will retain the best aspects of the current state, while adding the improvements made possible by the Asset Registry and Asset Management Planning Process[4].

A high-level, pictorial representation of this redesigned approach to the O&M resource planning processes is illustrated in figure 11.

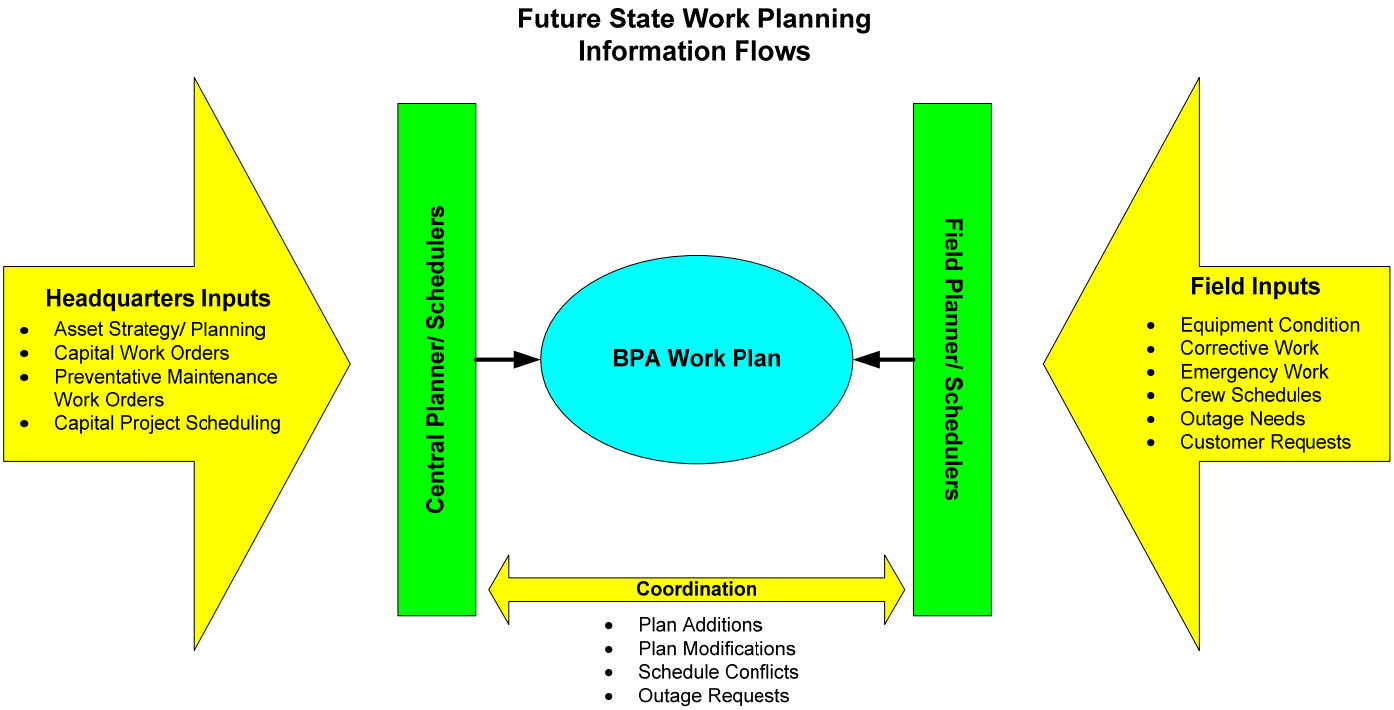
The EPIP team recommends several process changes that support a system perspective and an organization structure that is aligned with this new way of conducting business. These recommendations are consistent with closing the “best practice” gaps identified by the corporate Asset Management Council. The gaps they identified are:

- The condition of the FCRPS/FCRTS assets is not documented
- Asset information and performance data is inadequate for assessing asset performance
- Tools do not exist to evaluate long-term value and risks of alternatives across projects/programs
- There is a lack of a framework for making funding trade-offs across asset categories. This prevents the optimal allocation of financial resources
- Asset costs are not uniformly developed and tracked on a lifecycle cost basis
- Assessment of O&M costs is not integrated with investment decisions
- Governance for managing assets is uneven and not supported by policies and systematic, recognized internal controls
- Process is not in place to recalibrate funding decisions as conditions change during the budget year

Closing these gaps requires full participation from the O&M organization. Asset Management goes to the heart of the O&M mission. In fact, it is not an overstatement to say *Frontline Execution of the Asset Management Plan for Transmission Assets is what O&M does.*

[4] Concurrent with the conclusion of the O&M Future State analysis, the EPIP team recognizes that a high degree of coordination will be required in the Implementation phase to effectively coordinate the Agency’s newly-developed Asset Management practices. This included the concept of using an “Asset Register” to guide the use of O&M tools, planning activities, and front-line execution.

Figure 11



With the organizational approach suggested by figure 11, a number of key improvements would be expected to current business processes:

- A data driven system view is combined with field input to create a superior plan without loss of crucial input from those closest to the equipment.
- Outages will occur at times when the system is likely to be available thereby maximizing the likelihood that the outage will be taken when scheduled.
- Outage planning will minimize the frequency and duration of outages while accomplishing more work.
- Valuable resources will be applied in a way that yields maximum benefit for the system as a whole.

The O&M EPIP team recommends several process changes that support a system perspective and an organization structure that is aligned with this new way of conducting business.

An important note is that a pre-condition for the roll-out of these new business processes is the completion of the systems work that will provide the centralized planners with the tools and data required to facilitate the redesigned processes. During the roll-out, the need for field personnel to remain as the 'eyes' and 'ears' and 'first-line of defense' for the transmission system will be upheld and reinforced. Corrective maintenance will be initiated in the field in the future, in much the same way that it is initiated today

Recommendations That Support This Goal:

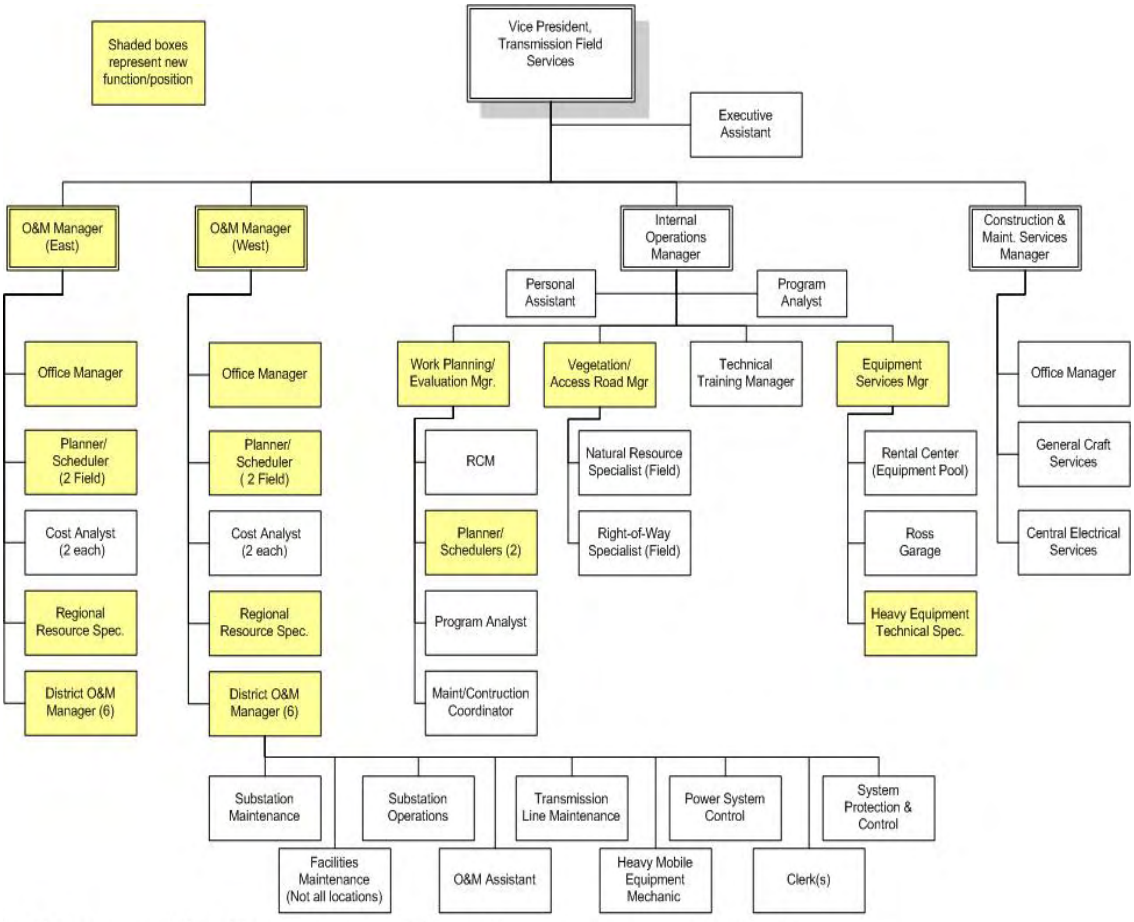
- ***Align Transmission Field Services to refocus on system priorities and place management closer to the field forces and customers:*** TBL needs TF to take a system perspective when planning its maintenance work. Those lines which are the most critical will receive the greatest level of attention. The current Regional structure does not promote a system perspective concerning the appropriate allocation of maintenance resources. Seven regions compete for finite resources. Also, the span of control of the Regional Manager is excessive, leaving little time for adequate planning, scheduling and managing of the maintenance work force. This also limits their ability to effectively coordinate work activities with other Regional Managers. The future state organization will seek to address both of these concerns. First, the TF senior O&M Managers will work with the Asset Manager to define system priorities. Second, the addition of the District O&M Managers will convey this message to the crafts to enable craft level coordination.

  The EPIP team believes a redesign of TF will result in a better mechanism for system-wide work prioritization and field management. The proposed restructured TF organization is illustrated in figure 12. Selected characteristics of the restructured Transmission Field Services include:

  - The current structure of seven (7) regions should be consolidated into two (2), each led by a Tier III O&M Manager. In reaching this conclusion, the team also evaluated six other options: three regions with three managers, two regions with two managers, and the status quo. After an extensive evaluation of the strengths and weaknesses of each option, the team selected the two-manager model with an approximate North West to South East division of territory. This option offers a fairly equal division of resources and prevents the transmission paths from being sub-optimally divided. This option is also expected to produce the greatest net financial benefit.

- The roles of the proposed O&M Managers differ from those of the existing Regional Managers. The O&M Managers are expected to be more strategically focused - i.e., 70 to 80 percent of their time is expected to be focused on Agency-wide issues, as well as dealing with regulatory requirements and supporting the Asset Manager in developing the preventative maintenance plan. The remaining time will ideally be spent working directly with the District O&M Managers.

Figure 12



Note: The reporting structure for District O&M Managers reporting to the O&M Manager (East) are not depicted on the organizational chart due to space limitations. The reporting structure for District O&M Managers depicted for O&M Manager (West) are the same for the O&M Manager (East)

- Twelve (12) O&M Districts are created, six (6) each within the two regional organizations. Each District is to be led by a Tier IV District O&M Manager. The district activities will be re-allocated to ensure uniformity in the work and that the right activities are being performed by the right type of personnel with a focus on efficiency and customer service.

- The District O&M Manager positions would be located in the field at redefined District Headquarter locations. The team is not recommending the creation of

any new offices. A primary tenet of the team was to not create unnecessary personnel moves; therefore, the 12 District offices will be housed in existing facilities. Their primary focus will be day-to-day work management.

- The Work Planning and Evaluation manager will be responsible for the top-down overall construction and maintenance work plan development. In addition, this individual's staff will evaluate the progress against the plan, as well as identify the resource requirements needed to execute the plan. The key additions to the existing staffing complement are the two planner/ schedulers.

- The Vegetation Program will be centralized in Vancouver under the direction of the Vegetation /Access Road Manager. In the current organization, this individual is responsible for the program but not for directing the field resources. In the future state, both the program and the field resources will be managed under this position. Input from the field will continue to be solicited and supported. The field employees will be a critical information source, as they report on conditions that can only be known by people in close proximity to the assets.

- The Equipment Services Manager will be under the Internal Operations Manager and will have responsibility for managing the equipment pool, uniform vehicle specifications, the Ross garage, and supporting the mechanic training program.

The Duty stations for the two O&M Managers will be determined during implementation. Location decisions will be driven by several key considerations:

- Continuity of operations in the event of a disaster
- Effective response to BPA customer needs, as determined by a customer survey to be conducted during implementation, prior to making organizational changes
- Sufficiency in field staff development on a local basis, as a means to training and guiding, and succession development.

The processes, systems, and tools that enable a more centralized management approach must be in place before any large-scale, organizational redesign is implemented.

The new structure is intended to provide:

- A system-wide perspective and priority for allocating maintenance resources
- More attention to field supervision of crews
- A more structured and broader-scoped work planning and scheduling process

- More emphasis on preventative maintenance
- A more robust environment for succession planning
- Administrative economies-of-scale
- A longer-termed combined construction and O&M resource requirements planning process, which should identify critical staffing situations in time for management to develop cost effective solutions.

A critical characteristic of this new structure is a more centralized and rigorous outage coordination and work management function.
Finally, O&M is the organization that is ultimately responsible for restoring service in the event of a catastrophic occurrence, such as a major earthquake. Leadership succession, the strategic placement of field resources, and the design of all that we do must be informed by Continuity of Operations Plan (COOP) considerations. Development of the COOP for O&M is a high priority initiative that will be developed and implemented prior to any organizational redesign changes. The establishment of an effective COOP will be expedited and coordinated in a fashion that permits O&M future state implementation to be well-informed by this plan.

- ***Create a Centralized Work Planning & Evaluation organization in Internal Operations:*** There is no centralized work planning function to coordinate Regional (District) outage and work prioritization within the TF organization today. The impact of this lack of coordination means that resources are not being fully optimized, potentially resulting in increased number of planned outages and increased capital and maintenance expenses. This situation makes maximizing resource productivity difficult and drives up the frequency and duration of outages. As an example, regions can independently request outages on the same lines for preventative maintenance work, but at different times.

  The EPIP team believes the creation of a formal Work Planning and Evaluation organization in Internal Operations will address any resource issues that emerge from the new work planning and scheduling process. The proposed structure will include: Reliability Centered Maintenance (RCM), maintenance and construction integration, system-wide planning and scheduling, and system data analysis. This will require the establishment of Work Planning and Evaluation Manager (WEM) and two Planner/Scheduler positions. Planned responsibilities for both positions will include:

  - Production of TF's combined O&M and capital work plans annually. This will provide TF management with a complete picture of the use of its resources and allow early identification of constraints.
  - Oversight of the proposed work on transmission paths that cross District boundaries, to facilitate work and outage coordination.

- o Coordination of any construction work with the maintenance to further reduce planned outages.
- o Increased outreach to BPA's generation partners to further coordinate transmission planned outages with planned generation outages.

In addition to assuring maximum productivity from maintenance resources via improved internal coordination, this recommendation is expected to lessen customer concerns about redundant outages. To support this effort and to reinforce the RCM function's ability to capture completed work data, the recommendation "*Refine and enhance the workload methodology*" (described below) will need to be implemented first.

- ***Refine and enhance the workload methodology:*** Over time, the metrics used in the current workload analysis tool have become less precise and inadequately reflect advancements in time-saving technology. The result is that resource requirements are set too high, guiding management decisions to potentially request more resources than actually required. The current work load methodology tool works, but doesn't reflect the potential impacts of technological advancements on work productivity. Furthermore, the underlying data used to estimate resources has not been validated. Institution of a workload methodology and processes that will permit TF management to more accurately project staffing requirements is suggested. This should help to determine the need to more effectively augment BPA forces based on the future Asset Manager's requirements for enhancing and maintaining the transmission system. The benefits from this recommendation should include:

  - o The use of a planning tool which will more closely reflect the potential impacts of technological advancements and permit adjustments to work requirements.
  - o Improved estimates which reflect the true work requirements for better planning and scheduling.

  An additional characteristic of this new structure is a more centralized and rigorous equipment procurement and management function. The planning process itself would be modified to more effectively incorporate field input on equipment condition and corrective maintenance.

- ***Extend the use of equipment pooling - Internal Operations:*** The management of major tools and equipment is fragmented between the Tools & Equipment Acquisition Program (TEAP) committee responsible for determining what equipment (e.g., vehicles, major mobile and test equipment) is purchased annually, and the various groups who manage the pools of equipment across the system. The annual budget for TEAP ranges from $3M to $5M. It is estimated that TF can save $0.3M annually through better coordination of these two activities, by improving the availability on individual pieces of equipment/vehicles, while simultaneously reducing their numbers.

- Equipment requirements are determined on a local basis today, with each region specifying its own requirements and having the equipment purchased via TEAP. Equipment is typically purchased for the exclusive use of the requisitioning region. This exclusivity practice leads to lower than optimum availability of equipment when and where it is needed most, while increasing overall TF costs.

  To better manage this situation, equipment service managers will be provided increased responsibilities and supporting tools and processes. This includes, but is not limited to, the creation of:

  - A system-wide equipment pool
  - An equipment charge-back system to encourage effective and efficient use of equipment
  - Equipment utilization performance standards and monitoring and adherence guidelines
  - Equipment specification standards and acquisition priority criteria
  - Appropriate training curriculum for mechanics
  - A participatory role on the TEAP Committee

  These changes are expected to facilitate greater availability of construction and maintenance equipment when needed, while saving an estimated $0.3M annually.

- ***Enhance fixed connectivity:*** BPA's current fixed network performance and functionality is insufficient to meet the needs of field users. BPA's employees in field offices outside the Portland/Vancouver area routinely experience performance issues accessing BPA's business information systems. Problems include long delays in query response times, slow screen refresh rates, log-on difficulties, and system timeouts. These performance issues result in lost work, reduced productivity, and user frustration. In addition, some crafts have no Internet access and, as a result have difficulty staying informed. This connectivity issue seriously impacts TF management's desire to centralize key functions and interferes with rapid response and most importantly the lack of needed information impairs their ability to do their jobs.

  To resolve this issue, the J and TF organizations should work jointly to identify the underlying issues that are degrading system performance at field offices, develop a phased plan to solve them, communicate the plan to the field offices, and then implement the plan.

  The EPIP team also believes strong consideration should be given to creating video conferencing capabilities between the 12 proposed District offices and the Ross Complex. Video conferencing would likely improve communication between TF senior management and the district offices. It also should provide opportunities for distance learning and increasing field staff contact with activities in Portland/Vancouver.

Goal Three: Facilitate data-driven decision making

The EPIP team recognizes that accurate and timely cost and performance data is critical to efficient allocation and management of finite capital and O&M resources. They also conclude that there is a significant amount of pertinent activity and performance data being captured now. There are, however, two primary deficiencies with the current approach to data management.

First, there are various sources of knowledge and unique information on the condition and performance of system assets. These sources range from the personal experience of individuals to formal and informal databases and information systems. Decisions regarding repair vs. replacement are often based exclusively upon experience of individuals, without the benefit of empirical data analysis. A primary reason for this situation is non-integrated, disparate information systems and the difficulties of data entry and extraction.

Second, the recently adopted Asset Management program is intended to create a comprehensive framework for collection and analysis of system asset condition. It also recommends analytical tools that facilitate decisions regarding what to repair and what to replace. Critical to this effort will be the integration of current maintenance planning and reliability performance data found in legacy information systems. These important systems are not electronically integrated today and, as a result, important data sources are not readily available to support a rigorous asset management program.

In the future, O&M data management is recommended to be a vital factor in facilitating cost-effective allocation of capital and O&M resources. Repair versus replace decisions should be data-driven, with information easily provided by integrated legacy systems. Some immediate actions should be implemented to achieve this future state. Five major efforts are therefore recommended by the EPIP team.

Recommendations That Support This Goal:

In addition to the substation and microwave data and transmission corridor portal recommendations previously presented, the following recommendations support data driven decision making.

- ***Institute a formal process for data stewardship – Value of data:*** Many critical O&M decisions are being made using information that is obtained without the benefit of consistent and clear roles and responsibilities for data entry, data integrity, and data stewardship. Employees often do not see a direct value of capturing and recording O&M data and can express increasing frustration for the amount of time spent entering data. Even within the processes for data entry, expected roles and responsibilities are not consistently followed or enforced.

The EPIP team recommends a chartered data stewardship program be created for those systems that provide information on which construction and maintenance resources allocation decisions are based. This program would be expected to provide a clear understanding of data stewardship roles and responsibilities and, most importantly, the reasons why data is collected, how it is to be used, and what importance data and data integrity means to assuring good decision making. This program should provide an Agency perspective for employees, enabling greater data consistency and quality. Accurate data is the foundation for every decision made at BPA.

- ***Provide useful KPIs to all TF management levels:*** The current list of formal KPIs and PIs related to O&M is insufficient in both scope and organizational depth to enable effective management of the operation and maintenance of the transmission system. TF and Asset Management should develop a portfolio of O&M KPIs to support and drive on-going conditional assessment and performance improvement. Key indicators should, at a minimum, include: $/ Work Order (as a high-level measure of productivity/efficiency), number of planned outages by voltage class, SAIDI, SAIFI, O&M dollars spent per breaker, and O&M dollars spent per mile of line. These and other candidate KPIs are further detailed in Appendix B. Naturally, the primary value of the KPIs is to indicate asset health and, as such, to provide a warning when out of compliance tolerances are being approached, so that appropriate correct actions can be formulated.

- ***Form a joint field/IT team:*** There is insufficient coordination between standard IT solutions and field automation needs. The perception is that what works in the Portland/Vancouver area will work in the field and, in some instances, the field does not require the same level of IT equipment or connectivity that is required in headquarters. A joint team of TF and J subject matter experts should be convened to recommend additions, enhancements, or removal/replacement of obsolete IT systems used by field personnel. This team would also recommend actions that can improve the field's ability to effectively use existing and emerging information technologies.

Goal Four: Improve transmission system capacity availability and reliability

Outage and work planning and scheduling is mostly conducted on a "local" basis with limited inter-regional coordination and collaboration. This lack of a system perspective is most acute with the outage coordination process. The ideal time to work on the equipment often conflicts with a system need for the equipment. Balancing these two demands requires field input and system perspective. Frequently, transmission lines are taken out of service by individual regions, unnecessarily reducing system transmission capacity when that same line may be

subject to subsequent outage requests from other regions. The net result is the need to take lines out of service multiple times per year for planned outages.

System growth, and thus the need to have as much capacity as possible at all times, necessitates a more structured approach for coordinating outages and assuring the planned work is conducted in a timely and efficient manner.

The EPIP team believes that a more structured, integrated and disciplined approach to work management is needed to assure minimum system down time for planned maintenance. The team also believes this can best be achieved by centralizing work management planning and outage coordination in the recommended redesign of TF's Internal Operations organization.

Recommendations That Support This Goal:

- ***Formalize O&M planning and evaluation processes***: Among other identified issues, TF's management of the health of the BPA network faces three challenges: limited resources, aging of vital transmission physical assets, and increasing customer pressure to reduce the frequency and duration of planned outages. If not managed effectively, they have the overall effect of potentially increasing O&M costs, degrading system reliability, reducing revenue, and generating customer dissatisfaction. The current maintenance planning, prioritization, scheduling, and evaluation processes are fractured and inconsistent within O&M. As a result, BPA cannot demonstrate that its resources are being appropriately applied to optimizing system reliability and managing system risks.

  Establishing a planning and prioritization role, and supporting processes, at the TF level would help to facilitate the development of standards and consistent prioritization/planning processes for both capital and maintenance work. The Planner/Scheduler role/function would implement and monitor the O&M work plan. The new function should also provide BPA with the information, standards, solutions, and staffing guidelines to analyze, report, and manage the performance of the O&M programs and crafts. The new planning and evaluation processes would seek to improve O&M crews' effectiveness and reduce outage durations.

- ***Adopt a formal work planning policy:*** Presently, there is no formal work planning policy to govern all maintenance work, except for WECC and Significant Equipment OB-19. This places the lower voltage (below 230kV) transmission lines at a slightly higher risk if its maintenance is not current. There is a need for Field Services to develop a priority structure for operations, maintenance, and construction work that would govern the planning and scheduling of limited resources to achieve BPA's goals. This would help to ensure maximum utilization of outages and increased reliability, as well as enhanced work performance. Having a priority structure would also help

provide a system-wide perspective for planning and scheduling work, as well as a framework to track the effectiveness of the plan.

- ***Create a Planner/Scheduler function:*** Each portion of the current TF work planning and scheduling process is performed independently by craft and field supervisors. This is, in part, due to lack of clarity of process or system prioritization, with little or no formal coordination. The planner/scheduler positions would provide a more strategic approach to planning work and system outages by prioritizing and combining outage requests that would increase system availability. Additionally, it is anticipated that more coordinated work would result in greater resource productivity and a reduction in backlog. It is not expected that the planner/scheduler would schedule 100% of the crew's available work time but would instead work collaboratively with the field supervisors and central planner/schedulers to plan and schedule outages, projects and resources. The role of the Asset Manager is evolving. This role will be engineered into the planning and scheduling process during implementation. The planner/scheduler position is a benefit for the outage office by prioritizing field services work prior to submittal for an outage and by providing one point of contract for the outage dispatcher. The resource specialists would work in concert with the planner/scheduler by ensuring the crafts are trained and equipped with appropriate tools and equipment to perform the work at hand. To accomplish this, financial resources are managed through a strategic approach in order to obtain maximum value in test equipment, tools, vehicles, and training.

- ***Install a work planning tool:*** For the most part, BPA employees cannot see all operations, maintenance, and construction work scheduled for any given time period. As a result, work is not always planned as effectively as possible and multiple outages can be scheduled for the same line. In order for the Planner/Scheduler to accomplish their work, they need a functioning, automated tool to simultaneously view all work requirements. Currently, various data tools are cobbled together for partial solutions, but require tremendous investment in time and effort to keep information current. An interim solution is to use a programmer to link data from various BPA programs to provide real-time data. A long-term solution recommended by the EPIP team would be to purchase or build software that would support the planning and scheduling of work. Investment in planning/scheduling software would provide a more effective view of work schedules system-wide with the expectation that this would permit a more strategic approach to planning outages.

- ***Centralize the vegetation and access road programs***: An analysis of cascading outages in the United States has pointed to vegetation as the root cause in almost all cases. If performed efficiently and effectively, targeted vegetation removal, both on and off the Right-of-Way, enhances the protection of the system. Effective and efficient vegetation management requires that several functions be performed very well and that they be tightly coordinated for maximum effect. Decentralization of BPA's vegetation and access road programs has resulted in inconsistent program standards, processes,

and performance across the regions. This approach has inhibited the identification and implementation of performance improvements and increased the risk of vegetation caused unplanned outages.

The EPIP team recommends the centralization of the Vegetation Management and Access Road Programs, under a single manager. This manager would be responsible for developing and executing improved policies and processes, based on industry leading practices and "lessons learned" across BPA regions. The new organization should improve the effectiveness of vegetation and access road maintenance and reduce the risk of unplanned or cascading outages.

- ***Refine and enhance the workload methodology***: (See page 29 for the description of this recommendation)

- ***Align Transmission Field Services to refocus on system priorities and move management closer to the field forces and customers:*** (See page 25 for the description of this recommendation)

- ***Create a Centralized Work Planning & Evaluation organization in Internal Operations:*** (See page 28 for the description of this recommendation)

Goal Five: Provide timely and efficient response to regulatory initiatives

TF anticipates that compliance with the Federal Energy Policy Act (EPAct) of 2005 will require BPA to provide more and detailed transmission system activity and performance information. Compliance with the EPAct is expected to add managerial, craft and administrative work load to assure reliability accountabilities are met.

The recommendations crafted by the EPIP team, collectively, create an infrastructure that facilitates providing timely and pertinent compliance information. The productivity improvements expected through revised business processes will also offset some of the unanticipated work load that could be created by the EPAct and other impending regulatory requirements.

Recommendations That Support This Goal:

- ***Formalize the O&M Planning and Evaluation processes*** (See page 33 for the description of this recommendation)

- ***Align Transmission Field Services to refocus on system priorities and move management closer to the field forces and customers:*** (See page 25 for the description of this recommendation)

- ***Provide useful KPIs to all TF management levels:*** (See page 32 for the description of this recommendation)

Goal Six: Implement logical and sustainable cost controls

The EPIP team believes prudent cost management will be facilitated by formal work management processes, integrated information systems, innovative technology applications and disciplined planning and scheduling.

Recommendations That Support This Goal:

- ***Develop a structure for guiding work sourcing decisions:*** Many of the maintenance contracts in place today are for limited scope or with insufficient lead times, often resulting in contract premiums of 10 to 15% over prudent market costs. Contracting is performed in the TF organization today, but it is generally only applied to the large annual programs. Some contracting occurs opportunistically on small efforts when internal Agency resources are found to be constrained. By the time the work is identified, the lead times are often too short for sufficient bidding and the Agency pays a premium for the external work. Thus, there is a need to more effectively identify and implement opportunities and potential customer alliances to control maintenance expenses. Initial possible opportunities include work identified which occurs during peak work periods and with priority completion times. This recommendation seeks to establish a formal sourcing decision process and framework by merging the Cost Benefit Analysis, the Agency Risk Analysis, and the Agency Decision Framework tools into a single, predefined methodology tied to the Agency's business strategy. Identifying opportunities with sufficient lead time would better allow management to package work scope and gain improved market prices.

- ***Extend the use of the Field Information Network (FIN):*** As a result of not fully developing the FIN, TF incurs higher SPC maintenance travel costs than necessary. Currently, when an unplanned outage occurs on the network, the system operator contacts the local SPC engineer to determine where the problem is likely to be found. To make this determination, the engineer frequently needs to travel to the site to interrogate the relay and identify the problem location. In addition, when setting new, programmable relays, the engineer and craftsmen generally travel to the substation to make the necessary program changes. The EPIP recommendation is to expedite the Field Information Network (FIN) project implementation relative to current plans. By placing a higher priority on the project, the Agency would be able to establish more efficient and effective communication and emergency response capabilities, establish engineering and other analytical employees in centralized locations, and provide more real-time data to other emergency response crews in the near-term. In the future, the engineer or craftsmen can perform most of these duties from their office, instead of driving to the substation, thus reducing time and travel expenses associated with these

tasks. Implementation of this recommendation will require close coordination with Cyber Security to ensure all security considerations are addressed.

- ***Introduce O&M knowledge into the capital planning, design and replacement projects:*** SPC and PSC engineers spent a significant portion of their time, up to an estimated 50 percent and 40 percent respectively, troubleshooting new designs in the field. Unwarranted O&M expense can occur in situations where preventative maintenance is performed on equipment and a capital project is subsequently implemented to replace the same equipment. Among several others identified, there are two major issues facing TF in the regions today. First, when new construction plans are sent to the field for implementation, field engineers are often faced with spending a significant portion of their time adjusting designs which won't conform to original specifications. This issue, which has previously been identified and described in the PDB EPIP as the "red-line" issue, annually generates thousands of red-lined drawings which must then be redrawn and re-issued.

  Second, introducing and requiring O&M knowledge to be incorporated into the standards, planning, design and replacement processes at the front-end could reduce the level of field analysis and redesign work during capital projects. In addition, having advanced knowledge of equipment replacement activity could permit the maintenance programs to be adjusted to reduce unnecessary work caused by future replacement plans. The supplemental FTE requirement for implementing this proposal is already identified in the Work Planning and Evaluation group of the PDB EPIP.

- ***Integrate wireless installations and maintenance into a TF program:*** Wireless installations on BPA transmission towers represent a growing BPA revenue source. As part of these revenue agreements, BPA is making contractual and regulatory maintenance and replacement commitments with these customers. A backlog of installations is growing because an outage is required for current installation methods and a low priority is generally assigned for this type of work where resources are constrained. This backlog represents a loss of revenue to BPA from the leased installation, an increasing contractual liability.

  The EPIP team recommends the implementation of a structured program for wireless installations, including higher priority for wireless installations. This program would also include a dedicated BPA installation team, alternative new installation designs and methods, and favorable outsourcing options for equipment installation. This program would ideally work with the recommended Planner/Scheduler functions to coordinate outages and resources, thus potentially reducing the existing backlog and respond more effectively to new installation requests. The overall benefits would include more timely realization of revenue and maintenance of customer trust.

- ***Optimize the number of diagnostic services special equipment:*** Reviews of the needs, costs, and benefits of O&M equipment are not consistently conducted by BPA,

resulting in unnecessary equipment expenditures and overall higher maintenance costs. A recommendation to address this issue is to require a formalized evaluation of the needs, costs, and benefits of leased and purchased O&M equipment.

The evaluations could be conducted when current leases are renewed and new purchases/leases are budgeted. For example, the Doble test set lease is scheduled for renewal in November 2006. The EPIP team has estimated that number of leased Doble test sets can be reduced without impacting TF maintenance performance. Renewing the Doble test set leases with a reduction in required sets would achieve immediate savings and establish the evaluation process for additional reductions in O&M equipment expenses.

Note: The specialty teams described below address multiple goals. They support the aging workforce goal by leveraging scarce skill sets, serving as the vehicle for knowledge transfer and they reduce the training required to develop and maintain a fully competent workforce.

- ***Develop a dedicated fiber splicing team****:* One of the key drivers of the Fiber Optic Communication Program has been the ongoing FCC requirement for BPA to surrender some of its currently licensed radio frequencies for use with other microwave systems. Fiber optic cable has proven to be a favorable replacement to the existing radio system for internal communications. In creating a fiber ring for BPA's communications needs, a new revenue source (leasing excess dark fibers) was created. As BPA continues to surrender radio frequencies, the fiber optic circuits will become more critical. As a result, fiber optic circuit repairs will become an even greater priority.
  Fiber circuit installation and repair requires a good deal of training, practice and a specific skill set to achieve quality results and crew productivity. Currently, fiber splicing is performed by many crews on a sporadic basis across the system. Skills that are not in continuous use require annual refresher training. Therefore, the EPIP team recommends the establishment of dedicated teams of BPA line personnel with the specific skills. External contractors may be used to supplement the BPA specialists, when necessary. The combination of BPA line personnel specialists and external contractors should increase the efficiency of splicing crews, reduce BPA training costs, and maintain a high level of expertise.

- ***Establish a power transformer specialty team:*** There are approximately 600 power transformers installed on the BPA system. These components are large, expensive and intolerant of mistakes. The infrequency with which this work is performed by the average craftsperson means that each job is performed on the steep part of the learning/relearning curve. Lack of practice produces inefficiency and an increased probability of mistakes.

  A dedicated team would provide the specialized skills and experience to support the transformer overhaul crews. A specialized and experienced crew would be expected to increase the efficiency of outage downtime and reduce transformer outage durations.

A move toward the use of specialty teams would also likely have the added benefit of supporting the application of the highest maintenance principles across the system, and restricting the highly specialized training to a smaller set of craftsmen, thereby reducing overall training costs.

- ***Refine the vegetation program contract process:*** Vegetation contracting practices and resources are not being optimized to achieve a reduction in contractor's fees and internal BPA Supply Chain and Vegetation contracting costs. Over 300 vegetation program contracts are issued annually to more than 60 service providers. Many of these contracts are for projects valued at $3,500 or less. A recommended action is for the Vegetation Management and Supply Chain groups to utilize the available tools in the Bonneville Purchasing Instructions (BPI), along with multi-year budgeting principles, to optimize vegetation program performance and costs. TF Natural Resource Specialists (NRS) should also be provided greater authority to procure contract services to meet emergency or urgent situations. Contracting costs should be reduced by the implementation of redesigned contracting policies and practices.

- ***Align Transmission Field Services to refocus on system priorities and move management closer to the field forces and customers:*** (See page 25 for the description of this recommendation)

Business Benefits and Implementation Costs

When fully implemented, the future state recommendations in this report should increase the transparency by which the Bonneville Transmission system is operated and maintained. This increased transparency should enable Bonneville to focus more proactive attention on major strategic issues, especially those with long-range, large-scale impact, and enable these issues to be addressed expeditiously. Beyond operating transparency and increased standardization, the proposed new business processes, information systems and organization structure should enable the realization of substantial benefits in efficiency (costs), effectiveness (customer service) and risk reduction (reliability), as well as lead to greater overall productivity from both human and physical assets.

Benefits

As with other EPIP initiatives undertaken by Bonneville, this effort has identified achievable benefits that can be categorized into three broad groupings. Specifically, these benefit groupings are as follows:

1. *Reduction of direct costs*. These are substantive reductions to budgets that are relatively easy to track and report. The dollars saved are significant in themselves, but still represent only a fraction of the total positive financial impact achieved by implementing the future state vision.

2. *Performing more work and accommodating increasing operating demands without an increase in required budgets.* These benefits are catalogued as "efficiency savings", but really represent a "reinvestment of savings" into ongoing system enhancement and tuning. Fundamentally, this type of savings enables management to make choices about the best possible use of available resources. Combined with the new approach to needs identification and risk management, management will be able to re-deploy these savings to achieve increased system performance.

3. *Financial, good will, and stewardship benefits that accrue to the region and all transmission users as a result of increased system availability.* Increased availability from fewer outages, increases availability to all Transmission customers including BPA's Power business.

The end-state, annualized financial benefits[5] after full implementation are estimated at $9.4M against the TF controllable spend baseline of $80.6M[6] annually.

[5] "Financial Benefits", as referenced in this report, include estimated improvements in one or more areas: revenue increases, cost reductions, and productivity savings.

[6] Fiscal year 2004, TF O&M actual expenses for System Maintenance and System Operations. These are Level 3 accounts 1018 – System Main. and 1016 – System Ops.

Appendix A provides a one-page business summary for each of the recommendations described in the Future State Recommendations section. It should be noted that the financial benefits are premised upon the full implementation of all recommendations. This is an important aspect of this recommendation – many of the recommendations, while presented as individual initiatives, are indeed part of an overall performance enhancement mosaic, with all the pieces having a distinct role in achieving the desired outcome.

Fiscal year (FY) 2004 Transmission Field Services' O&M expenses form the basis for estimating O&M EPIP financial impacts. TF's total expenses include those associated with both indirect costs (14%) charged by BPA staff outside of TF and direct Field Services' costs (86%), as shown in figure 13. Only the latter represent those financial areas under direct control by TF management and staff, and are the principal focus of EPIP efforts.

Figure 13

Transmission Field Services: FY 2004 Total Expenses ($M)	
System Maintenance (direct)	*$ 63.53*
System Operations (direct)	*$ 17.04*
Corporate Shared Services – Expenses (indirect)	$ 6.12
TBL Marketing & Business Support (indirect)	$ 4.63
TBL Services (indirect reimbursable)	$ 2.00
Environment Expense (indirect)	$ 0.23
TBL System Development (indirect)	$ 0.01
Total TF Expense	**$ 93.56**

The O&M EPIP Baseline will be the actual, direct FY 2004 Transmission Field Services expenses ($81M). These costs are further delineated in figure 14.

Figure 14

O&M EPIP Baseline: TF Direct Expense Categories ($M)			
Direct Expense Category	**System Operations**	**System Maintenance**	**Total TF Direct**
Personnel Compensation and Benefits	$ 13.70	$ 41.02	$ 54.72
Materials and Equipment	$ 1.00	$ 11.17	$ 12.17
General Contracts	$ 0.03	$ 10.75	$10.78
Rents, Utilities and Land	$ 2.28	$ 0.41	$ 2.69
Internal/ Non-BBL Transfers	$ 0.03	$ 0.18	$ 0.21
Total O&M EPIP Baseline	**$ 17.04**	**$ 63.53**	**$ 80.57**

These TF direct expense categories are aligned with the improvement recommendations offered in this report. The net financial benefits resulting from the implementation of the O&M EPIP recommendations is estimated at $24.8M over the five-year period commencing in FY

2007. This figure is inclusive of the estimated implementation costs associated with realizing the desired outcome. Figure 15 outlines the estimated financial benefits from each sub-team.

Figure 15

O&M EPIP Business Case Summary			
Totals for 2007 - 2011 Period			
	Gross Benefits ($M)	**Implementation Costs ($M)**	**Net Benefits ($M)**
Total Future State Recommendations	**$ 32.9**	**$ 8.1**	**$ 24.8**
Sub-Team A: O&M Roles	**$ 8.7**	**$ 2.2**	**$ 6.5**
Refine and enhance the workload methodology			
Develop a structure for guiding work sourcing decisions			
Expand the use of the Field Information Network (FIN)			
Introduce O&M knowledge into capital planning, design, and replacement projects			
Sub-Team B: Processes and Practices	**$ 3.1**	**$ -**	**$ 3.1**
Integrate wireless installation and maintenance into a TF program			
Formalize the O&M planning and evaluation process			
Optimize the number of diagnostic service special equipment			
Develop a dedicated fiber splicing team			
Establish a power transformer specialty team			
Sub-Team C: TF Functional Design	**$ 6.7**	**$ 0.2**	**$ 6.5**
Align Transmission Field Services to refocus on system priorities and place management closer to the field forces and customers			
Extend the use of equipment pooling - Internal Operations			
Create a centralized work planning and evaluation organization: Internal Operations			
Sub-Team D: Work Planning	**$ 2.2**	**$ 1.5**	**$ 0.7**
Adopt a formal work planning policy			
Create a planner/scheduler function			
Install a work planning tool			
Sub-Team E: ROW Management	**$ 0.7**	**$ -**	**$ 0.7**
Centralize the vegetation and access road programs			
Refine the vegetation program contract process			
Formalize the process for access road rights and recordation			
Sub-Team F: Data Driven Performance	**$ 11.5**	**$ 4.2**	**$ 7.3**
Install a substation and microwave data portal			
Install a transmission corridor data portal			
Institute a formal process for data stewardship - value of data			
Provide useful KPIs to all TF management levels			
Form a joint Field/IT Team			
Enhance fixed connectivity			

The reduction in the number of planned outages is expected to have a significant economic benefit to BPA's customers, as it increases their ability to more efficiently and consistently move energy across the system. Increasing the transparency of O&M and operating the system in a more integrated fashion should enable further benefits from the demonstration of

good stewardship. These benefits, though of great value to the region, are not easily quantified or tracked, and therefore do not form the basis for the EPIP recommendations.

Throughout the EPIP effort, care was taken to maintain overall operational alignment with the Four Operating pillars depicted in figure 16. Specific references to the Agency's Strategic Objectives are also listed by letter identifiers, with the definitions provided in Appendix C: BPA Flight Plan.

Figure 16

Recommendations	Low Cost Provider	System Reliability	Regional Accountability	Environmental Stewardship
Refine and enhance the workload methodology	I1, P2	S1, S2		
Develop a structure for guiding work sourcing decisions	I1	S2	I6	
Expand the use of the Field Information Network (FIN)	I1, I4	S1	I6	
Introduce O&M knowledge into capital planning, design, and replacement projects	I1	S1		I4
Integrate wireless installation and maintenance into a TF program	F2		I5	I5
Formalize the O&M planning and evaluation process	I3	I1, S1, S2	I6, S9	
Optimize the number of diagnostic service special equipment	I1			
Develop a dedicated fiber splicing team	I1			
Establish a power transformer specialty team	I1	S1		
Align Transmission Field Services to refocus on system priorities and place management closer to the field forces and customers	I3, P2	I1,S1, I2, P1	S10,I5,I6,P4	I7
Extend the use of equipment pooling: Internal Operations	I3	I1		
Create a centralized work planning and evaluation organization: Internal Operations	I3	I1,S2	I6	I7
Adopt a formal work planning policy	I3	I1,S2	I6	I7
Create a planner/scheduler function	I3	I1,S2	I6	I7
Install a work planning tool	I3	I1,S2	I6	
Centralize the vegetation and access road programs	I3	I1,S1,S2,P1	I5, I6	I7
Refine the vegetation program contract process	I1			
Formalize the process for access road rights and recordation	I1	I3,S1		
Install a substation and microwave data portal	I1	I3,I4,S1		
Install a transmission corridor data portal	I1	I3,I4,S1		
Institute a formal process for data stewardship: value of data	I3	S1		
Provide useful KPIs to all TF management levels	I1	S1		
Form a joint Field-IT Team	I1	P2		
Enhance fixed connectivity	I1			

Impact to O&M Expense

Figure 17 depicts the actual historical TF (controllable) expenses from 2000 through 2005, along with budget projections through 2012. O&M budget projections are driven by a rate case cap on staffing levels and by payroll rate increases. These projections also do not reflect additional maintenance workload that may be required due to new regulatory guidelines, expansion of the BPA system, or addressing the growing maintenance backlog.

O&M management and the O&M EPIP team believe that gaps will develop between annual funding level mandates and maintenance workloads required to maintain BPA system reliability and availability. The O&M EPIP team also believes that additional future workload requirements can be addressed by implementing the recommendations outlined in the six goals already stated. As a result of implementing the recommendations, overall work unit rates are expected to improve, resulting in lower unit rate costs.

Figure 17

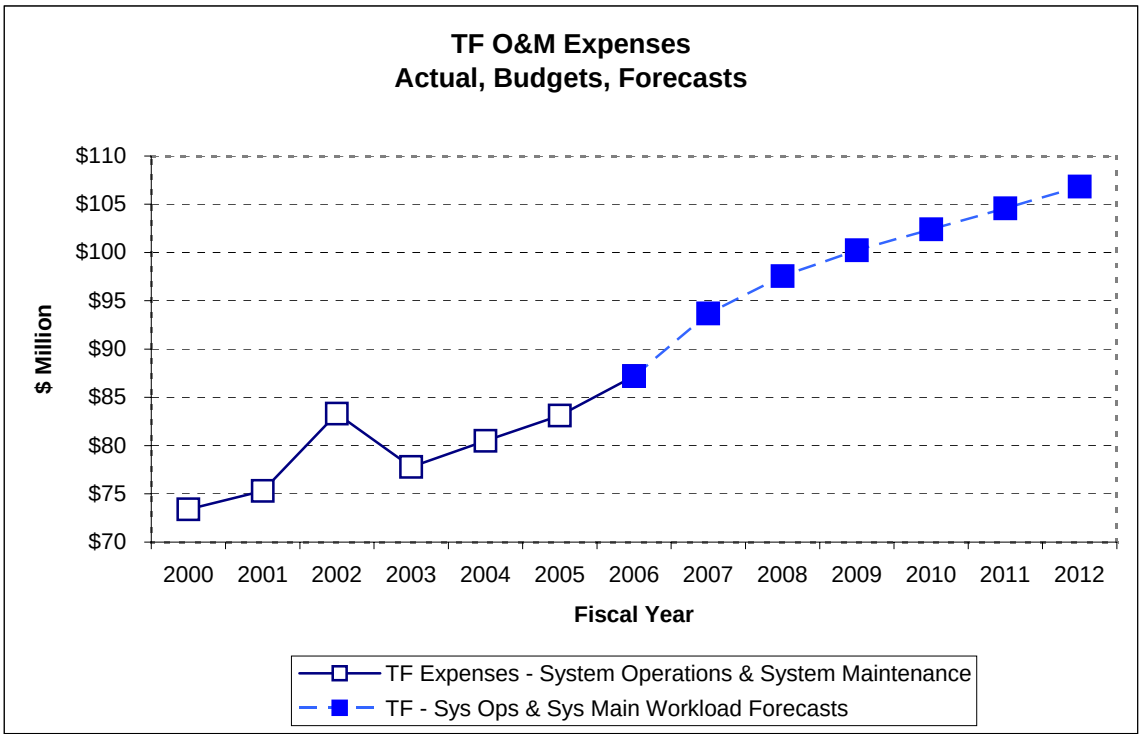
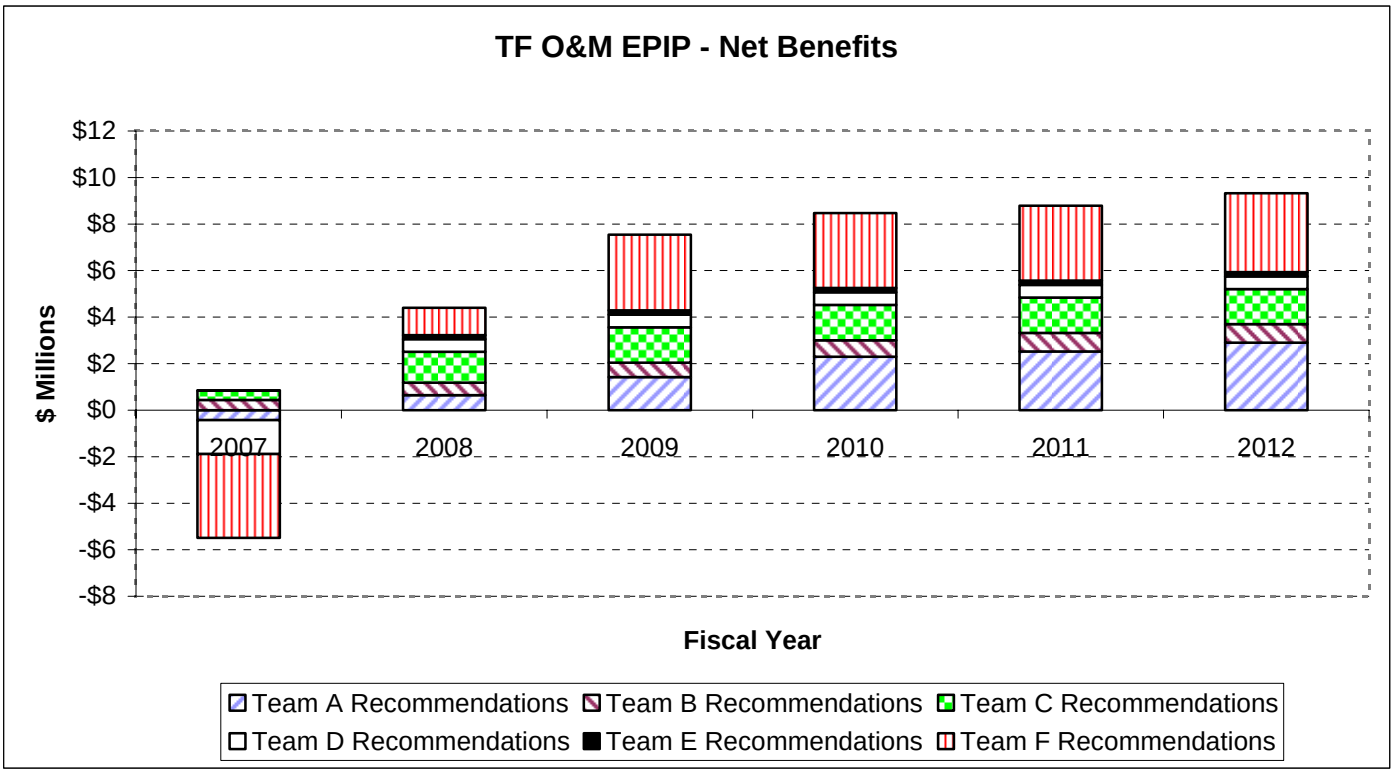


Figure 18 below depicts the 5-year plan to realize the projected $24.8 million in net benefits associated with full implementation. Detailed net savings for each recommendation are in

Appendix E: Estimated Net Financial Benefits. This benefit glide-path is based on current implementation scenarios, combined with the expected timing of the cost and benefit streams.

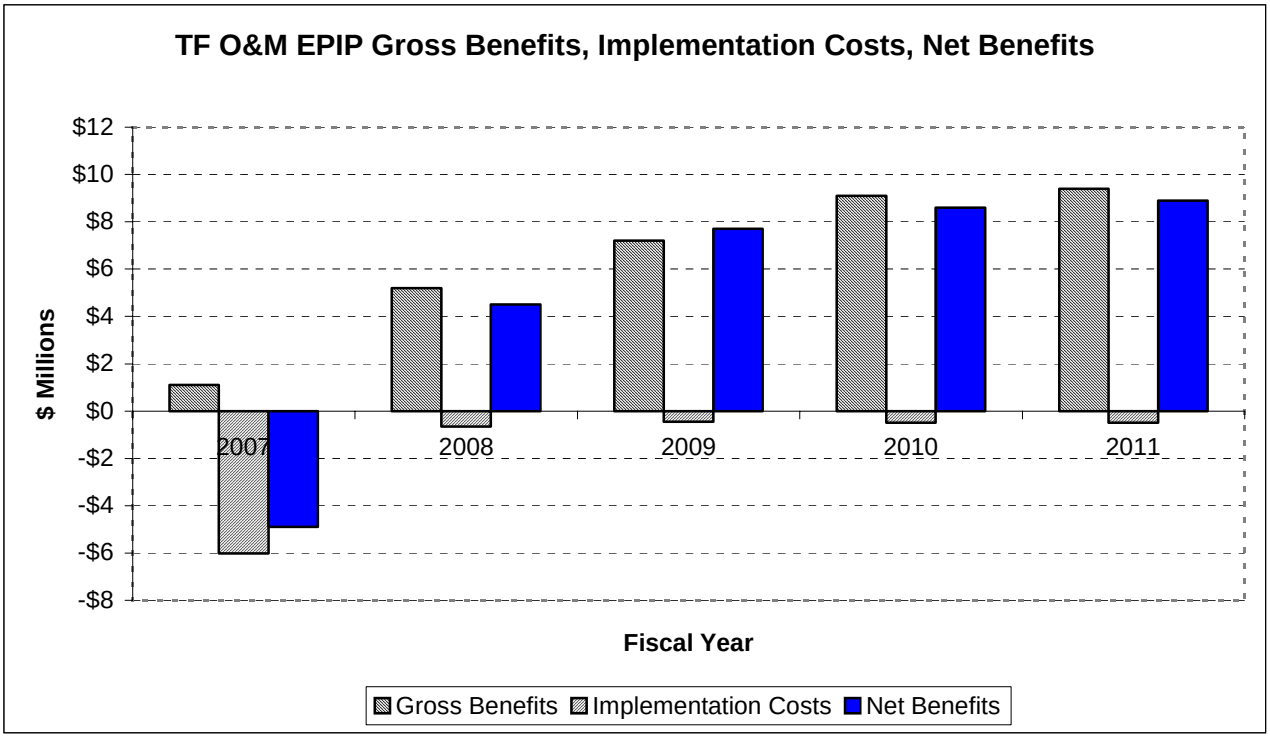
Figure 18



	2007	2008	2009	2010	2011	2012
Annual Estimated Net Financial Benefits	($ 4.9M)	$ 4.5M	$ 7.7M	$ 8.6M	$ 8.9M	$9.4M
% of Total Annual Estimated Net Financial Benefits	- 52%	48%	82%	91%	95%	100%

Implementation requirements for scheduling and Information Technology (IT) recommendations account for more than 50% ($4.6M) of the Total Implementation Costs ($8.1M) to be expended in the first year. Assuming an on-schedule deployment, this investment should be recovered within 3 years (by 2010) from the financial benefits expected to accrue. The total view of the EPIP recommendation gross benefits, implementation costs, and net benefits is shown in figure 19.

Figure 19



	2007	2008	2009	2010	2011
Implementation Costs	$ 6.0M	$ 0.7M	$ 0.5M	$ 0.5M	$ 0.5M
% of Total Implementation Costs	74 %	8 %	6 %	6%	6 %

The cost to implement all of the O&M EPIP recommendations is estimated at approximately $8M. The team has been in close collaboration with IT, training, supply chain and other organizations to arrive at this estimate.

Major Implementation Steps

The initial, high-level O&M EPIP implementation plan (see Appendix D: EPIP Implementation Plan) calls for work to be undertaken in five (5) waves of activity. Each wave has a defined grouping of projects associated with it. The team applied the following three principles in arriving at their conclusions regarding the number of implementation waves to be pursued:

- Implementing substantive organizational change was predicated on the availability of the required data and tool infrastructure. Without these, the proposed organization change would likely not be effective.
- Begin the work planning tool project quickly, as it will require the longest lead time, which is currently estimated at approximately fourteen months in duration.
- Work small initiatives (those which have little or no implementation costs, essentially requiring little effort) into the early waves.

Some overlap among the waves is expected due to different skill sets and user groups that will be impacted by the implementation. Every effort will be made to minimize simultaneous projects for a specific work group. This initial implementation plan will be modified based on leadership's priorities, as well as resource and budget realities.

It should be noted that the first task for the implementation team will be to identify dependencies between action steps to be taken during implementation. For example, the team has identified important preconditions to moving forward with the organizational redesign. The timeline presented below is ambitious and could slip if critical preconditions are not met. The first status report to the BOB will supply the detailed implementation plan with highlighted dependencies.

Wave 1

Wave 1 begins many of the high priority projects identified by the teams. These are a combination of enabling tasks and those that can realize benefits quickly for BPA. These tasks are to:

- Construct a high-level work plan for the each of the waves.
- Construct a detailed work plan for Wave 1.
- Analyze and report benchmarking results.

- Implement the following recommendations:
    - Focus on reducing the backlog of wireless projects to realize increased Agency revenue.
    - Begin development of the planning and scheduling tool.
    - Initiate the enhanced vegetation contracting program in conjunction with the Supply Chain EPIP.
    - Begin development of the substation and microwave portal.
    - Form the joint IT-Field Services Task Force to pursue enhancements to the field IT connectivity infrastructure.
    - Establish the framework for data stewardship

Wave 2

Wave 2 continues the momentum from Wave 1 with a smaller grouping of projects, while implementing other “quick hit” projects.

- Construct a detailed work plan for Wave 2.
- Implement the following recommendations:
    - Begin FIN development and implementation.
    - Design and implement the specialty team construct

Wave 3

Wave 3 implements several additional foundational tasks.

- Construct a detailed work plan for Wave 3.
- Implement the following recommendations:
    - Develop the enhanced workload methodology to support system-wide planning and scheduling.
    - Implement the system-perspective work planning policy.

Wave 4

Wave 4 focuses on the organizational transformation of TF and the move to a system-wide perspective.

- Construct a detailed work plan for Wave 4.
- Implement the following recommendations that address the reorganization of TF:
    - Align Transmission Field Services to refocus on system priorities and place management closer to the field forces and customers.
    - Create a planner/scheduler function.
    - Centralize vegetation and access road management program.

- Implement the following recommendations that address the other key TF functions:
    - Extend the use of equipment pooling - Internal Operations.
    - Establish the work planning and evaluation group - Internal Operations.
    - Develop a structure for guiding work sourcing decisions.
    - Formally introduce O&M knowledge into capital planning, design and replacement projects.
    - Develop the O&M planning and evaluation process.
    - Install a transmission corridor portal.

Wave 5

Wave 5 implements the remaining recommendations identified in the O&M EPIP, including:

- Construct a detailed work plan for Wave 5.
- Formalize the process for access road rights and recordation.
- Provide useful KPIs and PIs to all TF management levels.
- Enhance fixed connectivity.

Metrics for Success

The O&M EPIP recommendations provide benefits that increase revenues, improve crew and staff productivity, and reduce staffing levels. TF Management and the O&M EPIP implementation team will establish a cascading system of metrics to monitor the results of the implementation and report on the impacts of the recommendations. These metrics would seek to address:

- Performance and schedule of the O&M EPIP Implementation Wave – Progress against project plans, milestones, and deliverables
- Benefits and costs results of the implemented recommendations – Performance against benefits, savings, and cost targets
- Health of the transmission system and performance of TF O&M – Quality measures comparing how well a process is functioning at baseline (established during implementation and post recommendation implementations)

The O&M EPIP Implementation phase will establish the project management tools and reports for support of the BPA “In Depth” project reviews and for project status updates to the BOB. The project management tools and reports will include:

- A catalog of recommendations approved for implementation
- Project plans outlining major activities, responsibilities, schedules and percentage completion
- List of milestones and deliverables
- List of performance metrics approved by the “In Depth” project review and by the BOB
- Data and sources for identified metrics
- Information on the method used to collect metric data and the frequency with which it is collected
- Benefits and costs timelines (glide slope) with both projected and actual results.
- Information about scope adjustments that have been made or any adjustments regarding inflation that are being used in calculations
- For each benefit claimed, a list of the action steps that will lead to the benefits

Measurement of the benefits and cost results will require a tiered approach of traditional project management metrics (schedule and cost tracking), existing TF KPIs, and new performance indicators. The O&M EPIP will seek to develop an approach, with the approval of TF management and the BOB, for effectively identifying and reporting the impacts of the recommendations. The recommendations will expect to have identified savings linked to specific areas, applied across crafts, and demonstrated in TF O&M expenses. Some of the initial, proposed metrics are identified in figure 20 below.

Figure 20

Measurement Level	Benefits and Costs	Measurement of Benefits
TF O&M	Increased Efficiencies	• Increase in work performed (number of work orders) • Decrease in costs of units of work performed ($ costs per work order) • Decrease in number of planned outages • Reduction in planned outage durations (total and averages)
Crafts	Increased Efficiencies Improved Planning and Scheduling	• Increase in work performed by crafts • Decrease in man-hours per work order required to complete tasks (efficiency) • Increase in productive staff-hours for crews • Reduction in work backlog
Recommendations	Increased Efficiencies	Tracking and reporting of specific performance metrics and assumptions of the EPIP recommendations, such as: • Status of backlog of wireless installations and revenue • Results of renewed leasing contract for Doble testing units • Increased utilization of TEAP equipment and changes in TEAP expenditures • Reduction in staff-hours charged to administrative, data entry, and other indirect tasks

In addition to the metrics discussed above, the various EPIP sub-teams have identified a candidate portfolio of approximately 60 existing and new O&M performance indicators (PIs) to monitor the performance and health of TF and the power system. From this portfolio (as detailed in Appendix B), the TF EPIP, TF Management, and the Asset Manager could implement PIs that specifically measure the effectiveness of O&M standards and guidelines on the power and transmission system's health. This would seek to more effectively monitor system reliability during the interim steps of the EPIP implementation. These PIs will be incorporated into the EPIP Implementation phase status reports presented to the BOB. The actual PIs would be selected during the O&M EPIP implementation.

Appendix A: Future State Recommendations Details

RECOMMENDATION

Enhance workload methodology & process

CURRENT STATE ISSUE

Team A concluded that the Agency does not have a full picture of the workload required to operate and maintain the transmission power system. Over time the metrics used in the current workload analysis tool have become less precise and don't reflect advancements in time-saving technology. The result of this imprecision artificially sets the resource requirements higher, causing management to potentially request more resources. By allowing some level of corrective work to creep into the base metrics prevents the Asset Manager from having a complete picture of the health of the equipment.

SOLUTION

Institute a workload methodology and process that will permit TF management to accurately project staffing requirements and determine the need to augment BPA forces based on the future Asset Manager's requirements for enhancing and maintaining the transmission system. Management needs to assess the future need for resources in response to the growing additions of capital improvements, equipment retirements, integration of new generation sources and the growing level of transmission congestion.

ASSUMPTIONS AND BENEFITS

By developing a consistent and repeatable workload study methodology, the agency will be better equipped to adapt to anticipated and real changes in the workload. The team believes the accuracy, credibility, and usefulness of the workload studies as a management tool will increase significantly, allowing a more targeted use of our resources, resulting in a gain in the efficient and effective use of our BPA FTE and other labor resources. The agency can be much more strategic in terms of staffing (the right people in the right places doing the right work).

Based on past KEMA experience, having a well benchmarked and documented set of time standards is critical for identifying true labor requirements. Accurately identifying the work content and actual time to perform it in a work order, and modifying BPA's standards appropriately, can yield between 2% and 5% efficiency gains in performing preventative maintenance work orders. For this recommendation, a value of 3% was selected. The resulting estimated savings are $1.2M annually.

COSTS

Refining the workload study methodology and performing the first study under the new method requires dedicating a team of subject matter experts, representing the crafts to be studied, and analysts for 4-6 months at an estimated cost of $300k. The implementation effort will consist of three primary steps:

- Defining those work activities which account for 90% of the work
- Assessing the value of each activity identified
- Calibrating those identified activities' time requirements
- Refining the workload model to one that is predictive

RECOMMENDATION

Develop a structure for guiding work sourcing decisions

CURRENT STATE ISSUE

Many major capital projects are currently contracted today. Contracting is not coupled with a robust work planning function forcing contracting decisions to be made late in the process resulting in a 10 percent to 15 percent premium on the contracts.

SOLUTION

Use a formal outsourcing decision process/ framework to identify and implement outsourcing opportunities and potential customer alliances to control maintenance expenses.

- Establish a formal outsourcing decision process/framework by merging the formal existing processes of the Cost Benefit Analysis, the Agency Risk Analysis, and the Agency Decision Framework into a single predefined methodology tied solidly to the Agencies Business Strategy.
- The outsourcing decision framework should be applied in the workload studies and management's decisions in developing a staffing strategy.
- In those areas where the methodology consistently indicates the use of outsourcing, we should establish master agreements and work to remove barriers in policy and practices to streamline the outsourcing process.
- Develop an Alliance policy by identifying a few strategic contracting partners

ASSUMPTIONS AND BENEFITS

By applying a consistent and repeatable decision framework we can better assure that our decisions to outsource work have been balanced against the risk, costs and benefits.

- Keep our crews at optimal levels while giving better assurance we are prepared to accomplish the critical work during the peak workload periods, thereby, minimizing the need to add staff that would only be fully utilized during peak periods and preventing the Agency from incurring a potential increase in expense costs as a result of adding BFTE in lieu of outsourcing.
- Potentially allow us to get more work done by more effective use of our existing crews, resulting in a safer and more reliable transmission system

- Achieve quicker response time (improve SAIDI) for those stations located greater distances from the O&M crews in emergency situations and save on overtime and travel costs
- As work requirements increase, TF will look for work tasks that generally occur either over a short duration of time annually or those which are difficult to staff because of remoteness and look to outsourcing and client alliances (primarily with other major utilities) to fill the need.
- Outsource solutions can on a job by job basis cost more, but when compared to adding new BFTEs with lower potential utilization of a BFTE make the outsourcing solution very cost effective.

The expected annual savings on both capital and expense contracting are $612K and $47K respectively. This is based a 12.5% 2005 base of $4.9M for capital and $375K for expense work.

COSTS

The cost to develop this program once the planning and scheduling process is developed is estimated to be $120K.

RECOMMENDATION

Expand the use of the Field Information Network (FIN)

CURRENT STATE ISSUE

FIN provides SPC personnel with the ability to evaluate relay information about an event and program relay setting from their office desk. The ability to remotely obtain event information quickly hastens the restoration effort. The impact of FIN is a reduction in travel time to and from substations for SPC personnel and can range from four to six hours. The FIN project is slowly being implemented in an "opportunistic" fashion. The FIN has been under development for several years and typically has been one of the lower priority projects.

SOLUTION

Expedite the Field Information Network (FIN) project at a rate that ensures the agency gains the benefits from it before the technology is replaced. Specifically the team recommended:

- Short-Term: Train appropriate personnel on how to access relay information from their district headquarters where the FIN, or other legacy system, is available.
- Long-Term: Fund and execute an overall coordinated implementation plan to extend the (FIN) throughout BPA. Additionally, install a Database Server on the FIN that can push, through a firewall, valuable data to the BPA administrative network. This data can then have wide spread distribution without providing any widespread access to the BPA power system equipment through the FIN. A comprehensive design for the FIN has already been developed but lacks a plan that has been approved for funding.

ASSUMPTIONS AND BENEFITS

- FIN significantly reduces field response and repair time (improves SAIDI) by providing operational and maintenance information resulting in reduced expense costs and revenue losses.
- Improvement in the security of power system equipment, i.e. internal secure network;
- Lowered cost for implementation of the FIN;
- A more usable network that is faster resulting in reduction in legacy equipment;
- Quicker data for our dispatchers enabling them to get basic fault location data and pass it on to TLM crews which could speed up the repair on transmission lines.;

- Potential to save significant hours for operations staff through remote hold orders freeing them up for more critical tasks. It is estimated that there are 1600 hold orders each year with each hold order taking on average 2 hour commitment including travel and associated switching to accomplish that equates to nearly 2 FTE savings annually.;
- Reduced costs for call-outs of multiple crafts when Operations and SPC are trained how to access relay information.
- SPC personnel must travel monthly to substations to check relays and perform fault analysis when FIN is not installed. Per twelve substations this can amount to $49K efficiency savings annually.

COSTS

The current cost to install FIN on an “opportunistic” basis is $28K per installation. With a formal plan Supply Chain could negotiate better pricing on the equipment.

RECOMMENDATION

Formally introduce O&M knowledge into capital planning, design and replacement projects

CURRENT STATE ISSUE

The lack of early involvement by O&M in the capital project process costs the Agency significant capital and expense dollars. As documented by sub-team #17 (PSC/SPC Engineering Function Review Team) in its Current State review of BES reports obtained through the RCM group, SPC and PSC engineers spent a significant portion of their time, up to 50 percent and 40 percent respectively, troubleshooting new designs in the field. Unwarranted O&M expense occurs when O&M performs preventative maintenance on equipment and a capital project is let after the fact to replace the equipment.

SOLUTION

Become a strategic partner with planning, design and standards to develop an input, review and decision process for future installations and equipment specifications. Support TBL's Planning, Design and Standards functions by ensuring they understand the true cost of ownership (operation and maintenance) when considering adding new or different technology to the system. Provide design with integration support during design.

ASSUMPTIONS AND BENEFITS

More informed capital investment decisions. Better understanding of future O&M resource needs. Transmission Field Services will be better prepared to support the capital projects and/or know how and where to place crews in the future.

As equipment in the field becomes more consistent the level of training required and the cost of maintaining this equipment should lead to a two to three percent savings in overall maintenance and training costs. These dollars could then be re-invested to address lower priority system issues.

Reduce the number of red line drawings created by designs that didn't reflect the existing substation conditions during the planning and design process.

Eliminate maintenance work that is going to be unnecessary as a result of future upgrades. This typically occurs 10% of the time. The annual maintenance savings could amount to $761K based on the total maintenance spend.

These additional expenses are associated with the field engineers having to complete the design work in the field which entails a significant amount of troubleshoots on capital projects. The capital savings is estimated to amount to $221K annually.

COSTS

The cost to develop the strategic partnership process is estimated to be $120K.

RECOMMENDATION

Wireless Installation and Maintenance

CURRENT STATE ISSUE

Wireless installations for BPA external customers' wireless communication systems on BPA transmission towers represent a BPA revenue source and a contractual and regulatory commitment with BPA customers. Installation, maintenance and upgrades for BPA external customers' wireless communication systems on BPA transmission towers are difficult to schedule and complete. A backlog of contractual required wireless installations is increasing because an outage is required for current installation designs and methods. In addition, wireless installations are not considered priority TF work. The backlog represents a loss of revenue to BPA from the leased installation, an increasing contractual liability, and potential loss of Customer and community trust.

SOLUTION

Implement a program for wireless installations including higher priority for wireless installations, dedicated BPA installation team, alternative new installation designs and methods, and outsourcing installation to external companies. This program working with the new Planner/Scheduler function will be able to coordinate outages and resources reduce existing backlog and respond to new installation requests.

ASSUMPTIONS AND BENEFITS

$225,000 increase in annual BPA revenue will result from reduction of wireless installation backlog. Complete installation and generate revenue within 12 months of new wireless installation requests from external customers.

Assumptions/Calculation:

Revenue from Current Backlog:

- Current backlog – 15 wireless installations
- Revenue, Leasing - $15, 000 per year per installation
- Revenue from reducing backlog - $225,000 per year (15 x $15,000 per year)

Revenue from New Installation Requests:

- Estimate new installation requests – 5 to 7 per year based on past history
- Revenue, Leasing - $15, 000 per year per installation
- Revenue from new installation requests - $90,000 per year (6 installations x $15,000 per year)

Cost of new program and processes:

The recommendation will not generate significant incremental costs above the normal O&M activities and processes. New installation requests represent a 0.3% increase in BPA line crew work orders.

All BPA wireless installation costs (for BPA personnel and/or contractors) are 100% reimbursable to BPA by the external customers.

COSTS

There is no implementation cost associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

O&M Planning and Evaluation

CURRENT STATE ISSUE

TF O&M management of the health of the BPA network faces 3 challenges: Limited resources, aging of vital transmission physical assets and pressure to reduce frequency and duration of planned outages. If not managed effectively, they have the overall effect of driving-up O&M costs, degrading system reliability, reducing revenue, and generating customer dissatisfaction. The current maintenance planning, prioritization, scheduling, and evaluation are fractured and inconsistent within BPA O&M. BPA cannot demonstrate that its resources are being appropriately applied to optimizing system reliability and managing the risk to the system. Addressing this situation necessitates having a well structured and comprehensive resources planning process. Key information, formalized processes and standards for measuring transmission assets' conditions, maintenance work levels and craft performance essential to supporting the planning and scheduling function are incomplete.

SOLUTION

Implement a Planning, Scheduling, and Analysis function including new System Planning/Evaluation manager and region-level Planner/Schedulers; a prioritization process based on regulatory (WECC & OB19 mandates), criticality, health, risk considerations, and customer service implications; and Information Management and Scheduling solutions. The new function will provide BPA with the information, standards, solutions, and staffing to analyze, report, and manage the performance of the O&M programs and crafts.

ASSUMPTIONS AND BENEFITS

The Prioritization, Scheduling, and Analysis function will provide information for improved decisions on O&M programs and resources, will increase the efficiency of the craft with improve scheduling, and will reduce the number and duration of planned outage with scheduling and coordination of crafts.

This recommendation is a complementing element of recommendations from the O&M Organization Alignment (Team C) and the O&M Work Planning (Team D) teams. The benefits and costs associated with the implementation of this recommendation are outlined in the Teams C and D reports.

Based on the O&M Core Team and Sub-team reviews, the benefits and costs are reported as benefits and costs for Team C and D recommendations.

COSTS

Implementation costs associated with this recommendation are accounted for in other O&M EPIP recommendations. Costs for the specific roles are addressed in the recommendation "*Create a planner/scheduler function"*. Costs for the work planning tool are addressed in the recommendation *"Install a work planning tool"*. Costs for the process to be developed are addressed in the recommendation *"Work planning and evaluation – Internal Operations"*.

RECOMMENDATION

Diagnostic Service Special Equipment

CURRENT STATE ISSUE

Reviews of the needs, costs, and benefits of O&M equipment is not consistently conducted by BPA. BPA leases 29 Doble Power Tests sets for the districts crews and training when a lower number of sets could satisfy the planned workload.

SOLUTION

Require a formalized evaluation of the needs, costs, and benefits of leased and purchased O&M equipment. The evaluations are to be conducted when current leases are renewed and new purchases/leases are budgeted. If sharing of O&M equipment between districts or crews is required, a coordination and exchange process will be established to support the craft work schedules. The coordination/exchange process could be incorporated into the O&M Planning and Scheduling process. Renewing the Doble Test set lease with a reduction in leased sets will achieve immediate savings and establish the evaluation process for additional reductions in O&M equipment expenses.

ASSUMPTIONS AND BENEFITS

Power factor tests set leases with the Doble Engineering Company is scheduled for renewal in November 2006. Twenty-nine (29) Doble test sets are assigned to the districts, the Laboratory field test unit, and to Test and Energization (T&E) unit. During the past several years, many of the oil insulated equipment and air blast circuit breakers have been replaced with equipment that does not require power factor testing. Also, scheduled maintenance and testing intervals have been extended which requires fewer scheduled tests each year (200 scheduled power factor tests over next 12 months).

Assumptions / Calculations

Current lease - 29 units at $352,000 annually

The O&M Sub-team estimated the maintenance need at 21 units (30% reduction) to be shared between districts, Laboratory field test unit, and Test and Energization unit.

Estimated Net savings - $90,000 per year (for Doble test sets)

The O&M Sub-team estimated the net savings after reviewing and considering lease costs savings, shared equipment costs of coordination/exchange, and other considerations. Additional savings may be achieved as other current equipment leases are reviewed.

COSTS

There are no implementation costs associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

Fiber Splicing Team

CURRENT STATE ISSUE

As BPA continues to lose radio frequencies due to federal sale of those frequencies, the fiber circuits for critical circuits and their repair will become a critical priority. Fiber circuit installation and repair requires a good deal of practice and a specific skill set to achieve the appropriate quality of light transmission and crew productive. Establishing and maintaining the required skill level in all line personnel is not practical because the workload level of BPA System does not provide sufficient "hands on" experience.

SOLUTION

Establish dedicated teams of select BPA line personnel and external contractors with the specific skills to achieve the required quality of light transmission repair and installations and to increase the crews' efficiency. The external contractors will be used to supplement the BPA specialists when necessary. External contractors selected must be capable of satisfying BPA response times for repairs and at BPA established comparable costs. A combination of skilled BPA line personnel and qualified external contractors will provide BPA the critical skills to maintain the fiber circuits at reasonable costs.

ASSUMPTIONS AND BENEFITS

The combination of BPA line personnel specialist and external contractors will increase the efficiency of splicing crews, reduce BPA training costs, maintain within BPA the high level of expertise required, and increase system reliability.

Estimated Benefits and Costs

The estimated benefits and costs result from increased work crew efficiency and avoided costs in training.

Annual fiber splicing training course consists of 4 days (3, 8 hours days and 1 day of travel). Reducing the annual fiber splicing training requirements from 20 personnel to 6-8 specialists will result in savings in man-hours and direct costs (equivalent to 0.25 FTE). An estimated 30% to 35% increase in work crew efficiency results from using personnel with specialized skills and proven experience (equivalent to 0.25 FTE). After considering and being unable to quantify other potential savings and cost impacts (such as travel) of using specialists to support the work crews, the O&M Core and sub-team estimated a conservative Net Savings of 0.25 FTE or $25,000 per year (50% of quantified training and efficiency savings).

Costs

There is no implementation cost associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

Power Transformer Specialty Team

CURRENT STATE ISSUE

There are approximately 600 power transformers installed on the system. On average, they require a complete service approximately every 30 years, or about 20 complete services per year. Transformer complete services involve technical and environmental issues including complete re-gasket, bushing and pump replacements, diagnostic testing, and reconditioning the insulating oil. Because of the service's complexity, limited district maintenance resources, and higher maintenance priorities, the complete maintenance services have been postponed on a large number of transformers. Extended maintenance cycles increases the potential risks of unplanned transformer outages including catastrophic failure and increases O&M costs.

SOLUTION

Establish a designated maintenance team to supplement the district maintenance crews for transformer complete services. The Central Electric Services Ross Complex Staff sub-group, Untanking Tower Crew, has the skills, experience, and tools required for this specialized maintenance work. When requested in the past, the Untanking Tower Crew assisted district maintenance crew with transformer maintenance. An additional resource for the designated transformer maintenance team would be the Laboratory Field Test group for transformer electrical testing.

ASSUMPTIONS AND BENEFITS

A designated specialized transformer maintenance team would provide the skills and resources required to complete the required transformer maintenance. A specialize and experienced crew would increase the efficiency of the maintenance and reduce the transformer outage duration. Eliminating the practice of extended transformer maintenance cycles will reduce the potential risk of unplanned transformer outages.

Estimated Benefits and Costs:

The estimated benefits and costs result from increased work crew efficiency, travel, reduced outage transformer durations, and reduced risks of unplanned transformer outages.

The estimated average transformer complete service requires 900 man-hours over 23 days. Using personnel with specialized skills and proven experience results in an estimated 10% to 15% increase in work crew efficiency. A dedicated crew would permit restoring a normal transformer maintenance cycle (every 30 years or 20 transformers per year). After considering both quantified (efficiency) and unquantified (travel, outage duration, etc.) potential savings and cost impacts, the O&M Core and sub-team estimated a conservative net savings of 1.0 FTE or $100,000/yr.

Costs

There is no implementation cost associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

Align Transmission Field Services to refocus on system priorities and place management closer to the field forces and customers

CURRENT STATE ISSUE

Currently, the seven regions function in decentralized manner and determine how best to complete their required preventative maintenance. The current structure can increase O&M expense as a result of craft delays caused by timeliness of decisions. The decentralized approach to work planning doesn't support minimizing the number of planned outages across the system. Since the RMs generally have a large span of control, most of their time is devoted to tactical operations. The TF management lacks a strong strategic staff to evaluate future threats and opportunities resulting in the Agency being out of compliance with emerging mandatory reliability criteria.

SOLUTION

Reorganize Transmission Field Services to reduce the number of regions to two, each led by a Tier III O&M Manager. Create 12 O&M Districts, within the two organizations, each led by a Tier IV District O&M Manager. The current plan locates the O&M Managers in the Vancouver Area to support policy and strategy. During implementation analysis we will evaluate the risks and benefits of this location in light of the Continuity of Operations Plan (COOP), customer support, etc. The District O&M Manager positions would be located in the field at the District Headquarter locations.

ASSUMPTIONS AND BENEFITS

The new configuration will provide the following benefits in support of the O&M objectives:

- Ensure a system wide perspective is applied across the system
- Locate management closer to the crews to eliminate any obstacles impeding their work
- Provide central structure for the new planning and scheduling process
- Focus more management attention on understanding the full impact of the preventative maintenance program
- Provide a more robust environment for succession planning
- Ensure critical administrative tasks are being performed in the most cost effective manner
- Permit a forward-looking combined construction and O&M resource plan to identify critical staffing situations earlier in the work planning cycle

Assumptions:

There are net BFTE savings for this recommendation. Detailed position changes are documented in the Team C report. There are two types of savings:

- $584K in admin personnel savings from the restructuring only
- $735K in productivity improvements by providing closer supervision. Industry range is from 2% to 5%, the team chose to use 3%.

COSTS

- Implementation planning costs are $184K
- Other implementation costs for any personnel moves to fill key manager roles will be determined during implementation when the management team is identified.

RECOMMENDATION

Extend the use of equipment pooling - Internal Operations

CURRENT STATE ISSUE

The management of major tools and equipment is fragmented between the Tools & Equipment Acquisition Program (TEAP) committee responsible for determining what equipment (vehicles, major mobile and test equipment) is purchased annually, and the various groups who manage the pools of equipment across the system. The budget for TEAP ranges from $3M to $5M. It is estimated that TF can save $300K annually through better coordination of these two activities, by improving the utilization on the individual pieces and concurrently reducing their numbers.

SOLUTION

In the future state, TEAP equipment will be held in pools across the system. District personnel will draw equipment from the pool and will be charged a daily rate. By making the costs visible and the District's responsibility, the Districts will be more inclined to return the equipment to the pool. Annually, the manager of the pool will evaluate the equipment use and condition to determine when to replace or add more units to the pool. The goal is to drive the usage rate up and minimize the number of units setting in the pool, thereby reducing the annual major equipment spend.

ASSUMPTIONS AND BENEFITS

Equipment utilization will increase and the need to buy additional units will decline. If the annually capital budget is $3M to $5M the estimated capital savings is $300K of deferred purchases.

COSTS

The implementation cost of $200K will be to design and locate the individual pools, develop utilization targets, rental charging process and policies, replacement tools and polices and the formal annual program to retire and replace equipment.

RECOMMENDATION

Work Planning & Evaluation - Internal Operations

CURRENT STATE ISSUE

There is no coordinated work planning function within the TF organization today. The impact of this lack of coordination means that resources are not being fully optimized, potentially resulting in increased number of planned outages and increased capital and maintenance expenses. This is evidenced by the regions independently requesting outages on the same lines for preventative maintenance work. This has allowed transmission lines to be removed from service more than one time per year. There is also no centralized formal evaluation of the TF maintenance programs. The current RCM group gathers and reports data associated with maintenance activities. However, there is insufficient subsequent analysis of that data to proactively provide information that supports O&M programs.

SOLUTION

Create a Work Planning and Evaluation function, which includes the following functions: RCM, maintenance and construction integration, system-wide planning and scheduling, and system data analysis. This will require establishing a Work Planning and Evaluation Manager (WEM) and two Planner/Scheduler positions. The Work Planning & Evaluation Group under the Internal Operations Manager will:

- Be responsible for producing TF's combined O&M and capital work plans annually. This will provide TF management with a complete picture of the use of its resources and allow early identification of constraints.
- Oversee the proposed work on transmission paths that cross district boundaries to ensure it is well coordinated. It is expected that this group will also coordinate any construction work with the maintenance to further reduce planned outages. In the future, the group will reach out to its generation partners to further coordinate transmission planned outages with planned generation outages.

ASSUMPTIONS AND BENEFITS

This system approach to planning and scheduling will lead to:

- Strategic coordination of equipment outages will result in increased productivity and system availability;
- More effective facilitation of resource sharing between Districts;
- Less customer impact caused by redundant outages; and
- Earlier identification of outsourcing opportunities, which will support effective resource balancing.

The savings for this were captured in Team D - Planning & Scheduling.

COSTS

In conjunction with Team D's implementation the following requirements will be developed:

- Develop a construction and maintenance integration plan process,
- Develop a maintenance program evaluation tool incorporating RCM,
- define resource requirement triggers, and
- Develop associated policies.

The additional cost to develop these elements will be $300K.

RECOMMENDATION

Adopt a formal work planning policy

CURRENT STATE ISSUE

Field Services has not established an overall priority structure for work. WECC and Significant Equipment OB-19 are the only priorities agreed to by all parties; however, a large percentage of the work does not fall into these categories. The Eugene Region has developed a priority structure called the Rainbow Chart that has worked in that region, but other regions do not use this priority structure. Each group – including those outside of Field Services, have their own view of the priorities and of course, their work is the most important.

SOLUTION

Implement a priority structure, similar to the Eugene Region Rainbow Chart, for all of TF. TF management will set this priority structure and will be followed for the duration of the fiscal year. TF management will review and evaluate the priorities each year to ensure priorities are consistent with agency direction – recognizing there may be exceptions throughout the year.

ASSUMPTIONS AND BENEFITS

The work planning policies will expect to provide the following benefits in support of the O&M objectives:

- System-wide perspective for planning and scheduling work.
- Strategic approach to planning outages in order to accomplish the integrated work plan.
- Measure to resolve scheduling conflicts caused by constrained resources.
- Framework for communicating and tracking work that is deferred due to insufficient resources.

The associated savings for this recommendation are expected to be largely non-quantifiable.

COSTS

- Minimal

RECOMMENDATION

Create a Planner/Scheduler function

CURRENT STATE ISSUE

Each portion of the TF work planning and scheduling process is performed independently by craft and field supervisors, in part due to lack of clarity of process or system prioritization, with little or no formal coordination. In other cases work planning and scheduling is inconsistent and incomplete. There is no system-wide coordinated, synchronized effort to maximize outage opportunities and minimize repeated outages. This process has evolved by itself, with no formal strategy. TOE Capital and Reimbursable Work Plans are developed independently of TF work plans and are not coordinated to best utilize available resources relating to projects.

SOLUTION

Implement planner/schedulers at central field locations and resource specialists at central locations. The planner/scheduler positions would provide a more strategic approach to system outages by prioritizing and combining outage requests that would increase system availability. It is not anticipated the planner/scheduler would schedule 100 percent of the crew's available work time, but work collaboratively with the field supervisors and central planner/scheduler to plan and schedule outages, projects and resources. The resource specialists would work in concert with the planner/scheduler by ensuring the crafts are trained and equipped with appropriate tools and equipment to perform the work at hand.

ASSUMPTIONS AND BENEFITS

The planner/scheduler function will provide the following benefits in support of the O&M objectives:

- More strategic approach to outages
- Prioritization of outage requests by the Planner/Schedulers
- Reduction in the number of scheduled outages
- The savings from the reductions in overtime, unplanned and unscheduled work and backlog are estimated to be $2.2M annually

COSTS

The costs for these individuals are captured in CI as part of the restructuring effort.

RECOMMENDATION

Install a work planning tool

CURRENT STATE ISSUE

BPA employees cannot see all operations, maintenance, and construction work scheduled for any given time period. As a result, work is not planned as effectively as possible and multiple outages are scheduled for the same line. Employees involved in work planning and scheduling have developed partial solutions (e.g., Excel, Project, reports, etc.) to see this work, but the plans are incomplete and require a tremendous investment in time and effort to keep current. Bottom line – current tools are not working.

SOLUTION

Team D recommends that BPA either build or acquire a planning/scheduling tool.

ASSUMPTIONS AND BENEFITS

The work planning tool will provide the following benefits in support of the O&M objectives:

- Provide benefits of $2.2 M already identified in recommendation D2
- Work scheduling tool would reduced overtime due to lack of planned and scheduled work visibility
- Work scheduling tool used by the planner/scheduler would reduce time spent by supervisors on scheduling work.
- Work schedules could be viewed from a system-wide perspective.
- Work scheduling tool would provide a strategic approach to planning outages in order to accomplish the integrated work plan.

COSTS

- Implementation costs are estimated at $1.4 M

RECOMMENDATION

Centralization of Vegetation and Access Road Management Programs

CURRENT STATE ISSUE

Vegetation is a root cause of cascading outages in the United States. Targeted vegetation removal both on and off the right of way done efficiently and effectively enhances the protection of the system. Effective and efficient vegetation management requires that several functions be performed very well and that they be tightly coordinated for maximum effect. These include aerial inspection, land based inspection and tree marking and vegetation removal by employees and contract service providers. The current Vegetation and Access Road management and responsibility matrix of policy authors, performance managers, BPA crews, and external contractors results in inconsistent programs, processes, and performance across the regions. This approach inhibits the identification and implementation of performance improvements and increases the risk of vegetation caused unplanned outages.

SOLUTION

Establish a single centralized Vegetation Management group responsible for policies, standards, practices, budget and execution of the BPA Vegetation Management program (Vegetation Management, Danger Tree Management and Access Road Management). Reducing overlapping lines of authority and responsibilities will focus the Vegetation and Access Road programs and their ability to achieve greater consistency across the system.

ASSUMPTIONS AND BENEFITS

The Vegetation and Access Road Management program will be re-organized with a “One BPA” system-wide focus. The re-organization of the Vegetation and Access Road Management programs will change to the roles and responsibilities of the Program Manager, Natural Resources Specialists (NSRs), and Right of Way Specialists (ROWs) and over time, the staffing levels. The re-organization will result in lower programs costs through reduced management, increased efficiencies, and transition to a new combination of NSR and ROW skills. The new organization and optimized standard practices will reduce the potential risk of vegetation caused unplanned outages.

Staffing Skill Levels

The O&M Core and sub-team envision programs with NSRs and ROWs having Right of Way area responsibilities and working across districts. The transition to the appropriate staffing combination of NSRs and ROWs will occur over time and through attrition. The teams estimated the staffing would change from 8 NRSs / 1 ROW to 5 NRSs / 5 ROWs and result in an estimated savings $70,000 per year.

Management Oversight and Efficiencies

Currently multiple managers are involved in setting programs policies and oversight of the NRSs, ROWs, and contractors. Establishing a single line of responsibility and oversight will result in efficiencies in management and field performance. After reviewing the savings and costs factors, the O&M Core and Sub-team estimated a minimum net savings of 0.1 FTE or $10,000 per year will be achieved.

COSTS

There is no implementation cost associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

Vegetation Program Contract Process

CURRENT STATE ISSUE

The Vegetation Management Program and Supply Chain contracting policies, practices, decisions, and resources are not being optimized to achieve a reduction in contractor's fees and internal BPA contracting costs. The current practices have resulted in reduced contractor competition, inconsistent services costs, and unnecessary internal contact costs.

SOLUTION

Use the available tools identified in the Bonneville Purchasing Instructions (BPI) and multi-year budgeting to optimize Vegetation Management Program performance and costs (both internal BPA and Contractors). The Vegetation Management Program and Supply Chain will reduce Vegetation program costs by reducing the number of contracts issued, increasing the scope and economy of scale for contractors, and issuing long-term contracts.

ASSUMPTIONS AND BENEFITS

Over 300 vegetation program contracts are issued annually with over 40% for $3,500 or less. Changes in Vegetation program contracting practices will result in internal efficiency savings and lower contractor expenses. The Supply Chain EPIP has estimated a combined total 12% savings resulting from efficiencies and lower contractors' costs across BPA. Based on discussions with the BPA Supply Chain EPIP and vegetation contractors, the O&M sub-team estimates the savings in vegetation contractors saving could be higher than Supply Chain EPIP's estimate and in the range of 6% to over 15%.

The Supply Chain EPIP have establish within their project scope the estimated benefits and costs for recommendation for changes in contracting policies and practices. To prevent actual and perceived overlapping benefits and savings of EPIP initiatives, the O&M Core and Sub-team decided not to include the savings for vegetation contracting.

The Vegetation Programs will work with the Supply Chain EPIP to maximize the efficiency and savings in contracting vegetation services.

COSTS

There is no implementation cost associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

Access Road Rights and Recordation

CURRENT STATE ISSUE

Unimpaired access to BPA's transmission facilities is critical to maintaining system reliability and reducing the duration of outages. BPA's Access Road System primarily uses written/recorded legally described rights for its Access Road Program. However, many field personnel have secured unrecorded verbal/handshake agreements with landowners that may have no lasting use beyond the immediate use at the time. There is no system wide inventory of these verbal agreements and the access route locations. BPA's access to its transmission facilities is impacted by delays in locating access paths when the information is not readily available to all crews and contractors. Landowner issues develop when BPA crew do not use the agreed access routes. In the future, the access road information will be potentially lost though BPA retirements.

SOLUTION

Document "verbal/handshake" and other access right agreements in a TLM application, tied to GIS for distribution to field personnel. BPA will work with the landowners to execute access agreements satisfying landowners'' concerns and BPS transmission maintenance needs. With access rights and path locations documented and available, the field crews will have unimpaired access to BPA transmission facilities to maintain system reliability or respond to unplanned outages.

ASSUMPTIONS AND BENEFITS

The benefits of documenting and communication access rights and road locations are reducing field crew delays locating and using proper access roads and eliminating the conflicts between field crews and landowners. The O&M sub-team reviewed the recommendations, benefits, and costs with field crew foremen and other field personnel. The general consensus is that the recommendation would save delay and travel times for field crews (estimates of 5 to 10 minutes per week), improve access, and improve relations with landowners.

The costs of information collection, TLM application, and GIS are incorporated in the existing BPA programs or can be incorporated in to current practices without significant impacts.

The O&M Core and sub-team estimated a net savings of 1 FTE or $100,000 per year resulting from the time savings of over 300 field personnel dependent on access road information (5 to 10 minutes per week)

COSTS

There is no implementation cost associated with this solution. Based on the O&M Core Team and Sub-team review, the implementation can be accomplished within the normal activities and budgets for O&M.

RECOMMENDATION

Install a substation and microwave data portal

CURRENT STATE ISSUE

Because of the large number of separate information systems and equipment databases, it is difficult to determine the asset health of substation and microwave equipment. To access information on substation and microwave site equipment, users must access multiple systems and databases. It is time consuming for the users to access all the information. Users have to stay current on all the applications they may need to do their job. When time is limited, users cannot get all the information they need to make the best decision. When users need to enter or edit information for a piece of equipment, they frequently need to enter that same information in multiple systems. Duplicate data entry wastes time and increases the chance of error during data entry. There are time delays in updating information among systems, therefore data sources can be out of sync and may contain conflicting data.

SOLUTION

Build a Cascade-based platform that will link/integrate related databases and allow a single point of access for substation and microwave site information and data entry wherever cost effective. Explore the possibility of reducing the number of like or related databases to reduce database maintenance and promote ease of use. BPA owns Cascade and a significant portion of the substation equipment information is loaded.

ASSUMPTIONS AND BENEFITS

The substation and microwave data portal will provide the following benefits in support of the O&M objectives:

- Provide benefits totaling $7.4 M results from field supervisors and craftsmen spending less time searching for the needed information
- Supports TBL Flight Plan Goal – Mission and Business critical information is reliable, consistent, and useful.
- Reduced time on data entry
- Reduced duration of emergency outages due to less time spent researching information

COSTS

- Implementation costs of $1.6 M

RECOMMENDATION

Install a transmission corridor portal

CURRENT STATE ISSUE

Because of the large number of separate information systems and equipment databases, it is difficult to determine the asset health of transmission system equipment. Requiring users to access multiple systems to obtain all the necessary information to successfully execute their work is an inefficient use of employee's time. Likewise, requiring users to enter duplicate data in multiple systems is an inefficient use of employee's time and compromises the quality of critical equipment and asset health information.

SOLUTION

Build a GIS-based platform using in-house or vendor provided software that will link/integrate related databases and allow single point of access for line and right-of-way information and data entry wherever cost effective. Explore the possibility of reducing the number of like or related databases to reduce database maintenance and promote ease of use.

ASSUMPTIONS AND BENEFITS

The transmission corridor portal will provide the following benefits in support of the O&M objectives:

- Benefits of $3.7 M, from reduced time being spent entering and researching data by engineers, field supervisors and craftsmen
- Supports TBL Flight Plan Goal – Mission and Business critical information is reliable, consistent, and useful.
- Reduced time accessing information
- Reduced time on data entry
- Reduced duration of emergency outages due to less time spent researching information

COSTS

- Implementation costs of $1.6 M

RECOMMENDATION

Institute a formal process for data stewardship

CURRENT STATE ISSUE

Decisions are being made using O&M data, without the benefit of consistent and clear roles and responsibilities for data entry, data integrity, and data stewardship. Employees do not see a direct value of the O&M data and express increasing frustration for the amount of time spent entering the data. Even within the processes for data entry, expected roles and responsibilities are not consistently followed or enforced.

Very few positions contain specific performance elements related to data entry and integrity. The TBL Balanced Scorecard does contain an ellipse describing "reliable, consistent, and useful data" but this initiative does not flow down through the entire organization. For those responsible for oversight of the data stewardship program itself, this element is only a collateral duty, often receiving a lower priority relative to other duties.

Finally, BPA collects vast quantities of data, but does not ask if it is the right data. BPA is "data rich, but information poor". Without the emphasis on collecting the right data, it is difficult for employees to see the value of the time spent collecting and entering the O&M data.

SOLUTION

Develop and implement a standardized data stewardship program within both TBL and across BPA. Team F's Appendix B lists essential tasks that were identified through the O&M EPIP current state and need to be incorporated within the standardized data stewardship program.

ASSUMPTIONS AND BENEFITS

The data stewardship program will provide the following benefits in support of the O&M objectives and other O&M EPIP recommendations:

- Data is accurate, reliable, and timely.
- Supports strategic objective of OMB A-123 compliance.
- Shift employee time from data compilation and verification (technical) to actual analysis (operational).
- Data stewardship provides a key foundation for successful asset management.
- Promotes more informed decisions and reduced risk in decision making with accurate, complete, and consistent information.

COSTS

- $150K to support the development of a formal data stewardship process.

RECOMMENDATION

Provide useful KPIs and PIs to all TF management levels

CURRENT STATE ISSUE

The current list of formal KPIs and PIs related to O&M is insufficient in both scope and organizational depth to enable effective management of the operation and maintenance of the transmission system. We collect enormous amounts of data, but we are not consolidating it into a usable form for decision making. We are “data rich and information poor.”

SOLUTION

TF and Asset Management validate and implement a portfolio of O&M KPIs and PIs (based on the list in the data team’s current state report appendix) that drives performance improvement in Maintenance (Substation Maintenance, Transmission Line Maintenance, System Protection Control, Power System Control, Non-Electric Plant, Heavy Mobile Equipment Maintenance), and Substation Operations functions.

ASSUMPTIONS AND BENEFITS

The work planning policy will provide the following benefits in support of the O&M objectives:

- Visibility of performance—“what gets measured, gets done”.
- Clear line-of-sight by operational personnel to agency strategic objectives—an understanding of how their work fits into the big picture.
- Ability for O&M management and functional analysts to view performance results at appropriate levels for their work requirements with drill down to additional details when required.

COSTS

- KPIs and PIs will be validated and implemented overtime.
- Implementation costs for identifying and gathering the data for calculating the KPIs is estimated at $490K for the complete portfolio.

RECOMMENDATION

Form a joint Field-IT team

CURRENT STATE ISSUE

There is a disconnect between standard IT solutions and field needs. Although TF field employees make up approximately 40 percent of TBL and 25 percent of the agency, they do not have a collective voice in regard to IT solutions for their unique work environment. Rather the perception is that what works in the Portland/Vancouver area will work in the field and in some instances that the field does not require the same level of IT equipment or connectivity that is required in headquarters.

There are many J projects to support TF with information technology in the field, but there is no overall vision and little coordination. Also J and TF need to discuss the unique operating needs of field deployed, remote users, not just in the short-term, but over time as new technology emerges that could enhance field efficiencies.

SOLUTION

Form a joint team to monitor existing and new information technology and policies that impact O&M field resources. This team will be comprised of O&M management, field and IT representatives from the TF and J organizations. This team will recommend additions, enhancements, or removal of information technology used in the field looking at best commercial IT practices. This team will also review policies that can improve the field resources' ability to effectively use information technology.

ASSUMPTIONS AND BENEFITS

The joint field-IT team will provide the following benefits in support of the O&M objectives:

- Keeps BPA up with the best commercial IT technology and practices for field deployed, remote users.
- Increase efficiency and productivity by meeting the needs of field deployed, remote users.
- Long-term cost savings (reduced travel, delays waiting for information).
- More effective allocation of IT dollars to support field users.
- Enhancement of the cultural connection with headquarters as leading edge technology can reduce the isolation of remote users through communication improvements (e.g. net meeting, video conferencing).

COSTS

- There are no implementation costs associated with this recommendation.

RECOMMENDATION

Enhance fixed connectivity

CURRENT STATE ISSUE

BPA's employees in field offices outside the Portland/Vancouver area routinely large delays in query response times, screen refresh rates, log on difficulties, and system timeouts accessing BPA's business information systems. These performance issues result in lost work, reduced productivity, and increased user frustration. These issues may also occur in the Portland/Vancouver area, but when field employees come to Portland/Vancouver, they are envious of system response times.

BPA makes limited use of video conferencing and distance learning technology to improve communication with field offices or reduce administrative travel.

SOLUTION

The recommendation has two components. The first component is to implement video conferencing between the 12 new district offices and the Ross Complex. Video conferencing will improve communication between TF senior management and the district offices. It also provides opportunities for distance learning and increasing the fields' contact with activities in Portland/Vancouver.

The second component is to have J and TF to work jointly to identify the underlying issues that are degrading system performance at field offices, develop a phased plan to solve them, communicate the plan to the field offices, and then implement the plan. This could be accomplished within the existing J and TF organizations or it could be passed to the Joint Field-IT Team proposed in recommendation F-5.

ASSUMPTIONS AND BENEFITS

Improving fixed connectivity will provide the following benefits in support of the O&M objectives:

- Benefits of $420K
- Reduce the disconnect between Portland/Vancouver and the rest of BPA
- Make services available to field employees that are currently only available in Portland/Vancouver (retirement seminars, etc.)
- Improved productivity for BPA employees in field offices. Heavy users of BPA information systems such as Cost Analysts, Maintenance Assistants, Planner/Schedulers, Resource Specialists, Office Managers and Clerks could see a substantial improvement in productivity.

COSTS

- Implementation costs for video conferencing is estimated at $233K

Appendix B: TF O&M Performance Indicators – Current and Recommended Additions

Performance Indicators for measuring and report on BPA Transmission System and TF O&M

* Indicates PIs currently reviewed by BPA and TF O&M for management review

Ref. No.	Performance Area / Type	Title	Description	Unit/ Calculation	Current Format
41	System/Human	SAIFI Detail	Number of miss operations vs. number of switching errors by craft.	Number	Proposed - Current & Future State Reports
4	System	Transmission Line Outage Duration – SAIDI	Average number of automatic outage minutes by BPA line category	Minutes	Pbviews
5	System	Transmission Line Outage Frequency – SAIFI *	Average number of automatic outages by BPA line category	Number	Pbviews
6	System	Transmission Line Availability *	The percentage of time that BPA's most important transmission lines are available for service.	Percentage	Pbviews
12	System	Cascading Outages	The number of events where involuntary curtailments of firm load occurred due to cascading outages originating on the BPA's system.	Number	Pbviews
13	System	Corrective vs. Preventive Maintenance	The ratio of corrective maintenance vs. preventive maintenance. Currently viewed as data rather than specific target.	Percentage	Reports
17	System	Number of Callouts	Number of callouts for emergencies	Percentage	Reports
18	System	Outages on Channels	Microwave channel outages	Number	Reports
19	System	MW and Fiber Availability	Availability of analog microwave and fiber systems.	Percentage	Reports
20	System	Network Mgmt System for Digital MW Availability	Availability of digital microwave availability	Percentage	Reports
25	System	Inadvertent Outages *	Percent of human-caused outages (e.g., switching errors) (switching errors alone are currently reported annually to Tier 2)	Percentage	Operations Report
26	System	Forced Outages	Percent of forced outages	Percentage	Proposed - Current & Future State Reports
28	System	O&M Costs per Circuit Mile	Cost of Operations and Maintenance by Circuit Mile	Dollars	Proposed - Current & Future State Reports
33	System	Equipment Failure Causes	TBD - metrics based on cause codes for outages	??	Proposed - Current & Future State Reports
34	System	Various	Metrics based on ASSET HEALTH	??	Proposed - Current & Future State Reports

Ref. No.	Performance Area / Type	Title	Description	Unit/ Calculation	Current Format
35	System	Cost of Availability	Measurement of availability that coincides with financial impacts	Dollars	Proposed - Current & Future State Reports
38	System	Outage Frequency by ROW Width		Number	Proposed - Current & Future State Reports
50	System	Failures per Relay Operation		Percentage	Benchmark
55	System	Measured System Performance - Analog	Percentage Availability of Analog Comm System for WECC Compliance	Availability Calculation	Proposed - Future State
56	System	Measured System Performance - Digital	System Performance and Availability based on Bit Error	Yet To be decided BERT Tests?	Proposed - Future State
57	System	XAIDI	Duration of Comm System Outages	Sum of Circuit Failures minutes/Total number of circuits	Proposed - Future State
58	System	XAIFI	Frequency of Comm System Outages	Total number of Circuit Failures/Total number of Circuits	Proposed - Future State

Performance Indicators for measuring and reporting on TF O&M and Crew Performance

* Indicates PIs currently reviewed by BPA and TF O&M for management review

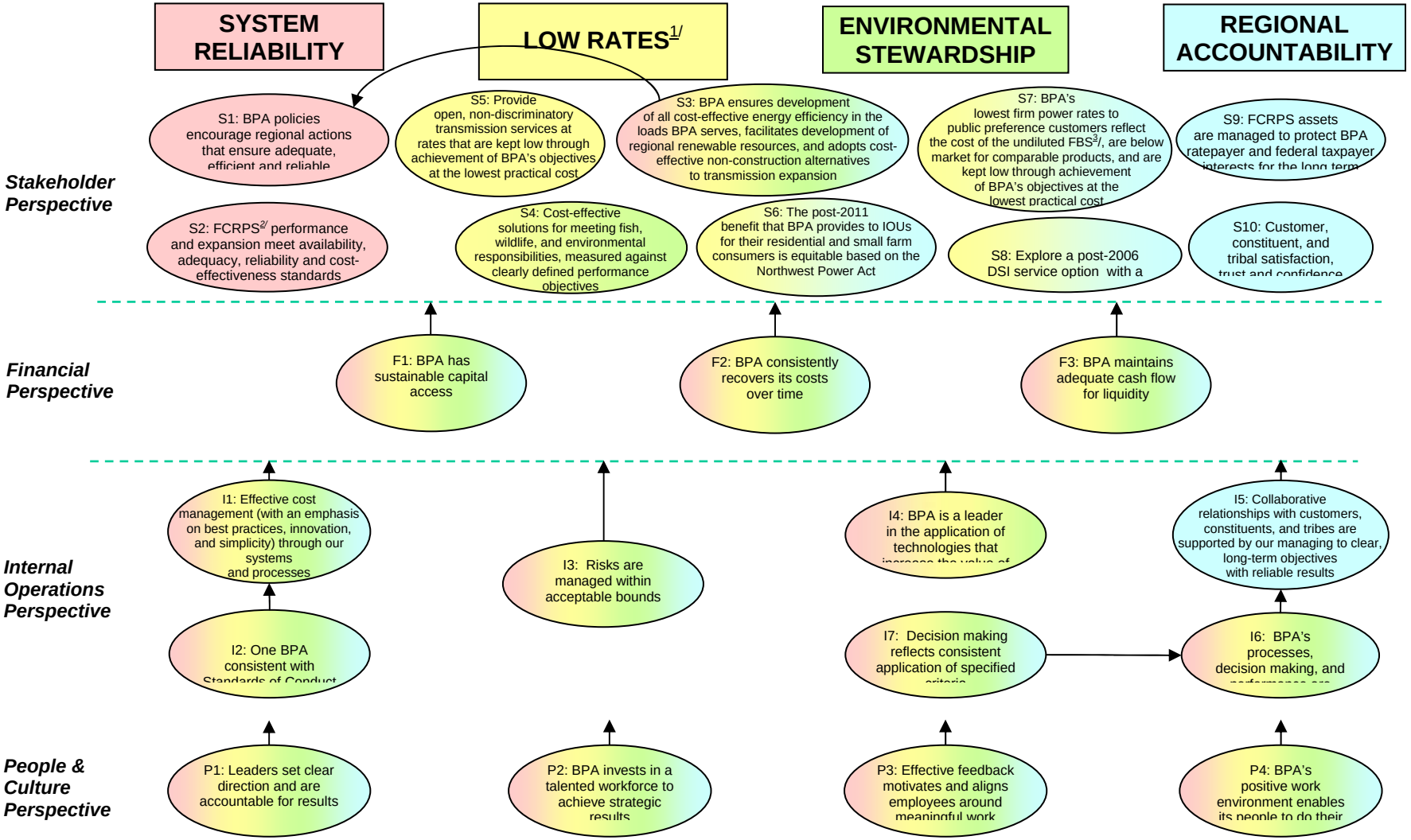
No.	Performance Area / Type	Title	Description	Unit/ Calculation	Current Format
1	Human	WECC Maintenance	Completion of WECC required maintenance	Percentage	Pbviews
2	Human	Significant Equip Maint	Completion of Significant Equipment required maintenance	Percentage	Pbviews
3	Human	Vegetation Related Outages	Report of outages with a cause related to vegetation (trees) for transmission lines 200 kV+. Includes outages coded as tree, tree-blown, tree-cut, or tree-growth, and characterized as inside the BPA right-of-way.	Number	Pbviews
7	Human	System Maint Cost Performance *	The amount spent on BPA's system maintenance program in terms of start-of-year budget versus actual.	Dollars	Pbviews
8	Human	System Operations Cost Performance *	The amount spent on BPA's system operations program in terms of start-of-year budget versus actual.	Dollars	Pbviews
9	Human	Environmental Compliance Inspections *	Findings as a result of internal audits (percent of audits/inspections that result in no findings of non-compliance).	Percentage	Pbviews
10	Human	Lost-Time Accident Frequency Rate *	Lost-time injuries and occupational illness per 200,000 staff-hours worked	Number	Pbviews
11	Human	Lost-Time Injuries	Maximum cumulative number of lost time injuries for the Transmission Field Services organization.	Number	Pbviews
14	Human	Other PMs Completed	Non-WECC or Significant Equipment PMs Completed	Percentage	Reports
15	Human	Vehicle	Number of preventable vehicle accidents	Number	Reports

No.	Performance Area / Type	Title	Description	Unit/ Calculation	Current Format
		Accidents			
16	Human	Emergency Overtime	Ratio of overtime to straight time hours and dollars. Currently viewed as data rather than specific target.	Percentage	Data
21	Human	Budget vs. Actual by ROW Sub-program (Vegetation/Access Roads/Danger Trees) *	Budget vs. actual performance	Percentage	ROW Dashboard
22	Human	Accident Severity Rate *	Work days rest x 200,000/staff hours worked	Number	Reports
23	Human	Maintenance Hours per Service *	Number of average hours to perform maintenance tasks *(currently used by RCM - mirrors old WULAMC report)*	Number	Reports
24	Human	History Briefs *	Percent of history briefs completed for corrective work. *Not tracked since 2004.*	Percentage	Data
27	Human	Live Line Maintenance	Percent of maintenance done while line is in service.	Percentage	Proposed - Current & Future State Reports
29	Human	Cost per FTE	Field Services total costs per FTE	Dollars	Proposed - Current & Future State Reports
30	Human	Significant Equipment Planned Outages	Number of times a piece of significant equipment is taken out of service	Number	Proposed - Current & Future State Reports
31	Human	Various	Human performance metrics *(WULAMC)*	Percentage	Proposed - Current & Future State Reports
32	Human	Percentage of Indirect Maintenance	Percentage of indirect vs. direct hours or dollars for the maintenance program	Percentage	Proposed - Current & Future State Reports
36	Human	Quality of Work	Metric to measure quality of work completed and program effectiveness	??	Proposed - Current & Future State Reports
37	Human	ROW Cost per Acre	Costs per acre over long periods of time for same ground	Dollars	Proposed - Current & Future State Reports
39	Human	Backlog	Percent of overdue tasks on critical and non-critical equipment	Percentage	Proposed - Current & Future State Reports
40	Human	OTC Violations		Number	Proposed - Current & Future State Reports
42	Human	Percent of Callbacks	Percent of time call backs are incurred after routine or planned maintenance.	Percentage	Proposed - Current & Future State Reports
43	Human	Outage Efficiency	Metric to measure better use of outages	Percentage	Proposed - Current & Future State Reports

No.	Performance Area / Type	Title	Description	Unit/ Calculation	Current Format
44	Human	Maintenance Timeliness	Metric to measure the timeliness of preventive maintenance	Percentage	Proposed - Current & Future State Reports
45	Human	O&M $ per MWH Transmitted		Percentage	Benchmark
46	Human	O&M $ per Transmission Circuit Mile		Percentage	Benchmark
47	Human	O&M $ per Transmission Asset Value		Percentage	Benchmark
48	Human	O&M $ per Installed Breaker		Percentage	Benchmark
49	Human	O&M per Installed Relay		Percentage	Benchmark
51	Human	Hours per service		Hours	Benchmark
52	Human	Budget-vs.-Actual by asset type		Percentage	Benchmark
53	Human	% Assets w/asset health record		Percentage	Benchmark
54	Human	Unit costs by Contract Type		Number	Benchmark
59	Human	Engineering Survey	Survey to customers of PSC engineering staff to document quality of function.	Summation of weighted answers to survey questions	Proposed - Future State
60	Human	Work Plan Accomplishments	Track accomplishment of maintenance and capital work plan - *may be difficult to do without a tool in place*	Annual work plan/completion - tracked quarterly	Proposed- Future State
61	Human	Efficiency of PSC Equipment Maint	Determining proper PSC equipment maintenance intervals and tasks	(CM)b/(CM)a & OTCM/CM	Proposed - Future State

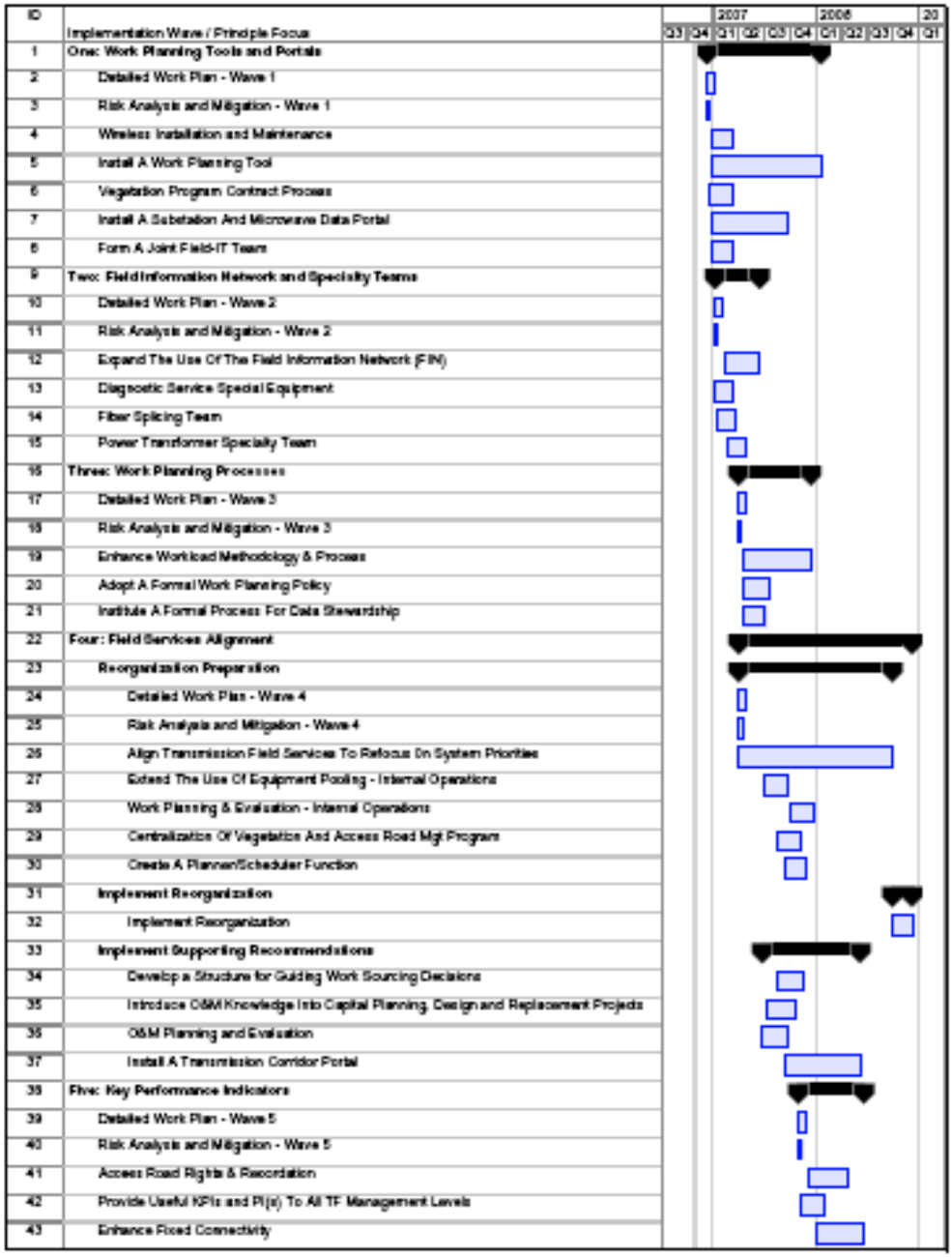
Appendix C: BPA Flight Plan

BPA DIRECTION: FLIGHT PLAN TO 2007-2011



Appendix D: EPIP Implementation Schedule

The chart below depicts an initial outline of the implementation schedule for realizing the benefits described in this report. A detailed work plan will be developed as each successive wave of implementation I launched. Additional detail can be found in the Major Implementation Steps section.



ID	Implementation Wave / Principle Focus
1	One: Work Planning Tools and Portals
2	Detailed Work Plan - Wave 1
3	Risk Analysis and Mitigation - Wave 1
4	Wireless Installation and Maintenance
5	Install A Work Planning Tool
6	Vegetation Program Contract Process
7	Install A Substation And Microwave Data Portal
8	Form A Joint Field-IT Team
9	Two: Field Information Network and Specialty Teams
10	Detailed Work Plan - Wave 2
11	Risk Analysis and Mitigation - Wave 2
12	Expand The Use Of The Field Information Network (FIN)
13	Diagnostic Service Special Equipment
14	Fiber Splicing Team
15	Power Transformer Specialty Team
16	Three: Work Planning Processes
17	Detailed Work Plan - Wave 3
18	Risk Analysis and Mitigation - Wave 3
19	Enhance Workload Methodology & Process
20	Adopt A Formal Work Planning Policy
21	Institute A Formal Process For Data Stewardship
22	Four: Field Services Alignment
23	Reorganization Preparation
24	Detailed Work Plan - Wave 4
25	Risk Analysis and Mitigation - Wave 4
26	Align Transmission Field Services To Refocus On System Priorities
27	Extend The Use Of Equipment Pooling - Internal Operations
28	Work Planning & Evaluation - Internal Operations
29	Centralization Of Vegetation And Access Road Mgt Program
30	Create A Planner/Scheduler Function
31	Implement Reorganization
32	Implement Reorganization
33	Implement Supporting Recommendations
34	Develop a Structure for Guiding Work Sourcing Decisions
35	Introduce O&M Knowledge Into Capital Planning, Design and Replacement Projects
36	O&M Planning and Evaluation
37	Install A Transmission Corridor Portal
38	Five: Key Performance Indicators
39	Detailed Work Plan - Wave 5
40	Risk Analysis and Mitigation - Wave 5
41	Access Road Rights & Recordation
42	Provide Useful KPIs and PI(s) To All TF Management Levels
43	Enhance Fixed Connectivity

Appendix E: Estimated Net Financial Benefits

NOTE Used Descriptions of Benefits in Executive Summary EXCEPT For A-1, A-2, A-3

Estimated Net Financial Benefits ($ Million)	2007	2008	2009	2010	2011	2012	Total 2007 - 2011
Total	**-4.9**	**4.5**	**7.7**	**8.6**	**8.9**	**9.4**	**24.8**
Increased Revenue	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.6**	**2.0**
Cost Reductions (FTE reductions, equipment costs, etc.)	**0.4**	**1.5**	**1.7**	**1.7**	**1.7**	**1.8**	**7.0**
Productivity Savings (efficiency improvements, reduction in overtime, etc.)	**-5.5**	**2.7**	**5.6**	**6.4**	**6.6**	**7.0**	**15.8**
Increased Revenue	**0.2**	**0.3**	**0.4**	**0.5**	**0.6**	**0.6**	**2.0**
Integrate wireless installation and maintenance into a TF program	0.2	0.3	0.4	0.5	0.6	0.6	2.0
Cost Reductions (FTE reductions, equipment costs, etc.)	**0.4**	**1.5**	**1.7**	**1.7**	**1.7**	**1.8**	**7.0**
Optimize the number of diagnostic service special equipment	0.1	0.1	0.1	0.1	0.1	0.1	0.5
Align Transmission Field Services to refocus on system priorities and place management closer to the field forces and customers	0	1	1.3	1.3	1.3	1.3	4.9
Extend the use of equipment pooling - Internal Operations	0.3	0.3	0.2	0.2	0.2	0.3	1.2
Centralization the vegetation and access road programs	0	0.1	0.1	0.1	0.1	0.1	0.4
Productivity Savings (efficiency improvements, reduction in overtime, etc.)	**-5.5**	**2.7**	**5.6**	**6.4**	**6.6**	**7.0**	**15.8**
Refine and enhance the workload methodology	-0.1	0.4	0.7	1	1.2	1.2	3.2
Develop a structure for guiding work sourcing decisions. Capital	0	0.3	0.5	0.6	0.6	0.6	2.0
Develop a structure for guiding work sourcing decisions. Expense	0	0.2	0.2	0.2	0.2	0.2	0.8
Expand the use of the Field Information Network (FIN)	-0.3	-0.2	-0.2	-0.1	-0.1	0.2	-0.9
Introduce O&M knowledge into capital planning, design, and replacement projects	-0.1	0.1	0.1	0.2	0.2	0.2	0.5
Impact to capital work performed by SPC & PSC field engineers	0	0.1	0.3	0.5	0.5	0.5	1.4
Develop a dedicated fiber splicing team	0	0	0	0	0	0	0
Establish a power transformer specialty team	0.1	0.1	0.1	0.1	0.1	0.1	0.5
Install a work planning tool	-1.5	0.5	0.5	0.5	0.5	0.5	0.5

Centralization the vegetation and access road programs	0	0	0	0	0	0	0
Formalize the process for access road rights and recordation	0	0.1	0.1	0.1	0.1	0.1	0.4
Install a substation and microwave data portal	-1.6	0.9	2.2	2.2	2.2	2.2	5.9
Install a transmission corridor data portal	-1.6	0.4	1.1	1.1	1.1	1.1	2.1
Institute a formal process for data stewardship - value of data	0	-0.2	0	0	0	0	-0.2
Provide useful KPIs to all TF management levels	0	-0.1	-0.1	-0.1	-0.1	0	-0.4
Enhance fixed connectivity	-0.4	0.1	0.1	0.1	0.1	0.1	0

Appendix F: Principle O&M Data and Information Systems

Number	Application or Database
1	Access Roads Management Systems (ARMS)
2	ASPEN One-Liner
3	BES-MSP Interface (BMI)
4	Bonneville Administrative Request System (BARS)
5	CAD
6	Cascade
7	Circuit Breaker Timing
8	Communications Circuit Listing (CCL)
9	Compass (Coordinated Outage Mgmt Planning & Scheduling System)
10	Danger Tree Analysis System (DTAS)
11	DigSys
12	Dispatch Logging System (DLS)
13	Doble DTA Office System
14	Drawing Information System (DIS)
15	Emma
16	Frequency Management Program
17	Fiber Management System (FMS)
18	Fuel Utilization & Tracking System (FUTS)
19	Geographic Information System (GIS)
20	Geomatics
21	Historical Queries
22	HRmis (Human Resources Mgmt Information System)
23	Lab Reports
24	Land Information System (LIS)
25	Lightning strikes
26	Meter Data Management (MDM)
27	MetroScan
28	MSDS (Material Safety Data Sheets)
29	MV90
30	OARS (Operations Analysis Reporting System)
31	Orange Book
32	PbViews
33	PEDS (Production Enterprise Data Store)
34	Peoplesoft financials
35	PI (Plant Information)
36	PassPort - includes Work Management, Shipping, & Inventory modules

Number	Application or Database
37	ProjectWise
38	RCM Tools
39	Safety statistics
40	SARA EPCRA
41	SF6 Gas Logs
42	Snohomish Land Owners
43	Sunflower
44	TBL Data Administration
45	TBL Data Warehouse
46	TCMS (Transmission Contract Mgmt System)
47	TLM Application
48	TLM Field
49	Transformer Oil Analyst (TOA)
50	Transmission Line Design Database (TLDD)
51	Transmission Reference Entity Database (TRED)
52	Tview
53	WaveWin