Transmission Capital & Asset Strategy Workshop

May 17, 2010

9-12 and 1-4

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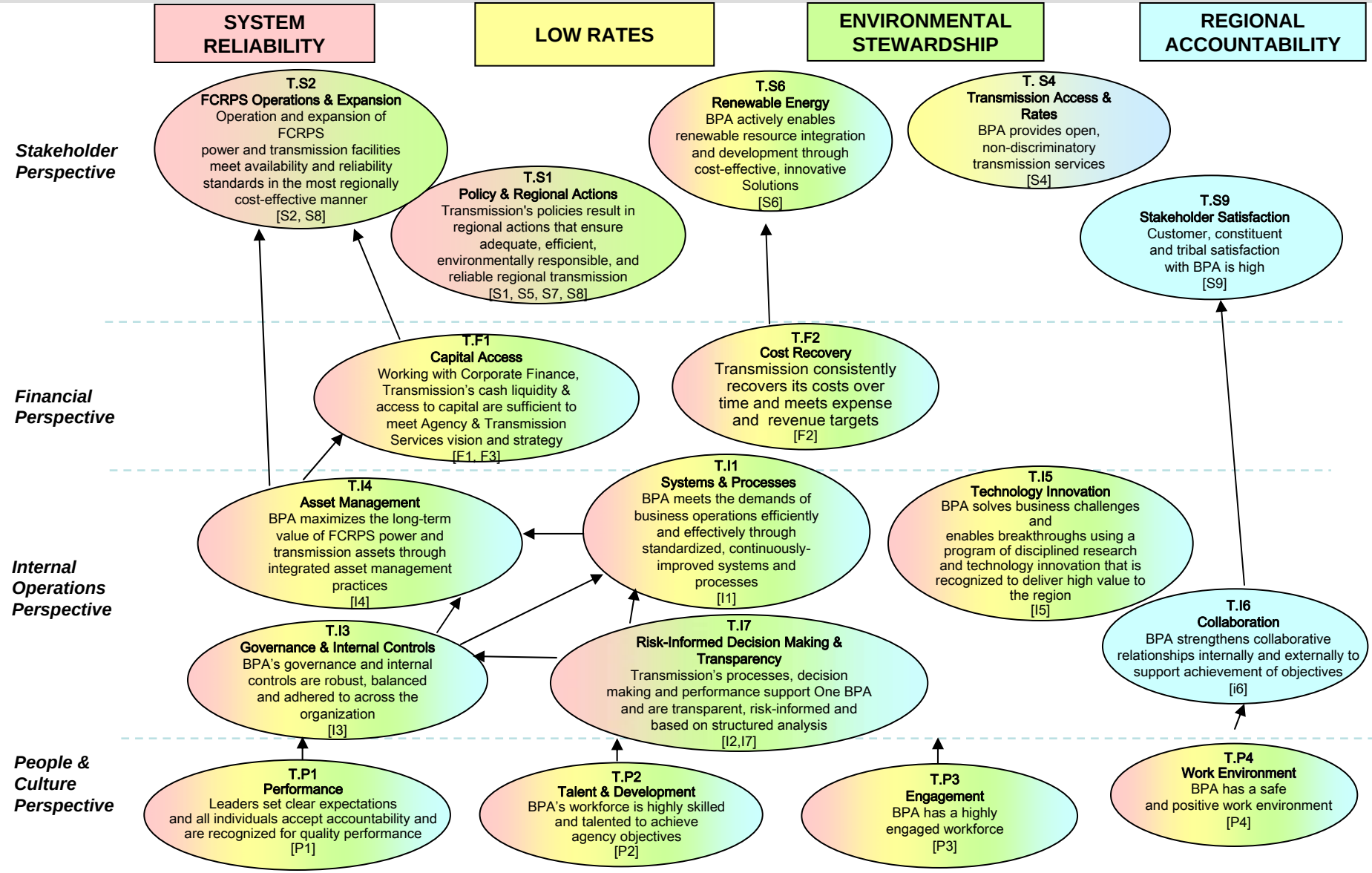
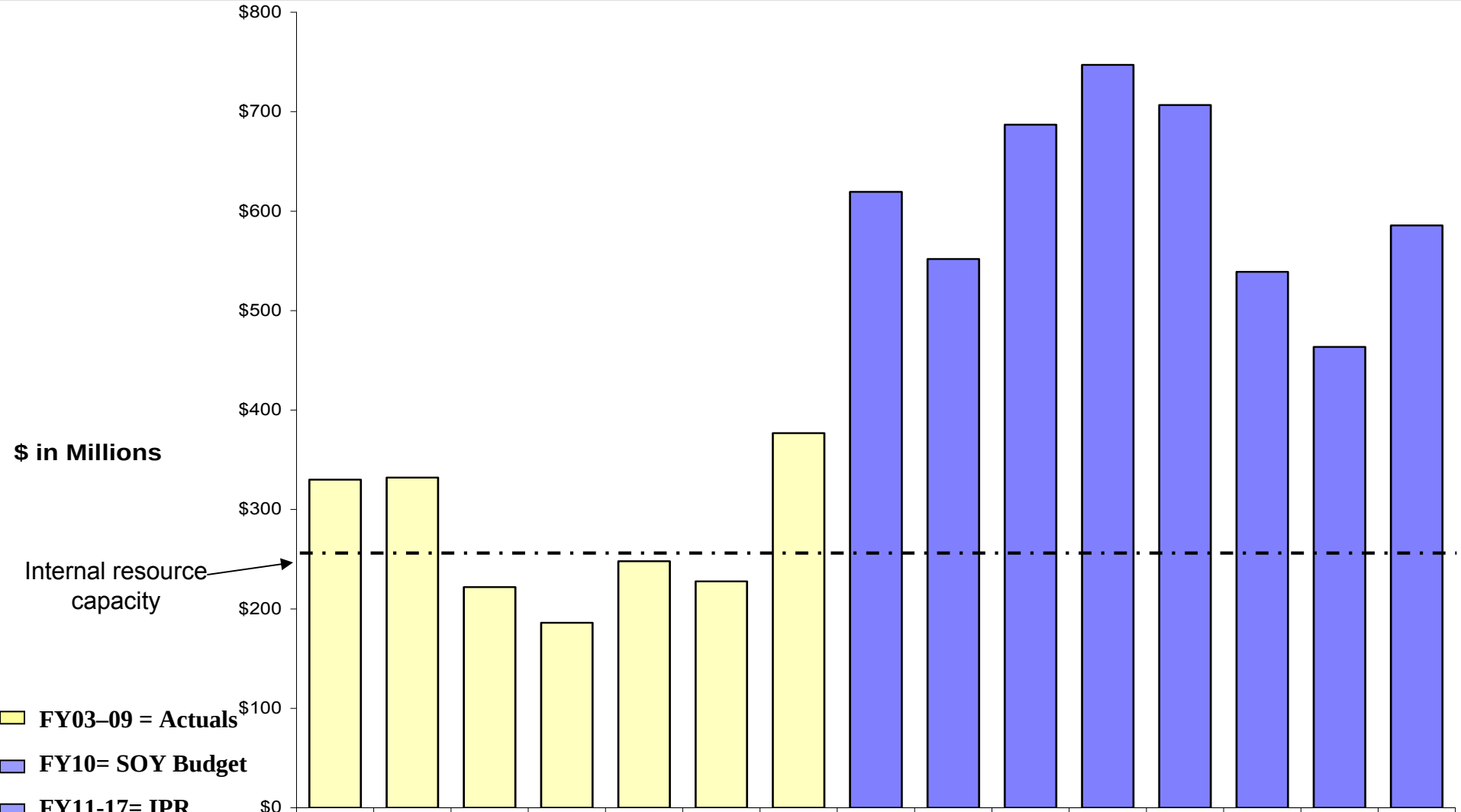
Transmission Strategy Map: FY 2010-2016



Transmission Capital[1] : FY2003 - FY2017



	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	FY12	FY13	FY14	FY15	FY16	FY17
Capital Project Spending	$330	$332	$222	$186	$248	$228	$377	$619	$552	$687	$747	$707	$539	$463	$586

[1]Proposed Capital Levels (FY10-17) do not include lapse factor.

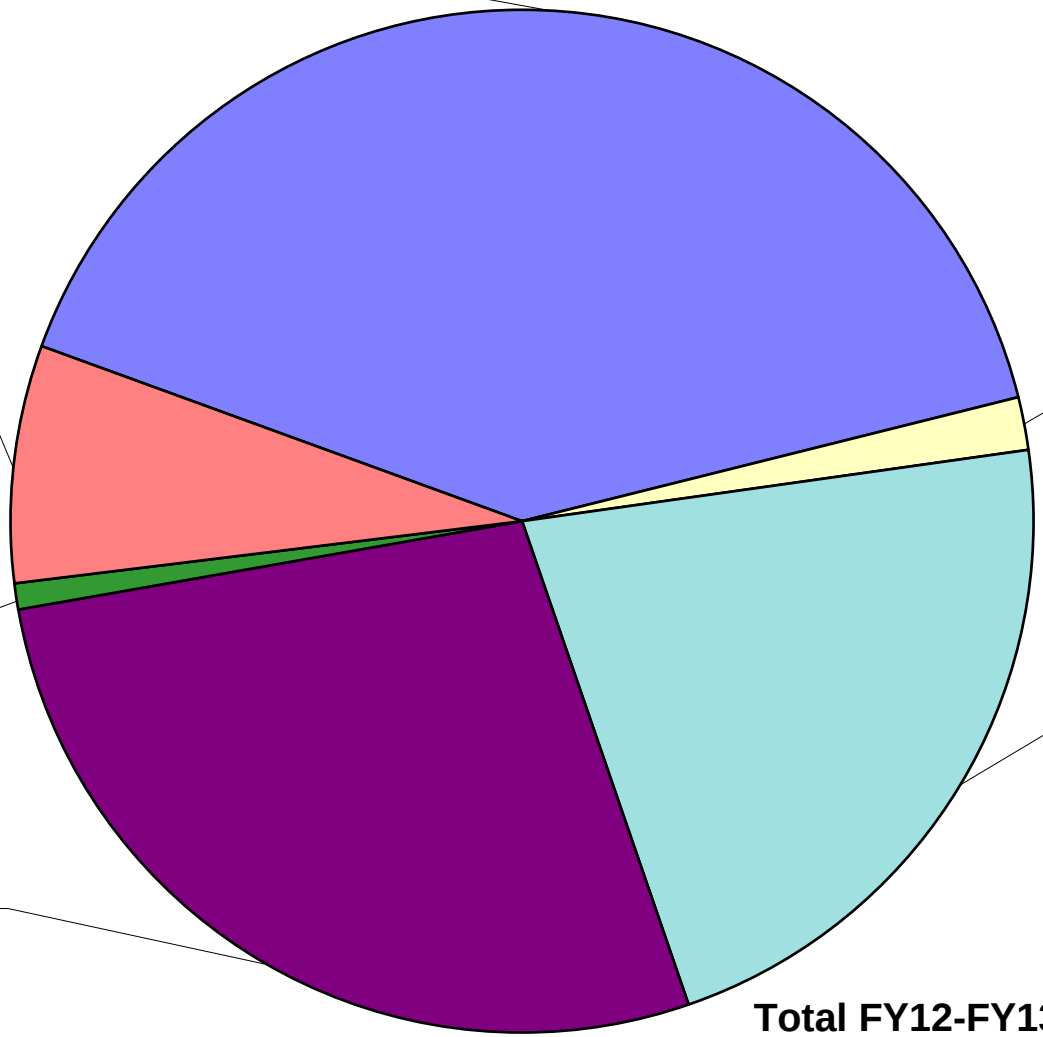
Transmission Proposed Capital Spending Levels[1]

Transmission Capital by Program	2009 Actuals	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
Main Grid	58,152,911	128,073,598	189,938,700	110,011,000	213,390,800	270,144,700	255,011,100	138,247,400	86,879,000	189,404,200
Area & Customer Service	11,452,179	37,103,360	6,255,900	6,025,300	11,324,900	9,470,100	10,749,200	16,156,700	17,130,600	28,295,400
System Replacements	115,722,167	137,146,004	138,423,175	131,671,687	157,248,543	169,430,778	188,319,480	172,039,290	160,873,183	159,372,689
Upgrades & Additions	56,899,513	103,321,871	112,584,640	103,562,730	137,432,400	122,839,000	81,191,300	51,937,700	45,280,300	46,965,100
Environment Capital	3,369,545	5,530,189	5,752,088	5,752,088	5,868,854	5,983,884	6,101,169	6,320,000	6,446,000	6,575,300
PFIA	36,784,922	106,605,296	102,286,449	86,792,200	44,431,800	43,714,500	29,693,600	22,309,700	22,649,500	22,986,700
Total Direct Capital	282,381,237	517,780,318	555,240,952	443,815,005	569,697,297	621,582,962	571,065,849	407,010,791	339,258,583	453,599,389
Capital Indirects	74,631,576	80,412,502	81,052,210	83,437,257	86,053,465	87,540,257	88,872,135	90,530,781	92,624,746	94,250,895
Transmission AFUDC	19,676,227	21,300,000	22,467,500	24,624,000	31,157,000	38,075,000	46,890,000	41,400,000	31,521,000	37,771,000
Total Indirect Capital	94,307,803	101,712,502	103,519,710	108,061,257	117,210,465	125,615,257	135,762,135	131,930,781	124,145,746	132,021,895
Total Capital Program	**376,689,040**	**619,492,820**	**658,760,662**	**551,876,262**	**686,907,762**	**747,198,219**	**706,827,984**	**538,941,572**	**463,404,329**	**585,621,284**
Transmission Lapse Factor	-	(105,117,600)	(109,902,416)	(81,678,935)	(102,158,664)	(111,179,733)	(105,101,698)	(79,896,236)	(68,543,149)	(86,853,193)
Total Capital with Lapse Factor	**376,689,040**	**514,375,220**	**548,858,246**	**470,197,327**	**584,749,098**	**636,018,486**	**601,726,286**	**459,045,336**	**394,861,180**	**498,768,091**

[1] Transmission Capital includes a 15% lapse factor.

Average Direct Transmission Capital Expenditures[1]: FY2012- FY2013

($ in Millions)



Main Grid
$241.77, 40%

Area & Customer Service
$10.40, 2%

Upgrades and Additions
$130.14, 22%

* includes Corporate Security Enhancement and IT Capital

System Replacements
$163.34, 27%

* includes Corporate Facilities Capital

Environment
$5.93, 1%

Customer Financed/Credits/ PFIA/Radio Spectrum
$44.07, 7%

Total FY12-FY13 Average = $596M

[1]Proposed Capital Levels do not include lapse factor.

ASSET MANAGEMENT

ADVANCING ASSET MANAGEMENT

- **Transmission made the decision to become PAS-55 Compliant**
  - PAS-55 is a Publicly Available Specification which provides a structured approach and methodology for establishing a sound asset management system

- **Retained Woodhouse Partnership Inc. to evaluate Transmission's asset management program against PAS-55 compliance**
  - Identified 52 findings needing improvement
  - Focusing on asset strategy and plan development, process improvement, and associated documentation
  - PAS-55 compliance target date is September 2014

- **Improving Strategy and Plan Development**
  - Significantly improved strategies in the following program areas:
    - Wood Lines - Steel Lines
    - SPC - Control Centers
    - Hired Strategic Decision Group (SDG) to help develop a long-term strategy for PSC and Communications (Project underway)
  - Continuing to work on the remaining strategies

- **Improving Asset Management Processes**
  - **Asset Register** - Developing Transmission Asset System (TAS) register to manage inventory, maintain historical performance data, and advance reliability centered maintenance and provide a centralized data repository that is complete, accurate and readily accessible
  - **Work Planning and Scheduling**
  - **Plan, Design, Build**
  - **Project Management**

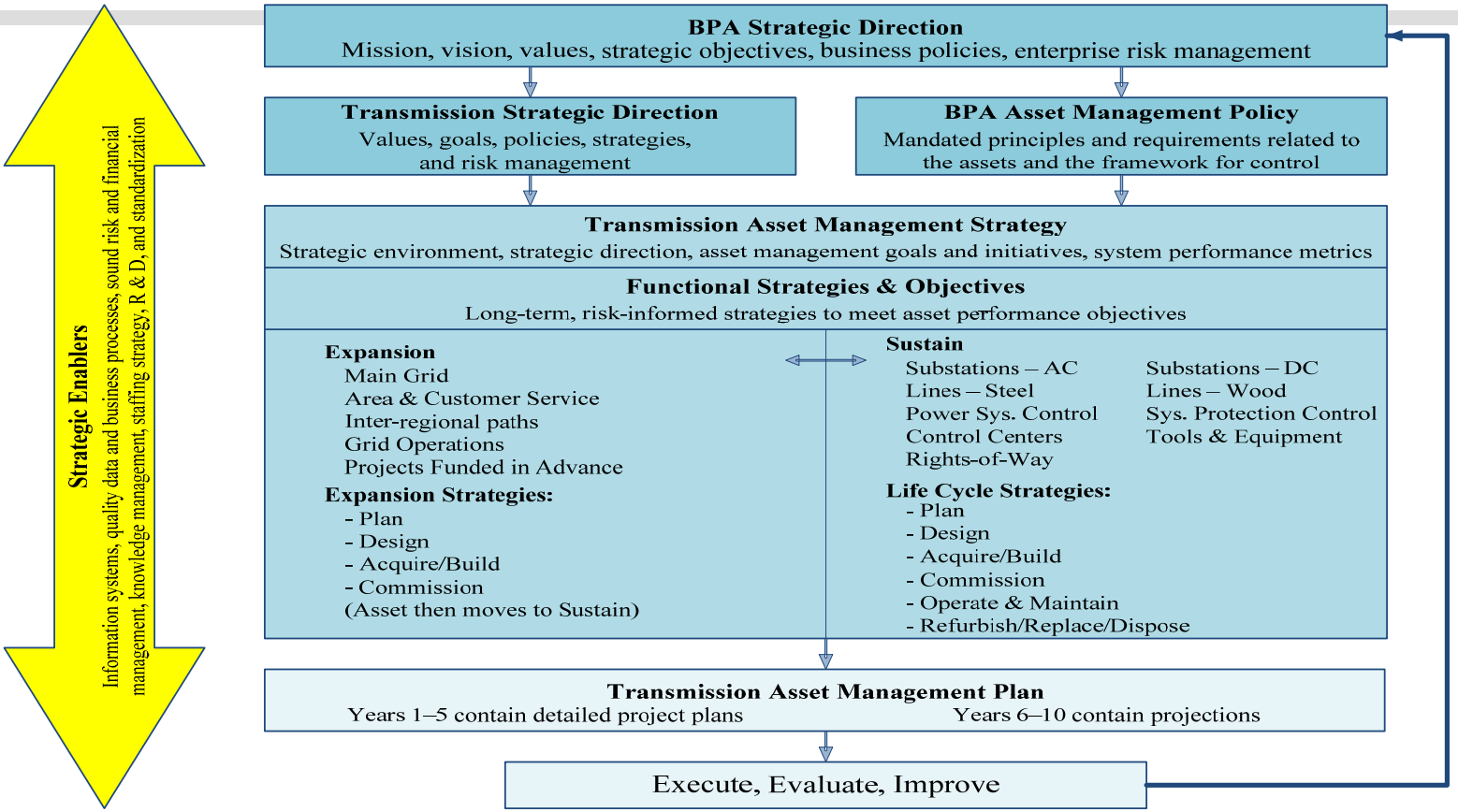
Advancing Asset Management

- **Re-organizing to centralize Transmission's asset management program under Planning and Asset Management (in line with industry best practice)**

- **Established Program Manager positions in the following asset management program areas:**
  - **Sustain**
    - Wood Lines - Steel Lines
    - System Protection & Controls (SPC) - Power System Controls (PSC)
    - Control Centers - Substations - AC
    - Substations – DC - TEAP (Fleet and Tools and Equipment)
    - Rights of Ways (Access Roads, Land Acquisition, and Veg. Management)
  - **Expansion**
    - Main Grid - Communications
    - Area and Customer Service, including Projects Funded In Advance (PFIA**)**

- **Established a Contract Management Office**

Transmission Asset Management System Framework



graphic update 5/12/2010

Transmission Long-Term Goals

Vision

Strategic Objectives

Long-term Goals
For managing transmission assets

Improving Practices

Asset management practices conform with leading practices

Expansion, replacement, and maintenance are integrated, prioritized in terms of asset criticality and risk, and directed at meeting reliability and other standards at least life cycle cost

Asset management plans deliver on the strategy, and projects are completed on time, within scope and on budget

Expand

Load service obligations and customer service requests meet standards and tariff requirements

An integrated regional expansion planning process is implemented

A robust grid that effectively and efficiently integrates diverse energy resources

Inter-regional transfer capacity meets reliability standards and commercial needs

Fuller, more optimal use is made of existing transmission capacity through technological, policy and process change

Sustain

Information on asset attributes (condition, performance, costs) is complete, accurate, and readily accessible

Assets are proactively maintained and replaced

- Maintenance, replacements and sparing integrated
- Priority given to critical assets at greatest risk
- Reliability and other standards met at least life-cycle cost

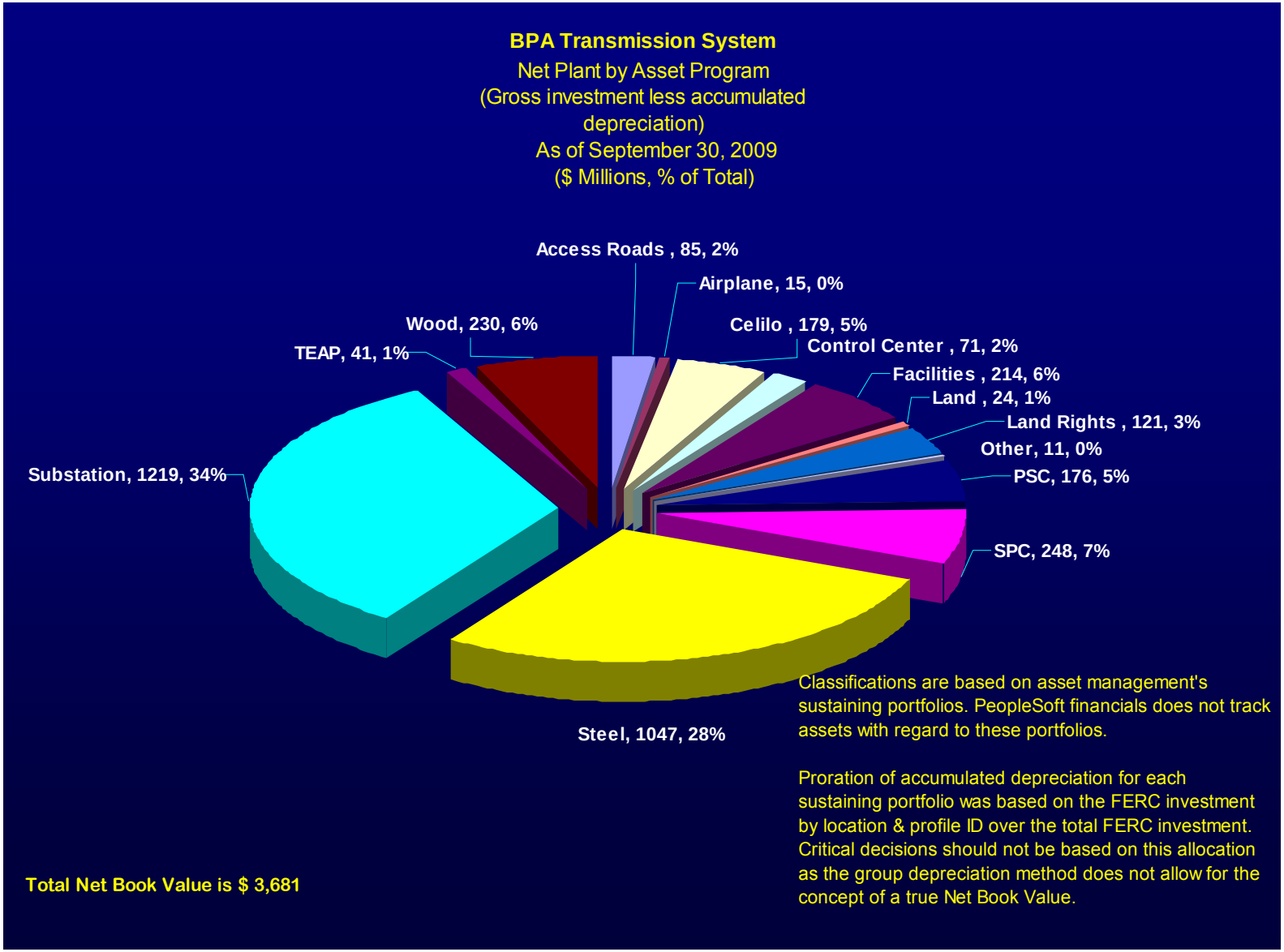
Maintenance is reliability-centered (condition-based)

Asset Management Strategy Development

- Strategies are designed to:
  - Convert the agency's mission, vision, and strategic objectives into long-term investment and maintenance strategies
  - Seek to:
    - Ensure the critical assets operate reliably, meet availability requirements and provide adequate capacity into the future
    - Ensure long-term asset costs will be prudent and economic
  - Designed to answer these questions:
    - What objectives should be set for asset performance?
    - How are these assets performing today?
    - What are the risks to meeting the objectives?
    - What should investment and maintenance strategies be to meet the objectives?
    - What are the anticipated costs?
- Improved planning levels for capital investment and maintenance
- Developing detailed asset management plans spanning 10 years
  - Establishing asset performance objectives
  - Priority to most critical assets at greatest risk

Sustain Strategies

Transmission Net Plant



Transmission Capital – System Replacements

Program Description

- Replacement of high-risk, obsolete and maintenance-intensive facilities and equipment to reduce the chance of equipment failure affecting the safety and reliability of the transmission system. Replacements are based on transmission asset management strategy and plans, findings and recommendations.
- This program also includes the Transmission capital dollars associated with the plan, design and construction of new facilities, replacement of existing facilities; hazardous materials abatement; and demolition of buildings no longer useful to BPA.

Strategic Objectives- S2 – FCRPS Operations and Expansion, S9 – Stakeholder Satisfaction, I4 – Asset Management , 17 – Risk-Informed Decision Making and Transparency

Key Products and Outputs

- Keep the existing transmission assets operating in accordance with safety, reliability and security requirements
- Improve asset health and therefore maintain and/or improve system performance
- Facilities Asset Management key products and output include plan, design, and build new facilities as required by BPA business activities, hazmat abatement, and asset decommissioning.

Transmission Capital – System Replacements

Capital - System Replacements	2009 Actuals [1]	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
TOOLS & WORK EQUIPMENT		-	7,000,000	-	-	-
LINES - STEEL HARDWARE REPLCMT		19,918,776	-	16,091,300	20,551,800	12,772,300
LINES - WOOD POLE LN REBUILDS		19,397,648	-	42,296,900	41,537,100	43,447,800
MISC FACILITIES- NON-ELECTRIC		22,750,000	-	11,679,287	17,818,743	18,737,478
MISC. REPLACEMENT PROJECTS		16,666,155	114,058,381	-	-	-
PSC - FIN/OP NETWORKS		300,000	-	185,100	235,500	240,200
PSC - SCADA/TELEMTRY/SUP CNTRL		782,000	-	3,605,300	4,618,800	4,909,200
PSC - TELEPHONE SYSTEMS		945,000	-	625,800	540,600	305,700
PSC - TLECOM TRANSPORT		1,484,000	-	1,514,500	1,156,000	1,179,000
PSC - TRANSFER TRIP		6,069,000	-	8,413,700	5,137,900	6,113,300
PSC- TELECOM SUPPORT EQUIPMENT		1,060,301	-	1,809,000	1,250,200	1,414,800
SPC - DFRS		2,977,800	-	3,510,600	251,500	-
SPC - METERING		372,225	-	262,900	535,200	545,800
SPC - RELAYS		4,457,804	-	2,835,400	10,410,800	22,313,400
SPC - SER		744,450	-	1,407,200	3,341,800	3,235,700
SUB CAPACITORS		921,000	-	724,600	-	-
SUB CIRCUIT BREAKER REPLACMENT		11,123,820	-	10,054,400	20,213,500	21,985,000
SUB CVT/PT/CT REPLACEMENT		1,165,004	-	1,490,300	1,523,200	1,504,300
SUB DC		5,814,141	-	1,304,100	5,309,200	7,052,100
SUB LOW VOLTAGE AUX.		2,913,762	-	4,802,100	5,651,700	5,075,100
SUB NON-ELECTRIC PLANT		563,914	-	485,900	750,400	691,000
SUB TRANSFORMERS & REACTORS		3,709,021	-	5,351,100	5,710,600	5,900,400
TEAP - EQUIPMENT		12,060,000	-	12,170,500	9,633,600	10,916,500
TEAP - TOOLS		950,183	-	1,051,700	1,070,400	1,091,700
TL SPACER DAMPER REPLACEMENT		-	10,852,996	-	-	-
TL WOOD POLE REPLACEMENTS		-	6,511,798	-	-	-
[2] **Total**	**115,722,167**	**137,146,004**	**138,423,175**	**131,671,687**	**157,248,543**	**169,430,778**

[1] Due to changes to the data structure historical spending is not available at the same level of detail.

[2] Dollars reported are direct dollars

Transmission Capital – System Replacements

Capital - System Replacements	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
TOOLS & WORK EQUIPMENT	-	-	-	-	-
LINES - STEEL HARDWARE REPLCMT	12,772,300	13,032,800	13,288,900	13,542,400	13,794,000
LINES - WOOD POLE LN REBUILDS	43,447,800	41,660,300	42,138,200	40,164,200	43,032,600
MISC FACILITIES- NON-ELECTRIC	18,737,478	27,316,180	22,530,390	20,232,483	20,390,189
MISC. REPLACEMENT PROJECTS	-	-	0	-	-
PSC - FIN/OP NETWORKS	240,200	245,100	374,800	382,000	389,100
PSC - SCADA/TELEMTRY/SUP CNTRL	4,909,200	5,844,700	5,959,500	6,941,400	7,070,300
PSC - TELEPHONE SYSTEMS	305,700	345,300	408,900	416,700	424,400
PSC - TLECOM TRANSPORT	1,179,000	1,203,000	1,635,600	1,666,800	1,697,700
PSC - TRANSFER TRIP	6,113,300	6,683,500	6,814,800	6,944,800	7,073,900
PSC- TELECOM SUPPORT EQUIPMENT	1,414,800	1,755,500	1,790,000	1,939,900	1,976,000
SPC - DFRS	-	-	-	-	-
SPC - METERING	545,800	557,000	567,900	578,700	589,500
SPC - RELAYS	22,313,400	31,387,800	32,004,600	32,615,200	25,733,500
SPC - SER	3,235,700	3,301,600	3,366,500	3,430,700	3,494,500
SUB CAPACITORS	-	-	-	-	-
SUB CIRCUIT BREAKER REPLACMENT	21,985,000	19,200,200	14,630,300	9,109,300	9,137,100
SUB CVT/PT/CT REPLACEMENT	1,504,300	1,258,700	1,249,400	1,273,200	1,385,300
SUB DC	7,052,100	13,077,300	2,271,600	-	-
SUB LOW VOLTAGE AUX.	5,075,100	2,283,500	3,373,300	2,826,500	3,259,900
SUB NON-ELECTRIC PLANT	691,000	931,200	539,500	-	-
SUB TRANSFORMERS & REACTORS	5,900,400	5,982,800	5,465,500	4,919,200	5,187,500
TEAP - EQUIPMENT	10,916,500	11,139,100	12,493,800	12,732,200	13,558,200
TEAP - TOOLS	1,091,700	1,113,900	1,135,800	1,157,500	1,179,000
TL SPACER DAMPER REPLACEMENT	-	-	-	-	-
TL WOOD POLE REPLACEMENTS	-	-	-	-	-
Total [2]	**169,430,778**	**188,319,480**	**172,039,290**	**160,873,183**	**159,372,689**

[2] Dollars reported are direct dollars

FY 2014-2017 Drivers of Proposed Spending Forecast

- Same drivers as identified for FY 2012-2013
- Increased spending in circuit breakers and switchgear, capacitors FY14, and relays FY14-FY17 consistent with asset strategies

Transmission Capital – System Replacements

FY 2012-13 Program Spending Drivers

- Wood Pole Line Rebuilds
- Steel Hardware Replacements
- Various Substation Replacements (circuit breakers, switchgear, CVT/PT/CT, low voltage, transformers & reactors, capacitors, non-electric plant)
- Power System Control (PSC) (VHF, telecom transport, SCADA/telemetry/sup control, FIN/OP networks, transfer trip, telephone systems)
- System Protection and Control (SPC) (relays, RAS, metering, DFR, SER, Tools and equipment)
- Misc. Facilities

Potential Risk

- Capital funding, identified in the previous IPR process for FY12-13, is not adequate to support required replacements as identified by the updated FY10 asset management strategies and plans.
- Failure to fund programs as identified will result in further degradation of system performance and health.
- Delays to construction could also increase overall construction costs due to inflation of materials and labor rates.

WOOD LINES

Assets within program – Wood Lines

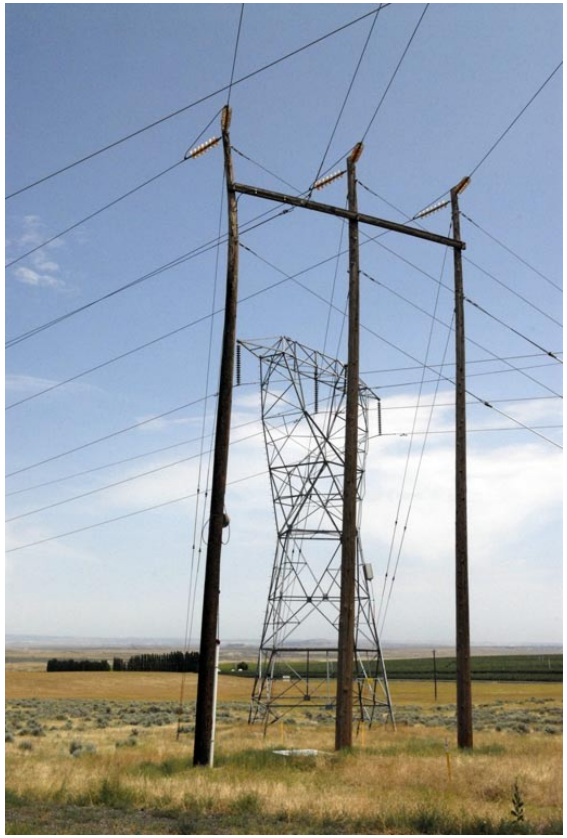
- **Approximately 5,000 miles of low voltage transmission lines with predominately wood poles**
  - 75,000 wood poles
  - Over 500,000 insulators
  - Oldest lines on BPA system

- **Line assets include the following:**
  - Poles, conductor, insulators
  - Cross arms
  - Guys
  - Hardware, connectors
  - Counterpoise and switches

- **Types of poles, conductor and insulators:**
  - Poles: cedar, douglas-fir, larch, various treatment types
  - Conductor: ACC, ASCR, ACC/TW, ASCR/TW, Copper and specials
  - Insulators: porcelain, glass, and composite

- **Program does not include:**
  - access roads
  - vegetation management
  - right-of-ways or fiber optic cable

- **Includes hardware to attach fiber optic cables**



Asset objectives – Wood Lines (1 of 2)

Reliability objective

Frequency of unplanned outages

- Performance objective: Minimize the ***number*** of unplanned transmission line outages on the most critical wood pole transmission lines (categories 1 through 4, 1 being most critical).
- Measure: System Average Interruption Frequency Index (SAIFI) – average number of automatic outages by BPA Line Category
- End-stage Target: Control Chart violation per year:
  - **No more than 1 control chart violation per year for Wood Pole Transmission classified lines (typically line importance categories 3 and 4).**

Duration of unplanned outages

- Performance objective: Minimize the ***duration*** of unplanned transmission line outages on the most critical wood pole transmission lines (categories 1 through 4, 1 being most critical).
- Measure: System Average Interruption Duration Index (SAIDI) – average number of automatic outage minutes by BPA Line Category
- End-stage Target: Control Chart violation per year:
  - **No more than 1 control chart violation per year for wood pole transmission classified lines (typically line importance categories 3 and 4).**

For both SAIFI and SAIDI, a control chart violation is defined as follows:

- **Latest fiscal year above the Upper Control Limit (short-term degradation)**
- **2 of last 3 fiscal years above the Upper Warning Limit (mid-term degradation)**
- **Continuous worsening trend in the last six fiscal years (long-term degradation)**

Availability objective

- Performance Objective: Optimize availability of service from BPA's transmission lines.
- Measure: Line availability percentage (includes planned outages)
- End-stage Target:
  - **BPA's most important transmission lines (Category 1 and 2) are available for service at least 98.0 percent of the time.**
  - **BPA's next most important transmission lines (Category 3 and 4, and generally primarily wood pole structure type) are available for service at least (X) percent of the time.**

Asset objectives – Wood Lines (2 of 2)

Adequacy objective

- Performance Objective: Provide adequate transmission capacity to serve future customer load growth.
- Measures: Forecasted peak load on transmission line segments.
- End-Stage Targets: Mitigate risk of overload transmission lines (category 3 and 4) to a less than 1 in 20 chance.
- Key driver: Agency 20 year load forecasts

Compliance objective

- Performance objective: Maintain and inspect wood pole transmission lines in accordance with NERC/WECC requirements.
- Measures: Transmission Maintenance & Inspection Plan (TMIP) is reviewed and revised annually; Wood pole lines are maintained in accordance with the TMIP; Maintenance records are maintained as required by the TMIP
- End-Stage Targets: BPA wood pole line maintenance & inspection practices comply with NERC/WECC standard PRC-STD-005-1

Safety objective

- No public safety event or injuries.
- No BPA or contracted employee fatalities or injuries.

Asset assessment – Wood Lines

- Over 2,000 miles of Wood Pole Transmission lines or 40% are over 50 years old (aging asset problem)
- Expected life of wood pole transmission line is approximately 60 years on average
- Overall performance of these lines is currently acceptable but at increasing risk of unacceptable performance as these lines continue to age
- Over 20,000 wood poles (out of a total of 75,000) are currently classified for priority replacement due to condition and/or age
- Over 500 miles of transmission lines currently have obsolete copper conductor that is difficult to repair and replace after a conductor failure
- Oldest lines typically have the original hardware, insulators, guying and counterpoise in place and condition of these assets in many cases is unknown
- Constraints limit the level of line maintenance and construction activity each year due to availability of planned outages and environmental issues
- Over past decade wood pole program focus has been on replacing poles >60 years of age and not addressing other components such as guys, hardware and insulators
- Program needs to ramp up to address possible future bow wave of line rebuild work and reduce risk of future decline in system reliability

Risks to meeting the objectives – Wood Lines

Reliability Risk

- Risk that a component (conductor, wood structure, insulator, or hardware) would fail to perform its intended purpose resulting in an unplanned transmission line outage interrupting service to customers.
- Likelihood: Components fail due to a variety of causes on these transmission lines every year
- Consequence: Usually it is inconsequential but in the case of a radial feed line it could result in customers going dark for a short period of time until crews can be dispatched to restore service.

Safety Risk

- Risk that a line structure would fail while an employee is working on the structure which could result in serious injury or even fatality.
- Likelihood: Rare – wood poles and hardware usually are replaced before they would get in a condition that would pose a safety hazard to employees that might have to work on these structures and lines.
- Consequence: Significant consequence – loss of human life.

Availability Risk

- Risk that a backlog of transmission line maintenance and capital replacement work could accumulate such that planned outages would be difficult and if not possible to schedule to complete the work in a timely manner.
- Likelihood: Likely to happen every year and limit the amount of work that could be completed.
- Consequences: As a result of not getting a planned outage to complete work may result in a future unplanned outage where work would be completed in an emergency situation.

Adequacy Risk

- Risk that a transmission line may not have adequate capacity to meet required future demand.
- Likelihood: Rare – load growth in region relatively flat and not expected to be significant driver for sustain program.
- Consequence: Significant – may result in customers not being serviced, outage.

Asset strategy – Wood Lines

- **Systematic replacement of aging line assets.** Asset replacement program evolves from a wood pole condition-centric program to a comprehensive approach that considers health of all line components, line performance (actual and anticipated) and criticality.
  - **Worst Performing Circuits.** When overall condition and performance of lines deteriorate to the point that it poses an unacceptable risk to meeting asset objectives, then these lines are targeted for future replacement. Transmission lines will be prioritized for replacement based on condition, performance and line importance and criticality.
  - **Obsolete components will be replaced.** Opportunities to replace obsolete components with standard components in conjunction with other scheduled work and replacement opportunities will be considered. For example, copper conductor no longer manufactured and difficult to repair and find spare parts.

- **Pole Replacement.** When poles fail to meet the required strength and their condition has deteriorated to the point that it poses a risk to individual component failure, i.e. classified as a danger pole, then these poles will be scheduled for replacement within 12 months.
- **Timely and comprehensive line inspections.** Line working patrols are conducted annually on all transmission lines. Working patrols are conducted per the BPA Transmission Line Maintenance standards and guidelines.
- **Managing backlog of line conditions.** Proactively manage backlog of conditions (problems) found through working patrols and logged for later repair or replacement.

Asset strategy – Wood Lines

- **Transmission line rebuild execution strategy:**
  - **Standardization of replacement components**. Standardization of structures, conductor and insulators when rebuilding. Components stock items and quicker to restore service in the event of an unplanned outage.
  - **Utilize Owner/Engineers.** Design work, for existing line rebuilds will be contracted to Owners/ Engineers when the workload for design exceeds what can be done with BPA design resources.
  - **Contract rebuilds.** With the exception of small rebuild jobs, most of this work will be performed by contractors.
- **Identify additional asset health data needs and develop a process to collect, store and analyze the data**.
  - Develop short-term plan that fills the asset health data gaps on specific line components where data is lacking. Assess retired component health.
  - Develop a long-term plan for collecting asset condition assessment data for all line components
  - TAS is an important part of these plans
- **Fiber optic cable replacement and maintenance.** In conjunction with partial and major line rebuild projects, fiber optic cable, if present, will be evaluated and assessed for replacement.

Planning estimates – Wood Lines

Capital cost – direct dollars

Capital - System Replacements	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
LINES - WOOD POLE LN REBUILDS	42,296,900	41,537,100	43,447,800	41,660,300	42,138,200	40,164,200	43,032,600

STEEL LINES

Assets within program – Steel Lines

BPA's steel transmission lines consists of about 10,800 circuit miles on approximately 43,200 steel lattice towers, steel lattice poles and engineered steel poles. This includes the DC intertie (~260 circuit miles), all of the 500 kV grid (~4500 circuit miles including the AC interties) along with about 80 percent of the 230-345 kV system (~5200 circuit miles) and about 13 percent of the 115 kV system (~900 circuit miles.)

- **Assets consist of:**
  - Lattice towers
  - Lattice poles
  - Engineered steel poles
  - Footings: concrete pier, rock, grillage, plate, pile
  - Guying systems: guy anchors, rods, guy strands, guy insulators
  - Conductor: AAC, AACTW, ACSR, ACSRTW, copper, specials
  - Conductor insulators assemblies and associated hardware: insulator string (ceramic, glass, NCI), suspension shoes, armor rod, vibration dampers, jumpers and jumper attachment hardware, shunts
  - Spacers and spacer dampers
  - Ground wire and associated hardware
  - Fiber optic cables and associated hardware (maintenance currently managed by Transmission Line Maintenance
  - Airway warning: lighting, marker balls

- **Asset systems consist of:**
  - Network critical transmission lines
  - Interties
  - Key points of interconnection with many of our load serving wholesale full and partial requirements customers

Asset objectives – Steel Lines

Reliability Objective

- Performance Objective**:** Reduce or avoid unplanned outages on BPA's most important steel transmission lines (category 1 and 2) due to equipment condition or age related failures.
- Measures: Outage frequency (SAIFI) and duration (SAIDI) due to equipment condition or age related failure
- End-stage Targets: Maintain SAIDI and SAIFI at or below historic averages:
  - Zero Control Chart Violations for SAIDI and SAIFI for category 1 & 2 lines
  - No more than one control chart violation per year for line categories 3 & 4

Availability Objective

- Performance Objective: Ensure BPA's steel transmission lines meet availability targets.
- Measures: Duration of planned outages for maintenance
- End-stage Target: BPA's most important transmission lines (Category 1 and 2) are available for service at least 98.0% of the time.

Safety Objective

- Performance Objective: BPA transmission lines are maintained and operated in a way that limits risk to health and safety of employees working on the lines and to the public
- Measures: Frequency of lost-time accidents and near misses
- End-Stage Target: Lost-time accident frequency rate ≤ 1.5 per 100,000 hours worked, No fatalities occur to BPA employees or contract employees working on BPA facilities

Asset assessment – Steel Lines

- Sixty percent of our 10,800 circuit miles of steel lines are 40 years or older and many still have the original hardware in place.
- Theoretical life expectancy of the most critical active components is 40 years.
- In the 5 year period between 2005 through 2009, we experienced 37outages in excess of 240 minutes that were likely due to material failure.
- The advanced age of components is assumed to increase their likelihood of failure during severe weather.
- We are experiencing material failures that indicate that active components (connectors, insulators, dampers, spacers, airway warnings) have a finite lifespan and are approaching that limit; reliability and availability of the operating line will decrease as a result.
- Failing components could result in extended line outages and possibly a multiple line outage if a span crossing over other lines fails.
- We need to be proactive in addressing these aging assets and avoid putting ourselves in a reactive mode with regard to material failure on our transmission lines.
- Maintenance costs to repair or replace failing components in a piece meal fashion will be less cost effective than a proactive whole line component replacement approach.

Risks to meeting the objectives – Steel Lines

Reliability Risk

- Components which are approaching or have reached their end-of-life begin to fail and continue to fail in increasing numbers, resulting in an increased likelihood of unplanned outages.
- Likelihood: Very likely. Line components that experience mechanical load cycles have a finite lifespan; eventual failure is inevitable, even more so for those components considered to be a high risk of failure.
- Consequence: Significant
  - Reliability of the operating line will decrease
  - SAIFI and SAIDI end-stage targets will increasingly not be met
  - Failing components could result in extended line outages
  - Maintenance costs to repair or replace failing components in a piece meal fashion will be less cost effective than a proactive whole line component replacement approach
  - Station equipment will experience increased duty with increasing automatic outages
  - Staff will be diverted from implementing planned program work

Availability Risk

- The anticipated increase of replacement work will lead to an increasing frequency of planned outages resulting in decreased transmission line availability.
- Likelihood: Likely. Line components that experience mechanical load cycles have a finite life expectancy; eventual failure is inevitable and without a systematic approach to preemptive replacement, the failure rate will likely be unmanageable from a maintenance perspective.
- Consequence: Significant
  - Maintenance backlog will increase to an unsustainable level.
  - Maintenance costs to repair or replace failing components in a piece meal fashion will be less cost effective than a proactive whole line component replacement approach.
  - Availability of the operating line will decrease overtime, until enough hardware has been replaced to move the line out of a high maintenance category.

Safety

- Age-related deterioration of line components results in component failure during maintenance activities, storm events, etc, leading to injury or death.
- Likelihood: Low. Depending on the failure mechanism, it may be difficult for field personnel to readily identify materials, like insulators, that have severely deteriorated strength capacity.
- Consequence: Significant – Potential injury or loss of human life

Asset strategy – Steel Lines

- **Insulator Assemblies and Associated Hardware (planned to start 2011)** Capital

- **Replace the entire insulator assembly and associated hardware, shunt deadends and jumper connections.**

  Background: Unlike the spacer damper replacement program where there were obvious physical indicators of components having reached the end of their service life, the condition of the insulator assemblies and associated hardware is not always obvious and can be difficult to ascertain by field observation alone. An on-going strategy for testing retired components will give us the data necessary to appropriately target and pace the program.

  Phase One

  - Replace the full insulator assembly and any associated hardware on discrete line sections.
  - Shunt compression fittings at deadends
  - Based on age of asset, field observation of condition, weather exposure, frequency of material caused outages, line criticality and outage availability, a group of line sections is targeted for the first three years of the program, this list will evolve as new information becomes available.
  - Determine construction resources available and skill enhancement necessary to address hard to take out lines, which are often our most critical.
  - Replacement assemblies will have been reviewed and revised as necessary to meet our current policy to standardize hardware components when ever possible.
  - As insulator assemblies and associated hardware are replaced, a statistically significant sampling of the retired population must be evaluated to determine actual component condition, help refine service life predictions and identify predictors of urgency.
  - These evaluations will give us the data necessary to determine the pace at which this effort should move forward over the long term.
  - TAS implementation is critical to the sustain programs

Asset strategy – Steel Lines

- **Insulator Assemblies and Associated Hardware (continued)**

  Phase Two (on-going:)
  - Reevaluate the strategy for insulator assembly and associated hardware replacement for the next multi-year program period based on retired component analysis and other phase one program lessons learned.
  - Structure the next three to five year program according to urgency and critical indicators uncovered in phase one.
  - Continue to refine condition data collection efforts to best meet asset management needs

- Airway Marking (currently underway) Expense
  - Program started in 2004
  - Theoretical lifespan is 10 years for the fixture and 2-4 years for the flashtube.
  - Region expense budgets may allow between two and six towers per year (between $5K and $60K)
  - Program cost to date is about $3 million
  - Replacements prioritized based on criticality, condition and maintenance frequency and complexity
  - Standardizing around low maintenance, self-contained fixtures
  - Replace marker balls in conjunction with spacer replacement when possible
  - Program tracking is currently done by the PM on a locally maintained list, TAS will be taking over this function eventually.

- Steel Tower Components (strategy development to begin 2011) Expense/Capital
  - A steel transmission tower has a theoretical lifespan of 100 years, and footings up to 80 years.
  - Underground components may have corrosion issues that shorten this lifespan
  - Points of interface between the tower and the insulator string may experience accelerated wear.
  - Develop a systematic way to assess, document and track over time the condition of these passive components and their more vulnerable subparts. The expectation is that TAS will provide the means for collecting, storing and tracking this information.

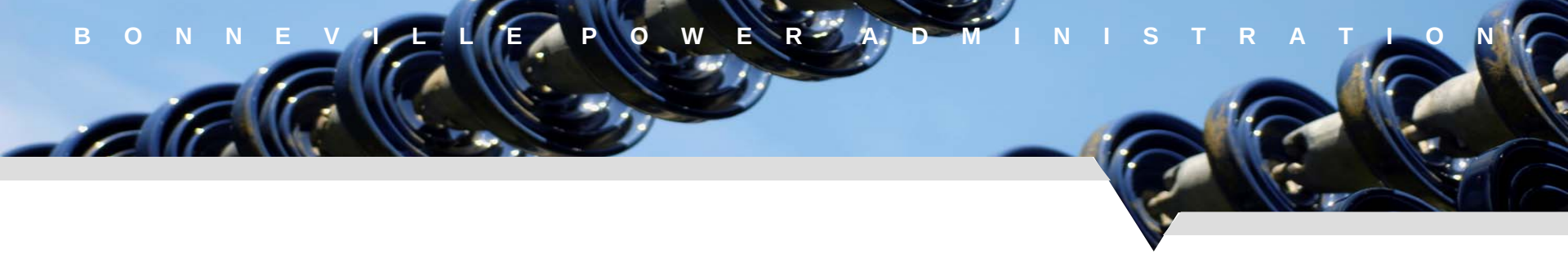
Asset strategy – Steel Lines

- Developing and Implementing assessment strategies for all transmission line components.
  - Working with our utility partners to share information, the entire industry is facing this issue
  - Developing and validating testing and assessment methods
  - Determining what parameters should be documented by TLM in TAS
  - Determining condition thresholds that will guide program schedule.
  - Component testing, assessment and tracking

- Other replacement and maintenance activities
  - Tower steel repair
  - Footing repair and protection
  - Guying repair or replacement
  - Conductor splice reinforcement – shunting
  - Premature spacer replacement due to material quality issues

Capital - System Replacements	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
LINES - STEEL HARDWARE REPLCMT [2]	16,091,300	20,551,800	12,772,300	13,032,800	13,288,900	13,542,400	13,794,000

[2] Dollars reported are direct dollars



POWER SYSTEM CONTROL (PSC) AND COMMUNICATIONS

Assets within program – PSC/Communications

- **Approximately 3,000 miles of fiber optic cable (predominately overhead)**
  - Predominately ADSS with some OPGW
  - External customers on leased dark fiber
  - Oldest fiber installed in 1995
- **Analog/Digital Telecom backbone**
  - Analog system at the end of its life. No longer supported by manufacturer
  - SONET based with 106+ optical nodes
  - Over 4,000 circuits on backbone
  - Covers entire BPA service area
  - Used for Operational purposes
- **Mobile Radio System**
  - 65 repeater sites, over 1,000 handheld/mobile units
  - Based on analog system and not supported by manufacturers
  - Used for Operational purposes
- **OMET (Optical Ethernet)**
  - New transport providing Ethernet connectivity for SMART Grid
- **Control and data functions enabling power system reliability:**
  - Transfer Trip/RAS
  - SCADA
  - Telemetering
  - Supervisory Control
- **Auxiliary systems supporting people, safety, and control systems:**
  - AC/DC Systems
  - Telephone systems
  - PA, Annunciator, audible warning systems
  - GPS, Fault Locator
  - Amplifiers, signal distribution

Asset objectives – PSC/Communications

Reliability Objective

- Performance objective: Minimize the number and frequency of unplanned communications or control outages that impact power system operation.
- Frequency of unplanned outages – Outage frequency does not impede power system operations
- Duration of unplanned outages – Outage lengths do not result in de-rating of transmission facilities
- Misoperations – potential sources of misoperations are managed to minimize risk of a major event

Availability Objective

- Performance objective: Optimize availability of service from BPA's communications and control systems.
- Measure: WECC availability criteria for critical circuits
- End-stage Target: BPA's communication and control systems support power system reliability

Safety Objective

- Performance objective: The lost-time accident frequency rate is ≤ 1.5 incidents per 100,000 hours worked. No fatalities occur to BPA employees or contract employees working on BPA facilities
- Measures: Lost-time accident frequency rate and near misses
- End-Stage Target: Set agency-wide at less than or equal to 1.5 accident per 100,000 hours worked.
- Reliable voice communications is available to work crews

Asset assessment – PSC/Communications

- Approximately 22% of communications and control systems are over 20 years old (aging asset problem.)
- Expected life is 7 – 12 years averaging across all equipment types.
- Competing priorities in the last several years has resulted in a huge replacement backlog.
- Overall performance of these assets is degrading leading to an exponentially increasing risk of reliability concerns and major event risks triggered by aging equipment.
- The analog microwave system has reached end of life with no manufacturer support. Large quantities of analog terminal equipment do not operate reliably on digital communications, resulting in system reliability, major event, and security risks triggered by misoperations.
- False trips have occurred due to incompatibility issues between analog and digital.
- Sections of fiber cable system have limited capacity remaining and no longer supported by manufacturer.
- Constraints limit the level of maintenance and construction activity each year due to availability of resources and planned outages.
- Resource constraints with the continued expansion of the communication system for support of generation integration.
- Acquiring and maintaining adequate levels of funding, FTE resources, skills and materials to achieve a long-term sustainable replacement program focused on supporting power system reliability.

Risks to meeting the objectives – PSC/Communications

Reliability Risk

- Risk that a component (control or communication) will misoperate or fail to operate resulting in an unplanned transmission line outage
- Likelihood: several misoperations or failures occur each year. The aging of the equipment and the push to convert to digital communications compounds the problem
- Consequence: Usually minor, but misoperation of certain components could result in significant outages to portions of the power system until proper functionality can be restored

Availability Risk

- Risk that a backlog of communications maintenance and capital replacement and expansion/upgrade work will accumulate such that volume of work would be difficult to complete in a timely manner
- Likelihood: Likely to happen every year and limit the amount of work that could be completed
- Consequences: Result of not getting planned work completed may result in a future unplanned outage where work would be completed in an emergency situation

Safety Risk

- Risk that voice communication is unavailable to maintenance crews when needed to complete work and remain in contact with Dispatch. Also risk of misoperation (or lack of operation) of critical circuit for line protection.
- Likelihood:
  - Voice - unlikely, but has happened – many areas of the system have cell phone service which provides a back up. There are areas that are not covered by commercial services where line crews in particular rely on mobile radios for dispatching and safety functions.
  - Line Protection – unlikely, however have had several false trips over the last few years.
- Consequence: Significant consequence – serious injury or loss of human life

Asset strategy – PSC/Communications

- **Systematic Replacement of aging communications and control assets.** Asset replacement program evolves from a "do what you can" program to a comprehensive approach that considers health and performance of all system components to maximize value of replacement work to power system reliability (actual and anticipated)
  - **Worst Performing Components.** Focus replacement efforts on transitioning most critical functions from analog to digital terminal equipment on digital communications
  - **Obsolete components will be replaced.** Opportunities to replace obsolete components with current standard components in conjunction with other scheduled work and replacement opportunities will be considered. For example, coordinating with relay and protection projects
- **Managing backlog. Proactively manage backlog of conditions to minimize impacts to power system reliability**
- **Communications replacement execution strategy**
  - **Standardization of replacement components.** Standardizes components and systems to the extent possible. Improves interoperability of components and minimizes spares and training costs. Components stock items and quicker to restore
  - **Utilize Contract resources for Plan/Design/Build process.** Volume of work to reduce replacement backlog exceeds BPA internal staffing resources in all areas of the Plan/Design/Build process. Significant contract resources will be required to meet the expected workload
- **Indentify Asset Health data needs and develop process to collect the data**. Identify data needs and develop a process for collecting asset condition assessment data communications and control system components
  - Intermediate plan that supports the Transmission Asset System effort and fills in data gaps needed for replacement planning
  - Long-term plan for establishing and maintaining consistent data upkeep practices

Asset Strategy – PSC/Communications

- **Asset Strategy Development Process for Telecommunications Upgrades/Additions and PSC Replacement**
  - A project is currently underway to develop a comprehensive Asset Strategy for Telecommunications/PSC to address the backlog of replacements and growth needs of the system.
    - Telecom Planning Lead and PSC Sustain Program Manager are working with Agency Asset Management and consultant to evaluate the current program and develop alternatives to meet the challenges of the additions and replacement needs
    - Develop a comprehensive model of the variables impacting the strategy decision
    - Evaluate the alternatives
    - Select the strategy that best balances power system reliability, communications and control system needs and ability to execute the strategy
    - The end goal is a strategy with long-term momentum for funding, FTE resources, skills, materials and project management that supports power system reliability and is positioned for future system needs

Planning estimates – PSC and Communications

Capital cost – direct dollars

PSC Sustain Planning Estimates

Capital - System Replacements	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
PSC - FIN/OP NETWORKS	185,100	235,500	240,200	245,100	374,800	382,000	389,100
PSC - SCADA/TELEMTRY/SUP CNTRL	3,605,300	4,618,800	4,909,200	5,844,700	5,959,500	6,941,400	7,070,300
PSC - TELEPHONE SYSTEMS	625,800	540,600	305,700	345,300	408,900	416,700	424,400
PSC - TLECOM TRANSPORT	1,514,500	1,156,000	1,179,000	1,203,000	1,635,600	1,666,800	1,697,700
PSC - TRANSFER TRIP	8,413,700	5,137,900	6,113,300	6,683,500	6,814,800	6,944,800	7,073,900
PSC- TELECOM SUPPORT EQUIPMENT	1,809,000	1,250,200	1,414,800	1,755,500	1,790,000	1,939,900	1,976,000
TOTAL PSC	**16,153,400**	**12,939,000**	**14,162,200**	**16,077,100**	**16,983,600**	**18,291,600**	**18,631,400**

Communications Upgrades and Additions Planning Estimates

Capital - Upgrades & Additions	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
FIBER OPTICS AND TERMINALS	21,560,200	39,001,300	35,260,400	32,126,500	16,014,800	5,208,600	6,248,600

SYSTEM PROTECTION AND CONTROL (SPC)

Assets within program - SPC

- **Protective relays: provide protection for all power system components including transmission lines, substation busses, transformers, etc. from 12.5kV to 500kV**
  - 1315 electro-mechanical and electronic (non-micro processor) relay terminals
  - 1674 digital (micro processor) relay terminals
  - Remedial action schemes (RAS) are special protection schemes included in this category; RAS equipment within the SPC program consists of input/output (I/O) relays for line loss logic and generation and load dropping, power rate relays, and logic controllers
- **Sequential event recorders (SER): gathers and time stamps discrete data on substation equipment status**
  - 140 SER units in BPA's more critical substations
  - Provides real time and historical data locally and remotely to the control centers via SCADA
- **Digital fault recorders (DFR): monitors power system equipment voltage and current waveforms and records this data during disturbances**
  - 105 DFR units in BPA's more critical substations
  - Provides historical data for disturbance analysis and troubleshooting
- **Meters:**
  - Approximately 1600 revenue and interchange meters are in operation at BPA and customer owned facilities
  - Data from revenue meters is used by BPA's billing organization to account for power entering and leaving the BPA power system
  - Interchange meters measure power entering or leaving the BPA balancing authority area
  - Some revenue meters and all interchange meters provide data for automatic generation control (AGC)
- **Control and indication:**
  - Control equipment includes auto sectionalizing, dead bus clearing, auto synchronizing schemes and synchronous control units (SCU)
  - Indicating equipment includes phasor measurement units (PMU), panel meters, control consoles, transformer temperature monitors, recording voltmeters, battery voltmeters, battery ground monitors, SCADA transducers and relay communication processors

Asset objectives – SPC

SPC Equipment Health Condition

- Performance Objective**:** Relays and other critical SPC equipment are at low risk of failure or obsolescence
- Measures**:**
  - Standardization and frequency of condition assessment for relays and SERS
  - Percent of relays and SERS that are assessed to be in poor health condition based on maintainability and obsolescence
- End-stage targets**:**
  - Health condition of relays and SERS is assessed consistent with (1) condition-based standards, (2) standardized inspection protocols (including schedule), and (3) standardized risk assessment criteria
  - By the end of FY 2016, no more than 5 percent of total protective relays and no more than 20 percent of SERS are in poor health condition

Protective Relay Reliability

- Performance Objective: Protective relays clear power system faults sufficiently fast to prevent primary equipment damage or power system instability and ensure personnel and public safety
- Measure: Number of relay misoperations reported in the Outage Analysis and Reporting System (OARS)
- End-stage target:
  - 0.5% or less of relay misoperations reported in OARS each year are a result of relay malfunction (not setting error) where the relay failed to operate for a fault inside of its zone of protection
  - 2.0% or less of relay misoperations reported in OARS each year are a result of relay setting error where the relay failed to operate for a fault inside of its zone of protection

Protective Relay Security (assurance a relay will not trip inappropriately or “false trip”)

- Performance Objective: When no fault is present and under normal operating conditions, relays should not initiate a trip as a result of component or equipment failure within the relay
- Measure: Number of relay misoperations reported in the Outage Analysis and Reporting System (OARS)
- End-stage target:
  - 0.5% or less of relay misoperations reported in OARS each year are a result of relay malfunction (not setting error) where the relay operated for a fault outside of its zone of protection or operated when there was no fault on the system
  - 1.0% or less of relay misoperations reported in OARS each year are a result of relay setting error where the relay operated for a fault outside of its zone of protection or operated when there was no fault on the system

Asset objectives – SPC

Sequential Events Recorder Accuracy

- Performance Objective: All events that occur on monitored and in-service substation equipment are recorded and time stamped within the accuracy of the GPS clock
- Measures: Number of reported loss of synchronization alarms (no system is presently in place to automatically monitor and collect instances of SER loss of sync alarms)
- End-stage Target: SER is synchronized with the station GPS clock to facilitate coordination of SER data with data from other time synchronized substation data recording devices

Sequential Events Recorder Availability/Reliability

- Performance Objective: Recorded SER data is immediately available to field and control center personnel in electronic form and hardcopy format at the substation for monitoring the operation and health of the power system and to analyze or troubleshoot system problems
- Measures: Number of reported SER trouble alarms (no system is presently in place to automatically monitor and collect instances of SER trouble alarms)
- End-stage Target: Chronologically continuous substation event data is recorded by the SER and is immediately available for use by operations and maintenance personnel locally and remotely where access exists

Asset assessment - SPC

- Lack of sufficient capital funding to replace SPC equipment in the last 15 years has resulted in a large inventory of obsolete (no manufacturer support, spare parts are not available) equipment still in operation
- 44% of nearly 3000 protective relay terminals are equipped with obsolete electro-mechanical or electronic relays
- 53% of 157 sequential event recorders are obsolete; another 27% are on the edge of obsolescence.
- 79% of 1600 revenue and interchange meters are 30 year old analog electronic technology that is nearly obsolete
- As SPC equipment remains in operation past its life expectancy, probability of failure is increasing and the risk associated with failure grows
- Expertise to maintain, troubleshoot and repair this obsolete equipment is held only by BPA personnel since manufacturer support no longer exists; most of these experts are either at or within 3 years of retirement age
- The training burden for new and current SPC personnel has grown significantly as new digital equipment is added to the system without complete retirement of obsolete technologies
- The increase in the capital replacement program necessary to retire the inventory of obsolete equipment will present challenges to BPA processes that will have to be overcome; the significant number of outages on critical transmission lines and substation components necessary to replace obsolete equipment may limit the rate at which replacements can be accomplished

Asset strategy – SPC

- **Systematic replacement of obsolete assets:** In the context of SPC, obsolete is defined as 1) no manufacturer support of any kind and 2) spare parts are only available from cannibalization of retired equipment
  - **Assets classified in poor condition:** Assets that pose the greatest risk of failure will be replaced on a 5 year plan; these assets include the electronic (early 80's to mid 90's vintage) protective relays for 500 kV transmission lines and 115 kV and 230 kV substation buses
  - **Assets classified in impaired condition:** Risk of failure of these assets is high but due to the somewhat lower system impact in the event of failure, these assets will be replaced on less aggressive timelines; this includes
    - Electro-mechanical protective relays across all voltages and application types; these relays will be replaced on a 10 year plan
    - The oldest model of sequential event recorder employed on the BPA system; these SER's will be replaced on an 8 year plan
- **Ongoing replacement of aging assets:** Establish replacement programs for all SPC assets based on equipment expected life, corrective maintenance data and equipment population size to ensure acceptable levels of asset health are maintained
- **Continue comprehensive preventive maintenance:** All SPC assets have established preventive maintenance intervals and procedures in place; PM practices will be continuously evaluated and improved to provide maximum asset performance and minimum life cycle cost

Capital - System Replacements	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
SPC - DFRS (Digital Fault Recorders)	3,510,600	251,500	-	-	-	-	-
SPC - METERING	262,900	535,200	545,800	557,000	567,900	578,700	589,500
SPC - RELAYS	2,835,400	10,410,800	22,313,400	31,387,800	32,004,600	32,615,200	25,733,500
SPC - SER (Sequential Event Recorders)	1,407,200	3,341,800	3,235,700	3,301,600	3,366,500	3,430,700	3,494,500
TOTAL SPC [2]	**8,016,100**	**14,539,300**	**26,094,900**	**35,246,400**	**35,939,000**	**36,624,600**	**29,817,500**

[2] Dollars reported are direct dollars

SUBSTATION - AC

Assets within program – Substation - AC

- **Approximately 382 AC Substations with 60 stations operating at 500 kV. Substation facilities include the following major equipment types and quantities in service (qty):**
  - Power Transformers (586), Reactors (117), & Fuses
  - Switchgear – Breakers & Circuit Switchers (2030), & Disconnects (6705)
  - Instrument Transformers (7095) & Arresters (3457)
  - Capacitors (612 groups)
  - Station Auxiliary – Control Batteries (767), Station Service (1084), Generators (86), Cabling
  - Substation Bus & Structures – Substation Structures, Insulators, Bus, Seismic

- **Substations that interconnect multiple utilities, generators, or serve to transfer power are considered "Network Facilities" – typical voltages are 230 kV – 500 kV**

- **Substations that serve radial utility loads are "Delivery Facilities" – delivery voltages range from 4160V up to 230 kV, the vast majority deliver power from 12.5 kV to 115 Kv**

- **Program does not include assets that incorporate a significant portion of Power Electronic Equipment:**
  - Direct current (dc) facilities
  - Static Var Compensators (SVC)
  - Series Capacitors

Asset objectives – Substation - AC

Reliability Objective

- Minimize the number and frequency of planned and unplanned outages (maintenance and in service failures) of substation high voltage equipment affecting transmission availability and system capacity

- Measure: Frequency of unplanned outages resulting in line outages – SAIFI
- End-Stage Target: Control Chart Violations

- Measure: Duration of unplanned outages resulting in line outages- SAIDI
- End-Stage Target: Control Chart Violations

Availability Objective

- Optimize availability of service from BPA's substation facilities

- Measure: Substation equipment outages affecting Available Transmission Capacity (ATC) and Operating Transmission Capacity (OTC)

- Measure: Substation terminal equipment outages affecting transmission line availability - including planned and unplanned outages

Safety Objective

- The lost-time accident frequency rate is ≤ 1.5 incidents per 100,000 hours worked. No fatalities occur to BPA employees or contract employees working on BPA facilities

- Measures: Lost-time accident frequency rate and near misses
- End-Stage Target: Set agency-wide at less than or equal to 1.5 accident per 100,000 hours worked

Asset assessment – Substation - AC

- Nearly 40% of all power transformers are over 50 years old with an average expected life span of 45 years - aging asset problem
- Approximately 9% of circuit breakers are over 45 years old and 20% are over 35 years old. Expected life span of circuit breakers varies from 25 to 35 years depending on type. Major problem – lack of spare parts reduces ability to repair/extend life
- Instrument transformers have an average expected life of 30 years. Approximately 13% are 45 + years and 32% are 35 + years. Inability to obtain bus outages for maintenance is a major factor and the practice of replacing only one unit when sister units should also be replaced
- Station Service (SS) facilities are typically run to failure with transformers, switches, and individual battery cells being the most common items to be replaced. As such the remaining SS cables, panels, and control battery sets are often much older
- Resource constraints - Additional design and construction resources are needed to reduce the backlog of needed replacements. Forced outages due to in-service failures reduce the ability to accomplish both planned maintenance and planned infrastructure improvements

Risks to meeting the objectives – Substation - AC

Reliability Risk

- High voltage (HV) equipment in-service failures pose a reliability risk in terms of forced outages due to faults caused by the equipment failure
- Likelihood: Likely 1-2 power transformer failures every 3 years, 5-6 breaker failures per year, 10-12 Instrument transformer failures per year.– Active monitoring of major equipment is practiced but is not feasible or financially practical for all equipment
- Consequence: Radial service HV failures will force a customer outage – duration varies from hours to days. Major 230 kV and 500 kV have redundancy but for any contingencies or faults on a bus forced outages will result

  - Target 1: For power transformers, reactors, and most switchgear the replacement strategy is not to exceed the current average failure rates over the next 10 years – See slides on asset strategy for transformers and switchgear

  - Target 2: For instrument transformers and station service equipment (transformers, DC batteries, and cable) the replacement strategy is to reduce the current rate of in-service (emergency) failures by approximately 25% over the next 10 years to improve both reliability and optimal use of resources - see slides on asset strategy for instrument transformers

Availability Risk

- Major HV equipment failures particularly for power transformers and switchgear can reduce Available Transmission Capacity and Operating Transmission Capacity
- Likelihood: Likely to happen every year
- Consequences: Forced curtailments or customer outages

Safety Risk

- Risk that a HV equipment failure may injure onsite workers. Risk to public is low
- Likelihood: Rare – Industry standards are practiced and followed. Most failures occur when workers are not present
- Consequence: Significant consequence – loss of human life

Asset strategy – Substation - AC

- **Planned Replacement of High Risk Assets:** Asset replacement program is driven by health, criticality and risk. Each equipment type has specific condition factors that are either periodically inspected or actively monitored. Replacements are based on historical performance and projected failures of similar models or designs
  - **Reliability Risk:** Substation equipment will be prioritized for replacement based on condition, performance and impact on system reliability relative to failure consequences
  - **Spare parts:** Equipment requiring parts that can no longer be obtained or remanufactured at reasonable cost will be replaced with the goal of planned replacement prior to a critical component failure. Critical parts will be salvaged from retired equipment to extend the life of remaining sister units
  - **Balancing Resources - Replace vs. Maintain**: Equipment may be replaced in lieu of continued maintenance when the cost of materials/parts, labor, and time out of service (reliability exposure) do not provide a significant life extension, typically 5 years for switchgear

- **Resource Strategy**
  - Contract for Owner-Engineer services for groups of switchgear replacements and battery replacements that are similar in design and materials. Will help reduce the backlog of replacements – better manage the peak cycles in design and construction work
  - Utilize master agreements with equipment vendors for optimum pricing and delivery for all types of HV equipment. New strategic sourcing programs have resulted in master agreements for power transformers and insulators, shaving both cost and delivery time over individually competed equipment. Strategic sourcing for power circuit breakers is underway

Planning estimates – Substation – AC

Capital Cost – direct dollars

CAPITAL - SYSTEM REPLACEMENTS	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
SUB CAPACITORS	724,600	-	-	-	-	-	-
SUB CIRCUIT BREAKER REPLACMENT	10,054,400	20,213,500	21,985,000	19,200,200	14,630,300	9,109,300	9,137,100
SUB CVT/PT/CT REPLACEMENT	1,490,300	1,523,200	1,504,300	1,258,700	1,249,400	1,273,200	1,385,300
SUB LOW VOLTAGE AUX.	4,802,100	5,651,700	5,075,100	2,283,500	3,373,300	2,826,500	3,259,900
SUB NON-ELECTRIC PLANT	485,900	750,400	691,000	931,200	539,500	-	-
SUB TRANSFORMERS & REACTORS	5,351,100	5,710,600	5,900,400	5,982,800	5,465,500	4,919,200	5,187,500
TOTAL SUB AC	**22,908,400**	**33,849,400**	**35,155,800**	**29,656,400**	**25,258,000**	**18,128,200**	**18,969,800**

SUBSTATION - DC

Assets within program – Substation - DC

- **Celilo HVDC Converter Station (HVDC)**
  - +/- 500 kVDC Bi-Pole rated at 3100A per pole. Overall rating 3100 MW.
  - Original installed in 1970 as +/- 400 kVDC, 1800 A bi-pole with 1 converter per pole and 3 series groups per converter
  - In 1984 a 100 kV group was added in series per pole and an increase in current raised the rating to +/- 500 kVDC, 2000 A
  - In 1988 a 500 kVDC, 1100 A converter was added in parallel per pole to increase to the present rating
  - These increases over the years have resulted in several vintages of controls and equipment that have to work together rendering a very complicated station to operate and maintain to adequate levels

- **Static VAR Compensators (FACTS)**
  - Keeler SVC, rated +350/-300 MVARS at 230 kV - installed 1992 to support Portland area network voltage
  - Maple Valley SVC, rated +350/-300 MVARS at 230 kV - installed 1992 to support Seattle area network voltage
  - Rogue SVC, rated +50/-45 MVAR at 115 kV – under construction

- **Series Capacitor Banks (FACTS)**
  - 11 - 500 kV Series Capacitor banks for the California Oregon Intertie (COI) transmission
  - 10 - 500 kV Series Capacitor banks to support AC transmission from eastern MT to Puget Sound area
  - 1 – 500 kV Thyristor Controlled Series Capacitor (TCSC) bank initially built as an EPRI research project now supports transmission flow west of McNary

Asset objectives – Substation - DC

Reliability Objective

- Performance objective: Reduce or avoid unplanned outages on BPA's most important transmission lines
- Measure: Outage frequency (SAIFI) and duration (SAIDI) due to equipment age related failure, do not exceed control chart violation limits by line importance
- End-stage Target: Maintain SAIDI and SAIFI at or below historic averages for transmission lines.
  - Zero Control Chart Violations for SAIDI and SAIFI

Availability Objective

- Performance objective: Optimize availability of service from BPA's HVDC and FACTS facilities
- Measure: Substation equipment outages affecting Available Transmission Capacity (ATC) and Operating Transmission Capacity (OTC)
- End-Stage Target: Substation terminal equipment outages affecting transmission line availability - including planned and unplanned outages

Safety Objective

- Performance objective: The lost-time accident frequency rate is ≤ 1.5 incidents per 100,000 hours worked. No fatalities occur to BPA employees or contract employees working on BPA facilities
- Measures: Lost-time accident frequency rate and near misses
- End-Stage Target: Set agency-wide at less than or equal to 1.5 accident per 100,000 hours worked

Asset assessment – Substation - DC

- Celilo HVDC Terminal was originally constructed 40 years ago. Since that time the station has been expanded and modified over the years resulting in a mixture of technology vintages which is becoming increasingly difficult to operate and maintain. Both the HVDC controls and the main circuit equipment are in very poor condition due to age and complexity. Much of the station equipment is no longer supported by the manufacturer, and the converter station is kept operational though a dwindling supply of spare parts

- The control systems for the SVC's at Keeler and Maple Valley are no longer supported by the manufacturer and spares are difficult to obtain. Both stations have experienced control malfunctions that are difficult to diagnose and fix. The main circuit equipment is generally in very good condition

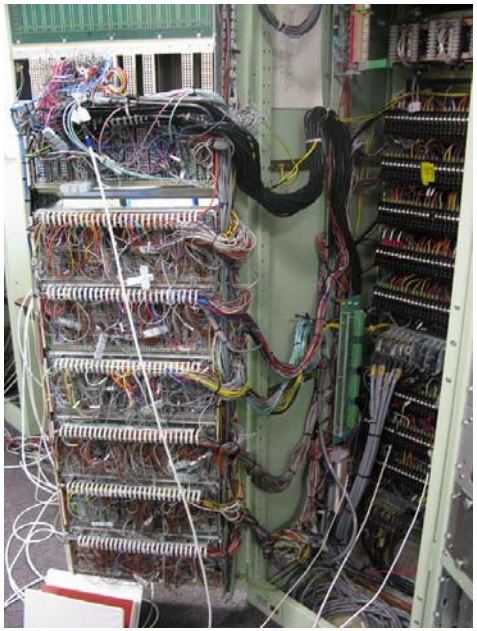
- Nine of eleven 500 kV Series Capacitors on the COI have control systems that are no longer supported by the manufacturer and some spare parts are no longer available. All banks from that vintage have been experiencing various degrees of control malfunction. The main circuit equipment is generally in very good condition

- The TCSC at Slatt needs to be kept in service another 10 years, until other network enhancements are made. A project is currently underway to upgrade various systems and obtain additional specialized spare parts

Risks if objectives are not met – Substation - DC

Reliability Risk

- HVDC and FACTS equipment failures pose a reliability risk in terms of forced outages due to equipment failure.
- Likelihood: HVDC Equipment - Very likely. Statistically overall PDCI reliability is degraded by the Celilo terminal performance more than Sylmar or the DC transmission line. Very high chance that long outages will occur in the next few years
- Consequence: Loss of the PDCI during spring run-off will cause BPA to miss opportunities for surplus power sales and can also restricts flow on the COI
- Likelihood: FACTS equipment – Somewhat likely. SVC systems and older series capacitor systems have a reasonable chance of causing unplanned outages
- Consequence: Loss of 230 kV SVC's will result in higher potential for voltage collapse for certain system conditions



Availability Risk

- HVDC and FACTS equipment failures can reduce Available Transmission Capacity and Operating Transmission Capacity.
- Likelihood: HVDC equipment – Very likely to happen every year, FACTS Equipment – somewhat likely to happen every year
- Consequences: Forced curtailments on major transmission paths

Safety Risk

- Risk that a HVDC or FACTS equipment failure may injure onsite workers.
- Likelihood: HVDC equipment – Higher than any other point on the transmission system. Several violent failures in the last 8-10 years. FACTS Equipment – rare
- Consequence: Significant consequence – loss of human life

Asset strategy – Substation - DC

- **HVDC Equipment - Celilo.** An asset strategy is being developed for the Celilo terminal. Engineering studies have resulted in two best options:
  - Refurbishment of the terminal – Retain the 4 converter main circuit architecture and replace equipment in a programmatic fashion over several years to maintain reliability and availability
  - Up-rate of the terminal – If the PDCI southern partners agree, a 600 MW increase of the PDCI rating is achievable for ~25% over the cost of refurbishment. This would result in added revenue possibility as well as a completely new terminal in a simplified 2 converter architecture
- **FACTS Equipment – SVC's.** Both SVC's (Keeler & Maple Valley) are the same age and were built by the same vendor. The main circuit equipment (transformers, valves, reactors and filters) is in very good shape and could last another 20 years if properly maintained. Strategy is to replace the control and protection system only. Rogue SVC is under construction
- **FACTS Equipment – Fixed Series Capacitor (FSC) Banks.** The 9 series capacitor banks for the COI are all the same age and were built by the same vendor. The main circuit equipment is in excellent condition and could last another 20 years. The strategy is to replace the control systems with new redundant digital controls. The remaining FSC banks are relatively new and with regular maintenance could reach design life. Control replacement would be considered in 15 years
- **FACTS Equipment – Thyristor Controlled Series Capacitor (TCSC) Banks.** Planning has determined that the TCSC needs to be maintained another 10 years before retirement until other system reinforcements are made. A project is underway to accomplish this task and should be finished by the end of FY10

Capital - Upgrades & Additions	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
CELILO UPGRADES PROJECT [2]	11,568,900	47,327,300	43,120,400	7,362,000	-	-	-

CAPITAL - SYSTEM REPLACEMENTS	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
SUB DC							
Series - 3rd AC Tie Control Replacement	1,304,100	5,309,200	5,414,600	1,381,200		-	-
Static VAR Compensator (SVC)			1,637,500	11,696,100	2,271,600		
TOTAL SUBS DC [2]	**1,304,100**	**5,309,200**	**7,052,100**	**13,077,300**	**2,271,600**	**-**	**-**

[2] Dollars reported are direct dollars

CONTROL CENTERS

Assets within program – Control Centers

- Approximately 50 systems that either directly control the Transmission system, or that support real-time decisions.
- All NERC CIP Critical Cyber Assets (13 identified CCA's) run in parallel at both Dittmer and Munro Control Centers (DCC and MCC).
- The remaining ~37 systems are all supported at the DCC, and all but a few are supported at MCC. As systems are replaced, upgraded, or expanded, any systems not yet at MCC are planned to include MCC implementation
- CC systems are managed within a strict Electronic Security Perimeter, and are subject to extensive NERC mandatory reliability requirements (this includes all cyber assets, not just CCA's).
- CC system asset subcomponents include: hardware, operating systems, multi-layered applications, network and other devices.
- The CC Asset Program does not include BPA's IT network or related systems, Commercial Business systems (CBS), and other business systems that do not directly support Transmission real-time operations.
- The CC contains the controlling and monitoring masters for all field remotes. Terminating ends of all communication systems and all digital and analog communications equipment in the CC budgeted and managed via the PSC Program, in coordination with the Transmission Operations' Control Center Hardware Design PSC staff that manage and implement them.

Asset objectives – Control Centers

Reliability & Compliance objective

- Performance objective: Replacement or maintenance actions result in no assets assessed as Critical Risk Level of failure, obsolescence, or noncompliance.
- Measure: Asset condition standards and Health Assessments incorporate sufficient requirements for assets to be NERC CIP and FISMA compliant.
- End-stage Targets: No assets are assessed as "Poor" Health, and "Critical" or "High" Impact, reaching a combined "Critical" Risk Level rating.

Availability objective

- Performance objective: Critical systems meet their respective availability targets.
- Measure: Annual average of scheduled and unscheduled outages of any one instance/site or component of the system
  - Run to failure is not an option for CC assets – the redundant operation standards of the control centers ensures that even if one site (or component) of a system fails, there is automatic fail-over and/or site jurisdictional transfer to maintain service.
  - While one system automatically takes over in the event of an outage, this metric refers to the outage of that specific site system, and does not refer to time with no service (i.e., it's not acceptable for SCADA service to be unavailable for more than a few min.)
  - Scheduled outages include system updates/upgrades, new deployments and various annual testing activities, etc.
- End-stage targets (Targets currently met)
  - SCADA: Available 99.95% per FY
  - AGC: Available 99.975% per FY

- Performance objective: In addition to being redundant, NERC CIP Critical Cyber Assets are deployed in a geographically diverse manner to help ensure continuity of operations in the event of loss of a control center.
- End-stage target: All CCA's are deployed at both Dittmer and Munro Control Centers - Target is currently met.

Refine Standards & Assessments objective

- Performance objective: Refine and approve condition-based standards for CC assets, and assess assets timely against these standards
- End-Stage Target: A plan for completing this effort is adopted by end of FY11 Q3.

Asset assessment – Control Centers

- The rate of technology change has been accelerating so that equipment and infrastructure life spans are significantly shorter than in the past. Yet due to the interdependencies between Control Center (CC) and field equipment installations, replacement strategies require long-term planning and execution. Many systems and technologies must be supported past their normal end-of-life to accommodate this.
- There are increased cyber and physical security challenges and related documentation and reporting requirements to address external mandates (DOE, FERC, NERC, WECC, OMB)
- CC infrastructure has grown (e.g. RAS, SCADA expansion, redundancy with Munro, PSST, redundant AGC, ICCP) while increasing in sophistication. Data and power system interconnections have increased over time as have needs for external coordination (WECC Net, ICCP, etc)
- The power system has changed over the past 30 years. Transmission and generation margins have decreased significantly. Available capacity has significantly declined. Advanced controls and tools have been used to maximize capacity. The availability of these tools and controls is becoming more and more critical (e.g., RAS).
- CC support staff numbers and institutional knowledge are being depleted by retirements. Experience with newer technology is somewhat limited. Critical roles are increasingly being filled by contract staff to support a range of old and new technologies.
- Efforts are currently underway to support cross-training and improve coverage depth for systems and technology, and succession planning, but these efforts are falling behind due to competing priorities.
- The recent increase in Agency expansion strategies (WIT initiatives, Smart Grid, ATC, etc.) is adding pressure towards keeping pace with desired infrastructure expansion while simultaneously maintaining existing assets
- Long-term maintenance and support costs for new systems and infrastructure are not adequately assessed, planned, or allocated when the investments are approved.

Risks to meeting the objectives – Control Centers

Assessment of software applications/systems and hardware health risks

- Asset Health = Likelihood of failure, obsolescence, or noncompliance
  - Assets are given Health ratings that take into account all of their components and the various levels of compliance requirements for our systems
  - Likelihood of failure are indicated by instances of component failures or intermittent system outages (i.e., a hard drive fails repeatedly).
  - Likelihood of obsolescence are indicated by loss of vendor or staff support, or problems with interoperability (i.e., vendor support is discontinued for a component, or component won't interoperate with other key components or systems).
  - Likelihood of noncompliance is indicated by technical feasibility of components or systems to comply with regulatory requirements.
  - In our Health Assessment columns, we've arbitrarily provided 2 columns simply to offer additional granularity in our scoring
- Impact = Severity of Impact to Operations (Critical, High, Moderate, Low), loss of service
- Health X Impact = Risk Level

Assessment of asset management practice risks

- Risks to achieving asset management goals and objectives
- Risk identification/definition (23 total risks) by team
- SME analysis and surveyed prioritization of top 11
- Selection of top 5 for improvement

Asset strategy – Control Centers

- Highest priority projects will be assigned to replacing, upgrading, or maintaining those systems with a Critical Risk Level. At present, nine systems fall in this category
- Projects are underway that should move these nine systems out of the Critical Risk Level. These projects and their estimated delivery expectations are:
  - Munro UPS Upgrade (FY11 delivery)
  - Digital Voice Recording (FY11 delivery)
  - Badger Master Replacement (early FY11 delivery)
  - RODS Replacement projects (FY12 delivery)
  - CCN Critical Infrastructure Service DCC *and* MCC project *(expense project to close network gaps for both DCC/MCC by FY11)*
  - Dittmer Building Management system (project being scoped today for FY11)
- In addition to these projects; maintenance, replacements, and upgrades must also be planned and executed so that systems assessed at "High" risk level ratings do not migrate to the "Critical" risk level over time.
- Many of the systems now rated at "High" risk level will be migrated to Windows platforms to reduce the range of technology support, improve compliance management, and increase interoperability.
- Risk assessments will be updated annually. Risk assessments will use standardized criteria for rating the likelihood and impact of system health consistent with the agency's risk management policy.
- Availability targets for other critical systems will be developed. Data collection, monitoring, and evaluation procedures will be established to support the additional targets. The first set of priority systems to have availability targets developed will be identified by FY11 Q4.

Asset strategy – Control Centers

- A rolling 2-3 year resource plan will be prepared to identify both sustain and expansion workload and skill requirements, allocate existing staff to greatest benefit, and anticipate where staff needs to be added, either BFTE or CFTE. The resource plan will be developed by end of FY11 Q1

- Outline alternative approaches to completing identified work by FY11 Q3, to include assessing:
  - Minimum requirements for expense budget that is sufficient to support current systems and maintenance activities.
  - Contracting strategies for supplementing additional priorities including priority Expansion Program work.
  - Alternative choices for delaying work/projects.

- ***Standards Refinement & Assessment***: A plan for completing condition-based standards refinements and assessment will be adopted by end of FY11 Q3.
  - Ensure a project is launched to complete all new assessment work by the end of FY11 Q3.
  - Standards will be prepared in consultation with PSC and SPC sustain program managers and in consultation with the Transmission Service's Standards group.

- ***Integrated Investment Planning:*** Adopt an integrated investment planning process with PSC and SPC to address related and dependent assets by FY12 Q1.
  - Incorporate the integrated assessment and planning with related PSC/SPC assets, and establish an ongoing mechanism to continue coordinated investment planning.

- ***Asset Information Management:***. Analysis project to include consideration of efficient access to useful financial information for repair vs. replace and other investment planning, project execution, maintenance/support planning and cost management, and other purposes. Project plan should be approved by FY11 Q4.
  - Analysis project will include coordination with the TAS team.
  - Includes outlining and approving the project plan for identifying business and data requirements, evaluation of current systems and data, gaps identification, and proposed solution alternatives for systems and processes

Capital - Upgrades & Additions	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
CC INFASTRUCTURE COMPONENTS	1,682,700	1,070,400	1,965,000	2,784,800	1,703,700	1,157,500	1,179,000
CC SYSTEM & APPLICATION	1,682,700	1,926,700	3,165,800	2,227,800	2,839,500	4,051,100	4,126,400
CONTROL CENTERS	3,996,500	4,495,700	2,510,800	2,784,800	3,407,400	2,893,700	2,947,400
TOTAL CONTROL CENTERS [2]	**7,361,900**	**7,492,800**	**7,641,600**	**7,797,400**	**7,950,600**	**8,102,300**	**8,252,800**

[2] Dollars reported are direct dollars

TOOLS AND EQUIPMENT ACQUISITION PROGRAM (TEAP)

Assets within program – TEAP (Mobile Equipment)

- Comprised of all mobile assets that BPA operates. New purchases of BPA owned equipment funded with capital. All Maintenance and operations cost funded by expense. GSA leased vehicles funded by expense.

- Current Fleet Inventory:
  - 1,198 BPA-owned vehicles including:
    - Man-lifts
    - Cranes
    - Derricks
    - Equipment Trailers
    - Bobcats
    - Bull Dozers
    - Forklifts
  - 903 GSA-leased vehicles including (Expense):
    - Sedans
    - SUV's
    - Pickups
    - Some trailers and large trucks

Asset objectives – TEAP (Mobile Equipment)

The program objectives are to ensure that BPA's fleet is as reliable, safe, adequate, and economical as possible, ensuring maximum system reliability for the transmission infrastructure. This is related specifically to:

Reliability

- Ensure BPA's fleet of mobile equipment meets its original design & function while also meeting employee safety objectives
  - When continued maintenance and repair of equipment is no longer feasible, plans to replace the equipment are developed that consider the unique circumstances of each case.
  - Where similar equipment is used throughout the transmission system, bulk refurbishment and replacement programs are considered to achieve economies of scale.
  - Replace failing existing equipment or to replace equipment that has reached the end of its cost-based useful life.

Safety

- Provide newer equipment that is safer from a technological/ergonomic aspect as well as equipment that has less chance of catastrophic failure due to equipment fatigue and parts failure.

Adequacy

- As our Transmission system has been updated and our capability as a grid increased, our old antiquated equipment (20-40 years old) is having trouble keeping up. This has resulted in the use of innovative techniques by crews to make existing equipment work (at the cost of time and efficiency) as well as increased rental rates for our crews to accomplish the mission.

Availability

- Increase equipment availability and usefulness. If this equipment is not replaced, BPA will incur a higher out of service rate due to increased maintenance requirements associated with equipment overhauls, increased inspections, and increased parts needs and a decrease in availability of equipment.

Asset Assessment – TEAP (Mobile Equipment)

- BPA has a large inventory of heavy mobile equipment that is well beyond its normal expected lifecycle in terms of age (Most equipment identified for replacement has been in the system from 18 to 40 years.)
- Equipment with boom and man-lift capabilities require a major rebuild every six years and it has been deemed more financially advantageous as well as more productive to work towards a replacement of all equipment prior to it's third major overhaul.
- Due to the excessive age of some of this equipment, the basic maintenance and overhauls are difficult and costly due to parts being obsolete and maintenance practices for older equipment being less efficient.
- In all cases, extending the useful life (rebuilding) of existing equipment is no longer practical for reasons such as maintenance costs exceed practical limits, lack of available parts due to age, and metal fatigue from being used for years in rough terrain and harsh conditions.

Risks if objectives are not met – TEAP – Mobile Equipment

Financial

- BPA will see a continuing rise in costs associated with aging equipment such as increased maintenance and unique parts needed.
- As the equipment continues to age, BPA will experience a continuing decrease in BPA owned equipment availability and a subsequent increase in equipment rental fees associated with daily operations. There is no available data on cost savings for owning vs. renting based on usage. Also for a significant number of items, rental is not an option due to the highly specialized nature of the equipment and the special engineering necessary to build it.
- By not funding this project, BPA incurs the risk of a decrease in operational reliability, due to the decreased mechanical reliability of the equipment.

Reliability

- This equipment has reached the end of its useful life and some requires substantial repairs. Unreliable equipment affects crew job efficiency, which affects the reliability level of the transmission system and will increase response times and outage lengths.

Safety

- The equipment identified for replacement has reached the end of its useful life and in a number of cases cannot be relied on to perform their functions efficiently or in the safest manner. This in turn significantly increases the likelihood of an on-site work environment that can quickly turn into an unsafe workplace.

Asset strategy – TEAP – Mobile Equipment

- **Currently under development**
  - Developing lifecycle analysis
  - Fleet “Right Sizing Analysis”
  - Development of a 5+ year replacement plan (Due Spring 2011)

Tools and Equipment (TEAP)

Tools and Equipment

- The lack of a program focused on the tools, machinery and test equipment needed for the crafts to perform their work has left the agency in a deficit in this area.
- The SPC craft has a critical need to purchase new test equipment that will support the new generation of meters and relays.
- PSC crafts will start replacing test equipment that is no longer compatible with the new radio equipment that is being installed on the system.
- General Shops will be replacing 50 year old equipment with new, more efficient equipment that will allow production increases of up to 70% over current practices.
- Sub Maintenance will be purchasing new circuit breaker and transformer testing equipment.
- The loan pool is purchasing tools and equipment that are used throughout the BPA system.
- The Ross laboratory currently has an approved business plan that addresses the need to replace outdated and obsolete test equipment. The Tools and Equipment program will be the conduit for the replacement program for the needed equipment

CAPITAL - SYSTEM REPLACEMENTS	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
TEAP - EQUIPMENT	12,170,500	9,633,600	10,916,500	11,139,100	12,493,800	12,732,200	13,558,200
TEAP - TOOLS	1,051,700	1,070,400	1,091,700	1,113,900	1,135,800	1,157,500	1,179,000
TOTAL TEAP [2]	**13,222,200**	**10,704,000**	**12,008,200**	**12,253,000**	**13,629,600**	**13,889,700**	**14,737,200**

[2] Dollars reported are direct dollars

RIGHTS OF WAY (ROW)

Assets within program – Rights of Way

Rights of Way are comprised of corridors of land and access roads around and leading to the transmission lines and fiber optic cables, substations, and non-electric facilities. BPA has varying levels of legal rights to the land and access roads.

Corridors:

- 331 transmission lines for a total of 14,888 circuit miles of transmission line
- BPA maintains 266,589 acres of Right-of-Way[1] transmission line corridors (144,102 are treatable acres[2])
- ~80,000 tracts of easement
- 289 substations

Access Roads:

- 11,500 miles of access road, including:
- Road travel way
- Trail travel way
- Bridges
- Culverts for water drainage
- Gates

Land (Capital) Assets

- Land rights for all existing facilities, perpetual easement rights, fee rights, leases, special use permits (government lands), and term easements
  - 30% (80,761) of Transmission ROW acres have vegetation agreements
  - 22% agriculture
  - 53% landscaping
  - 17% tree (orchards and Christmas trees)
  - 8% individual tree agreements

1. Reference: Agency Decision Framework – Align Vegetation Agreement Process with BPA's New Vegetation Clearance Standard. October 15, 2008
2. Treatable acres estimated as all acres minus 85% of the agricultural acres

Asset objectives – Rights of Way

Reliability Objective
- Performance objective: Minimize the number and frequency of unplanned transmission line outages on all transmission lines
- Vegetation Measure: # of SAIFI/SAIDI reports of ROW fall into vegetation
- Access Roads Measure: Travel time to access site where outage occurred

Availability Objective
- Performance objective: Optimize availability of service from BPA's transmission lines
- Vegetation Measure: Compliance with NERC and FERC standards for all sanctionable lines
- Access Roads Measure: Provide vehicle access to structures on BPA's transmission lines (Category 1 and 2) that have roads leading to them
- Land Rights Measure: Provide legal access to BPA's transmission lines

Safety Objective
- Performance objective: The lost-time accident frequency rate is minimized. No fatalities occur to BPA employees or contract employees working on BPA facilities
- Measures: Lost-time accident frequency rate and near misses
- End-Stage Target: Set agency-wide at less than or equal to hours worked as measured by OSHA standards

Asset assessment – Rights of Way

- **Vegetation Management**
  - NERC/WECC standards require that BPA improve the reliability of the electric transmission systems by preventing outages from vegetation located on transmission rights-of-way (ROW) and minimizing outages from vegetation located adjacent to ROW, maintaining clearances between transmission lines and vegetation on and along transmission ROW. BPA is currently meeting this standard.

- **Access Roads**
  - The AR system is a crucial part of the transmission system infrastructure that has been largely underfunded, ignored, and poorly maintained for decades, resulting in overall degradation to the system
  - This degradation exposes BPA to reduced reliability, safety concerns, and environmental damage
  - The AR system is inadequate for most of our modern equipment; it is critical that the system be upgraded to modern standards.
  - In order to do this upgrade, a systematic program must be developed that provides long term funding
  - The access road system that is currently in place allows for traffic and patrols for maintenance
  - On 10 percent of the system, roadway quality has deteriorated to the point where the only access is by foot patrols or by using quad vehicles regardless of weather conditions
  - BPA has not prepared adequately for the 2015 Fish and Wildlife deadline to remove fish blockages occurring at undersized or incorrectly installed culverts; many landowners resolve these problems by removing culverts on permitted BPA access roads, rendering the road unusable for vehicle traffic
  - Acquisition issues need to be resolved; often planned work activities are postponed until legal access to the work site can be obtained

- **Land Rights**
  - BPA does not have legal access rights to some right of way segments (including corridors and access roads)
  - BPA in some instances does not have perpetual rights to manage vegetation within the existing right of way corridors (ex. Orchard buy-back rights)
  - BPA has expiring land rights (easements) that need to be renewed with tribal, county, and government entities

Risks to meeting the objectives – Rights of Way

Reliability Risk

- Vegetation Management:
  - Risk that vegetation grows into or falls into transmission line
  - Likelihood: Vegetation continues to grow following maintenance. Likelihood is reduced by regular maintenance cycles and patrols that identify vegetation issues.
  - Consequence: Vegetation could cause an interruption of electrical service and NERC fines

- Access Roads:
  - Risk that crews traveling to an outage will not be able to reach the site in a timely manner
  - Likelihood: More likely to happen in the wintertime and more likely to happen if the program continues to be underfunded
  - Consequence: The length of the outage is extended and possible safety issues

Availability Risk

- Vegetation Management:
  - Risk that NERC and FERC clearance standards are not met
  - Likelihood: Rare – routine maintenance of vegetation on corridors combined with early issue identification of issues by patrols mitigates this risk
  - Consequences: NERC/FERC violation
- Access Roads:
  - Risk that there is not adequate access to BPA's most important transmission lines (category 1 and 2)
  - Likelihood: Very likely – currently the maintenance program is used only for unplanned emergency repairs. The capital program is making progress in line corridors, but these corridors only represent ~25% of the system.
  - Consequences: Time to complete patrols and/or repair lines is extended
- Land Rights:
  - Risk that there is not legal access to BPA's transmission lines
  - Likelihood: Very likely – long lead time required to acquire legal rights
  - Consequences: Trespass may be necessary to complete critical work; dissatisfied land owners and poor public image

Risks to meeting the objectives – Rights of Way

Safety Risk

- - All ROW Areas:
  - Risk that an employee would be injured or killed while performing traditional work activities
  - Likelihood: There are injuries every year. It is the goal of the program to minimize these and keep a low number of OSHA reportable incidents
  - Consequence: Significant consequence – loss of human life or serious injury

Asset strategy – Veg. Mgmt. – Rights of Way

Cross-Organization Coordination

- Improved coordination work across organizations that design, maintain, and support the Rights of Way (ROW) through re-instituting the ROW Functional Team to provide strategic and tactical direction for all ROW-related programs
- Install a clarified process for TLM and NRS staff to request access roads (currently done using a “Call Letter”)

Develop and Implement Asset Management Strategies

- Clearly define what it means for the ROW to be an asset and provide accurate, reliable, and timely asset health reporting
  - Implement a corridor health dashboard that provides measurements of key health attributes
  - Ensure BPA staff have the understanding of the asset management philosophy and approach by using change management methodology to roll out these changes
  - Ensure the BPA staff have tool set to measure and track these assets (assumption is that Cascade will fulfill this need)

Data, Reporting, and Analysis

- Provide ROW team members the ability to capture data and track all planning, contract management, response to reported vegetation, and project close-out activities within a limited number of user interfaces with data flowing smoothly between systems and databases
- Develop a Total Cost of Ownership model for the Rights of Way and apply this to future decisions
- Collect accurate and reliable cost and effort data with regard to treatment type, line mile, acre, hours, trees cut, terrain type, geographic location, and contracting relationship
- Provide managers with access to summary and detail information about progress on Vegetation Management Preventive and Out of Cycle Maintenance in real-time, or near real-time
- Analyze the cost and effort data to objectively identify best value approaches
- Provide information in a visual format that lets ROW team members quickly process complex information

Consistent Practices and Application of Standards

- Provide clear descriptions of ROW vegetation and access roads standards with strong guidelines and procedures to achieve those standards, and reinforce practices that deliver consistent attainment of standards across all districts

Asset strategy – Access Roads – Rights of Way

Data, Reporting, and Analysis

- Implement better functionality and more consistent practices for patrols and inspections (TLM, aerial, NRS) to capture road condition data using a standard road condition rating system
- Stratify inspection priorities by areas with more or less stability (i.e. those prone to land slides have more frequent field inspections – may have ad hoc inspections following severe weather conditions)
- Measure and track progress toward road repairs, based on priority of repair
- Clarify criteria for bundling road repair into capital rehab projects versus repairing as maintenance expense

  What could we do differently over the next 15-20 years to maintain current level of performance, assuming it is acceptable, and if not, improve future asset performance. Strategies to consider (there may be others) for the access road program

Asset Renewal Strategy

- Capital program would be a pro-active road upgrade program that would include rebuilding all roads ahead of planned line reconstruction/ BPA related activities and in support of other sustain programs
- Focus would be placed on roads in the mid-Cascades and the coast ranges
- 300 miles of minor upgrades and 80 miles of major upgrades annually

Asset strategy – Land Rights – Rights of Way

Review of Land Rights

- Review Land rights that are due and have expired
- Review rights to determine if they are still needed
- Prioritize identified tracts that are expiring

Review of Access Rights

- Determine which roads BPA only has verbal agreements on and prioritize these over the next 5 years
- Complete estimates to obtain legal access rights for all roads that currently have only a verbal agreement

Review of Vegetation Agreements and Current Rights

- Determine criticality of vegetation rights needed
- Complete estimate requests for vegetation perpetual rights
- Develop a logical budget and plan that is in alignment with other programs for the next 5-10 years
  - How much will these cost
  - How many
  - Staffing requirements

Capital - Upgrades & Additions	2011 IPR	2012 IPR	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
LAND ACQUISITION & REBUILDS	9,991,300	10,168,800	10,370,700	10,582,200	10,222,200	10,417,200	10,610,800
LAND RIGHTS - ACCESS ROADS	525,900	535,200	545,800	557,000	567,900	578,700	589,500
LAND RIGHTS - TRIBAL RENEWALS	3,681,000	3,746,400	-	-	-	-	-
LAND RIGHTS- VEG MITIGATION	525,900	535,200	545,800	557,000	567,900	578,700	589,500
TOTAL [2]	**14,724,100**	**14,985,600**	**11,462,300**	**11,696,200**	**11,358,000**	**11,574,600**	**11,789,800**

[2] Dollars reported are direct dollars

UPGRADES & ADDITIONS

Transmission Capital – Upgrades & Additions

Capital - Upgrades & Additions	2009 Actuals [1]	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
CC INFASTRUCTURE COMPONENTS		2,312,493	-	1,682,700	1,070,400	1,965,000
CC SYSTEM & APPLICATION		1,630,337	-	1,682,700	1,926,700	3,165,800
CELILO UPGRADES PROJECT		6,200,000	21,488,900	11,568,900	47,327,300	43,120,400
CONTROL CENTERS		2,541,975	-	3,996,500	4,495,700	2,510,800
FIBER OPTICS AND TERMINALS		12,762,000	-	21,560,200	39,001,300	35,260,400
IT PROJECTS		5,000,000	-	7,350,030	5,850,000	6,000,000
LAND ACQUISITION & REBUILDS		10,103,200	10,853,000	9,991,300	10,168,800	10,370,700
LAND RIGHTS - ACCESS ROADS		470,084	-	525,900	535,200	545,800
LAND RIGHTS - TRIBAL RENEWALS		25,329,994	-	3,681,000	3,746,400	-
LAND RIGHTS- VEG MITIGATION		500,000	-	525,900	535,200	545,800
LINE SWITCH UPGRADES		-	-	-	-	-
MISC. UPGRADES AND ADDITIONS		31,870,058	75,128,800	12,681,000	11,070,400	3,091,700
SECURITY ENHANCEMENTS		4,601,730	5,113,940	5,000,000	5,000,000	6,000,000
SUBSTATION UPGRADES		-	-	23,316,600	6,705,000	10,262,600
UPGRADES & ADDITIONS		-	-	-	-	-
[2] **Total**	**56,899,513**	**103,321,871**	**112,584,640**	**103,562,730**	**137,432,400**	**122,839,000**

Program Description

- Bonneville's Upgrades and Additions program consists of adding new equipment and facilities and replacing older equipment and facilities in order to maintain or enhance the capabilities of the transmission system.

Strategic Objectives- S2 – FCRPS Operations and Expansion, S4 – Transmission Access and Rates , S9 – Stakeholder Satisfaction, I4- Asset Management

[1] Due to changes to the data structure historical spending is not available at the same level of detail.

[2] Dollars reported are direct dollars

Transmission Capital – Upgrades & Additions

Key Products and Outputs

- Communications and controls additions and replacements such as:
  - Newer technology including fiber optics in order to maintain or enhance the capabilities of the transmission system
  - Special remedial action control and protection schemes to accommodate new generation & mitigate constrained paths
- Pacific DC intertie upgrades at Celilo
- Line and substation upgrades and additions
- Control center upgrades and additions
- IT upgrades and additions
- Land rights including renewals, access, and vegetation management
- Security enhancements

FY 2012-13 Program Spending Drivers

- Telecommunication upgrades and additions needed to replace:
  - Analog radio systems with new digital radio systems
  - The VHF radio system
- Celilo upgrades

Potential Risk

- Proposed spending levels are needed to maintain system reliability by moving to current technologies and equipment while replacing old equipment that is no longer supported by the equipment manufacturers and is also no longer maintainable.
- Fluctuations in the commodities market (price of materials) could affect proposed spending levels.
- Emerging technology could make existing equipment obsolete and difficulty in obtaining parts for maintenance could drive upgrades that were not anticipated.
- Increased spending levels support load growth and mitigate reliability concerns by preventing failures that may result if the needed equipment upgrades and additions are not made.

Transmission Capital – Upgrades & Additions

Capital - Upgrades & Additions	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
CC INFASTRUCTURE COMPONENTS	1,965,000	2,784,800	1,703,700	1,157,500	1,179,000
CC SYSTEM & APPLICATION	3,165,800	2,227,800	2,839,500	4,051,100	4,126,400
CELILO UPGRADES PROJECT	43,120,400	7,362,000	-	-	-
CONTROL CENTERS	2,510,800	2,784,800	3,407,400	2,893,700	2,947,400
FIBER OPTICS AND TERMINALS	35,260,400	32,126,500	16,014,800	5,208,600	6,248,600
IT PROJECTS	6,000,000	6,150,000	6,300,000	6,450,000	6,600,000
LAND ACQUISITION & REBUILDS	10,370,700	10,582,200	10,222,200	10,417,200	10,610,800
LAND RIGHTS - ACCESS ROADS	545,800	557,000	567,900	578,700	589,500
LAND RIGHTS - TRIBAL RENEWALS	-	-	-	-	-
LAND RIGHTS- VEG MITIGATION	545,800	557,000	567,900	578,700	589,500
LINE SWITCH UPGRADES	-	-	-	-	-
MISC. UPGRADES AND ADDITIONS	3,091,700	4,617,700	3,271,600	6,944,800	7,073,900
SECURITY ENHANCEMENTS	6,000,000	6,000,000	6,000,000	7,000,000	7,000,000
SUBSTATION UPGRADES	10,262,600	5,441,500	1,042,700	-	-
UPGRADES & ADDITIONS	-	-	-	-	-
Total [2]	**122,839,000**	**81,191,300**	**51,937,700**	**45,280,300**	**46,965,100**

FY 2014-2017 Drivers of Proposed Spending Forecast

- Communications and controls additions and replacements
- Line and substation upgrades and additions
- Control center upgrades and additions
- IT upgrades and additions
- Land rights including renewals, access, and vegetation management
- Security enhancements

[2] Dollars reported are direct dollars

ENVIRONMENT PROGRAM

Transmission Capital – Environment

Capital - Environment Capital	2009 Actuals [1]	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
MISC. ENVIRONMENT PROJECTS		5,530,189	5,752,088	5,752,088	5,868,854	5,983,884
[2] **Total**	**3,369,545**	**5,530,189**	**5,752,088**	**5,752,088**	**5,868,854**	**5,983,884**

Program Description

- The Environmental capital program consists of three portfolio areas: reduction of Polychlorinated Biphenyls (PCB), water resources protection, and oil storage containment facilities. These programs reduce environmental risks and resolve or prevent regulatory non-compliance.

Strategic Objectives S7 – Environment, Fish and Wildlife, F1 – Capital Access, F2 – Cost Recovery, I2- One BPA

Key Products and Outputs

- Replace or retire minimum of 15 pieces of PCB containing equipment with non-PCB equipment to reduce PCBs, a primary persistent bioaccumulactive toxin, on the transmission system.
- Upgrade/install drainage treatment and containment systems at 6 environmentally sensitive facilities for water resource protection and compliance
- Install oil storage facilities that meet regulatory requirements at 4 facilities for water resource protection and compliance

FY 2012-2013 Program Spending Drivers

- PCB mitigation
- Water resource protection
- Oil storage containment facilities

[1] Due to changes to the data structure historical spending is not available at the same level of detail.

[2] Dollars reported are direct dollars

Transmission Capital – Environment

Capital - Environment Capital	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
MISC. ENVIRONMENT PROJECTS	5,983,884	6,101,169	6,320,000	6,446,000	6,575,300
Total [2]	**5,983,884**	**6,101,169**	**6,320,000**	**6,446,000**	**6,575,300**

FY 2014-2017 Drivers of Proposed Spending Forecast

- PCB mitigation
- Water resource protection
- Oil storage containment facilities

Potential Risk

- Reductions to the proposed Environment program spending levels could negatively impact the programs ability to address regulatory and liability issues at facilities and is likely to adversely affect water and environmental resources
- Changes in environmental regulations could put BPA in non-compliance. However, this is not anticipated because BPA staff monitors regulatory changes and is likely to foresee changes in time to modify program efforts within the planned budget.

[2] Dollars reported are direct dollars

EXPANSION PROGRAM

Assets Within Expansion Program

Assets are grouped into the following categories:

- **Main Grid** – Consists of mostly 500 kV transmission and substation facilities as well as some 345 kV and a few 230 kV facilities. This category includes BPA's internal flow gates and large load service areas
- **Area and Customer Service** – Consists of facilities, typically 230 kV and below, which function primarily to serve customer loads.
- **Inter-regional paths** – Lines and facilities that interconnect with other transmission providers such as California Oregon Intertie (COI), Pacific Direct Current Intertie (PDCI), Montana Intertie, and Northern Intertie.
- **Grid Operations**– Hardware and software system investments to expand Control Center and commercial systems capabilities
- **Projects Funded in Advance** (PFIA)- Consists of facilities and/or equipment where BPA retains control or ownership but which are funded by a third-party or with revenues, in total or part. Also includes Commercial Spectrum Enhancement Act (CSEA) investment.

Expansion Asset Objectives

- Ensure adequate facilities are in place to meet existing loads and expected/forecasted growth
- Load service obligations and customer service requests meet standards and tariff requirements
- A robust grid that effectively and efficiently integrates diverse energy resources, especially the increasing volume of renewable resources
- Inter-regional transfer capacity meets reliability standards and commercial needs
- Fuller, more optimal use is made of existing transmission capacity through technological, policy, and process change
- Providing adequate capacity to accommodate requests for firm transmission service
- Accomplishing all of the above, with projects which are cost effective, least life-cycle cost and flexible to fit in with the future needs of the transmission system

Risks to Meeting the Expansion Program Objectives

- Changes in regulatory requirements for reliability
- Uncertainty of where large quantity of renewables will be delivered
- Larger volume of wind resources – intermittent nature poses risk to having adequate transmission facilities in place
- Variation and uncertainty of load forecasts
- Increased system complexity
- Environmental/siting process timelines impact project schedules
- Interregional Expansion projects require multiple utilities participation which affects project funding and schedules

Expansion Asset Strategy (1 of 2)

- Conduct studies for alternatives (including non-wires alternatives), and develop long-term plans for BPA's load-service areas where system reinforcement is necessary
- Ensure that BPA's response to customer service requests meets customer and tariff requirements and conforms with internal business practices
- Ensure generation interconnection (GI) requests meet tariff requirements
- Evaluate options for providing service to transfer customers that improve reliability and reduce life-cycle costs
- Coordinate and review through Columbia Grid and WECC

Expansion Asset Strategy (2 of 2)

- Ensure the implementation of a regional expansion plan that is
  (1) long-term and integrated with resource planning
  (2) meets reliability standards and
  (3) is directed at minimizing total system costs

- Select and implement operational tools and visualization techniques to give system operators critical decision-making information on wind fleet operating status, reserves availability, potential ramps and contingencies

- Optimize use of existing transmission assets

- Enhance grid operations

Transmission Capital – Main Grid

Capital - Main Grid	2009 Actuals [1]	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
BIG EDDY-KNIGHT 500kv PROJECT		3,627,000	-	9,465,500	81,382,800	27,935,500
CENTRAL FERRY- LOWER MONUMNTAL		3,371,731	-	12,620,600	53,541,300	40,521,300
I-5 CORRIDOR UPGRADE PROJECT		6,000,000	6,840,000	6,310,300	12,849,900	135,305,700
LIBBY-TROY LINE REBUILD		4,888,859	-	157,800	-	-
MIDWAY-VANTAGE LINE UPGRADE		3,200,000	-	7,004,400	-	-
MISC. MAIN GRID PROJECTS		22,088,199	97,772,229	14,889,500	58,592,200	61,673,600
OLYMPIC PENINSULA PROJECT		2,115,204	-	999,100	1,070,800	4,708,600
REDMOND TRANSFORMER ADDITION		3,807,797	-	7,362,000	-	-
WEST OF MCNARY INTEGRATION PRO		78,974,808	85,326,471	51,201,800	5,953,800	-
[2] **Total**	**58,152,911**	**128,073,598**	**189,938,700**	**110,011,000**	**213,390,800**	**270,144,700**

Program Description

Bonneville's Main Grid capital program consists of projects which reinforce and expand the system in order to meet the following objectives:

- Maintain reliable service to loads
- Ensure adequate reactive support to maintain system voltages
- Accommodate transmission service requests
- Relieve transmission congestion
- Comply with WECC and NERC Reliability Standards

Strategic Objectives S2 - FCRPS Operations and Expansion, S4- Transmission Access and Rates, I4 - Asset Management

Key Products and Outputs

- Maintaining a reliable transmission system and relieving congestion
- Meeting load service obligations
- Meeting firm transmission service obligations

1

[1] Due to changes to the data structure historical spending is not available at the same level of detail.

[2] Dollars reported are direct dollars

Transmission Capital – Main Grid

Capital - Main Grid	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
BIG EDDY-KNIGHT 500kv PROJECT	27,935,500	-	-	-	-
CENTRAL FERRY- LOWER MONUMNTAL	40,521,300	-	-	-	-
I-5 CORRIDOR UPGRADE PROJECT	135,305,700	138,064,600	80,372,100	1,127,500	-
LIBBY-TROY LINE REBUILD	-	-	0	-	-
MIDWAY-VANTAGE LINE UPGRADE	-	-	-	-	-
MISC. MAIN GRID PROJECTS	61,673,600	116,946,500	57,317,200	84,060,200	185,843,900
OLYMPIC PENINSULA PROJECT	4,708,600	-	558,100	1,691,300	3,560,300
REDMOND TRANSFORMER ADDITION	-	-	-	-	-
WEST OF MCNARY INTEGRATION PRO	-	-	-	-	-
Total [2]	**270,144,700**	**255,011,100**	**138,247,400**	**86,879,000**	**189,404,200**

FY 2014-2017 Drivers of Proposed Spending Forecast

- Completion of the I-5 Corridor Reinforcement Project
- Additional Olympic Peninsula Reinforcements
- West of Cascades Reinforcements
- Puget Sound Area Reinforcements
- Tri-Cities Area Reinforcements
- Central Oregon Reinforcements

[2] Dollars reported are direct dollars

Transmission Capital – Main Grid

FY 2012-13 Program Spending Drivers

- **Major network reinforcements identified from the 2008 Network Open Season: $363M**
  - Completion of the West of McNary Reinforcement Project - Group I
  - Big Eddy-Knight 500 kV Project
  - Central Ferry - Lower Monumental 500 kV Project
  - I-5 Corridor 500 kV Reinforcement Project
- **Reliability to loads:**
  - Olympic Peninsula Reinforcement
  - Portland / Vancouver Area Reinforcements
  - Salem/ Albany/ Eugene Area Reinforcement
  - Tri-Cities Area Reinforcement
  - Central Oregon Reinforcement
  - Facility Additions for NERC Compliance

Transmission Capital – Main Grid

Potential Risk

- **Changes to proposed spending levels could occur as a result of:**
  - Unexpected changes to project schedules (such as delays/deferrals)
  - Variations in load forecasts resulting in project schedule or scope changes
  - Changes to current regulatory requirements
  - Fluctuations in the commodities market (i.e. price of materials)
- **New requests for firm transmission service could drive additional investments**

NETWORK OPEN SEASON (NOS) PROJECTS

2008 NOS Projects- McNary John Day

McNary-John Day - West of McNary Reinforcement Group 1

Project Description: (Under Construction) 79 mile new 500kV transmission line, McNary and John Day Sub Bay Additions, Shunt Capacitor Additions at Jones Canyon Sub, McNary Transformer RAS, Upgrade McNary-Ross No. 1 345kV, John Day-Big Eddy No. 2 500kV and Big Eddy-Ostrander No. 1 230kV

PM: Theresa Berry

Schedule

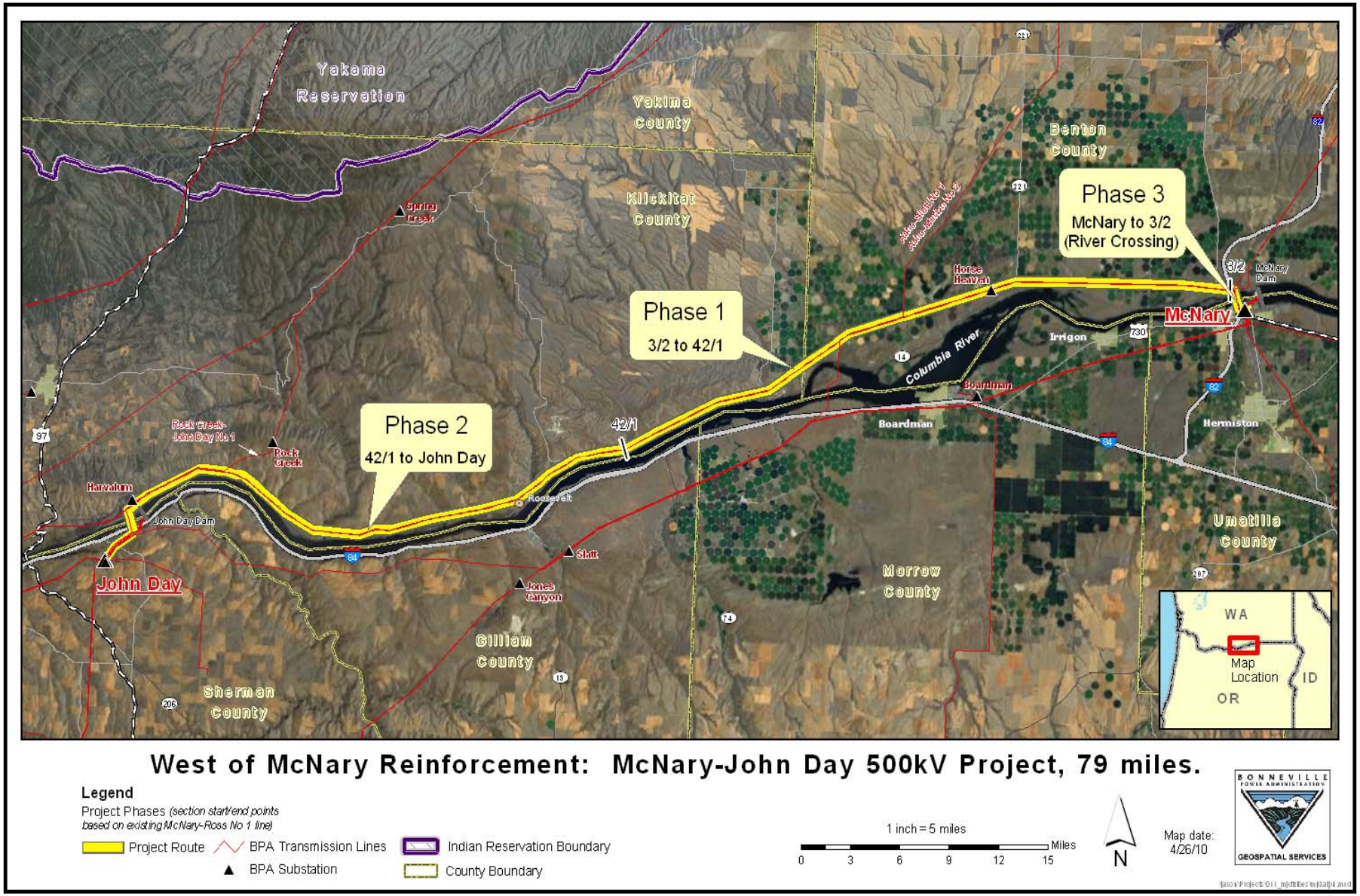
2009 Feb.	Project approved and launched
2009 June	Construction started by Wilson Construction Co. for Phase 1 and 2 (miles 3 to 79)
2010 May	Award McNary-John Day Phase 3 construction contract (miles 1 to 3)
2012 Feb.	Energization

Budget

	Proposed IPR Budget			TR-10 Rate Case
Dollars include direct costs only	FY 2011	FY 2012	Estimated Total Project Cost	Estimated Total Project Cost
West of McNary Reinforcement Group 1	51,201.8	5,953.8	158,712.2	246,545.1

Complete to Date:

- 30 miles of towers installed.
- 10 miles of conductor, OHGW, fiber strung.
- 18 miles transmission towers assembled in fly yard and ready to be installed.
- 54 line miles of access roads constructed or improved.



West of McNary Reinforcement: McNary-John Day 500kV Project, 79 miles.

Legend

Project Phases *(section start/end points based on existing McNary-Ross No 1 line)*

Project Route | BPA Transmission Lines | Indian Reservation Boundary

BPA Substation | County Boundary

1 inch = 5 miles

0 3 6 9 12 15 Miles

N

Map date: 4/26/10

BONNEVILLE POWER ADMINISTRATION GEOSPATIAL SERVICES

2008 NOS Projects- Big Eddy-Knight

Project Description: (In NEPA Review until June, 2011) 28 miles of new 500kV transmission line, Big Eddy Substation bay addition, and new Knight Substation.

PM: Steve Prickett

Schedule

2009 Feb.	Project approved for NEPA review and launched
2011 June	Final EIS and ROD
2013 Feb.	Energization

Budget

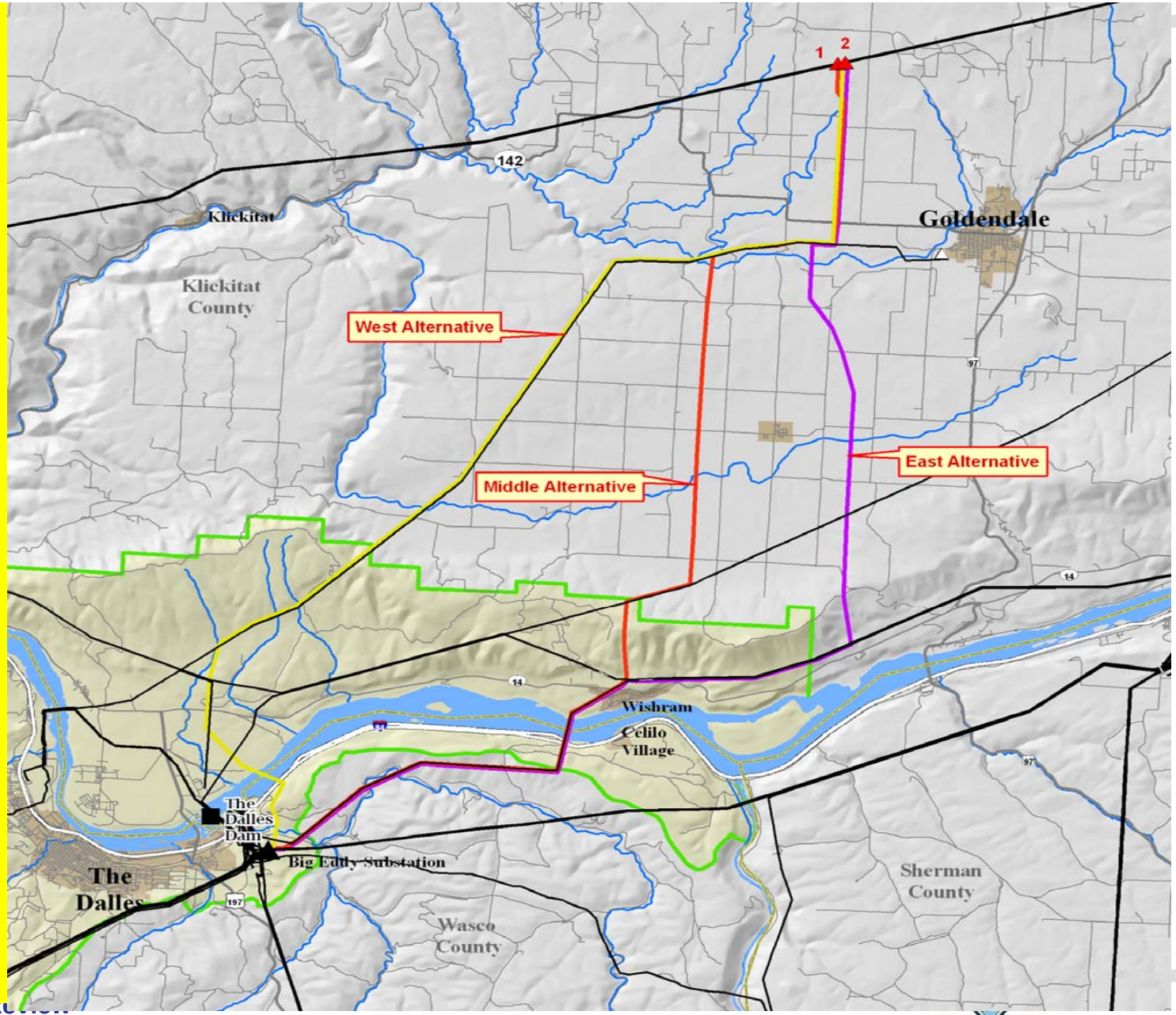
	Proposed IPR Budget				TR-10 Rate Case
Dollars include direct costs only	FY 2011	FY 2012	FY 2013	Estimated Total Project Cost	Estimated Total Project Cost
Big Eddy-Knight 500kv Project	9,465.5	81,382.8	27,935.5	122,783.8	115,658.0

Completed to Date:

- NOI
- Project Scoping and initial public meetings
- NEPA Field Analysis 50% complete
- Preliminary design 30% Complete
- Preliminary Draft EIS goes to cooperating agencies June 1

Big Eddy – Knight :

3 Routes being considered within the NEPA Process



2008 NOS Projects- Central Ferry-Lower Monumental

Project Description: (In NEPA Review) 40 mile new 500kV transmission line, Central Ferry and Lower Monumental Sub Bay Additions

PM: Theresa Berry

Schedule

2009 Feb. Project approved for NEPA review and launched

2011 March Final EIS and ROD

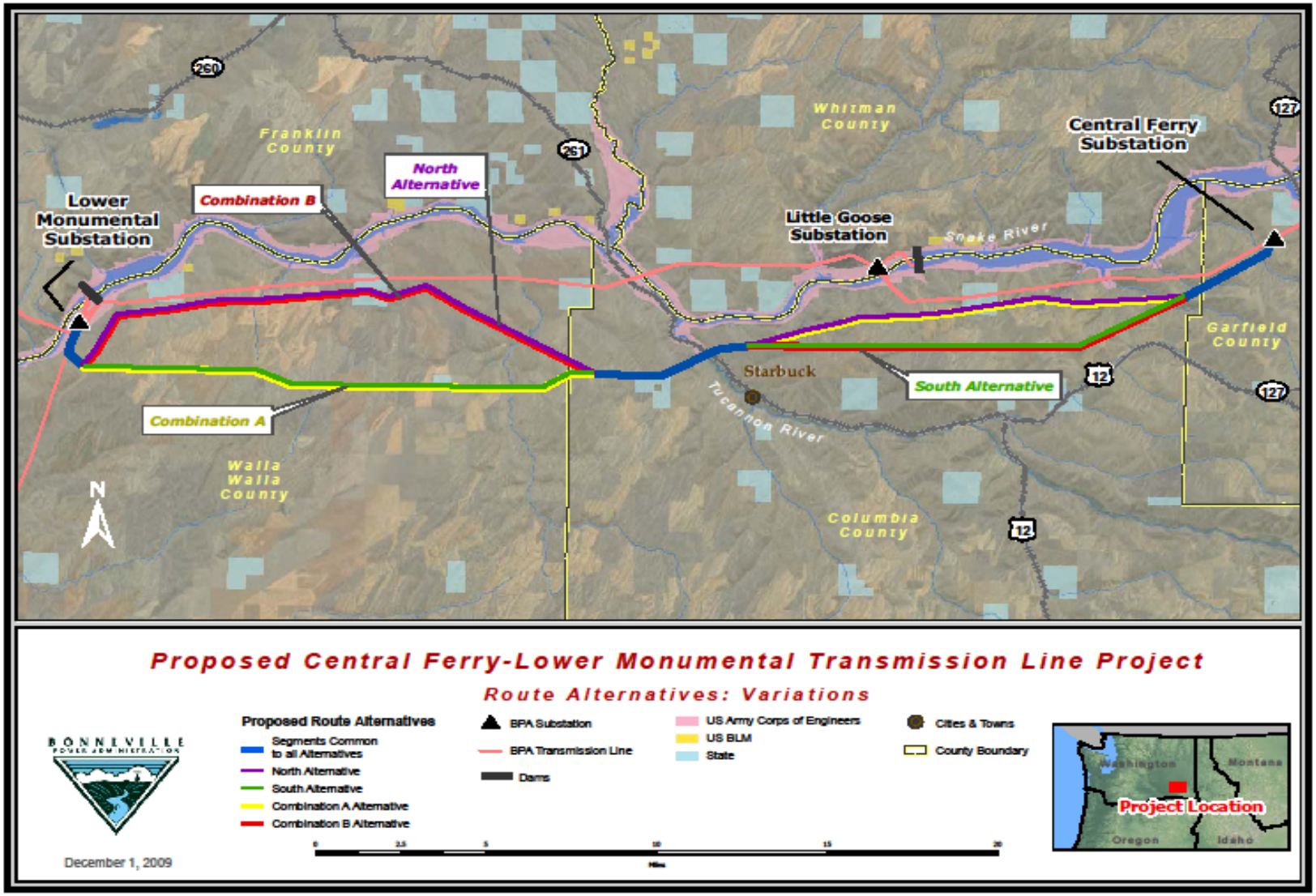
2013 July Energization

Budget

	Proposed IPR Budget				TR-10 Rate Case
Dollars include direct costs only	FY 2011	FY 2012	FY 2013	Estimated Total Project Cost	Estimated Total Project Cost
Central Ferry - Lower Monumental	12,620.6	53,541.3	40,521.3	111,683.3	99,435.0

Completed to Date:

- Project Scoping and initial public meeting
- NEPA Field Analysis 50% complete
- Preliminary design 100% complete and Final design 30% complete
- Preliminary Draft EIS sent to cooperating agencies April 13th (Comment period ends May 13th)
- Engineer reviewed angle points and structure sites in field (22 miles)
- Verified 10 miles of access roads


Franklin County
Whitman County
Central Ferry Substation
Lower Monumental Substation
Combination B
North Alternative
Little Goose Substation
Snake River
Garfield County
Starbuck
South Alternative
Tucannon River
Combination A
Walla Walla County
Columbia County
N
Proposed Central Ferry-Lower Monumental Transmission Line Project
Route Alternatives: Variations
Proposed Route Alternatives
Segments Common to all Alternatives
North Alternative
South Alternative
Combination A Alternative
Combination B Alternative
BPA Substation
BPA Transmission Line
Dams
US Army Corps of Engineers
US BLM
State
Cities & Towns
County Boundary
Project Location
Washington
Montana
Oregon
Idaho
December 1, 2009

2008 NOS Projects- I-5 Corridor Reinforcement

Project Description: (In NEPA Review) 70 mile new 500kV transmission line and 2 new substations

PM: Mark Korsness

Schedule

2009 Feb. Project approved for NEPA review and launched

2012 Sept. Final EIS

2013 Jan. ROD

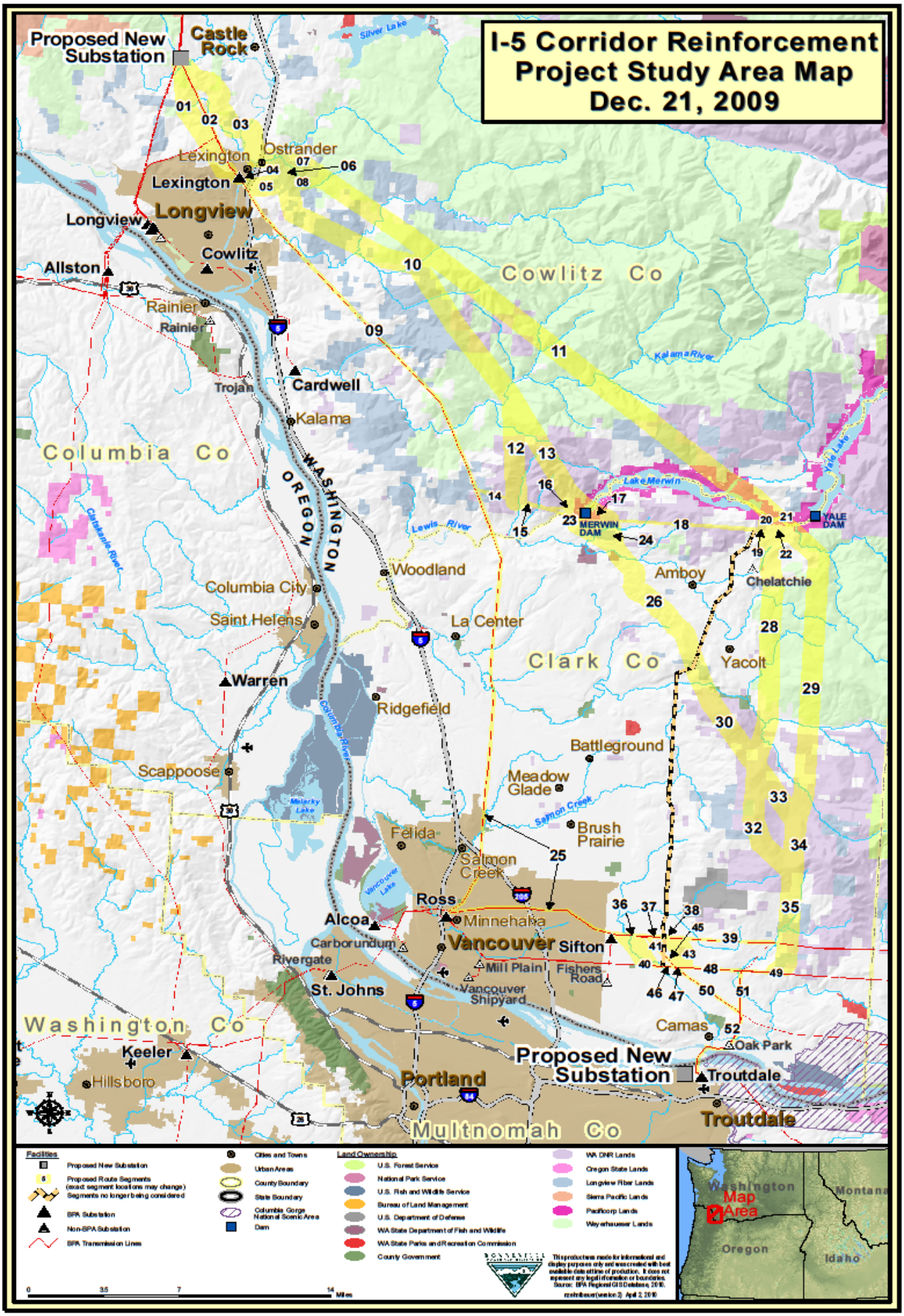
2015 Oct. Energization

Budget

	Proposed IPR Budget							TR-10 Rate Case
Dollars include direct costs only	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	Estimated Total Project Cost	Estimated Total Project Cost
I-5 Corridor Reinforcement Project	6,310.3	12,849.9	135,305.7	138,064.6	80,372.1	1,127.5	381,530.1	341,996.1

Completed to Date:

- NOI (Notice of Intent)
- Project Scoping and initial public meetings
- NEPA Field Analysis 10% complete
- Permission to Enter (PEP) 50% Complete
- Preliminary design 30% complete
- Continue to meet with landowner groups and elected officials



BONNEVILLE POWER ADMINISTRATION

AREA & CUSTOMER SERVICE

Transmission Capital – Area & Customer Service

Capital - Area & Customer Service	2009 Actuals [1]	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
CITY OF CENTRALIA PROJECT		2,026,378	-	-	-	-
LOWER VALLEY (CARIBOU) PROJECT		19,127,551	-	1,183,200	7,064,700	6,004,100
MISC. AREA & CUSTOMER SERVICE		9,545,947	6,255,900	4,842,100	4,260,200	3,466,000
ROGUE SVC ADDITION		6,403,484	-	-	-	-
[2] **Total**	**11,452,179**	**37,103,360**	**6,255,900**	**6,025,300**	**11,324,900**	**9,470,100**

Program Description

- **BPA's Area and Customer Service capital program consists of projects which reinforce and expand the system in order to meet the following objectives:**
  - Provide reliable service to customer loads in accordance with contractual obligations
  - Comply with WECC and NERC Reliability Standards
  - Facilitate customer interconnection requests (generation, line, and load interconnections)

Strategic Objectives - S2 – FCRPS Operations and Expansion, S9- Stakeholder Satisfaction, I4 – Asset Management

Key Products and Outputs

- Maintaining a reliable transmission system
- Meeting contractual obligations for serving customer loads
- Ensuring adequate reactive support at customer points of delivery

[1] Due to changes to the data structure historical spending is not available at the same level of detail.

[2] Dollars reported are direct dollars

Transmission Capital – Area & Customer Service

FY 2012-13 Program Spending Drivers

- Lower Valley Reinforcement
- Okanogan Area Reinforcement
- Kalispell / Flathead Valley Reinforcement
- Area Service Reactive Additions & Customer Service Facility Additions

Potential Risk

- The proposed spending levels are needed to ensure customer load service obligations are met and to ensure compliance with NERC Reliability Standards.
- Changes to proposed spending levels could occur as a result of:
  - Unanticipated changes to project schedules (such as delays/deferrals)
  - Variations in load forecasts resulting in project schedule or scope changes
  - Changes to current regulatory requirements
  - Fluctuations in the commodities market (i.e. price of materials)
- New customer interconnection requests could result in additional projects which would affect the proposed spending levels

Capital - Area & Customer Service	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
CITY OF CENTRALIA PROJECT	-	-	-	-	-
LOWER VALLEY (CARIBOU) PROJECT	6,004,100	-	-	-	-
MISC. AREA & CUSTOMER SERVICE	3,466,000	10,749,200	16,156,700	17,130,600	28,295,400
ROGUE SVC ADDITION	-	-	-	-	-
Total [2]	**9,470,100**	**10,749,200**	**16,156,700**	**17,130,600**	**28,295,400**

FY 2014-2017 Drivers of Proposed Spending Forecast

- Kalispell / Flathead Valley Reinforcements – FY 2014
- Longview Area Reinforcement
- Area Service Reactive Additions & Customer Service Facility Additions – FY 2014-2017

[2] Dollars reported are direct dollars

Projects Funded in Advance (PFIA)

Transmission Capital – PFIA

Capital - PFIA	2009 Actuals[1]	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
COI ADDITION PROJECT		25,482,894	23,442,472	11,238,500	-	-
GENERATOR INTERCONNECTION		63,809,900	65,117,977	57,784,700	35,266,700	36,450,300
MISC. PFIA PROJECTS		6,500,000	13,726,000	9,643,000	7,385,100	6,864,200
SPECTRUM RELOCATION		10,812,502	-	8,126,000	1,780,000	400,000
[2] **Total**	**36,784,922**	**106,605,296**	**102,286,449**	**86,792,200**	**44,431,800**	**43,714,500**

Program Description

- BPA's Projects Funded In Advance (PFIA) program includes those facilities and/or equipment where Bonneville retains control or ownership but which are funded or financed by a third-party or with revenues, either in total or in part.
- This program also includes investments associated with the Commercial Spectrum Enhancement Act (CSEA)

Strategic Objectives- S6 – Renewable Energy, S4 – Transmission Access and Rates, I4 – Asset Management, S8 – Climate Change

Key Products and Outputs

- Transmission line and substation modifications and additions to interconnect generation and line/load interconnection requests to the BPA transmission grid
- Integration of generation projects connected to third-party transmission and distribution systems that are located within BPA's balancing authority area
- Control area move projects
- Non-tariff reimbursable work performed for entities that require the relocation or modification of BPA transmission facilities (e.g. moving a transmission line to accommodate a freeway expansion)
- Address customer load service needs and interconnect renewable energy generation to the grid while minimizing risk to BPA.
- Relocation or modification of BPA transmission assets, funded by a third party.

[2] Dollars reported are direct dollars

Transmission Capital – PFIA

FY 2012-13 Program Spending Drivers

- Generation interconnection and line load interconnection projects
- Completion of the COI project
- Completion of the radio spectrum program
- Various other projects

Potential Risk

- BPA's Open Access Transmission Tariff requires BPA continue to integrate new generation projects into the BPA transmission grid in response to interconnection requests submitted via the large and small generation interconnection procedures outlined in the tariff.
    - Developers are required to advance finance the interconnections; therefore, there is always uncertainty on if and when a particular customer will authorize BPA to begin design and construction on a particular interconnection plan of service.
    - This results in great uncertainty in the projected spending levels.
- Miscellaneous PFIA spending levels are extremely difficult to forecast due to the nature of the projects. They are usually the unexpected consequence of a state or county moving or widening a road or freeway, resulting in BPA moving transmission lines.
- BPA lacks sufficient resources to accomplish the engineering, construction, testing and energization of all of these projects and expects to utilize the Owner Engineer and Engineer-Procure-Construct contracting strategies to help achieve the projected spending levels.

Customer Line- Load Expand Projects FY10-13

- **FY 2010 Projects:**
  - Silverado Substation (Clallam PUD)
  - Gardiner Substation, new 115 kV bay (Central Lincoln PUD)

- **FY 2011 Projects:**
  - Acord Substation (Benton REA)
  - Mt Adams Substation (Yakima Power)
  - Flathead Substation new 230 kV Bay (Flathead Electric)
  - Olympia Substation new 115 kV Bay (Puget Sound Energy)

- **FY 2012 Projects:**
  - Cathlamet Substation transformer addition (Wahkiakum PUD)

- **FY 2013 Projects:**
  - St Clair Substation, add 230 kV yard for loop-in of Olympia-S. Tacoma line (PSE)
  - Alderton Substation, add 230 kV yard for loop-in of S. Tacoma-White River line (PSE)
  - Juan de fuca HVDC, connect to 230 kV at Port Angeles substation
  - Big Sky Green Power, new 500 kV Substation at Townsend, Montana

Generation Expand Projects FY10-11

- **FY 2010 Projects under construction (Name, capacity, on line date, description):**
  - Linden Ranch (50 MW) - 6/2010 (Meters, control addition at Customer collector facilities)
  - Leaning Juniper 2 part 1 (90 MW) GI-226, 9/1/2010 (230 kV terminal addition at Jones Canyon)
  - Big Horn III (50 MW) GI 224, 9/1/2010 (meter/telemeter addition at Customer collector facilities)
  - Roosevelt Landfill BioGas (22 MW) GI 407, 7/1/2010 (meter/telemeter addition)
  - Coastal Energy Wind (6 MW) GI 407, 7/1/2010 (meter/telemeter addition)

  Total for FY2010 – 888 MW, 218 MW remaining

- **FY 2011 Projects (* design / construction in progress):**
  - Golden Hills (200 MW) GI 99, 10/1/2010 (230 kV Biglow Canyon station expansion; meters, control addition at Customer collector facilities)
  - Leaning Juniper 2 part 2 (110 MW) GI-226, 12/1/2010 (meter/telemeter addition)
  - Oregon Trail Wind (20 MW) I0003, 12/1/2010 (meter/telemeter addition)
  - Kittitas Valley (108 MW) GI 80, 12/1/2010 (New BPA 230 kV Bettas Road substation)
  - Juniper Canyon 1 (150 MW) GI 203,4 12/1/2010 (230 kV terminal at Rock Creek substation and Meters, control addition at Customer collector facilities)
  - Seneca Saw Mill Biomass (20 MW) GI 349, 3/1/2011 (meter/telemeter addition)
  - Hampton Wind Project (8 MW) GI 331, 3/2011 (meter/telemeter addition)
  - Sage 1-2, Lost Forest Solar (12 MW) GI 376,77,79, 8/2011 (meter/telemeter addition)
  - Heppner Biomass (10 MW) GI 399, 8/2011 (meter/telemeter addition)
  - Energetics Solar (10 MW) GI 387, 8/2011 (meter/telemeter addition)
  - Miller Ranch (122 MW) GI 233, 8/1/2011 (meters, control addition at Customer collector facilities)
  - Eight Mile Canyon (78 MW) GI 255, 8/1/2011 (meters, control addition at Customer collector facilities)
  - Shepherds Flat Phase 1 (250 MW) GI 118, 8/1/2011 (New 230 kV BPA Slatt substation addition and meters, control addition at customer collector facilities)

  Total for FY2011 – 1086 MW

Generation Expand Projects FY12-13

- **FY 2012 Projects (* design / construction in progress):**
  - Lower Snake Wind Phase 1 (PSE – 250 MW of 1250 MW) GI 284-6, 2/1/2012 (New 500/230 kV Central Ferry substation; Meters, control addition at Customer collector facilities)
  - North Valley & Fossil Lake Solar (10 MW) GI 409,10, 12/1/2011 (meter/telemeter addition)
  - Coyote Crest Wind (100 MW) GI-313, 8/1/2012 (115 kV terminal addition; Meters, control addition at Customer collector facilities)
  - West Butte Wind (104 MW) GI 300, 8/2012 (New BPA 115 kV substation addition Meters, control addition at Customer collector facilities)
  - Christmas Valley Solar – (10 MW) GI 385, 3/1/2012 (meter/telemeter addition)
  - Badger Peak Wind (20 MW) GI 388, 9/1/2012 (meter/telemeter addition)
  - Scoggins Ridge Wind (20 MW) GI 386, 9/1/2012 (meter/telemeter addition)
  - Fort Rock Solar (20 MW) GI 400, 9/1/2012 (meter/telemeter addition)
  - Windy Flats 2 (100 MW) GI 222, 8/1/2012 (meter/telemeter addition)
  - Juniper Canyon 2 (100 MW) GI 242, 8/1/2012 (New BPA 230 kV substation; Meters, control addition at Customer collector facilities)
  - Lund, etal (60 MW) GI 318,9,10, 8/1/2012 (meter/telemeter addition)
  - Shepherds Flat Phase 2 (250 MW) GI 118, 8/1/2012 (Meters, control addition at Customer collector facilities)

  Total for FY2012 – 1044 MW

- **FY 2013 Projects:**
  - Montague Wind 1 (200 MW) GI 238, 12/1/2012 (230 kV terminal; Meters, control addition at Customer collector facilities)
  - Lower Snake Wind Phase 1 part 2 (100 MW) GI 284-6, 12/1/2012 (Meters, control addition at Customer collector facilities)
  - GI 345 (100 MW) GI 345, 12/1/2012 (New BPA 230 kV substation, collector addition)
  - Radar Ridge Wind (100 MW) GI-288, 8/1/2013 (115 kV terminal addition; Meters, control addition at Customer collector facilities)
  - Shepherds Flat Phase 3 (250 MW), 8/1/2013 (230 kV terminal; Meters, control addition at Customer collector facilities)

  Total for FY2013 – 750 MW

Transmission Capital – PFIA

Capital - PFIA	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
COI ADDITION PROJECT	-	-	-	-	-
GENERATOR INTERCONNECTION	36,450,300	24,328,500	17,809,700	18,149,500	18,486,700
MISC. PFIA PROJECTS	6,864,200	5,365,100	4,500,000	4,500,000	4,500,000
SPECTRUM RELOCATION	400,000	-	-	-	-
Total [2]	**43,714,500**	**29,693,600**	**22,309,700**	**22,649,500**	**22,986,700**

FY 2014-2017 Drivers of Proposed Spending Forecast

- Generator interconnection projects
- Various other misc. PFIA projects

[2] Dollars reported are direct dollars

Generation Customer Interconnection (1 of 3)

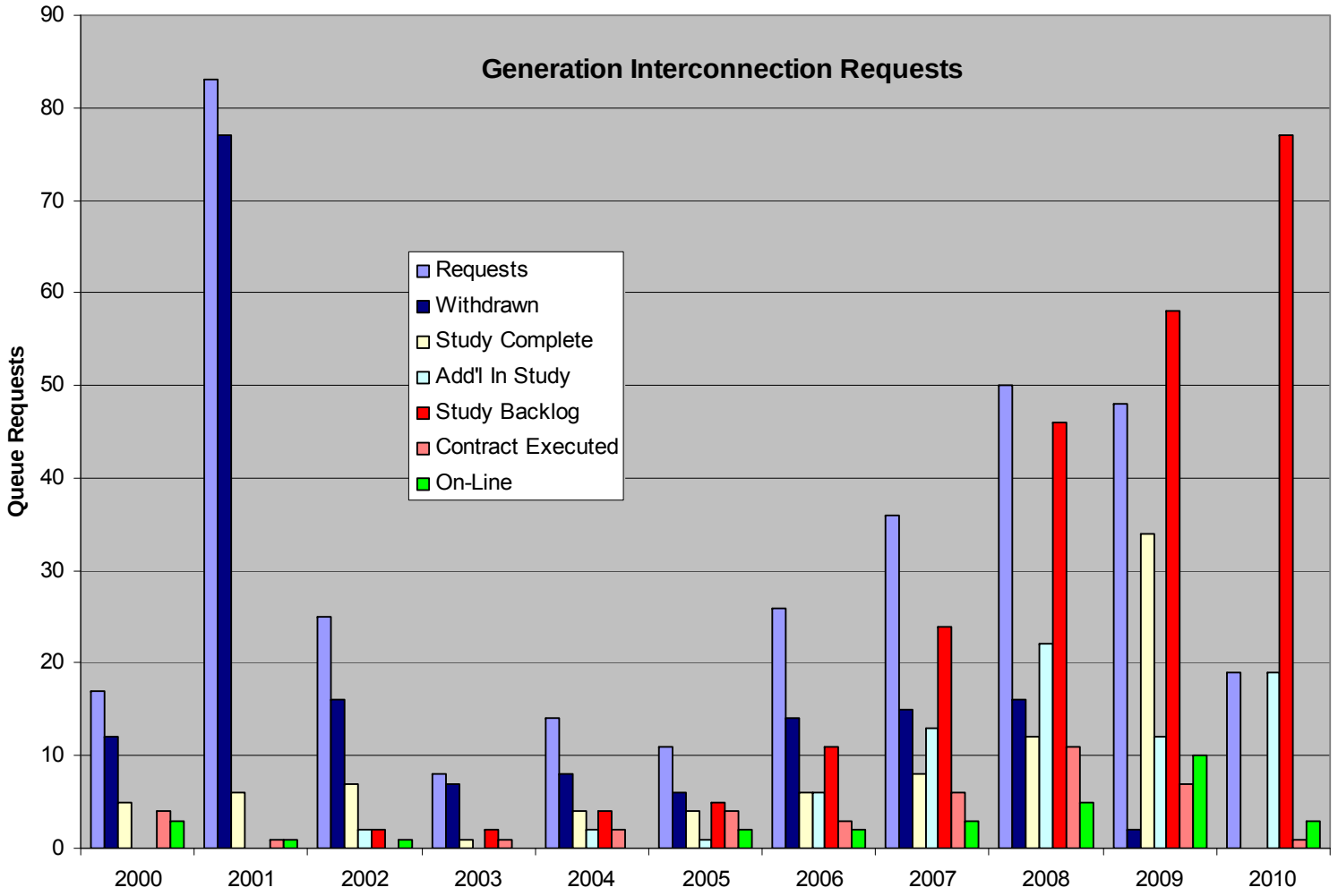
GI Interconnection Process:

- Completed studies for over 13,500 MW, (not including study work for some withdrawn requests) of over 24,000 MW in queue (LGIP/SGIP) presently *(See next slide for study stats)*
- Mostly wind projects in study queue (See slide 3)
- Seeing more Solar and other renewable requests lately
- Approximately 1700 MW thermal and 3000 MW wind generation connected since 2000
- 2,100 MW under construction
- List of Generation Interconnection Projects follows.

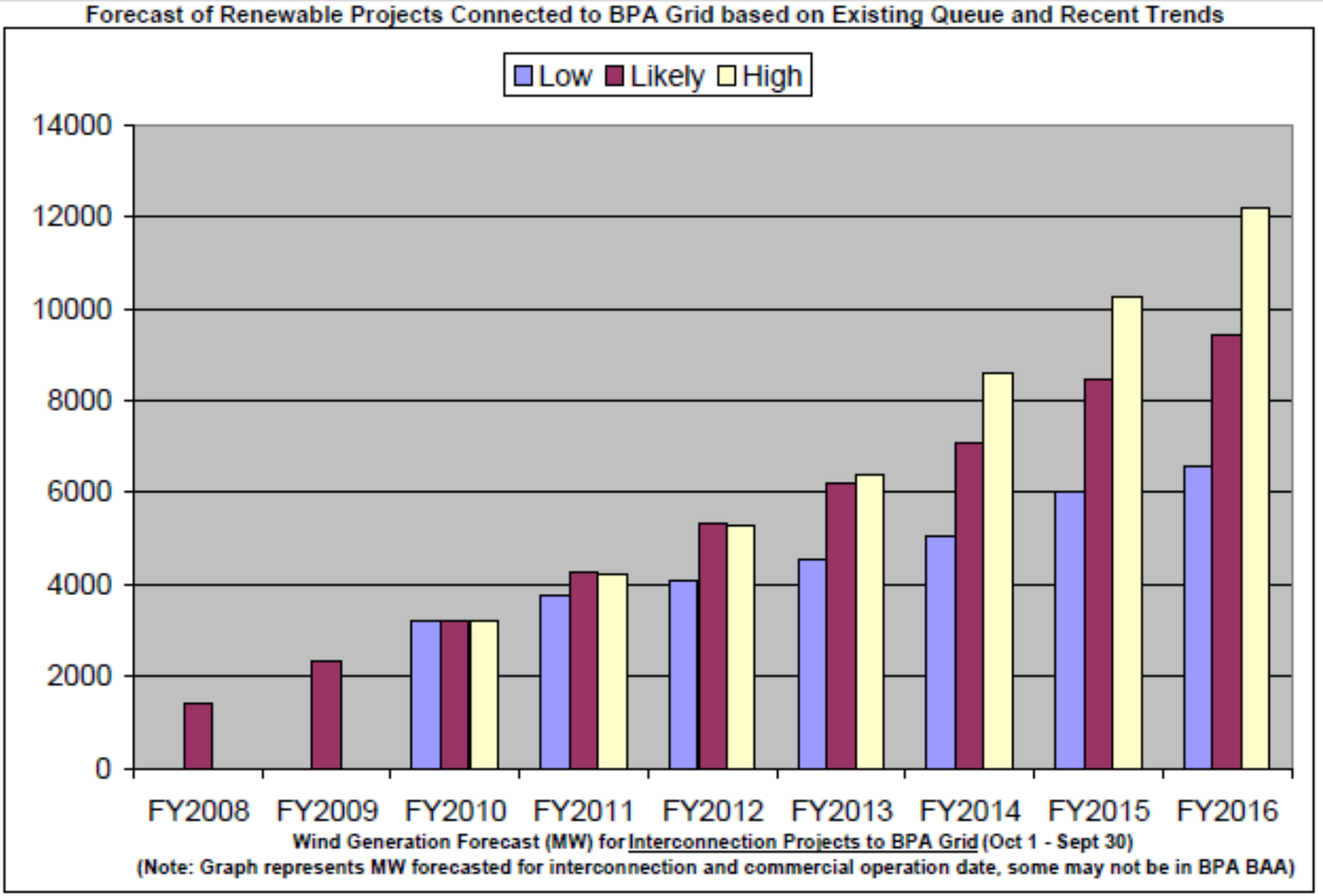
BPA NOS 2008 Projects in support of Interconnection:

- McNary – John Day 500 kV line 2/2012 (56 miles)
- Big Eddy – Knight 500 kV line 2013 (26 miles)
- Lower Monumental – Central Ferry 500 kV line 2013 (40 miles)
- Portland Area Reinforcement 500 kV line 2014 (70 miles)

Generation Customer Interconnection (2 of 3)



Generation Customer Interconnection (3 of 3)



AFUDC & INDIRECTS

Transmission Capital – AFUDC

Capital - Transmission AFUDC	2009 Actuals	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
FEDERAL AFUDC	-	-	22,467,500	24,624,000	31,157,000	38,075,000
Total	**-**	**-**	**22,467,500**	**24,624,000**	**31,157,000**	**38,075,000**

Program Description

- AFUDC measures the costs of financing construction projects and BPA's inclusion of AFUDC in rates, provides reasonable assurance of the ability to recover those costs in future rates. Generally Accepted Accounting Principles (GAAP) reference: FAS 71 (Accounting for the Effects of Certain Types Regulation) Paragraph 15 states:

  AFUDC. In some cases, a regulator requires an enterprise subject to its authority to capitalize, as part of the cost of plant equipment, the cost of financing construction as financed partially by borrowings and partially by equity. A computed interest cost and a designated cost of equity funds are capitalized, and net income for the current period is increased by a corresponding amount. After the construction is completed, the resulting capitalized cost is the basis for depreciation and unrecovered investment for rate-making purposes. In such cases, the amounts capitalized for rate making purposes as part of the cost of acquiring the assets shall be capitalized for financial reporting purposes instead of the amount of interest that would be capitalized in accordance with FASB Statement No. 34, (Capitalization of Interest Cost. 9/). The income statement shall include an item of other income, a reduction of interest expense, or both, in a manner that indicates the basis for the amount capitalized. 9/. Statement 34 requires capitalization of interest cost on certain qualifying assets. The amount capitalized is the portion of the interest cost incurred during the period that theoretically could have been avoided if the expenditures had not been made.

Transmission Capital – AFUDC

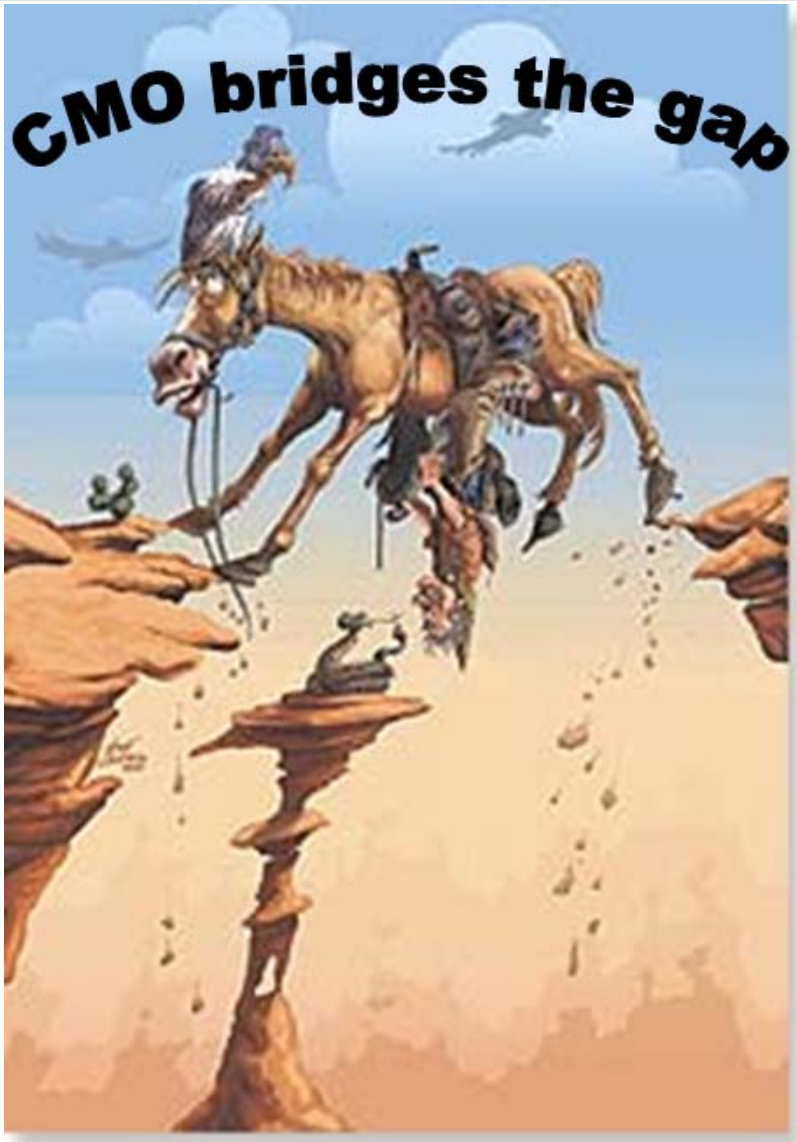
Capital - Transmission AFUDC	2013 IPR	2014 IPR	2015 IPR	2016 IPR	2017 IPR
FEDERAL AFUDC	38,075,000	46,890,000	41,400,000	31,521,000	37,771,000
Total	**38,075,000**	**46,890,000**	**41,400,000**	**31,521,000**	**37,771,000**

Transmission Capital – Indirects

Capital - TBL Capital Indirects	2009 Actuals	2010 SOY	2011 TR-10 Rate Case	2011 IPR	2012 IPR	2013 IPR
CORPORATE CAPITAL INDIRECTS		-	39,217,436	42,643,257	44,534,565	45,197,257
TBL CAPITAL INDIRECTS		0	41,834,774	40,794,000	41,518,900	42,343,000
Total	**74,631,576**	**0**	**81,052,210**	**83,437,257**	**86,053,465**	**87,540,257**

Program Description

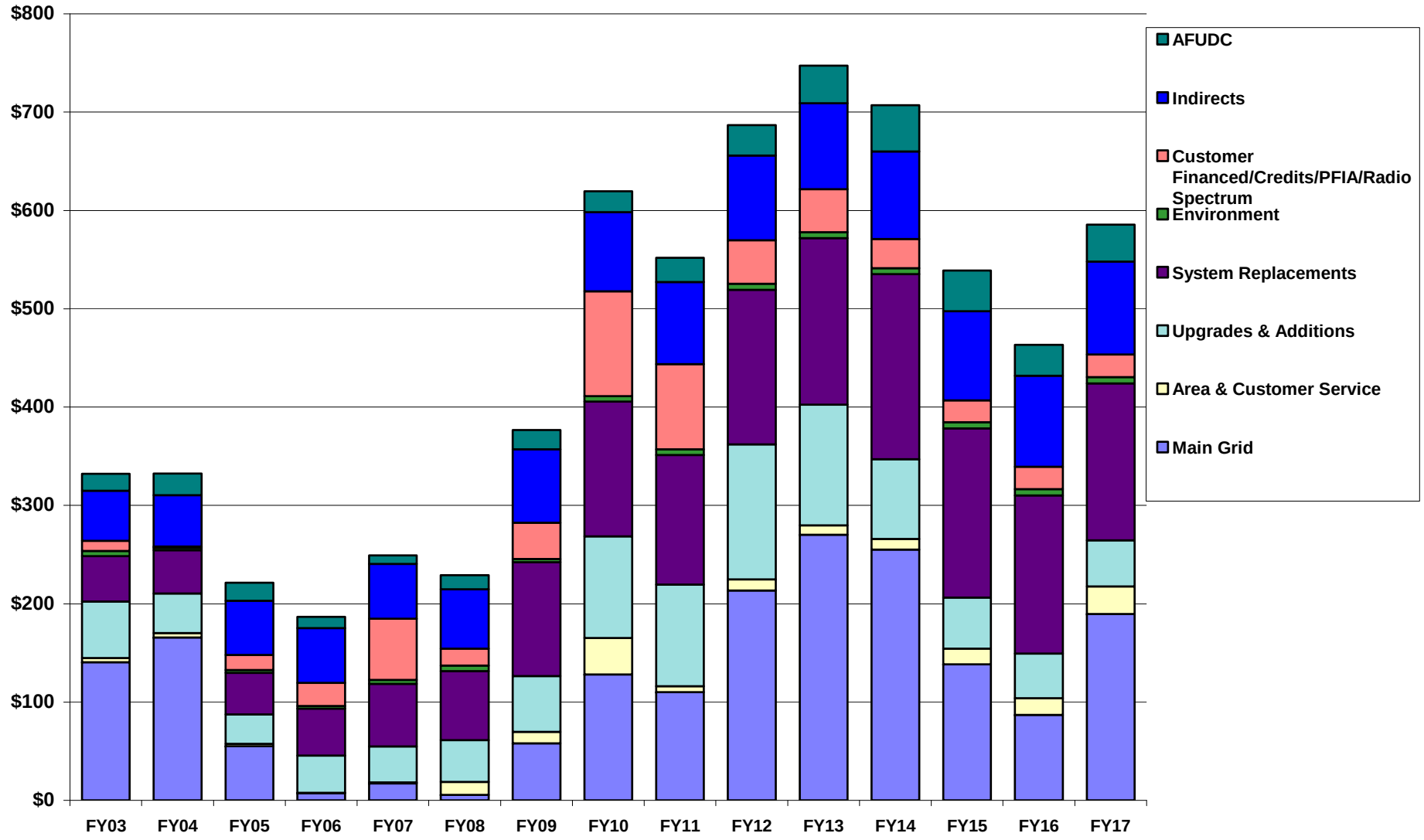
- Within the Transmission, capital costs are treated as either direct or indirect.
- T's indirect costs are comprised of Transmission Indirect costs, Transmission Support Services and Contracting costs, and Shared Services and Corporate Overhead costs.
- The Transmission Indirect and Support Services and Contracting costs originate in the Transmission organization and would normally be charged directly to projects but due to system processing issues, it is not cost effective to direct charge these costs. To determine the full cost of a direct project, the overhead costs must be associated with the final project to allow for proper capitalization and depreciation of the project.
- The process of allocating transmission capital indirects is determined by analysis of pricing the Transmission product which establishes the application of percentages at the beginning of the fiscal year. On a quarterly basis the balance in the indirect cost pool is reviewed to determine if the allocations are properly clearing.



ACCOMPLISHING THE CAPITAL PROGRAM

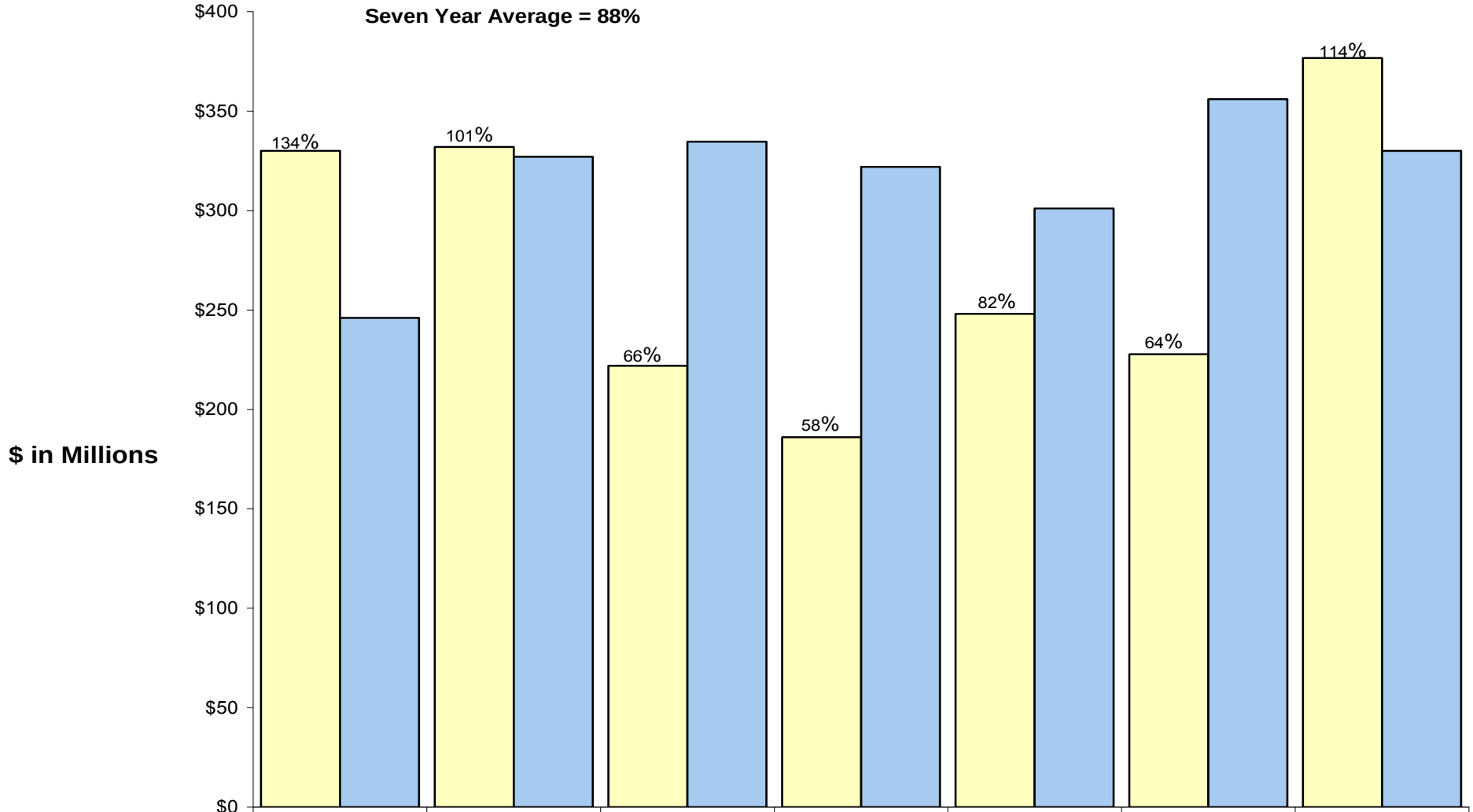
Transmission Capital[1] 2003-2017

$ in Millions



[1]Proposed Capital Levels do not include lapse factor.

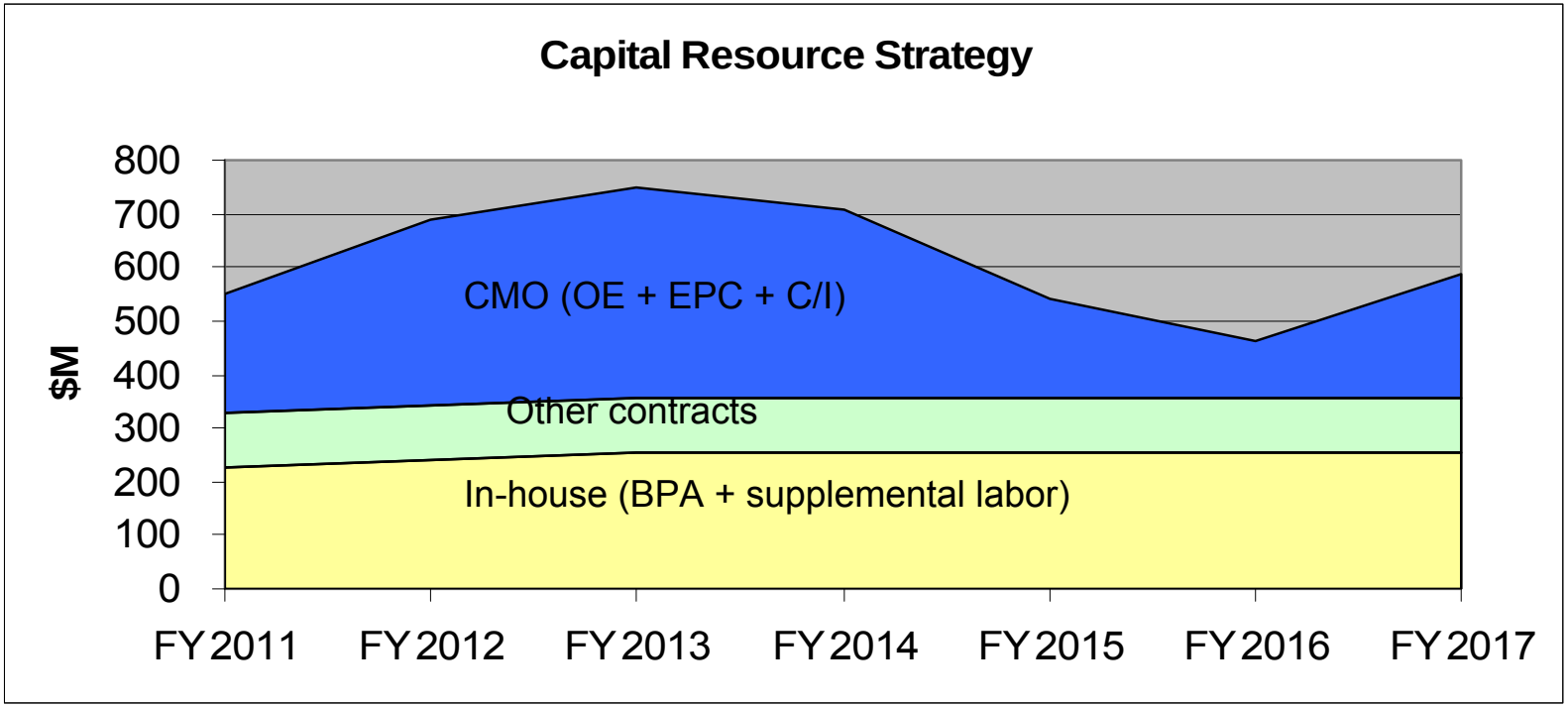
Historical Capital Spending Comparison



	FY03	FY04	FY05	FY06	FY07	FY08	FY09
Actual Expenditures	$330	$332	$222	$186	$248	$228	$377
IPR	$246	$327	$335	$322	$301	$356	$330

Accomplishing The Additional Work Effectively

- Given BPA-T's internal workforce constraint of $200M (direct $), BPA has developed a contract strategy that will ensure the completion of the sustain and expansion capital programs.
- The Contract Management Office (CMO) and other contracting strategies provide an increase in capacity to meet the capital program needs.
- Specific CMO objectives include achieving the increased capital program contracting without increasing employee levels as well as meeting project/program objectives within budget, scope, and schedule.



Owner's Engineer (OE), Engineer, Procure, Construct (EPC), and Contract Administration and Inspection (C/I)

Resource Strategies to Achieving Capital Program

- **Contract Management Office (CMO)**
  - 15 staff currently in this function overseeing contracts and work plan
  - Contracts include:
    - Owner's Engineer (OE)- awarded 2009
    - Engineer, Procure, Construct (EPC)- June 2010 award
    - Contract Administration and Inspection (C/I)- July 2010
    - Switchboard shop- under development, operational 3-6 months
    - Special services contracts- under development, operational 3-6 months

- **Other Contracts (outside of the CMO scope)**
  - Turn key solutions from original equipment manufacturers (e.g. series caps, Celilo enhancements)
  - Specialized vendor contracts for telecomm projects (e.g. 3G, mobile radio upgrades)
  - Fixed price material contracts for major equipment (transformers)
  - Construction contracts for non-electric plant facilities

- **BPA Internal Capacity**
  - Use of term employees (limited to 4 years)
  - Supplemental labor
  - New focus on managing and accepting work by contractors

What is the Desired Future State?

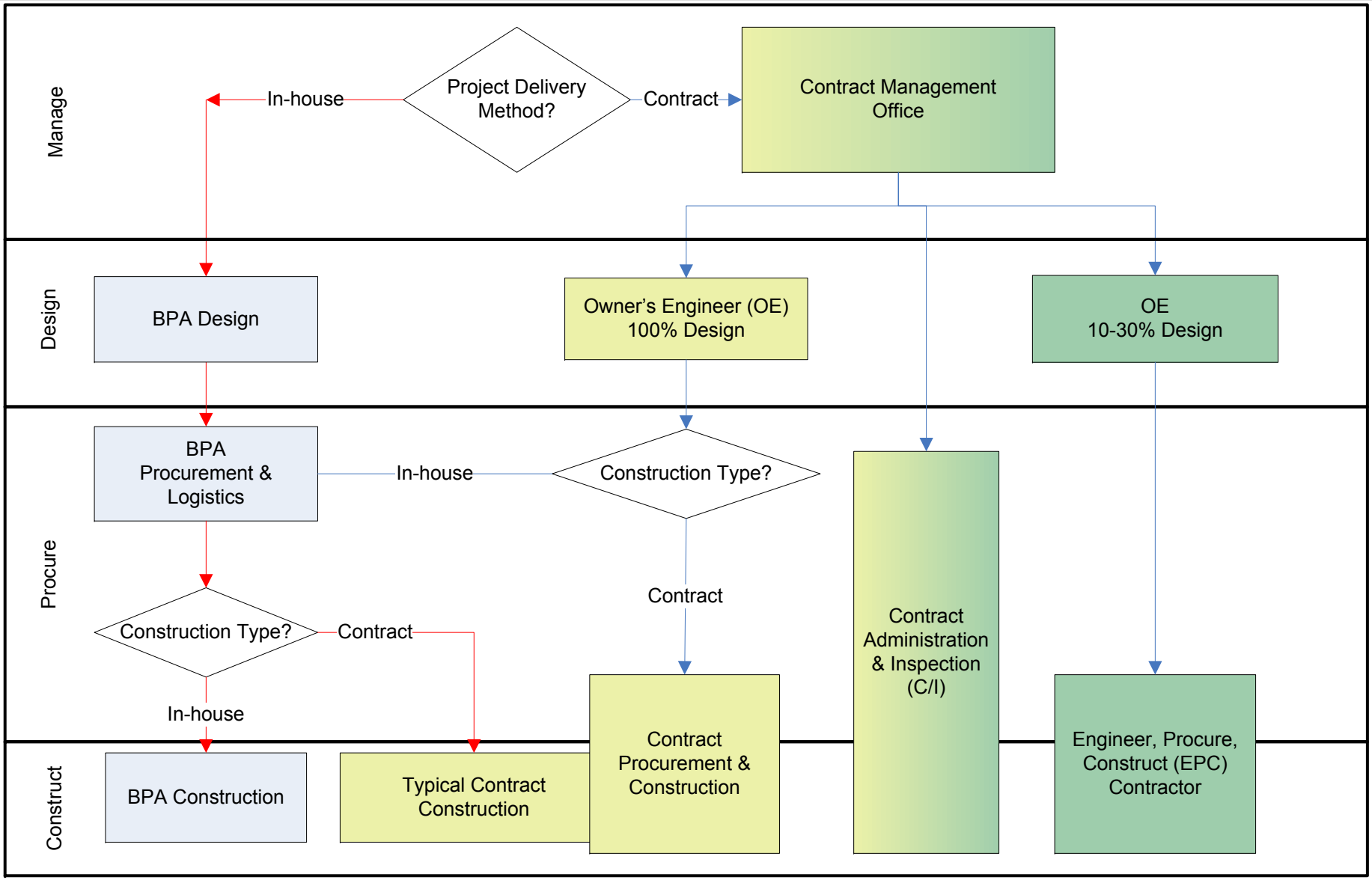
- **Have clearly defined agency level Talent Management Strategy that defines the "right size", "right skills" and "right work environment"**

- **Use Benchmarking to help define "right size" and "right skills"**
  - Navigant study- reviewing preliminary findings
    - Based on 2009 capital program
    - Results - below industry median for Transmission business wide
    - Functional analysis – shows some over and some under
      - Short on project managers
      - Span of control - 22 front-line supervisors (9% of total managers) with more than 20 staff
      - Short on technical crafts (protection and control, communications)

Short Term Staffing Strategies

1) Need to carefully assess what work really needs to be done by BPA employees. Only fill vacancies when really necessary;
2) Understand BPA may need to reassign work or workers to critical functional areas;
3) Continue to use supplemental labor contract resources.
4) Use the Supplemental Labor Information System to effectively access contracting needs;
5) Use tools to address peak work:
   - Use term employees where appropriate; and
   - Contracting mechanisms.

Contract Strategy Decision Tree



Note: Diagram is conceptual not operational

Capital Program Process Improvements

- **Embrace ongoing automation efforts and change management processes to provide a solid foundation for the capital program.**
- **Improve Design, Field, Construction, and CMO coordination**
- **Continue implementing strategies/systems to compare projects and resources**
- **Implement Work Plan in MS Project by July 2010**
- **Have 80% of the FY11 Work Plan and resource strategy developed by July 2010 prior to budget setting process**
- **Regularly review scope, schedule, and budget of projects underway for necessary defunding to improve end of year forecast**
- **Establish outyear contract strategy execution targets for available contracting methods**
- **Monitor key risk mitigation plans**

BPA's Financial Disclosure Information

- All FY 2010 – FY 2017 information has been made publicly available by BPA on May 13th, 2010 and does not contain Agency-approved Financial Information.
- All FY 2003 – 2009 information has been made publicly available by BPA and contains Agency-approved Financial Information.
- All FY 2011 Rate Case data has been developed for publication in rates proceeding documents and is being provided by BPA.