Grid West

Grid West Impact Assessment

Draft for Discussion with GW Forum – January 9, 2006

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Agenda

Today's presentation will cover the following topics…

- Background
- Design Impacts
- Benefits Impacts
- Cost Impacts
- Value Proposition

The mission of the TRG is to evaluate the impact of reduced transmission owner participation on the proposed design…

- **Design Impact –** Identify impacts and required changes to the proposed Grid West design
- **Benefits Impact –** Perform a high-level review of the impacts to the Grid West benefit assessment
- **Cost Impact –** Perform a high-level review of the impacts to the Grid West cost estimate
- **Value Proposition –** Summarize the business case for the formation of Grid West

Design Impacts

The design impact sections covers the following topics…

- Background
- Grid West System
- Key Concepts
- Design Impacts

The Grid West "Layer 2" design was described in the following white papers issued in May 2005…

White Papers

Module 1 Transmission Service	Module 2 Rights Administration	Module 3a Scheduling	Module 3b Operations	Module 4 Ancillary Services	Module 3c Settlement
1 Planning & Capacity Expansion	3 Transmission Rights Reconfiguration Service	7 Market Information System	11 NERC Reliability Functional Model	15 CCA Reserve Market	18 CCA Settlement Metering
2 * Tariff Administration	4 Day-Ahead Redispatch	8 Outage Coordination	12 Real-Time Monitoring	16. CCA Reserve Deployment	19 Settlements & Invoicing
	5 Bilateral Trading	9 Scheduling and Schedule Adjustment	13 Real-Time Balancing Service	17 CCA Participation in Reserve Sharing	20 Billing Dispute Resolution Process
	6 Rights Data Management	10 Transmission Losses	14 Emergency Operations		

Reference Papers

21 Congestion Management

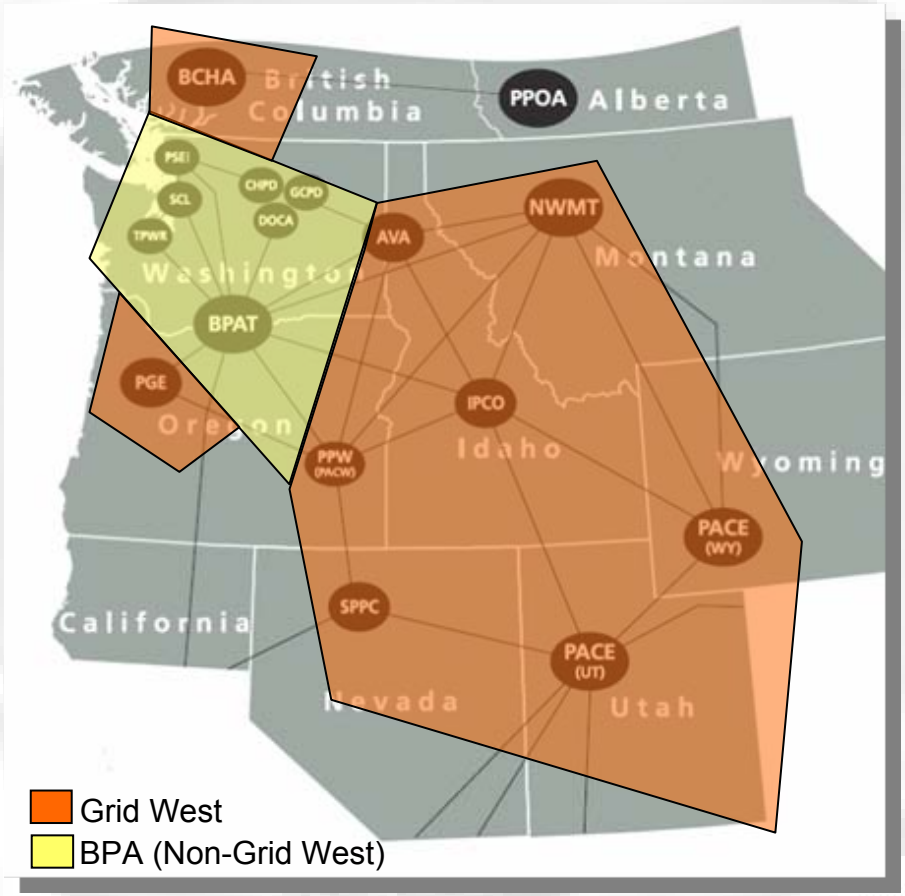
22 Auction Pricing

23 * Commercial Model

24 Grid West Seams Issues

* Note: Papers deferred to Layer 3

The withdrawal of BPA from Grid West creates a non-contiguous system…



Design Impacts
Impacts & Simplifications

The following is a summary of impacts and simplifications associated with BPA's withdrawal…

Impacts

- Grid West operations are feasible across non-contiguous systems but not as efficient
- There is an additional seam to manage (BPA), however, other markets have similar configurations (e.g. PJM-MISO)
- Non-signatories (including BPA) can still participate in the various markets
- Mutually beneficial business relationships are possible (e.g. BPA Bridge)

Simplifications

- No transfer of operational control for federal assets
- Fewer limitations on the use of resources
- Reduced system customization
  - Reduces implementation risk
  - Reduces development costs
- Reduced headcount
- Greater implementation flexibility

Design Impacts
Key Concepts

To understand the impacts to the current design, it is helpful to review some key concepts, including…

- **Seams** – Seams are created when business practices vary across regions. Under the new paradigm there will be a seam between Grid West and BPA. A seams agreement is often required to enable coordinated operations.

- **Dynamic Scheduling** – A scheduling practice enabling dynamic energy transfers between control areas. Commonly used to support external and/or non-contiguous parties participation in markets.

- **NERC Functional Model** – A model that defines the functions to be performed to ensure the reliability of the bulk power system. Under the new paradigm, some roles traditionally performed by the local control areas will now be performed by Grid West.

To understand the impact to the current design, it is helpful to review some key concepts, including…

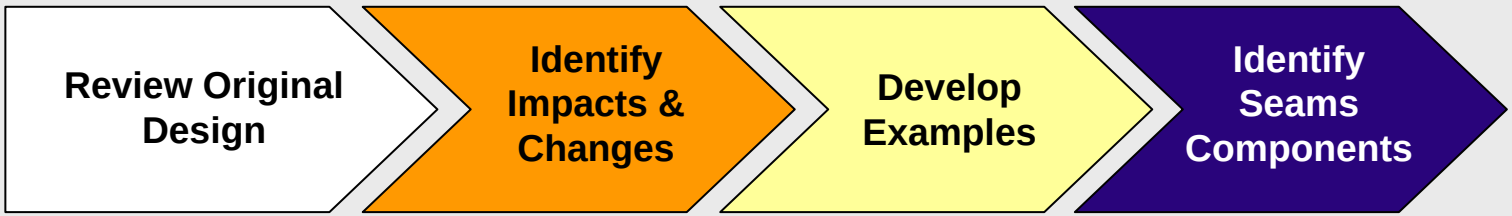
- **Reconfiguration** - Based on an algorithm that optimizes the use of the transmission system using flow-based methodology (versus contract path). It is workable across non-contiguous footprints.

- **Security Constrained Economic Dispatch** – A commonly used algorithm that optimizes the cost of producing energy to meet the load obligation while respecting operational limits. It is a major component of the real-time balance service.

- **Grid Management Charge** - The mechanism by which Grid West will recover its startup, annual operating, and financing costs. It can be assessed as multiple charges to collect contribution from all parties who use services. It is typically a fraction of a percent of the transaction value.

Note: Additional key concept details can be found in Appendix A…

Approach



Primary Focus

- Reconfiguration and IWRs
- Reliability
- Consolidation of Control Area Operations
- Reserve Markets
- Scheduling & Congestion Management
- Real-time Balancing Services

Key Questions

- What was the original design?
- What needs to change?
- Is it feasible for a non-contiguous area?
- How can different players participate?

Design Impacts
Summary of Impacts

At a high-level, we believe the Grid West design to be workable based on the following…

Measure	Contiguous Signatories	Non-Contiguous Signatories	Non-Signatories & Other Parties
Market Design	**Largely Unchanged**	**Largely Unchanged**	**Not Applicable**
Economic & Operational Efficiency	**Minimal Change** • Some efficiency reductions associated with reduced participation	**Moderate Changes** • Moderate efficiency reductions depending on the nature of a BPA bridge agreement	**Not Applicable**
Market Access	**Unchanged**	**Minimal Change** • Some firm-transmission requirements – similar to today	**Minimal Change** • Some firm-transmission requirements – similar to today
Incentives to Participate in Markets	**Unchanged**	**Unchanged** • Assuming adequate transmission bridge capacity is available	**Minimal Changes** • Minimal reduction in incentives due to increased transmission access costs

Design Impacts
Basic Findings & Assumptions

In evaluating the impacts to the design, we found…

- Incentives exist for GW & BPA to form a cooperative relationship
- Incentives exist for all parties to participate in new markets
- Signatories have substantial existing rights on the BPA system
- These rights can be used to enable GW functions
- GW features are workable using current business practices
- Benefits may be less than that of the original GW design

Therefore we assumed…

- Agreement will likely be reached on additional issues (e.g. use of a common flow-based methodology) and the value will approach the original GW design

We considered the evolution of a Grid West and BPA relationship because there is an alignment of mutual interests…

Practices	Description
Current	*Assumes the following…* • Current level of coordination with BPA • Existing business practices • Only existing signatory rights are available for crossing BPA
Improved	*Assumes the following…* • Improved level of coordination with BPA • Participation of BPA in Grid West markets • BPA offers rights for use in the RCS

The purpose of the reconfiguration services is to provide a forward transmission market to enable better use of transmission capability…

- Rights data management used to honor pre-existing rights and track IWR issuance
- Voluntary market providing new opportunities to sell/acquire transmission rights in forward periods
- Based on a flow-based methodology that reflects the true physics of power flows
- Does not abrogate existing rights – participants can only be made better off
- Optimizes the value of all IWR bids/offers – producing the most efficient solution
- Allows trading of IWRs of various durations (daily, yrly)

Assuming current practices…

- The rights data management design is largely unchanged
- Both the flow-based methodology and the reconfiguration auction are workable across non-contiguous areas
- There continue to be incentives for non-signatories to participate

Assuming improved practices…

- A common flow-based methodology between Grid West and BPA will lead to a more optimal solution

Grid West will continue to use the RCS to issue IWRs…

Contiguous Signatory

PAC wants to offer a firm transmission right within the GW System

- PAC offers into the RCS
- If the offer is economic it is selected and PAC is paid the clearing price
- Grid West uses the associated AFC to issue additional IWRs

Non-Contiguous Signatory

Powerex wants to obtain transmission to move power from a source within BC to a sink within PAC

- ***Current:*** Powerex must have rights across BPA (potentially from the RCS) and submit a bid into the RCS for segments within Grid West
- ***Improved:*** Using a common flow-based methodology, Powerex will likely be able to obtain rights across BPA directly from the RCS

Non-Signatory & Others

BPA wants to sell a block of firm transmission into the Grid West RCS auction

- ***Current*:** BPA can offer AFC from a specific POR to a specific POD into the RCS
- ***Improved*:** Using of a common flow-based methodology, BPA can offer AFC into the RCS without the one-to-one restriction

The following is a summary of the original design…

- Grid West serves as a single transmission provider
- Grid West centrally monitors and controls region
- Grid West consolidates the operations of at least three control areas
- Grid West assumes several of the NERC functional model roles, including:
  - Reliability Authority, Interchange Authority, Transmission Service Provider, Interconnection Planning Coordinator (for GWMT)
  - Balancing Authority, Market Operator (for the CCA)

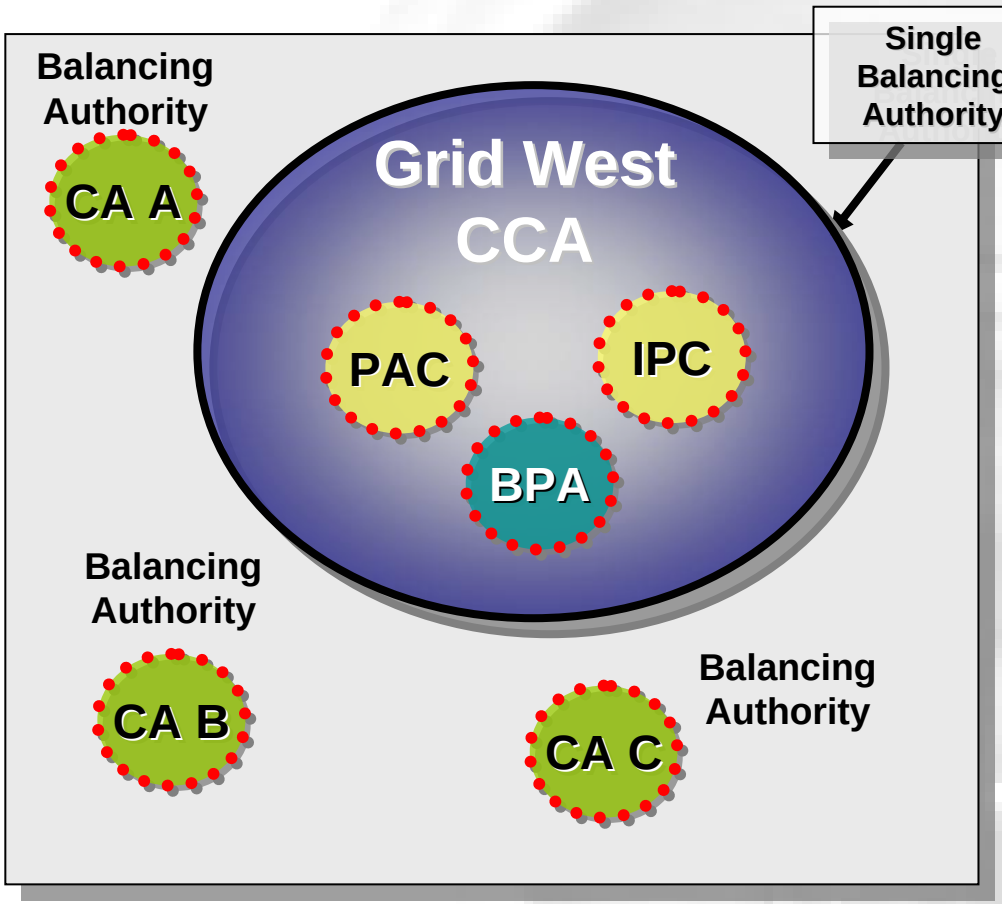
Assuming current practices…

- Grid West continues to perform similar roles as before but over a smaller footprint
- Grid West continues to offer improvements in reliability
- Grid West is a single balancing authority for all signatories
- Coordination activities with external control areas increase

Design Impacts

Consolidation of Control Area Operations: Original Design

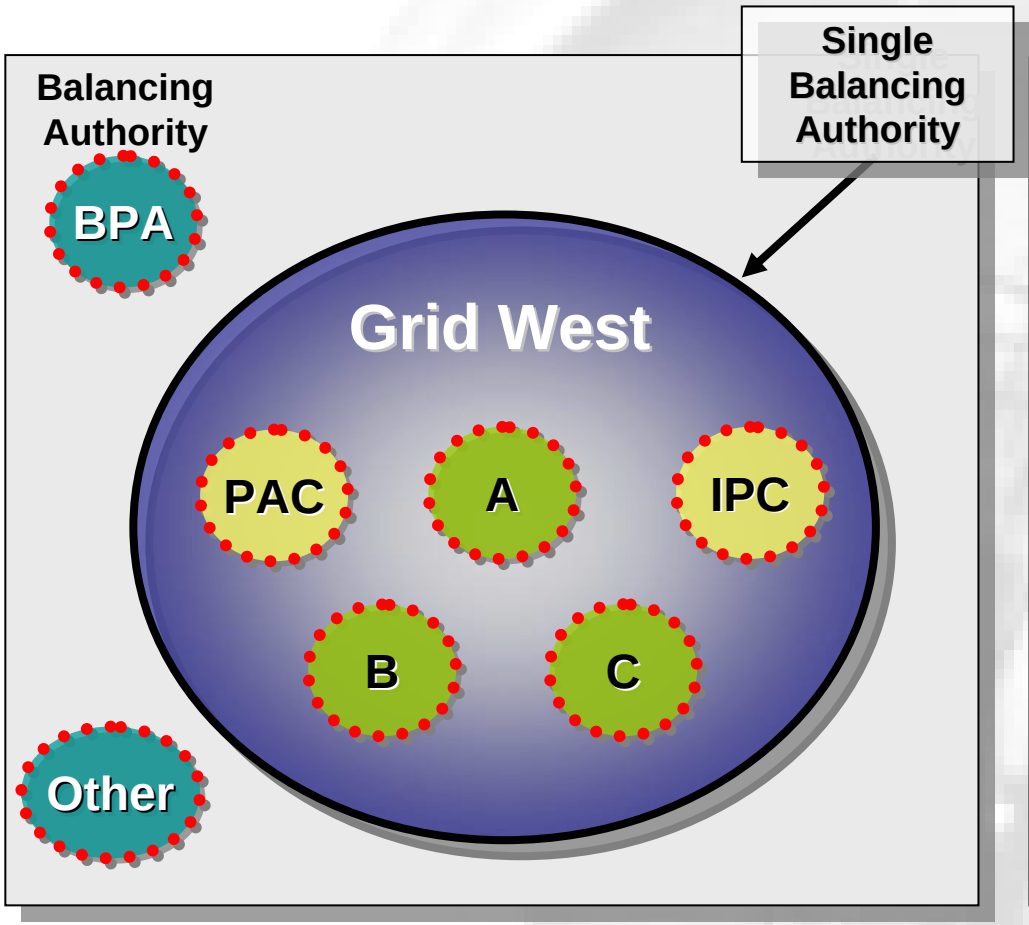
The original design called for the consolidation of at least three control areas into a single balancing authority (BA)…



Characteristics

- Multiple BAs (CCA + Non-Consolidating BAs)
- Each BA calculates its own ACE
- CCA-only balancing market
- CCA-only reserves market
- Existing TO control centers route dispatch instructions

Grid West is proposing the formation of a single balancing authority (BA) for the remaining control areas…



Characteristics

- Single BA
- Single ACE calculation for GW
- GW-wide balancing market
- GW-wide reserves market
- Existing TO control centers implement dispatch instructions
- BC may remain its own or nested BA

The purpose of the reserve market is to provide an organized market to obtain reserves at least cost…

- Voluntary market - new opportunity to sell/acquire reserves
- Reserves procured for CCA only – external supply allowed
- Control Area reserve obligations do not change – new mechanism
- Opportunity to pool regulating reserve requirement
- Reserve requirements based on NERC/WECC criteria
- Current contingency reserve sharing agreement preserved

Assuming current practices…

- The reserve market design is largely unchanged
- The reserve auction is workable across non-contiguous areas using dynamic transfers
- There continue to be incentives for non-signatories to participate
- Reserve “regions” may need to be created
- Firm transmission to the “boundary” is required for external generators and non-contiguous signatories

Reserves will be centrally procured by Grid West as in the original design…

Contiguous Signatories

Idaho Power wants to offer reserves into the Grid West reserves market

- Since the resource is within Grid West, no transmission is required with the offer
- Idaho Power submits a reserve offer
- If the reserve offer is economic, it is selected and Idaho Power is paid the market clearing price

Non-Contiguous Signatories

Powerex wants to sell reserves to Grid West

- **Current:** Powerex must have rights across BPA (potentially from the RCS) and submit an offer into the reserve market
- **Improved:** A BPA bridge agreement would create additional AFC, enabling additional reserve offers. Or, GW signatories can pool transmission rights.

Non-Signatories & Others

BPA wants to sell reserves to Grid West

- BPA must have rights to the GW-BPA boundary and submit a voluntary offer into the reserve market

The scheduling & congestion management design describes how these functions will be handled by Grid West …

- Grid West administers physical rights congestion model
- Scheduling is performed on a flow-basis vs. contract path
- All schedules have an associated transmission right
- New transmission rights issued by Grid West as IWRs
- IWRs issued ONLY if they are feasible - using true flows
- Existing transmission rights protected and unchanged

Assuming current practices…

- Scheduling and congestion management designs are largely unchanged
- Congestion management approach is workable across non-contiguous areas
- Scheduling across non-signatory territory require the proper transmission rights – similar to today

Assuming improved practices…

- A common flow-based methodology between Grid West and BPA will reduce seams and improve congestion management

A physical rights model is used for both scheduling and congestion management…

Scheduling

Agreement between BPA and GW to allow GW to act as scheduling agent for GW signatories rights

- **Current:** Schedules handled as collection of individually identified schedules transmitted to BPA;
- **Improved:** Provide bundled schedules and expected generation levels in each system

Congestion Management

Day-Ahead

- **Current:** RCS used within GW to find best utilize transmission capacity (within constraints)
- **Improved:** Make transmission available between the two systems through offers of scheduling flexibility

Real-time

- BPA could make inc-dec offers in RBS, which would enable joint redispatch to clear congestion rather than curtail

The following is a summary of the original design…

- Voluntary INC/DEC market - new opportunity to sell/acquire balancing energy (included a must offer backstop)
- Balanced schedule requirement (all load covered)
- Balancing energy procured by Grid West for CCA only – external participation allowed
- Balancing service supports generation/load following, manage congestion, and promote economic efficiency within the CCA
- Locational prices calculated for imbalance energy – however, load settlement may occur at an aggregated level (such as former control areas)

Assuming current practices…

- Design simplified – fewer restrictions on the use of resources
- The real-time balancing service and pricing methodology is workable across non-contiguous areas using dynamic transfers
- There continues to be incentives for non-signatories to participate
- Less transmission available in real-time to the optimization algorithm
- Firm transmission to the Grid West boundary required for external generators and non-contiguous signatories

Imbalance energy is centrally procured by Grid West…

Contiguous Signatories

PacifiCorp is willing to back down Utah generation to support the imbalance market

- Since resource is within Grid West, no additional transmission arrangements needed
- PacifiCorp submits a dec offer in the RBS
- Resource option used by SCED based on cost and transmission constraints

Non-Contiguous Signatories

An IPP within BCTC system wants to sell imbalance energy to Grid West

- **Current:** IPP must have rights across BPA (potentially from the RCS) and submit an offer into RBS
- **Improved:** A BPA bridge agreement would create additional AFC, enabling additional RBS offers. Or, GW can pool transmission rights.

Non-Signatories

An IPP within BPA system wants to sell imbalance energy to Grid West

- Same as Non-Contiguous Signatory

Design Impacts
Summary

The following Is a summary of the design impact assessment…

- The design remains workable in non-contiguous environment
- In some cases, the design can be simplified
- Less AFC to work with than originally expected
- Additional seams requiring coordination (still less than status quo)
- Firm transmission requirements for non-contiguous signatories
- However, improvement over status quo

To achieve full benefits, improvements in current practices should include…

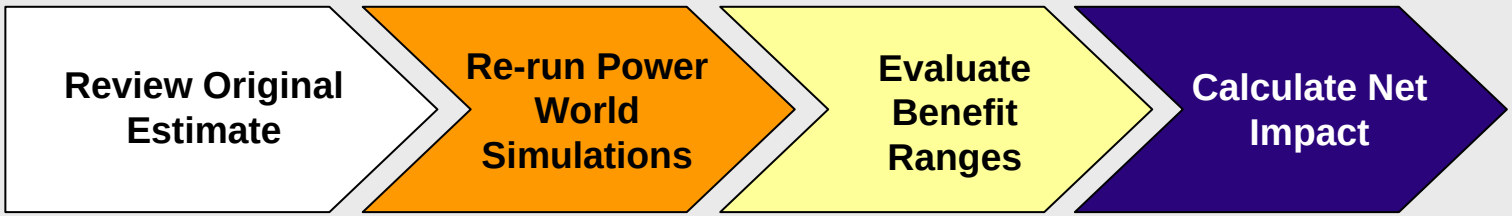
- Coordinated flow-based methodology
- Transmission products that support dynamic scheduling
- Pooled use of transmission rights (this goes to flexible use of transmission rights)
- Minimization of Pancakes (addressing short-term wheeling rates, multiple ancillary service charges, etc.)

Benefits Impacts

A recap taken from "A Summary of the Estimated Benefits of Grid West" January 5, 2006

Benefits Impacts
Approach

The Approach



Primary Focus

- Redispatch Efficiency
- Contingency Reserve
- Regulating Reserve
- Reduction of Pricing Pancakes
- Bulk Electric System Reliability
- Power Delivery System Reliability
- Reconfiguration Service
- Conservation & Demand Side Mgmt.
- Capacity Construction Deferral (NEW)

Key Questions

- What was the original estimate?
- How is it impacted?
- What is the net result?

Both the original and revised benefits estimates leveraged previous studies, including…

Study	Benefit	Description
Previous Studies	Contingency Reserves	Considered production cost savings due to more efficient unit commitment of reserve capacity
BPA Studies	Regulation	Demonstrated a reduced amount of capacity committed to regulating reserves due to ACE diversity over a wider region
PowerWorld Simulations	Redispatch	Computed production cost savings that would occur in real-time after pre-schedule unit commitments are locked in
Previous Studies	Reliability	Quantified by estimating the value of avoided outages at the regional and local level
Previous Studies	Reduced Rate Pancaking	Calculated by simulating dispatch with and without pancaked transmission rates
Previous Studies	Reconfiguration	Derived by increasing utilization of existing transmission capacity

In developing the benefits estimates, several cases were developed, including…

July Benefit Estimate

For the July estimate, two cases were developed:

1. The Four CCA Case: This level of benefits assumes consolidation among the BPA, Idaho and Pac East and Pac West control areas.

2. The Ten CCA Case: The case assumed participation by all Grid West participants.

Revised Benefit Estimate

For the revised benefits estimate, two cases were evaluated:

1. The Eight Plus Case: This level of benefits assumes consolidation among the current Grid West participants. In addition, the generation associated with Independent Power Producers, located in BPA's control area, is assumed to be available for the Grid West markets.

2. The Ten CCA Case: This level of benefits is assumes consolidation among the current Grid West participants as well as full participation in the Grid West markets by BPA and Puget Sound Energy.

Benefits Impacts

Original Estimate: Summary of Impacts

Component	Impact	Findings
Redispatch	⟷	Benefits are a function of the level of market participation
Contingency Reserves	↓	Benefits were reduced to avoid double counting
Regulating Reserves	⟷	Benefits are a function of the level of participating load
Reduction in Rate Pancakes	↓	Benefits are reduced due to the seam with BPA
Bulk Power System Reliability	⟷	Benefits are a function of the level of participating load
Power Delivery System Reliability	⟷	Benefits are a function of circuit miles involved
Conservation and DSM	⟷	Benefits are a function of the level of participating load
Construction Deferral	N/A	Benefits are a result of deferring for one to two years incremental generation or transmission capacity

Benefits Impacts
Summary of Benefits

Quantified Benefit Estimates*	Original Estimate 10 CCA		Revised Estimate 8 CCA	Revised Estimate 10 CCA
Control Area Markets				
1. Redispatch Efficiencies (RBS)	332		147	335**
2. Contingency Reserves	55		27	37
3. Regulating Reserves	21		16	21
Regional Services				
1. Rate Pancakes	20		10	10
2. Bulk Electric System Reliability - Cascading Disturbances	50		37	50
3. Power Delivery System Reliability - Momentary Sustained Outages	119		83	119
4. Reconfiguration - Transmission Utilization	30		30	30
5. Conservation & Demand Side Managaement	32		24	32
6. Construction Deferral (G, T, and D)	0		9	12
Quantified Group Total	659		383	646

** Some benefits have a degree of overlap*
*** Assumes full participation in markets by original participants*

The reduction of TO participation has not significantly impacted the estimated benefits…

- The net benefits, when evaluated for the region, are positive and significant
- The level of benefits are sensitive to the number of regional entities participating in the Grid West markets
- The benefits can be enhanced by having access over the BPA transmission system and the development of a common flow-based methodology
- The benefits have not been allocated or attributed to various market participants

Cost Impacts

Cost Impacts
Background

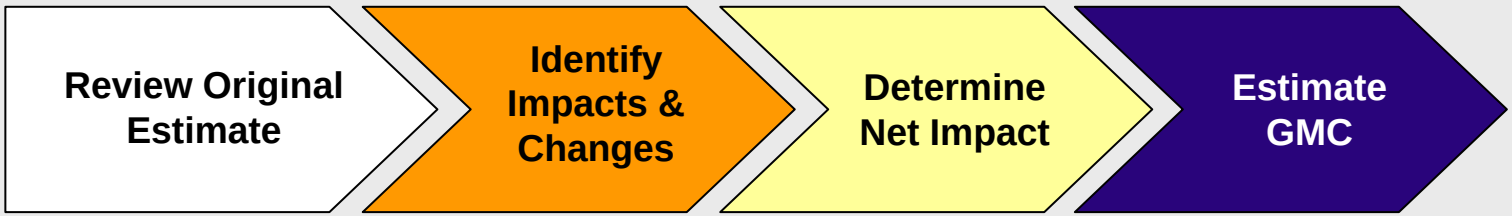
In October of 2005, Structure presented an estimate of Grid West start-up and operating costs…

- Bottom-up approach
- Detailed cost model
- Assumptions (BPA Dittmer facility, etc.)

Structure has been asked to determine the impact of the recent restructuring decision on the original cost estimate….

Cost Impacts
Approach

Our Approach



Primary Focus

- Employees
- Systems
- Facilities
- Data, Voice, Network
- Other
- Per Unit Cost

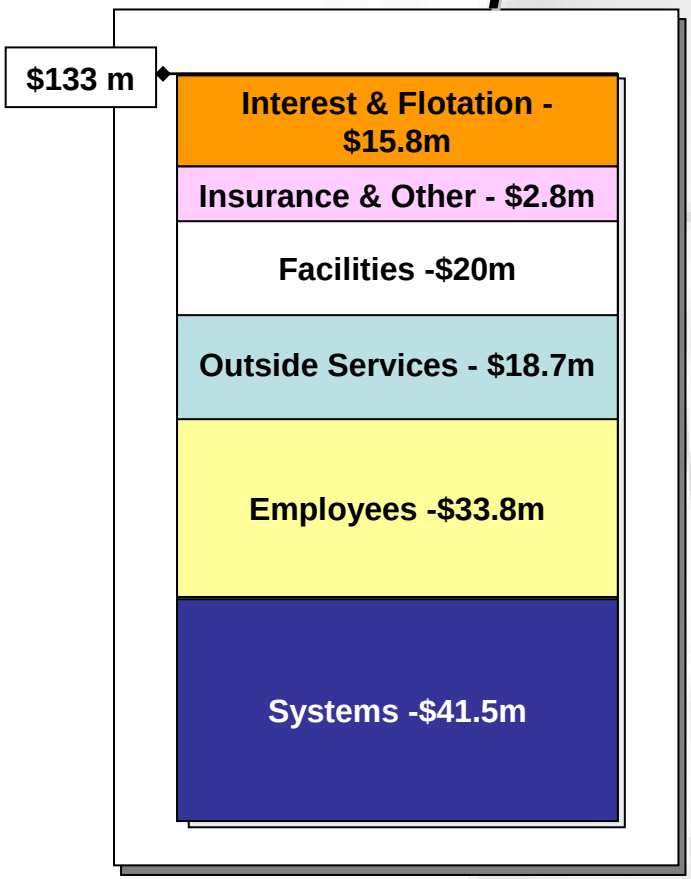
Key Questions

- What was the original estimate?
- How is it impacted?
- Are there opportunities to reduce costs?
  - Headcount
  - Systems
  - Implementation
- What is the net impact to the estimate?
- What is the impact to the per-unit cost?

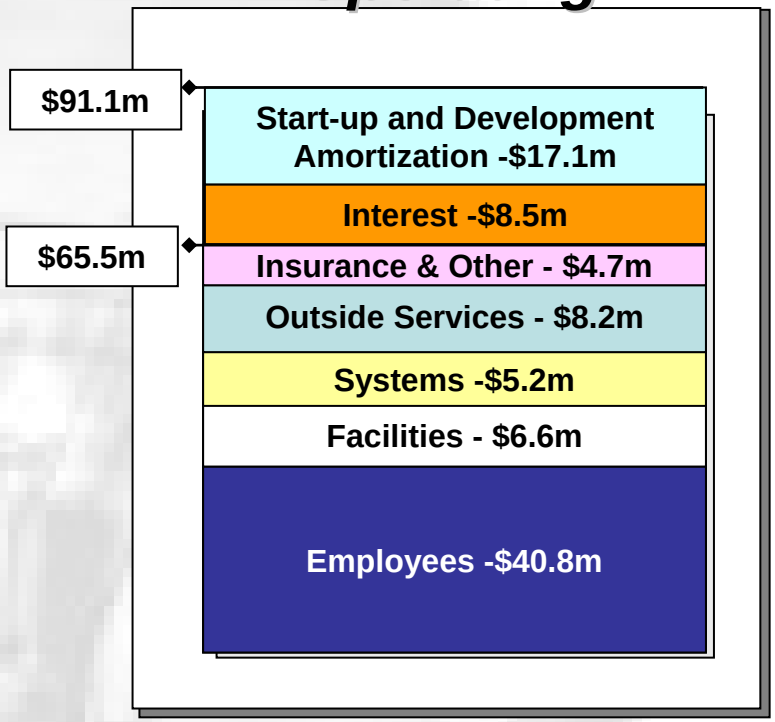
Cost Impacts
Original Estimate

The following is a summary of the original estimate…

Start-Up



Operating



Estimated Per Unit Cost - $0.31/MWh

(Based on Grid West load of 291,000,000 MWh)

Cost Impacts
Original Estimate: Summary of Impacts

At a high-level, we believe the impacts to be in the following areas…

Component	Impact	Findings
Employees	↓	Reduced number of operational positions No relocation costs
Facilities	↑	Increased hardening costs
Systems	↓	Reduced system costs Reduced implementation risks
Outside Services	↑	Increased outside services costs (seams)
Data, Voice, Network	↓	Reduced sites Increased infrastructure costs
Insurance	↔	No change in insurance costs (negligible)
Other	↓	No incremental FERC fees

Cost Impacts
Summary of Impacts

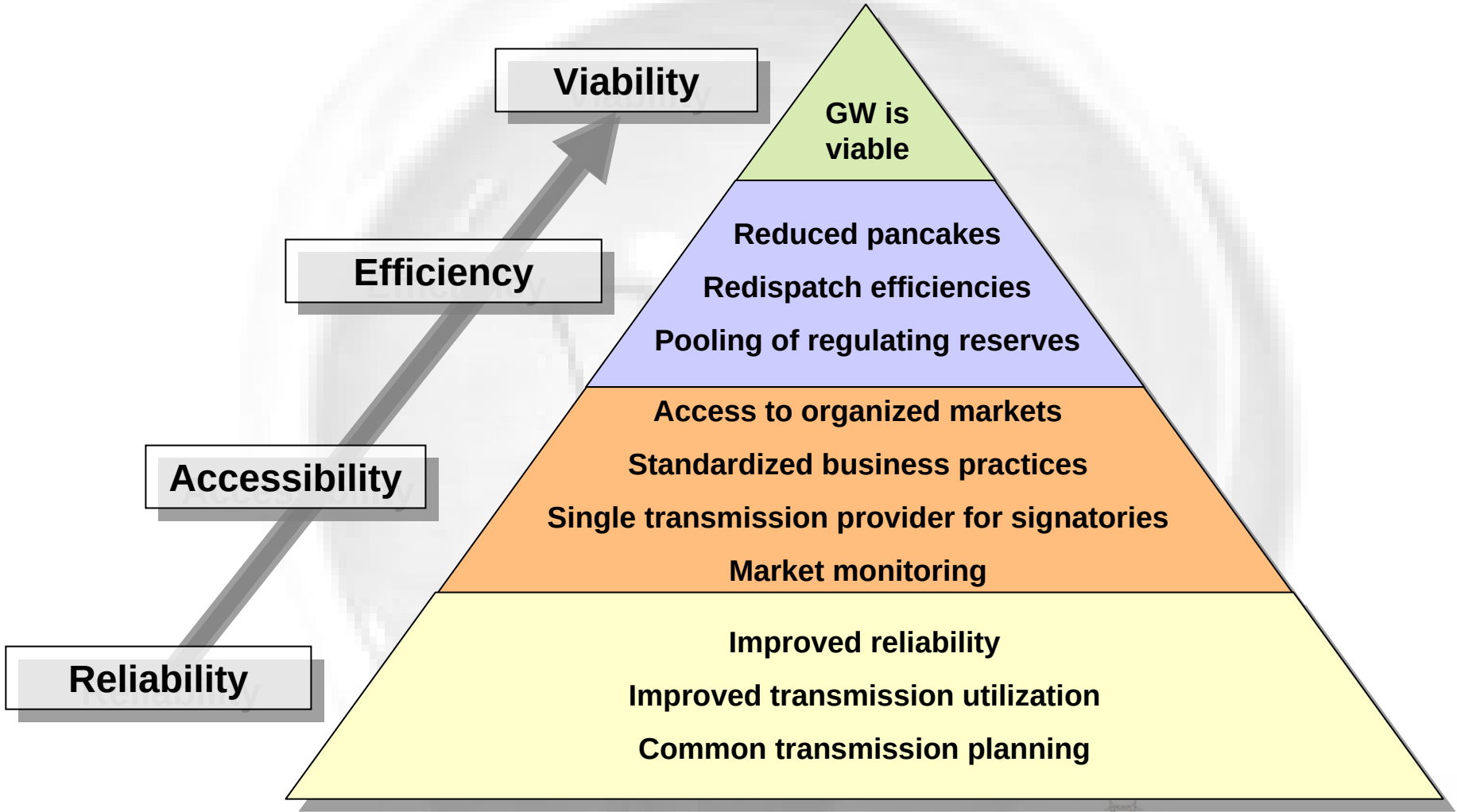
The net impact to the original cost estimate is…

Cost Area	Start Up Cost (in millions)	Operating Expense (in millions)
Grid West Labor	-$2	-$4
Facilities	+$6	+$2
Systems	-$3.5	-$1
Other	$0	-$2
Outside Services	+$1.2	$0
Net Impact	**+ $2**	**- $4.3**
Revised Totals	**$135m**	**$86.8m**

Note: Net Result does not total due to rounding differences.

Value Proposition

Value Proposition
Grid West Value Pyramid



The original value proposition is achievable even with reduced transmission owner participation…

- Design largely remains the same
- Most benefits are still attainable
- Significant improvements over current operations
- Integrates a substantial portion of the region
- A greenfield primary facility does not significantly impact costs
- Market opportunities are preserved
- Substantially workable and cost effective

Grid West will become the single transmission provider for signatories…

Today

From: Multiple Providers

- Multiple transmission queues
- Inefficient utilization of transmission
- Combined ownership and operations can lead to conflicting objectives
- Disparate scheduling processes
- Loose coordination of outages

Tomorrow

To: Single Provider

- Single transmission queue for signatories
- Improved utilization of transmission
- Independent decision making
- Common scheduling
- Centralized outage coordination

Value Proposition
Increased Transmission Utilization

Grid West will increase transmission utilization enabling access to diverse resources…

Today

From: Contract-path Methodology

- Present rules and practices prevent full utilization of transmission system
- Contract path does not reflect physics of the transmission grid
- Insufficient means to account for how one operator's actions affect surrounding systems
- Inefficient congestion management processes leading to ineffective curtailments
- Inability to predict "loop flow"

Tomorrow

To: Flow-based Methodology

- A flow-based methodology will increase the amount of AFC/ATC
- A flow-based methodology will recognize the physical realities of the grid
- More effective congestion management tools – reducing the number of unnecessary curtailments
- Increased access to diverse resources lowers production costs

Value Proposition
Access To New Markets

Grid West will provide access to new markets while preserving the existing bilateral markets…

Today

From: Bilateral Only Market

- No organized markets for imbalance energy, transmission, and ancillary services exist
- IPP's have limited access to markets
- Several artificial barriers to entry
- Lack of market prices and insufficient transparency
- Use of less-efficient congestion management processes over smaller footprint
- Lack of meaningful price signals

Tomorrow

To: Bilateral + Organized Markets

- Establishes new means to procure imbalance energy, transmission, and ancillary services
- Supports existing bilateral markets
- Levels the playing field for participants
- Market prices will influence bilateral agreements
- New generating units get fair, independent access to transmission services – leading to to more competition and lower production costs

Value Proposition
Redispatch Efficiencies

Grid West will generate a least-cost dispatch solution making use of the most affordable generation…

Today

From: Multiple Balancing Areas

- Dispatch is optimized over a limited footprint that can only consider the TO's resources
- Imbalance energy is not correctly valued – tariff pricing
- Lack of transparency

Tomorrow

To: Single Balancing Area*

- Dispatch is optimized over the entire Grid West region making best use of diverse resources
- Avoids using high-cost plants unless they are needed for dispatch adequacy or reliability
- Produces transparent, economically accurate prices
- Improves reliability

Grid West will pool regulating reserves…

Today

From: Individual Regulating Reserves

- Each control area controls to its own area control error (ACE)
- Unnecessary wear and tear of regulating resources
- Regulating reserves are not properly valued – tariff pricing
- Lack of transparency

Tomorrow

To: Pooled Regulating Reserves

- A single area control error (ACE) reduces the amount of required regulating reserves
- Regulating reserves will be provided by fewer units – less wear and tear
- Any participant can offer into the reserve market
- Access to a larger pool of resources will decrease costs and improve reliability

Value Proposition
Improved Reliability

Grid West will improve reliability…

Today

From: Multiple Levels of Coordination

- Multi- level coordination of:
  - Schedules
  - Frequency Control
  - Control area checkout
  - Maintenance
  - Planned outages
  - ATC calculations
  - Transmission planning

Tomorrow

To: Centralized Reliability Monitoring

- Reduced layers of coordination – reduced seams
- Improved view of grid conditions and better control
- Increased availability of resources in real-time
- Increased coordination of scheduled outages, path ratings, & maintenance
- Centralized operational planning
- Prices reflect real-time conditions informing participants on the state of the grid

The Grid West basic features includes a common planning model…

Today

From: Disparate Planning Processes

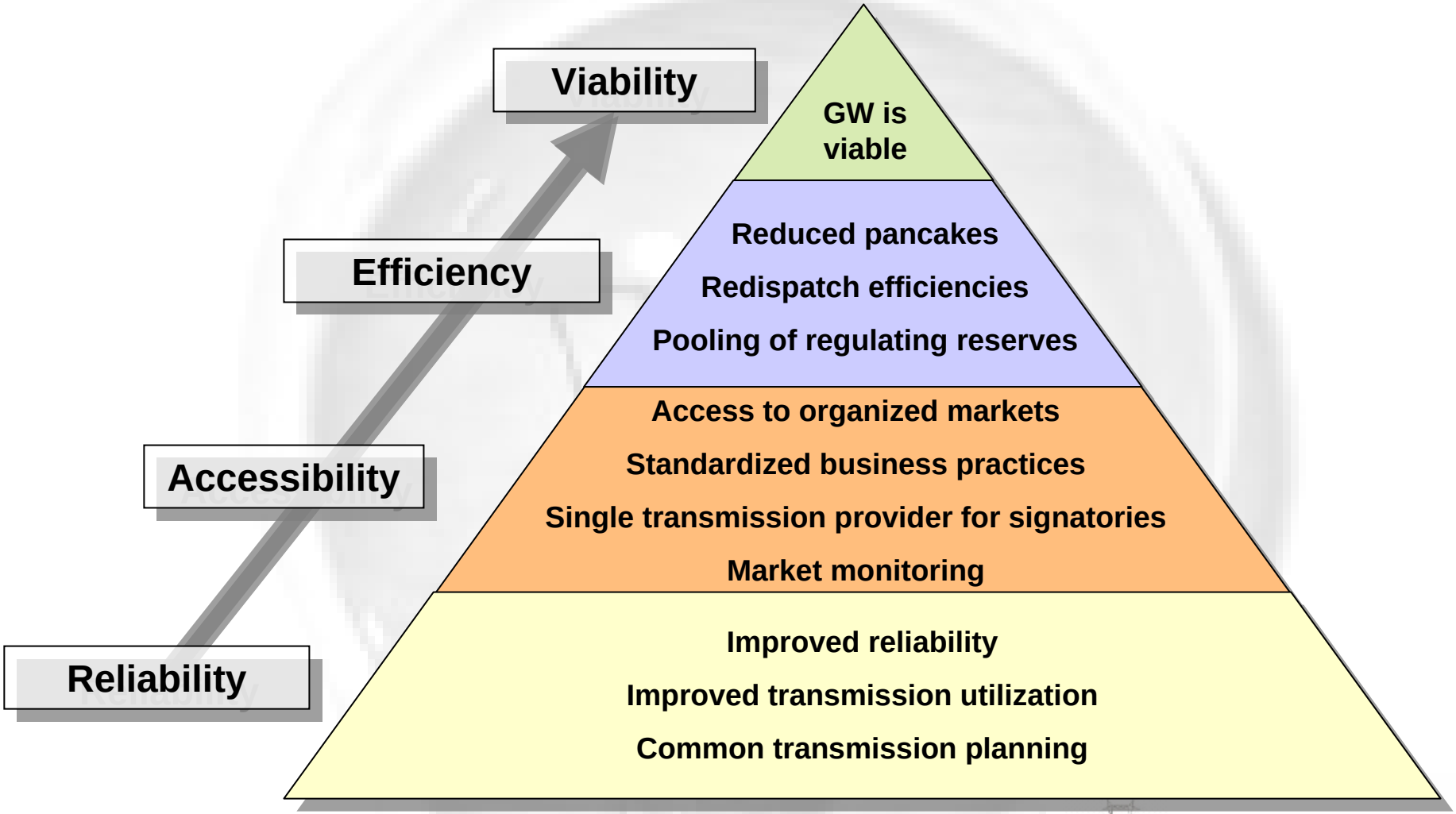
- No regional plan that looks at the best for the region versus the best for individual TO's

Tomorrow

To: Common Planning Process

- Single coordinated transmission plan
- Independent entity
- Centralized process

Value Proposition
Grid West Value Pyramid



Grid West Impact Assessment Appendices

Appendix A – Design Impact Details

In evaluating the impacts to the design, we found…

- It is in the best interests of both Grid West and Bonneville to develop a cooperative relationship that enables good, efficient operations of both systems.
- Grid West will provide opportunities for the sale of reserves and real-time energy; generator operators and energy marketers (including Bonneville) will have an incentive to make voluntary offers into these markets, on the basis of rational economic, i.e., entities who buy and sell energy today are expected to do so and to use new opportunities as they become available.
- The Grid West utilities have substantial amounts of existing transmission rights on the Bonneville system, either point-to-point rights or rights that will be replaced by point-to-point under the Bonneville tariff. Within the limits inherent under agreements, these rights can be used to enable Grid West functions to operate.
- Grid West features are workable with the minimum level of agreement that is described in the examples, although the benefits would be less than that of the original Grid West design.

Therefore we assumed…

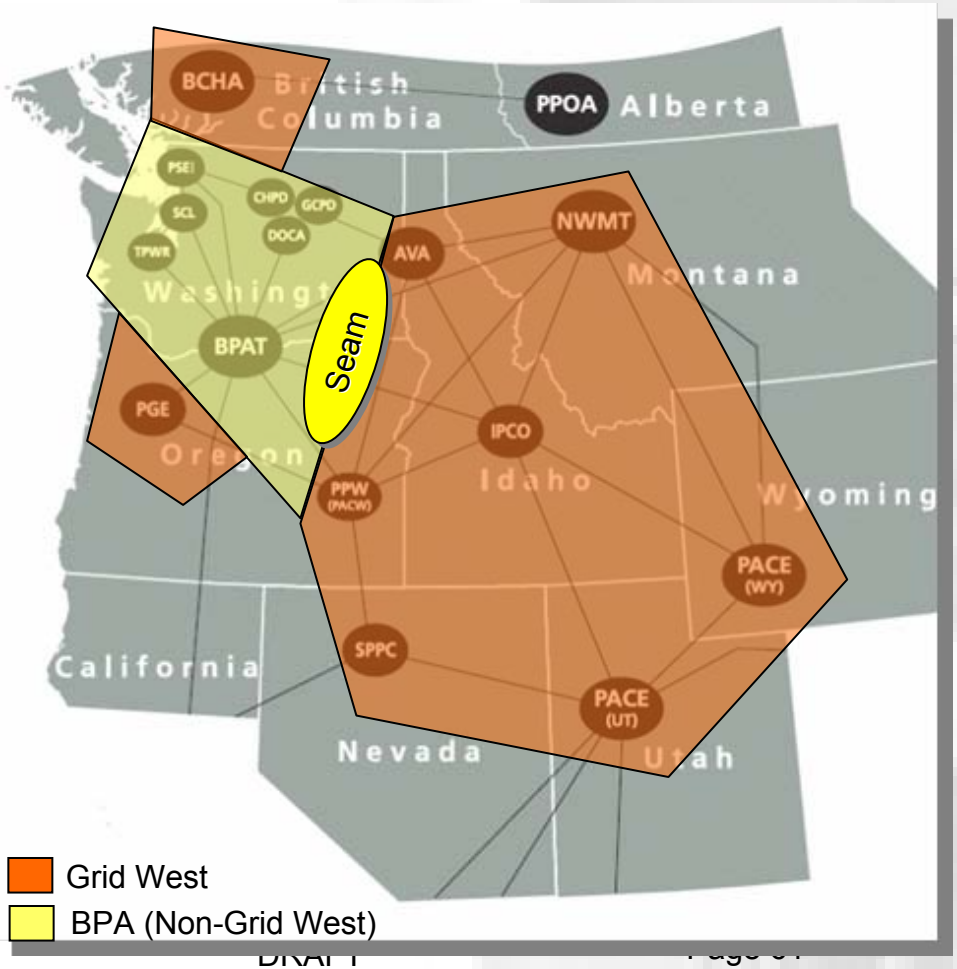
- Grid West and BPA are able to reach agreement on additional issues, e.g. a common flow-based method for transmission rights issuance, the functionality and benefits will begin to approach the original Grid West design.

Differences in business practices across a control area boundary creates a "seam"…

- Seams issues are not new; they have been discussed in various forums for years
- Seams issues typically focus on the following processes:
  - Scheduling Timelines, Network Modeling, Congestion Management, Scheduling, Curtailments, and Emergency Operating Procedures, Dynamic Scheduling, Multiple System Charges
- Existing transmission organizations have successfully negotiated and implemented seams agreements

Design Impacts
Key Concepts: Seams

Grid West will have to develop "seams agreements" with neighboring control areas…



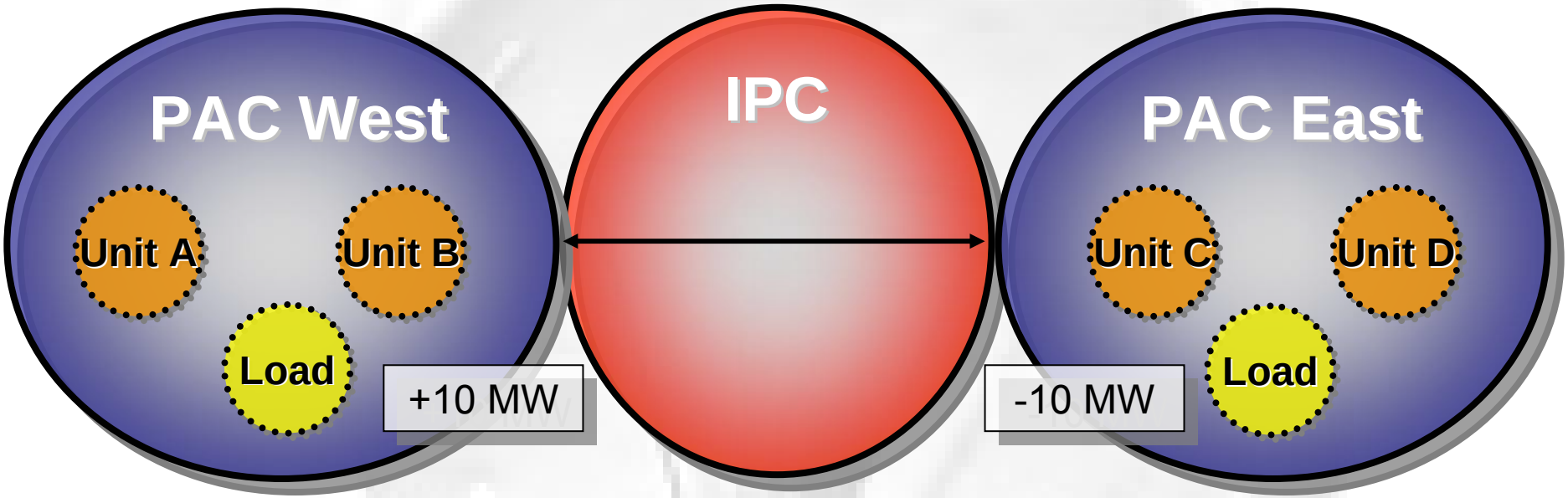
Summary

- Grid West was expected to have seems agreements with neighboring regions (e.g. CAISO, etc.)
- BPA withdrawal creates an additional seam
- Non-contiguous areas would benefit from "BPA bridge"
- Seams agreements recognize that system operations impact neighboring control areas

Dynamic transfers enable variable energy transfers between control areas. There are two different types of dynamic transfers…

- Dynamic actual (or pseudo-tie): utilizes a telemetered value (actual metered quantity), represented as a tie line in the ACE calculation though there is no corresponding physical tie, only firm transmission
  - Used to electrically move a metered quantity—either a generator or a load—from one control area to another control area for commercial reasons
  - Used to move the shares of jointly owned generation to the appropriate host control area
- Dynamic schedule: utilizes a schedule value that varies during an hour, (calculated quantity based on need), which affects net scheduled interchange (NSI) in the ACE calculations of the control areas involved
  - Typically used for transferring regulation services from one control area to another
  - Also can be used by Grid West for implementing transfers of INCs and DECs in the RBS from resources in external control areas

Today PacifiCorp uses a dynamic schedule (through IPC) between its two separate control areas. A similar methodology will be used to support non-contiguous and external participation…



A dynamic schedule of 10 MW from PACW to PACE would simultaneously affect PACW (NSI changes by +10), PACE (NSI changes by -10), and IPC—<u>no change in IPC total NSI, but changes to SI with both PACW (-10) and PACE (+10) result in a change to the scheduled transfer across IPC</u>)

The NERC Functional Model defines the functions to be performed to ensure the reliability of the bulk power system. The defined Authorities are:

Role	Description
Reliability Authority	Ensures the real-time operating reliability of its Reliability Authority area. Includes both transmission operations and balancing operations.
Balancing Authority	integrates resource plans ahead of time, and maintains load-interchange-generation balance within a Balancing Authority area and supports interconnection frequency in real-time.
Interchange Authority	coordinates the implementation of valid and balanced interchange schedules between Balancing Authority areas, and ensures communication of interchange transactions for reliability assessment purposes.

In addition to the Authorities, there are other defined roles include…

Role	Description
Transmission Operator	Ensures the real-time operating reliability of the transmission assets within a Transmission Operator area.
Transmission Service Provider	Administers the transmission tariff. Provides transmission service to qualified market participants under applicable transmission service agreements.
Market Operator	Administers markets to provide capacity, energy, balancing resources and other ancillary services subject to system requirements and constraints.
Interconnection Planning Coordinator	Ensures a plan (generally one year and beyond) is available for adequate resources and transmission within its Interconnection Planning Coordinator area.
Transmission Planner	Develops a plan (generally one year and beyond) for the reliability of the interconnected bulk power system within its portion of the Interconnection Planning Coordinator Area.

NERC defines several criteria needs for certification as a Control Area including …

- Generation – operate generation, or have the necessary contacts to operate generation, to provide for balancing and frequency control
- Metering and Data Communications - have meters on tie-lines with adjacent control areas to record actual interchange (MW and MWHR) in real-time control area and have adequate and reliable communications to assure the exchange of information
- Transmission arrangements – the control area shall have transmission arrangements to support its generation and load obligations
- E-Tag services – the control area shall provide e-Tag Authority and e-Tag Approval services.

NERC defines several criteria needs for certification as a Control Area including …

- Backup control center - provide a plan to continue operations in the event its control center becomes inoperable
- Coordination – coordinate maintenance and protective relaying that may affect reliability and other systems with those other systems and the Security Coordinator
- System restoration – have a restoration plan to reestablish its electric system and cover emergency conditions

The Reconfiguration Service is based on a flow based model…

- Reflect the physics of the grid
- Injection and withdrawal points are modeled at various levels
- Each injection has a measurable impact on its neighboring path
- Constraints are respected
- Supports non-contiguous areas
- The methodology is used extensively to conduct transmission rights allocations and auctions

The security constrained economic dispatch (SCED) is used to dispatch generation for load following, congestion management and economic optimization during the operating hour. The SCED…

- Optimizes the cost of producing energy to meet the load obligation while respecting operational limits
- Formulated as an linear programming problem:
  - Objective function - minimize bid-in production costs
  - Constraints – system balance equation, generator operating constraints, line limits
- Produces generator output levels and locational prices at generator nodes
- Typically executed every 5 minutes

The Grid Management Fee is the mechanism by which Grid West will recover its costs…

Original Illustration

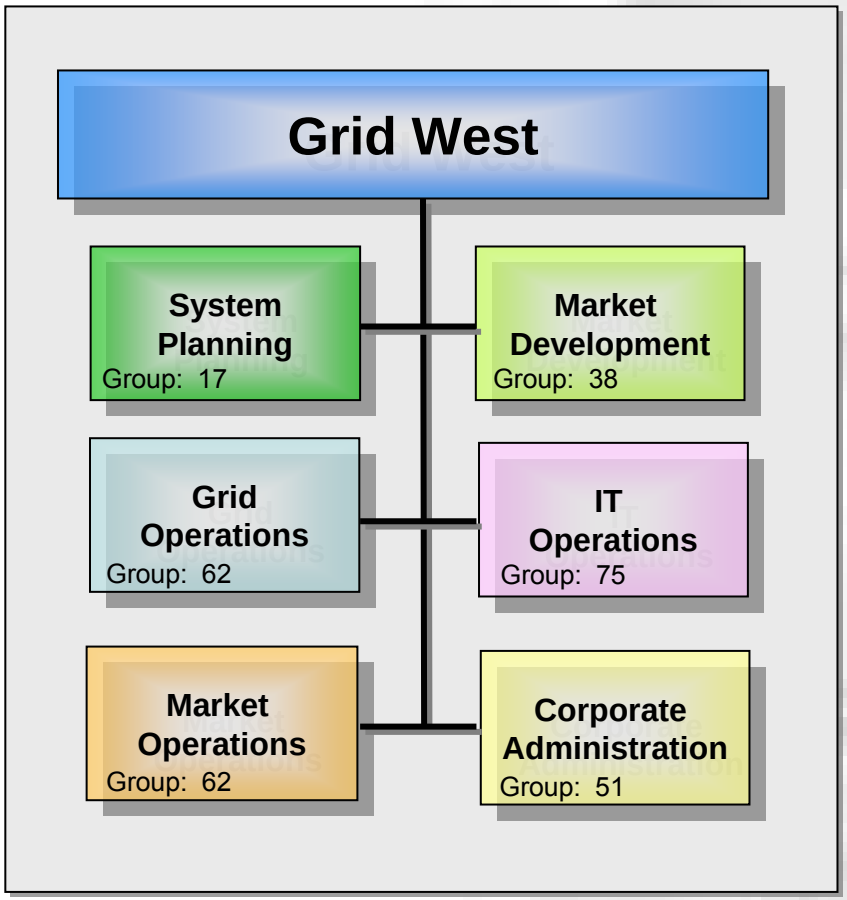
Annual Operating:	+ $66m/yr
Amortized Startup:	+ $13m/yr
Financing:	+ $7m/yr
Total	+ $86m/yr
divided by	
Annual Load	291 TWh
Per Unit Cost	$0.29/MWh

plus ~ $0.03/MWh for funding prior to Decision Point 2 or ~$0.32/MWh

- Typically a monthly charge used to recover Grid West's costs
- Costs include startup, annual operating, and financing costs
- Can be assessed as multiple charges to collect contribution from all parties who use services or participate in markets
- Typically a fraction of a percent of the transaction value

Appendix B – Cost Impact Details

The original estimate was…



Overview

- Divisions: 6
- Departments: 24
- 24x7 positions: 9 desks
- Staff per 24x7 position: 6
- Salary: Tiered structure
- Backup: Staffed
- FTEs: 305
- Employee expenses: $7,000/FTE

The impacts are…

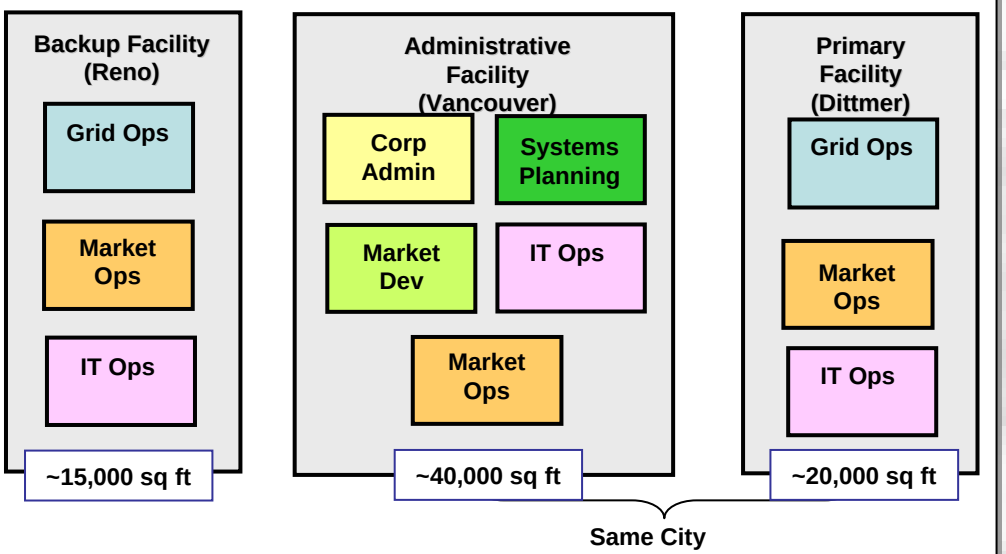
Department	Role	FTE	Rationale
Real-time Operations	RAS Coordination	-6	Less complex RAS schemes
Real-time Operations	Dispatcher Training	-4	Fewer in operations
Scheduling	Real Time Scheduling	-6	Smaller GW footprint
Scheduling	Outage Coordination	-1	Smaller GW footprint
Operations Planning	Operations Engineering	-6	Smaller GW footprint
System Planning	Various (Planning, AFC, etc.)	-4	Smaller GW footprint
Facilities and Security	Facility oversight	+2	No leverage of Dittmer
Net Change: 25 Fewer FTEs			

Savings: $2m reduction in start-up costs, $4m/yr in operating costs

Cost Impacts
Facilities: Original Design

The original facilities estimate assumed a three building configuration, including the use of the BPA Dittmer facility…

Illustration



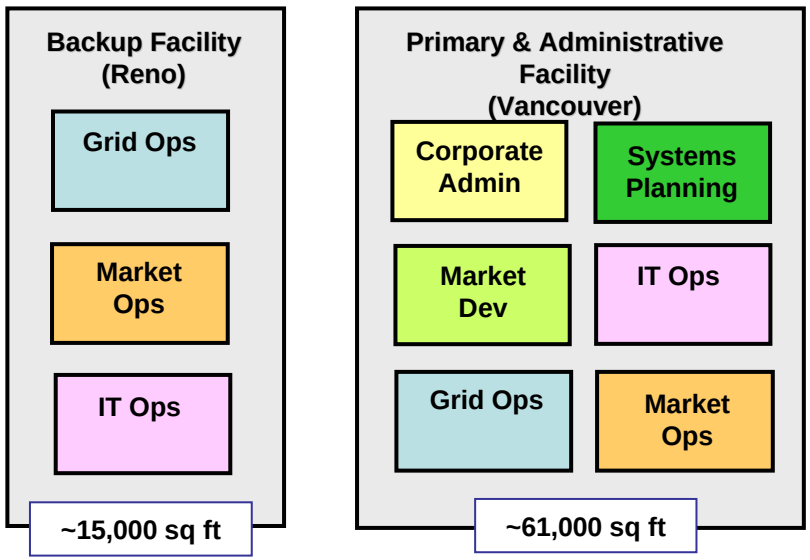
Summary

Facility	Lease Rate	Unit Cost	Total Cost
Primary	Lease	$23-26 sq.ft./yr	$460,600
	Furnishings	$5/sq ft	$95,500
	Data & Network	N/A	$1,083,600
	Utilities, Voice, Building Services	*Included*	*Included*
Backup	Lease	$27 sq.ft.yr	$407,700
	Furnishings	$5/sq ft	$75,500
	Data & Network	N/A	$1,083,600
	Utilities, Voice, Building Services	*Included*	*Included*
Admin	Lease	$19 sq.ft./yr	$775,200
	Furnishings	$5/sq ft	$204,000
	Data & Network	N/A	$237,600
	Utilities, Voice, Building Services	*N/A*	$1,500,000

Cost Impacts
Facilities: Required Changes & Impacts

The use of a greenfield primary site will have the following impact on the facilities estimate…

Illustration



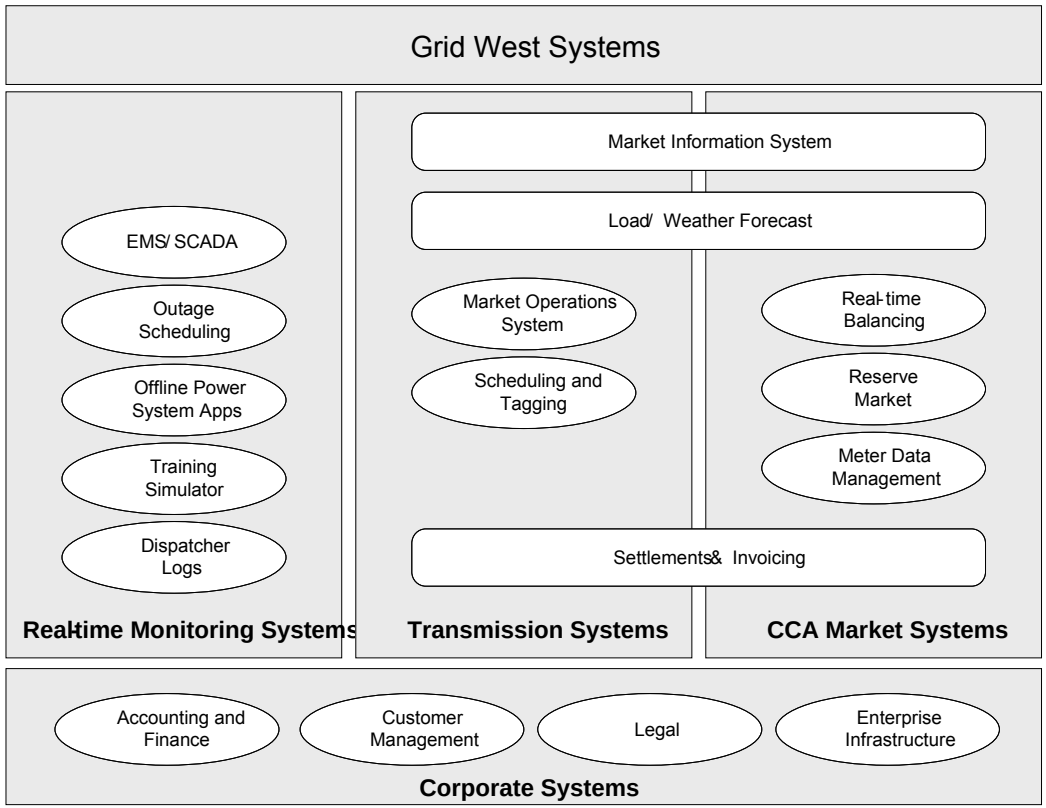
Summary

Cost Item	Impact	Rationale
Hardening and security	Increased hardening cost	Cannot leverage existing Dittmer infrastructure
Square footage	Increase	Original control room spaced based on available space at Dittmer
Utilities & Building services	Increased service cost and decreased $/sq ft lease cost	Full service Dittmer lease included utilities & building services at market value
Network, Voice & Data	Savings of $1m start-up and $500k/yr in operating costs	2 site configuration requires less networking between Grid West sites

Increased Costs: $7 m in start-up; $2 m/yr in operating costs

The original estimate included the following system groups…

Illustration



Summary

System Group	Total
RT Monitoring	$12.2 m
Transmission	$10.4 m
CCA Market	$10.2 m
Corporate	$7.4 m
Total	***$40.1 m***

The number of systems remain the same but they will require less customization…

Cost Item	Impact	Rationale
Reduced customization	$1.5 million savings in start-up	Energy Management System required more customization to meet BPA related functional requirements
Reduced implementation risk	$2 million savings in start-up	Less customization has less associated risk

Savings: $3.5 m savings in start-up , $1 m/yr in operating costs

Cost Impacts
Other: Original Estimate

The original estimate was…

- Financing: Bond issuance with 2.3% flotation costs
- Interest carrying costs: 5.5%
- Required insurance:
  - Property & Liability
  - Directors & Officers
  - Professional Liability
- Applicable taxes:
  - Property taxes
  - B&O taxes
- Incremental FERC fees: ~$2m

FERC annual program fees would be allocated based on area load, including BPA; $2 million in new incremental FERC fees was estimated based on BPA load (public power would be a pass through since paid today)

The estimated impacts are…

Cost Item	Impact	Rationale
Financing & Carrying Costs	Negligible	Accounted for in impact estimate for each required change
Insurance	Negligible	Property insurance will likely increase but scope of business reduced with smaller GW system. Current estimate benchmarked with CAISO & ERCOT.
Taxes	Negligible	Property tax and Business & Occupation (B&O) tax are not significant
FERC Fees	$2 million savings	BPA load will not be assessed an incremental FERC fee

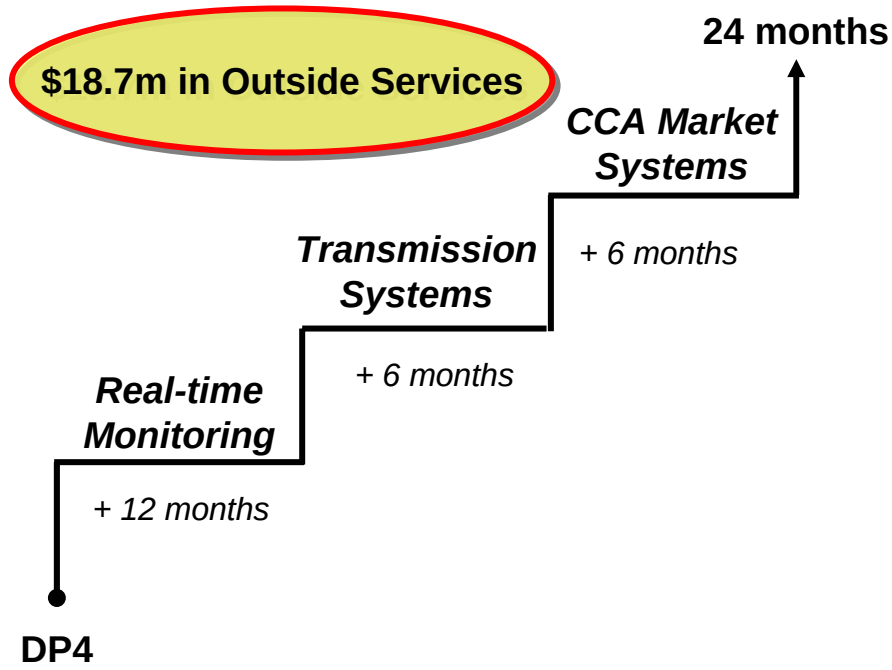
Savings: $2 m savings in operating costs

The original estimate was…

Grid West Evolution

- ***Phase 1****: Real-time Monitoring – This phase includes the core EMS/SCADA systems*
- ***Phase 2****: Transmission Systems – This phase includes the transition to flow-based scheduling and RCS auctions*
- ***Phase 3*** *– CCA Market Systems – This phase includes the implementation of the balancing and reserve markets*

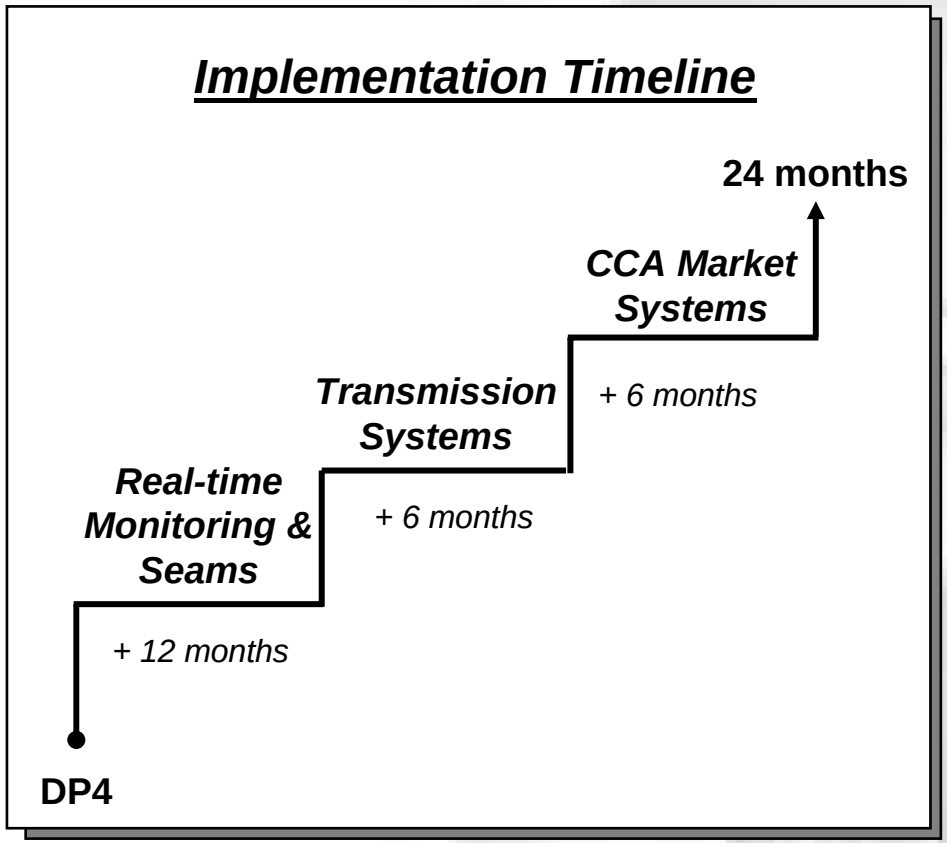
Implementation Timeline



Cost Impacts

Implementation: Required Changes & Impacts

The estimated impacts are…



Implementation Impacts
• Implementation timeline is unchanged
• Work on seams will occur in parallel with Phase 1, Real-time Monitoring
• Additional consultants needed for seams work

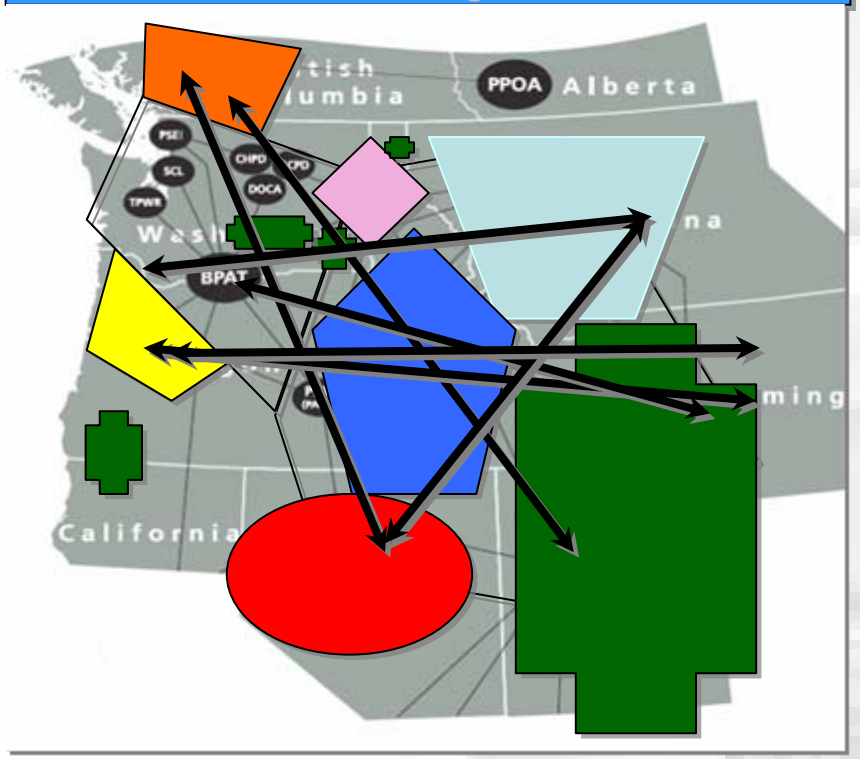
Cost Item	Impact	Rationale
Seams implementation	Additional resources needed for seams work (~ 3 FTEs for 1 year)	Addressing seams issues will require additional outside services during implementation

Increased Costs: $1.2 m in start-up costs

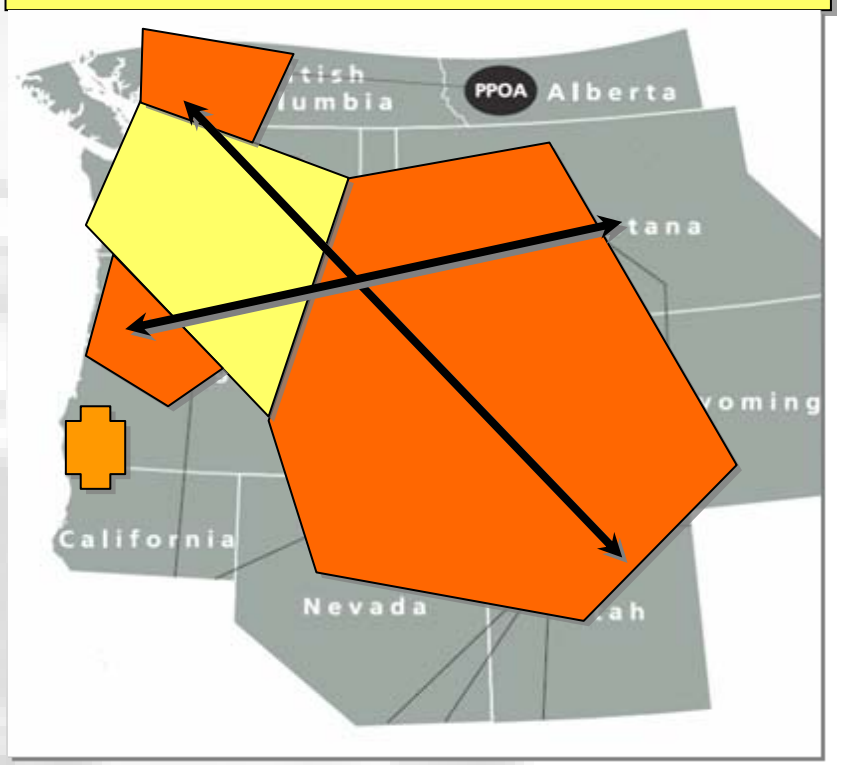
Appendix C – Value Proposition Details

Grid West will significantly reduce transmission rate pancaking…

Today



Tomorrow



Value Proposition
Reduced Transmission Pancaking

Grid West will significantly reduce transmission rate pancaking…

Today

From: Seven Different Rates

- Obtaining transmission right across several transmission owners
- More complexity in scheduling and tagging
- "Ad Hoc" secondary transmission market
- Fee for every transmission owner along path
- Multiple requests for every transmission provider

Tomorrow

To: One Rate (Within GW)

- One-stop-shop for all contiguous signatories
- One "bridge" across BPA or Puget
- Reduced fees paid by wholesale customers for wheeling energy through the area
- Single request for transmission service anywhere within or across Grid West
- Generation within that footprint receives network transmission service providing access to many customers

The Grid West basic features includes the formation of an independent market monitor…

Today

From: No Organized Market Monitor

- Market power is not monitored
- Various interpretations of rules and business practices
- Potential for conflicts of interest

Tomorrow

To: Organized Market Monitor

- Mitigation of market power
- Protection provided to participants and consumers
- Unaffiliated with any market participant
- Fair and competitive markets
- Protect against the exercise of market power
- Transparency