



# Control Centers

## Sustain Program

# Asset Management Strategy

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# Executive Summary

## Strategy Summary

- Control Center (CC) assets include ~65+ cyber assets and ~20 facilities assets which support real-time operations and some real-time system interfacing support to commercial business systems and Ops analysis.
- In 2010, asset risk was evaluated in terms of Health (likelihood of obsolescence, failure, or noncompliance) against severity of impact to operations if the system is out of service.
- The most significant risks to the Asset Strategy are all related to constrained resources in light of skills and knowledge sustainability, O&M versus replacement and expand workload, and increase in competing priorities.
- Identified Asset Performance Strategies include:
  - Critically rated asset risks will be addressed first, and asset and replacement planning ensures assets do not reach the 'critical' risk level. Projects were identified to address these.
  - Migration of VMS-technology systems, which include our major control systems (eg, SCADA, AGC, WebFG, etc), to a Windows platform for improved manageability and to maintain sufficient software vendor support.
  - Ensure that critical systems meet their established availability targets.
  - Asset Risk Assessments will be conducted at least annually.
  - As part of the CC's Demand & Capacity Planning initiatives, develop a 2-3 year rolling resource plan and sourcing strategies to support sufficiently maintaining and replacing risk-prioritized assets.
- Identified Asset Management Improvement Strategies include:
  - Identify a plan for completing condition-based standards refinements and assessment methodology.
  - Identify Availability targets for other assets as appropriate, and implement process to manage them.
  - CC Assets information management – identify asset management requirements and establish a plan to address them.
  - Adopt an integrated investment planning process with PSC and SPC to address related and dependent assets.

## Executive Summary (cont.)

### Progress Update Summary

- 5 out of 9 projects identified in 2010 to address critical asset risks have been completed as planned – the remaining 4 will be completed between FY12-14. The Asset Risk assessment performed in FY11 identified new critical risk assets for which there are projects underway to address them.
- Control systems Microsoft Windows migration strategy projects are underway and expected to complete in FY14.
- Significant improvements in CC Program Project Portfolio Management, including project standards and oversight processes, were established in FY11, improving Program and Project visibility and performance.
- CC had identified key areas of improvements and next steps to evolve its Demand & Capacity planning, both in terms of CC resource planning and management, as well as participating in the Transmission Capital Demand Planning processes.
- CC will be focusing energy in FY12 to complete important work to establish its asset framework, including clearer asset identification, performance standards, asset risk assessment refinements, and replacement planning for all assets.
- CC Facilities assets are being separated from the cyber assets for risk assessment methodology and asset management plans are being developed in coordination with the Facilities Asset Management program.
- Upon completion of the asset framework and performance standards development, evaluation and designation of any new appropriate availability targets will be completed.
- Asset Management information requirements will be defined from all of the above efforts and a plan for addressing the information needs will be outlined in FY12.
- Integrated asset planning with PSC and SPC for Communications and Control interdependent assets is being defined in the current Integrated Control Systems Strategy (ICSS) effort.

## Executive Summary (cont.)

### Next Steps

- Develop Asset Framework, performance standards, adjust health/risk assessment
- Build off of the TO functional strategic planning in Q2 to refine Expand and Sustain asset strategies
- Complete the ICSS project work and incorporate findings into the asset strategies and replacement plans
- Continue to refine and improve the Project Portfolio Management and Demand Planning disciplines for TO, and better integrate with the Transmission processes
- Define, commit, and staff the Asset Management Strategy initiatives to make them successful
- As all of the above-described takes shape, enabling asset planning and visibility, CC will have a more robust and longer-term Asset Strategy, and will be capable of developing further out-year planning projections.
  - At that point, CC should be able to develop a multi-year program business case that the Program can execute on (potentially for FY13 or FY14).

### Capital Planning Summary

- CC typically has the capacity to execute about \$5-7 million per year in capital work, depending on the amount of large facilities replacement work occurring.
- Currently, projections for FY13-14 suggest that CC will need the full \$7.2+ million budget for critical replacements that there will likely be capacity to complete.
- A 10% reduction will increase the backlog of system replacements and impact CC's ability to ever address 'should do' items before they become the next critical items on the list.

# Presentation Overview

- **What equipment and facilities are covered? (6)**
  - Functions & Stakeholders
  - Control Center Overview and Assets
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  - Situation assessment
  - Historical Investment
- **What performance objectives, measures and targets should be set? (14)**
  - Asset Performance Objectives & Targets
  - Asset Management Objectives & Targets
- **What is the health of the assets, and what risks must be managed? (17)**
  - Asset Health and Risk Assessments
  - Asset Management Practice Risk Assessment
- **What strategies should we undertake? (21)**
  - Strategy Considerations
  - Sustain Asset Performance Strategies
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- **What will it cost? (28)**
  - Capital Program History & Planning
  - Forecasting Sustain Capital Planning Levels
  - Capital & Expense Forecast Considerations
  - CC Capital & Expense Costs – Preliminary Analysis
- **Next Steps (33)**

**What equipment and facilities are covered?**

**What performance objectives, measures and targets should be set?**

**What is the health of the assets, and what risks must be managed?**

**What strategies should we undertake?**

**What will it cost?**

# Functions and Stakeholders

## Control Center (CC) Assets enable...

### ■ Key CC Functions

- Automatic Generation Control for Federal Generation
- Regional Outage Coordination
- Balancing Area Operation
- Responsibility for the Safety and Reliability of the Transmission Grid
- Black Start and System Restoration Coordination
- Grid Monitoring and Control

### ■ Stakeholders

- Federal and Independent Power Producers
- Neighboring Control Areas and Independent System Operators
- WECC Reliability Coordinators
- BPA Power Services Scheduling
- Customers and Northwest Citizens

# Control Center

BPA's two control centers provide secure and highly available dispatch locations, infrastructure, systems and tools to support the safe and reliable control and operation of the Northwest power system.

- Geographically separate operational redundancy for critical operations and control functions – the two Centers provide “active / active” back-up for each other
  - Automatic fail-over and jurisdictional transfer from one CC to another for systems and dispatch functions in the event of a control system failure
  - Dual-redundant systems, and dual-redundant communications infrastructure to both CC's
  - This means 'everything' to make a system connect and work is implemented x2.
- Centralized systems and tools also provide real-time monitoring, analysis and simulation
- Many systems facilitate or support increased grid utilization (non-wires solutions) and supported reduction of operational staff in the field
- Monitoring and alarm systems increase the mean time between failures and decrease the mean time to repair
- Communications infrastructure and control and monitoring equipment in the field enable the centralized functions of the CC to operate the system –requires redundant data feeds into both CC's
- BPA's Dispatch Training Facility includes copies of the CC systems needed to simulate the dispatch environment



## Control Center (CC) Assets

- Approximately 65+ system assets that either directly control the Transmission system, or that support real-time decisions.
- All but a handful of systems are supported at both Control Centers. As systems are replaced, upgraded, or expanded, any systems not yet at both Control Centers are planned to become dual redundant at implementation.
- CC systems are subject to extensive Federal security and reliability requirements.
- 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 TOH PSC staff that manage and implement them.

## Asset groupings

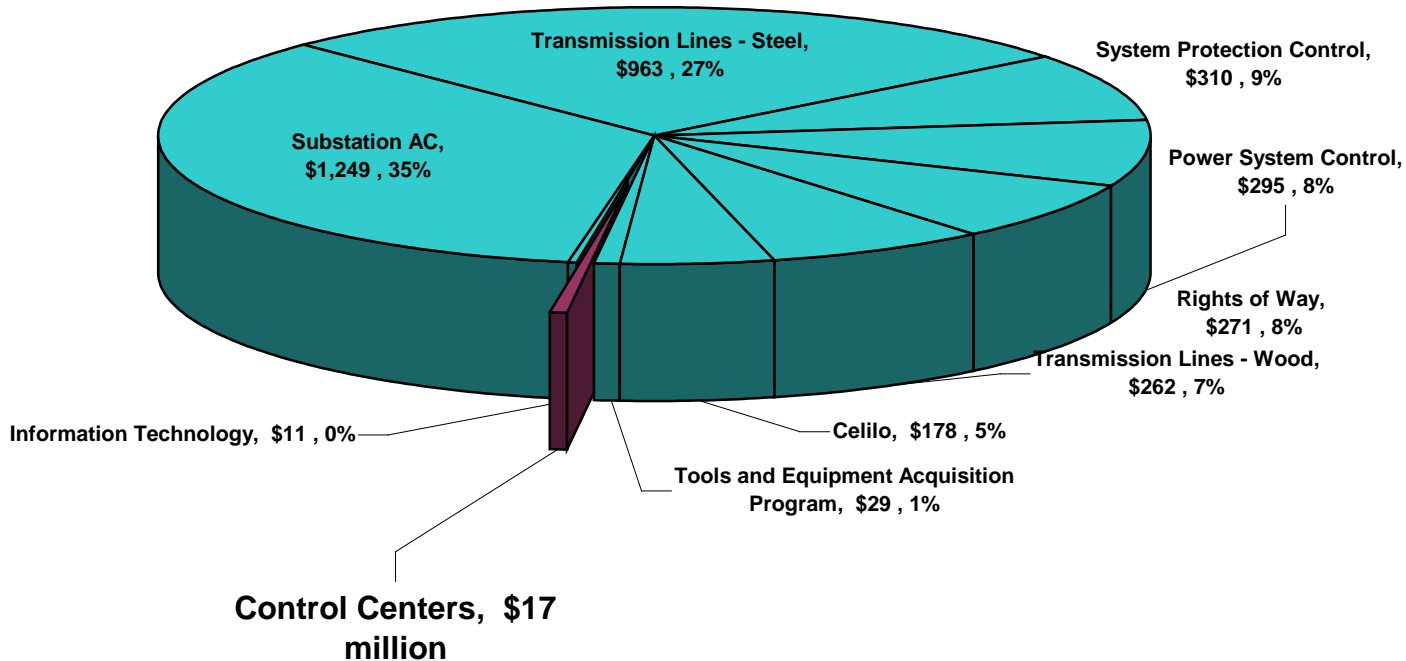
- Major CC Systems & Supporting Infrastructure – systems that control and manage the Transmission system.
- CC Cyber Infrastructure - Data Centers infrastructure, including, hardware, network, security, and data center monitoring systems, and communications infrastructure.
- CC Facility Facilities Infrastructure – Critical power & Cooling systems, fire suppression, lighting, etc.
- Monitoring and Alarm Systems – Equipment and systems that monitor the transmission field assets and communication systems.
- Misc. CC Tools and Data systems – A variety of different CC systems, including operations decision-support tools, transmission system analysis, central timing systems, and operations business process support.

# Historical investment – after depreciation

## Net Book Value

**Transmission Sustain Programs**  
**Historical Investment After Depreciation**  
**as of Sept. 30, 2011**  
 (in millions)

**Total Book Value is \$ 3,585 million**



## Situation Assessment

- 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 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 and systems have grown while increasing in sophistication. Dual redundancy across both CC's make implementations and maintenance more complex. Data and power system interconnections have increased over time as have needs for external coordination with customers and regional partners.
- 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.

## Situation Assessment *- continued*

- 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.

What equipment and facilities are covered?

**What performance objectives, measures and targets should be set?**

What is the health of the assets, and what risks must be managed?

What strategies should we undertake?

What will it cost?

# Sustain Asset Performance Objectives and Targets

- **Objective 1 - Reliability & Compliance**

**Replacement or maintenance actions result in no assets assessed as Critical Risk Level of failure, obsolescence, or noncompliance.**

- **Measures:** Assets that are assessed “High” Impact (3) and minimum combined Health score of 5 or above, and those assessed with “Moderate” Impact (2) and Health score of 8 or above, which result in a combined Critical Risk Level rating.
  - See Asset Health & Risk Assessment method and chart on slides 18-19.
  - 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 at a combined “Critical” Risk Level rating.

- **Objective 2 - Availability**

**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 (ie, 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

- **Objective 3 - Availability**

**In addition to being redundant, the most important systems are deployed in a geographically diverse manner to help ensure continuity of operations in the event of loss of a control center.**

- Target is currently met.

# Asset Management Objectives and Targets

## (Sustain Program)

- **Objective 4 – Refine Standards & Assessments**

- **Refine and approve condition-based standards for CC assets, and assess assets timely against these standards**

- End-Stage Target: By end of FY13, 100% of CC assets are effectively identified in the CC asset framework, and each have applied performance standards to reach a recognized asset replacement plan.

- **Objective 5 – Asset Information Management**

- **Ensure that information on CC assets is accurate, complete, secure, and readily accessible to those who need it**

- End-stage Target: Current asset information (tools, data, and processes) is analyzed, business requirements are defined, and a plan for closing any gaps is decided and approved by end of FY13 Q1.

- **Objective 6 – Coordinated Investment Planning**

- **Improve coordination and integration of upgrades and replacements planning across PSC, SPC, and CC**

- End-stage Target: Via implementation planning of the Integrated Control Systems Strategy effort, coordinated investments are recognized in the CC asset plan, and a plan for CC involvement in ICSS investment planning processes is identified by end of FY12.



**What equipment and facilities are covered?**

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# Risk assessments

## Two levels of risk assessment

### 1. Assessment of software applications/systems and hardware health risks

- **Asset Health** = Likelihood of failure, obsolescence, or noncompliance, each with a score of 3=High, 2=Moderate, or 1=Low
  - 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 (ie, a hard drive fails repeatedly).
  - Likelihood of obsolescence are indicated by loss of vendor or staff support, or problems with interoperability (ie, 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.
- **Impact** = Severity of Impact to Operations (Critical, High, Moderate, Low), loss of service
  - In the 2011 Assessment, the FISMA-required FIPS 199 Classification for each asset was used to set this score.
  - This classifies the impact level ("**X**") as: "Loss of confidentiality, integrity, or availability could be expected to have **limited/serious/severe or catastrophic**" adverse effect on organizational operations, organizational assets, or individuals. These ratings are translated into the CC Asset Risk Assessment Impact scoring as:
    - Limited/Low = 1
    - Serious/Moderate = 2
    - Severe or Catastrophic/High = 3 *(includes all NERC CIP CCA's, as well as others by this classification)*
- **Risk Level** = Health X Impact, reflected as Critical, Moderate-High, and Low
- Note – CC Facilities assets were removed from this scoring list since last year – performance standards, risks, and asset plans specific to these assets are currently being generated for these assets in coordination with the Facilities Asset Management (FAM) Program.

### 2. 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 Health & Risks Assessment

## CC FY11 Q2 Asset Risk Assessment, 3/31/2011

**2011 Health Assessment Scoring**  
Likelihood/Probability of  
obsolescence, noncompliance, or failure  
(H=3, M=3, L=1)

**Risk Ranges:**

|                   |         |
|-------------------|---------|
| Critical =        | 15 - 21 |
| Moderate - High = | 10 - 14 |
| Low =             | <=9     |

| row | CC System Asset | Obsolescence score | Failures score | Noncompliance score | Total Health Score | x | Impact of Loss (FIPS 199 severity rating) | = | Asset Risk Score (Health x Impact) |
|-----|-----------------|--------------------|----------------|---------------------|--------------------|---|---|---|------------------------------------|
| 1   | Cyber Asset #1  | 3                  | 1              | 3                   | 7                  |   | 3   |   | 21                                 |
| 2   | Cyber Asset #2  | 3                  | 1              | 3                   | 7                  |   | 3   |   | 21                                 |
| 3   | Cyber Asset #3  | 3                  | 1              | 3                   | 7                  |   | 3   |   | 21                                 |
| 4   | Cyber Asset #4  | 3                  | 3              | 1                   | 7                  |   | 3   |   | 21                                 |
| 5   | Cyber Asset #5  | 3                  | 2              | 1                   | 6                  |   | 3   |   | 18                                 |
| 6   | Cyber Asset #6  | 3                  | 3              | 3                   | 9                  |   | 2   |   | 18                                 |
| 7   | Cyber Asset #7  | 3                  | 1              | 2                   | 6                  |   | 3   |   | 18                                 |
| 8   | Cyber Asset #8  | 3                  | 1              | 1                   | 5                  |   | 3   |   | 15                                 |
| 9   | Cyber Asset #9  | 1                  | 1              | 3                   | 5                  |   | 3   |   | 15                                 |
| 10  | Cyber Asset #10 | 3                  | 2              | 2                   | 7                  |   | 2   |   | 14                                 |
| 11  | Cyber Asset #11 | 3                  | 1              | 3                   | 7                  |   | 2   |   | 14                                 |
| 12  | Cyber Asset #12 | 3                  | 3              | 1                   | 7                  |   | 2   |   | 14                                 |
| 13  | Cyber Asset #13 | 2                  | 1              | 3                   | 6                  |   | 2   |   | 12                                 |
| 14  | Cyber Asset #14 | 2                  | 1              | 3                   | 6                  |   | 2   |   | 12                                 |
| 15  | Cyber Asset #15 | 3                  | 2              | 1                   | 6                  |   | 2   |   | 12                                 |
| 16  | Cyber Asset #16 | 3                  | 1              | 1                   | 5                  |   | 2   |   | 10                                 |
| 17  | Cyber Asset #17 | 3                  | 1              | 1                   | 5                  |   | 2   |   | 10                                 |
| 18  | Cyber Asset #18 | 3                  | 1              | 1                   | 5                  |   | 2   |   | 10                                 |
| 19  | Cyber Asset #19 | 3                  | 1              | 1                   | 5                  |   | 2   |   | 10                                 |
| 20  | Cyber Asset #20 | 3                  | 1              | 1                   | 5                  |   | 2   |   | 10                                 |
| 21  | Cyber Asset #21 | 3                  | 1              | 1                   | 5                  |   | 2   |   | 10                                 |
| 22  | Cyber Asset #22 | 1                  | 1              | 1                   | 3                  |   | 3   |   | 9                                  |
| 23  | Cyber Asset #23 | 1                  | 1              | 1                   | 3                  |   | 3   |   | 9                                  |
| 24  | Cyber Asset #24 | 1                  | 1              | 1                   | 3                  |   | 3   |   | 9                                  |

*Simulation of the CC Asset Health and Risk Assessment Methodology – applied to all CC cyber assets, and conducted annually.*

Asset Performance Objective#1: No "Critical Level Risks"

# Asset Management Practice Risk Assessment

| <b>Results of Risk Assessment Survey</b> |  |  | Likelihood X Impact |
|--|--|--|---------------------|
|  | <b>Risk:</b>   | <b>Description:</b>  |                     |
| 1  | Projects are approved and funded without a corresponding commitment to operations and maintenance, both in terms of expense dollars and support staff. | The control center has a finite number of staff with operational expertise. This staff must support both operations and maintenance as well as function as primary implementers of new projects. Continued growth in the number of systems requiring support will invariably necessitate less time dedicated to new project work, causing project delays.  | 20.45               |
| 2  | NERC/WECC and FISMA compliance effort.   | NERC/WECC and FISMA requirements continue to increase the workload on TO staff. This pertains to implementing standards, system monitoring, reporting, and audit preparation. Improper or incomplete NERC-CIP related processes or documentation leads to sanctions and/or new mitigation work. This work then competes with other projects for resources. This results in failure to meet established schedules, increased net costs and inability to spend capital funds per FY SOY.   | 19.71               |
| 3  | Commitments to new initiatives (e.g. WIT, Synchrophasor)   | Significant commitment to these programs leads to unanticipated expansion work, as well as long-term support work. This diverts staff from existing Control Center systems and operations work. These commitments typically have aggressive timelines.   | 18.24               |
| 4  | TO staff retire, quit or transfer before succession planning can occur.  | The skill set required to maintain, operate and implement Control Center systems is highly specialized. There is a heavy reliance on retired BPA employees on contract with TO to meet many of these needs. Finding or training staff with the expertise needed would be difficult and time consuming (6-24 months) without the added constraints of an FTE cap. This problem is compounded by the increasing workload on existing staff who are becoming frustrated and stressed. The result is a reduction in system support and delays in new project work. Increasing reliance on contracting staff is an additional risk to maintaining core systems knowledge. | 17.01               |
| 5  | The continued maintenance of a range of old and new technologies with current staff.   | Maintaining a range of old and new technologies increases the institutional knowledge and technical expertise required to support it. This impacts staff requirements, cross-training and re-usability of system components.   | 14.45               |

**What equipment and facilities are covered?**

**What performance objectives, measures and targets should be set?**

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## Strategy Considerations

- Asset systems in the CC comprise multiple components: applications, operating systems, servers and in some cases, other hardware.
- The systems' components are frequently so interdependent, that the replacement of one component typically requires replacement of one or more of the other components. Additionally, there are interdependencies between field and master components in the CC's.
- Most of the systems in the control centers operate on the MS Windows OS, and there is an effort to migrate other systems to MS Windows where possible. The typical lifespan of a MS Operating system is 5-7 years. This is usually the longest a CC system can operate without a significant upgrade of its components.
- Commercial off-the-shelf software (COTS) applications tend to have the shortest lifespan, in-house developed software applications have the longest. CC tends to have significantly customized COTS deployed to our needs.
- Where possible, the CC uses commodity servers and hardware, and keeps spares available on-site.
- A manufacturer's support of their software applications can be unpredictable. A recent example of this was the CC's purchase of a software application that was discontinued by the manufacturer in the same calendar year it was purchased.

## Strategy Considerations (continued)

- If a manufacturer ends support for a component, and TO can no longer get spares (in the case of hardware) or expertise (in the case of software), the effective life of the component is considered to be at an end. There are instances of both hardware and software that TO staff maintain reliably after a manufacturer has ended support. The decision to replace a system is based on many factors, including both short-term and long-term costs, expandability and reliability.
- Evolving security standards may reduce the lifespan of an otherwise healthy component, if that component can not comply with the new standard.
- CC system managers and security staff actively monitor both component manufacturers and emerging security standards.
- The same resource pool that implements new systems, is also responsible for maintaining an ever-growing environment comprising both old and new technologies. While system number and complexity have increased, the number of support staff has not.
- The control center operates and monitors the Transmission Grid 24x7. This requires 24x7 on-site dispatch and systems support.
  - Dual CC dispatch operators 24x7 (transmission, generation, RAS, etc)
  - CC Control System Monitors (CSM's) 24x7 monitoring and call-out (for CC systems and field communications equip.)
  - CC System Resource Managers on call for application, hardware, and network support

## The Strategies that follow are directed at....

- **Prioritizing sustain-side work to ensure that...**
  - Critical systems meet needs with a low risk of failure, obsolescence, or noncompliance
  - Limited staff resources are channeled to greatest impact/benefit
  
- **Improving visibility and controls by...**
  - Refining and implementing condition-based standards,
  - Providing ready access to system performance, cost, and other asset information to support the development of these standards
  
- **Achieving the outlined objectives on slides 15-16.**



# CC Sustain Asset Performance Strategies

## *Support Asset Performance Objectives*

### **Strategies:**

- Highest priority will be assigned to replacing, upgrading, or maintaining those systems with a Critical Risk Level. From the 2011 Risk Assessments, 14 systems fall in this category.
- Projects are underway that should move these 14 systems out of the Critical Risk Level and are identified for delivery in the Program's Asset Plan.
- In addition to these projects, maintenance, replacements, and upgrades must also be planned and executed so that systems assessed at "High" Risk Level rating 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.

## CC Sustain Asset Performance Strategies (cont.)

- 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 end of FY13 Q1.
- As part of the CC's Demand & Capacity Planning initiatives, 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. The resource plan will be developed by end of FY13 Q4 in support of, and coordination with, the Transmission Asset Management Strategy's strategic initiative I-2\*.
  - \*I-2 - Streamline and integrate business processes and information systems and train the workforce on process changes (G1, G3).
- Outline alternative approaches to completing identified work by FY13 Q4, 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.

# CC Sustain Asset Management Strategies

## *Support Asset Management Objectives*

### Strategies:

- **Standards Refinement & Assessment:** A plan for completing condition-based standards refinements and assessment will be adopted by end of FY12 Q3.
  - Ensure a project is launched to complete the FY12 Assessment by the end of FY12 Q2..
  - Plan includes clarifying asset list/definition in a CC Asset Framework, identify asset condition-based standards and how to apply them across vertical and horizontal layers of CC assets to develop asset-specific replacement plans.
  - By end of FY12, 80% of CC assets are effectively identified in the CC asset framework, and each have applied performance standards to reach a recognized asset replacement plan.
  - Standards will be checked against dependencies or relationships with PSC and SPC sustain program managers and 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 the end of FY12.
  - Via implementation planning of the Integrated Control Systems Strategy effort, coordinated investments are recognized in the CC asset plan, and a plan for CC involvement in ICSS investment planning processes is identified by end of FY12.
  
- **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 FY13 Q1.
  - 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

**What equipment and facilities are covered?**

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## CC Program Capital History

| Sub Portfolio | Description                  | FY2007<br>Actuals   | FY2008<br>Actuals   | FY2009<br>Actuals*  | FY2010<br>Actuals   | FY2011<br>Actuals   |
|---------------|------------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| 0005516       | CONTROL CENTERS EXPANSION    | \$ 490,270          | \$ 4,321,084        | \$ (325,304)        | \$ 981,131          | \$ 726,498          |
| 0005668       | CC INFRASTRUCTURE COMPONENTS | \$ 1,594,135        | \$ 225,001          | \$ 496,749          | \$ 399,555          | \$ 3,561,658        |
| 0005669       | CC SYSTEM & APPLICATION      | \$ 2,003,107        | \$ 2,064,269        | \$ 1,238,605        | \$ 935,399          | \$ 619,302          |
|               |                              |                     |                     |                     |                     |                     |
|               | <i>Program Totals</i>        | <b>\$ 4,087,512</b> | <b>\$ 6,610,354</b> | <b>\$ 1,410,050</b> | <b>\$ 2,316,085</b> | <b>\$ 4,907,458</b> |

- **FY2009 low actuals due to NERC CIP implementation diversion - most all capital work was deferred during this year, and one large project had significant funds transferred to expense after the project was completed.**
- **FY10 low actuals also saw many challenges: NERC CIP follow-on work taking precedence to capital work; we did not sufficiently level budgets as a baseline (spread across FY's) to reflect actual work; and some projects did not get off the ground due to lack of capacity to start them. These Program management issues have since been corrected.**
- **FY11 showed marked improvement, both in terms of setting the plan and executing it. Had it not been for some late procurement issues, the Program would have spent another \$400+k, executing nearly 95% of our \$5.4M FY budget.**
- **CC's Capital Program now closely sets FY baselines with demand and capacity planning. We are currently running at an ability to execute between \$5 – \$7M, depending on the amount of facilities-type projects we have scheduled, as these are high equipment cost projects with largely contractor-based work.**

# Program Totals

Note: This implementation plan is a replacement program with the optimal funding, staffing resources, and outage availability to best mitigate risks identified in the strategy. These numbers are not aligned with the currently constrained IPR budget. Each sustain program is under review to determine a revised implementation plan that will align with capital budget availability, priorities, and resource constraints. This review will be complete by March 2012.

| <b>Capital Plan for Control Center, FY2012 to FY2021 (\$000s)</b> |                 |                 |                 |                 |                 |                 |                 |                 |                 |                 |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
|   | <b>FY2012</b>   | <b>FY2013</b>   | <b>FY2014</b>   | <b>FY2015</b>   | <b>FY2016</b>   | <b>FY2017</b>   | <b>FY2018</b>   | <b>FY2019</b>   | <b>FY2020</b>   | <b>FY2021</b>   |
| 5516 - Expansion  | \$ 186          | \$ 2,385        | \$ 2,646        | \$ 3,237        | \$ 2,500        | \$ 2,500        | \$ 2,500        | \$ 2,500        | \$ 2,500        | \$ 2,500        |
| 5668 - CC Infrastructure  | \$ 3,603        | \$ 1,867        | \$ 2,646        | \$ 1,619        | \$ 2,630        | \$ 2,706        | \$ 2,783        | \$ 2,861        | \$ 2,939        | \$ 3,019        |
| 5669 - System/Applications  | \$ 1,010        | \$ 3,008        | \$ 2,116        | \$ 2,698        | \$ 2,500        | \$ 2,500        | \$ 2,500        | \$ 2,500        | \$ 2,500        | \$ 2,500        |
| <b>Program Total</b>  | <b>\$ 4,799</b> | <b>\$ 7,260</b> | <b>\$ 7,408</b> | <b>\$ 7,554</b> | <b>\$ 7,630</b> | <b>\$ 7,706</b> | <b>\$ 7,783</b> | <b>\$ 7,861</b> | <b>\$ 7,939</b> | <b>\$ 8,019</b> |

## Implication of budget constraints:

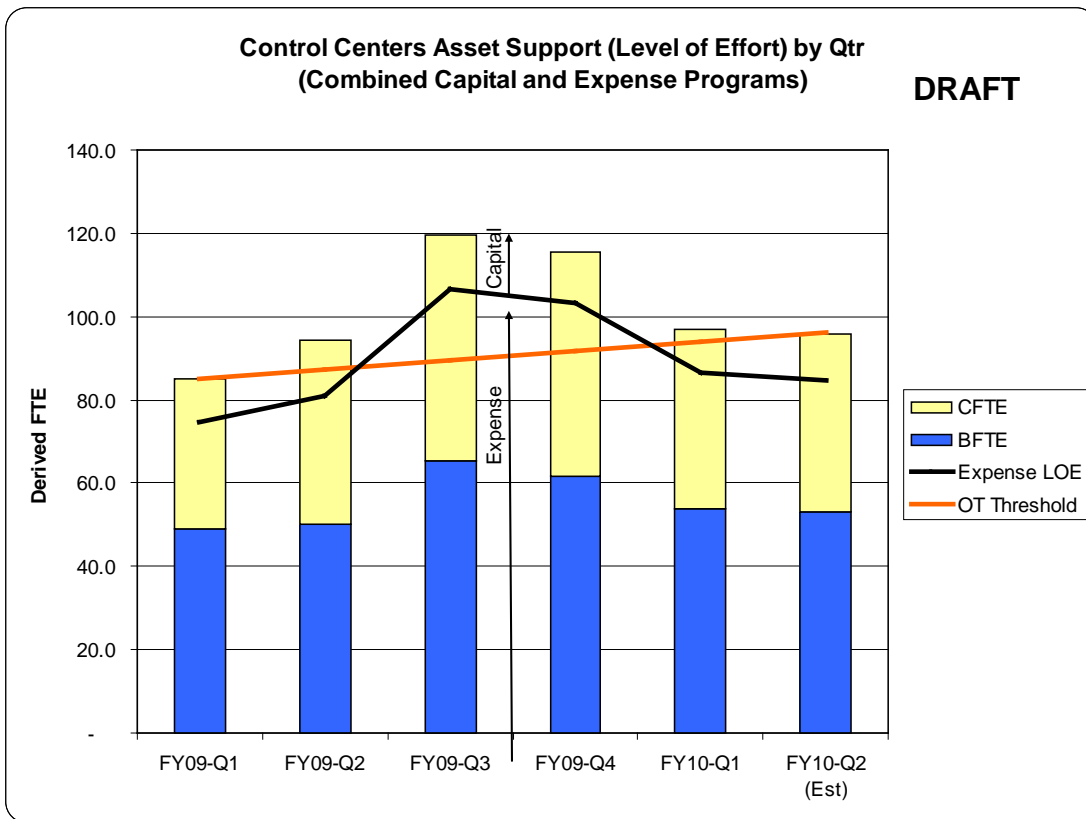
- Today, CC typically has the capacity to execute about \$5-7 million per year in capital work, depending on the amount of large facilities replacement work occurring. Currently projections for FY13-14 suggest that we will need the full 7.2+ million for critical replacements that we will likely have the capacity to complete, because of significant facilities replacement projects.
- Critical items will always be addressed first. With any budget reduction, program impacts likely to occur are continuing to generate a backlog of replacements work, and to never get to the “should do” items before they become the next significant issues. Some examples include:
  - Smaller less critical system replacements will be pushed out, adding to our backlog of sustain work – risks to operations decision support tools may impact dispatchers and operations activities.
  - Improving Operations functions, such as increased dispatch visibility to fault locations,
  - Upgrading the Dispatch Training Facility (being pushed off for years now, has not kept pace with current system simulations)
  - Dispatch floor improvements and expansion (needed for increasing wind and process demands)
  - Improving methods (tools) for managing and keeping up with our environment security and compliance requirements.
- As CC completes more of its asset planning work this year, we will have a more robust view of our projected capital replacement plans and requirements, extending farther than the 1-2 years we can see today. These budget demands and impacts will then need to be revisited, including the resource requirements and implications.
- Undefined work that we know is coming that will impact CC budget needs and priorities include NERC CIP version 5.0 standards to be released next year (expected to have significant impacts), the Energy Imbalance market (EIM) potential initiative impacts, and visualization efforts targeted at enhancing how dispatchers can see and process large amounts of data.

# Capital & Expense Forecast Considerations

## ■ Expense Costs and Resources

- Continued refinement of sustain standards may impact current Critical and High risk-assessed priorities in future years for forecasts.
- Further identification and tracking of expense projects will be necessary to complete the demand picture.
- CC tracks a number of projects not in our budget because they require demand on our resources. Projects such as DC RAS, Synchrophasor, OMET, RODS Replacements, and Alternate Scheduling Center initiatives, are prime examples that will be high priorities over the next few years that are not reflected in our capital budget.
- Expense costs include a broad base of activities, such as:
  - System minor enhancements and configuration changes
  - System break-fix and user support
  - Security-related monitoring, documentation, and projects
  - O&M work orders for standard system maintenance work
  - Compliance activities
- Identification and tracking of Expense activities is not sufficient today to adequately reflect how costs (especially FTE time) are spent. As mentioned in the strategies, an analysis effort should identify where improvements are needed to refine tracking processes.

# CC Capital & Expense Workload – Preliminary Analysis



### Early Observations:

- Very preliminary and gross estimation of general capacity (not head-count)
- Available resource for capital work is relatively finite (~10-15%)
- Constant pressure of O&M and expense efforts push on ability to make headway on capital efforts.

### Data Caveats:

- Making inferences on level of effort based on recorded costs
- Derived FTE scale applies current quarter cost and head-count data



## Next Steps

- **Significantly Expand on Expansion & Sustain Strategies (FY12)**
  - Develop Asset Framework, performance standards, adjust health/risk assessment
  - Build off of the TO strategic planning in Q1 to refine Expand and Sustain asset strategies
  - Complete the ICSS project work and incorporate findings into strategies
  - As the above takes shape, enabling asset planning and visibility, develop a program business case that CC can execute on (for FY13/14)
  
- **Develop Asset Management Plan**
  - Continue to refine and improve the Project Portfolio Management and Demand Planning disciplines for TO, and better integrate with the Transmission processes
  - Define, commit, and staff the Asset Management Strategy initiatives to make them successful