CURRENT HYDROPOWER ISSUES FOR OPMs

Operations Project Manager PROSPECT Course
27-31 July 2009

OBJECTIVES

- Students will have general knowledge of:
  - The Hydropower Program and where it's headed
  - Program Funding: Appropriations, Direct (PMA) and Customer Funding
  - Why it's important to build relationships with PMA and Customers
  - Important areas to be aware of in the Hydropower Program
  - What are some potential problem areas

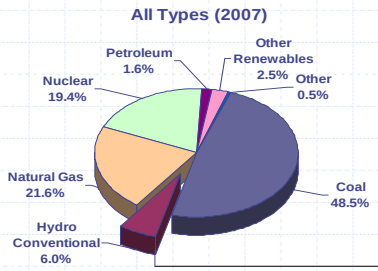
Hydropower Program Overview

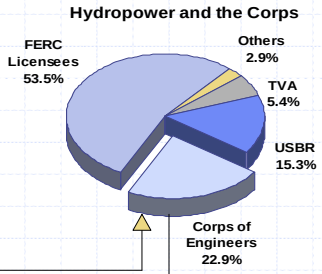
Vision & Mission Statement

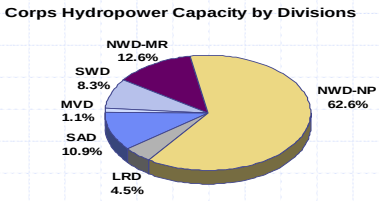
Be the premier stewards of entrusted hydropower resources

Provide reliable hydroelectric power services at the lowest possible cost, consistent with sound business principles, in partnership with other Federal hydropower generators, the Power Marketing Administrations, and Preference Customers, to benefit the Nation.

Generation Capacities and Corps Projects

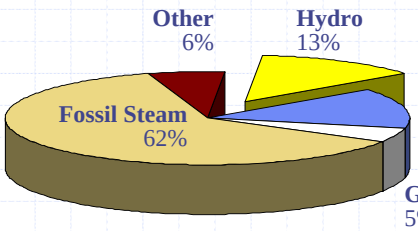




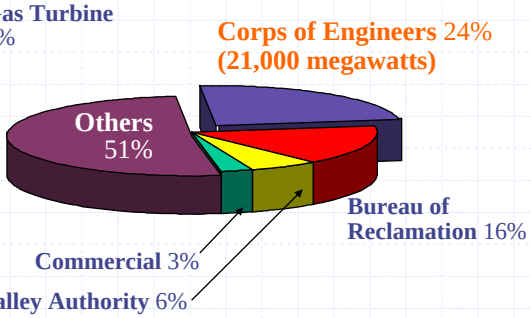


The Corps has a $20 billion investment in hydropower facilities that generates over $3 billion in annual gross revenue

Corps Hydropower Capability



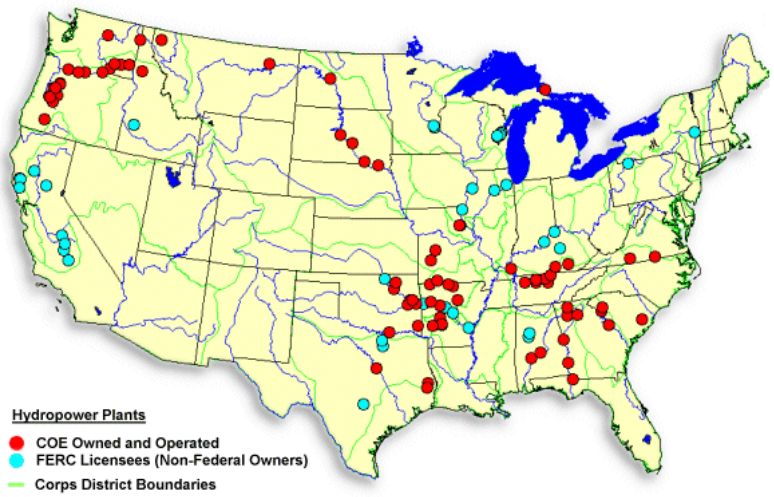
The Corps has an $18 billion investment in hydropower facilities. Over $2 billion in annual revenue



Corps of Engineers Hydropower

- Largest owner/operator of hydroelectric power plants in the U.S.
- Single largest producer of hydroelectric power in the U.S.
- 75 plants
- 350 generating units
- 20,750 Megawatts of installed capacity
- 70 billion average kilowatt-hours a year
  - 7.3 Million homes (approx)
  - Renewable, zero carbon footprint

USA Map of Corps Hydroelectric Projects



Corps HP Program Benefits

- Electricity at Lowest Sustainable Cost
  - Produced at 4/10ths of a cent per kW-Hr (gas plants cost 10X more).
- 70,000,000 MWh of Clean Power
  - Gas plants would produce 27,000,000 tons of Carbon Dioxide.
  - Coal plants would produce 77,000,000 tons of Carbon Dioxide.
  - Saves equivalent output of over 4,000,000 to 11,000,000 automobiles.
- Ancillary services
  - Maintains system reliability and grid stability

Hydropower Strategic Directions

HP Community of Practice

HP and Corps Strategic Plans

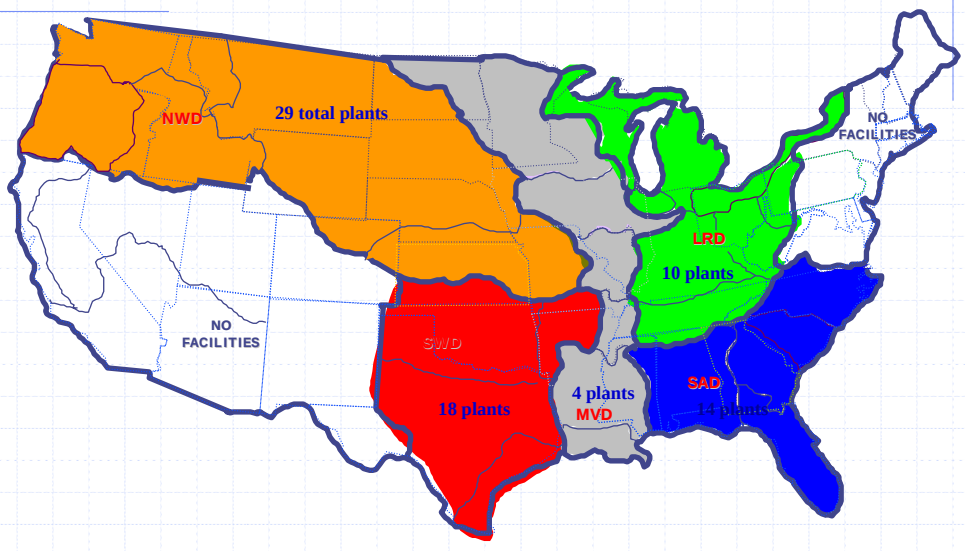
PMA Direct and Customer Funding

New relationships and what they mean to an OPM

Hydropower Program Strategic Objectives

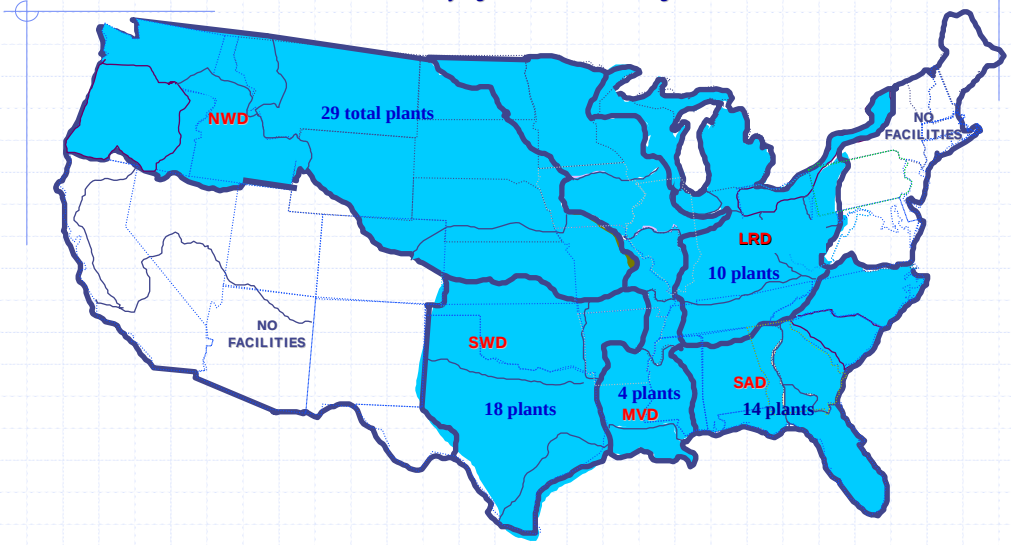
- Provide power services at lowest sustainable cost through sound project management principles.
- Meet or exceed industry standards for reliability and availability through sound strategies such as asset management and skilled workforce.
- Optimize the hydropower resources within authorized project purposes and environmental laws.
- Strengthen and sustain hydropower partnerships with the power marketing administrations, preference customers, and federal power agencies.

Regional Programs



One Community of Practice

"a group of professionals, informally bound to one another through exposure to a common class of problems, common pursuit of solutions, and thereby themselves embodying a store of knowledge."



HQ and Regional Business Line Managers

- National Business Line Manager - Kamau Sadiki
  - Kyle Jones – Sr. Program Manager
- Regional Business Center Business Line Managers:
  - SAD: Vacant (recruitment underway)
    - Richard Carroll (SAW), Jay Palmer (deployed) Brian Sautter Acting (SAS), Leon Cromartie (SAM)
  - SWD: Sherman Jones
    - Mark Dixson (SWL), Rod Shank (SWT), Terry Bachim (SWF)
  - NWD: Bob Schofiield (Acting)
    - Jim Mahar (NWP), Sue Chen (NWS), Jim Bluhm (NWW), Gary Hinkle (NWO), Pete Hentschel (NWK)
  - POD: None
  - NAD: None
  - SPD: None
  - LRD: David Mistakovich
    - (duel hatted, LRN), Steve Rose (LRE)
  - MVD: Jeff Artman
    - Dusty Wilsion (MVK), Sandra Spence (MVS)
- You need to know who your District BLM is
- These folks, working with the OPM's, will be instrumental in the success of the Hydropower business line
- FERC Coordinators – Should be one in each Corps District

HYDROPOWER ANALYSIS CENTER

The Hydropower Planning Center of Expertise

Training
FERC Licensing
Economic Analysis
Generator Rewind
Power Impact Studies
Hydropower Planning
Energy & Capacity Evaluation
Water Supply Storage Reallocation
Turbine Efficiency Improvement & Uprate

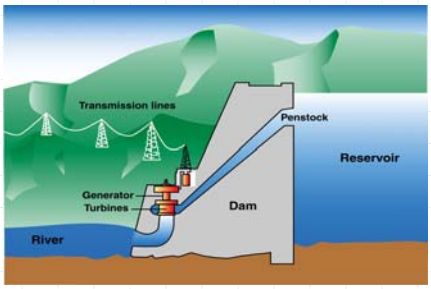
Website: http://www.nwd-wc.usace.army.mil/PB/welcome.html

HYDROELECTRIC DESIGN CENTER

The Hydroelectric Design Center is the US Army Corps of Engineer Mandatory Center of Expertise for hydroelectric power facilities and large pumping plants

Leaders in Hydropower Engineering

- Turbine and Generator Selection
- Switchyards and Transmission Terminations
- Powerplant Engineering and Design
- Cranes and hoists
- Powerplant rehabilitation
- Acceptance and performance testing
- Environmentally acceptable lubricants
- Troubleshooting



https://www.nwp.usace.army.mil/hdc

Hydropower Asset Management Initiatives

- hydroAMP Condition Assessment Tool
- Relative Risk/Reliability
- Cost Benchmarking
- FEM Implementation
- FERC/NERC Electric Reliability Compliance

Hydropower Asset Management Partnership (HydroAMP)

- Developed by team made up of BoR, CoE, Hydro Quebec and BPA
- Process by which condition assessments are made for critical hydroelectric generation equipment
  - Develop long term investment strategies
  - Prioritization of capital investment
  - Coordination of O&M budget processes and practices
  - Identification and tracking of performance goals
- The qualitative outputs of this assessment process will be condition indices
- Two tiered approach
  - Tier 1: testing resulting in condition indices
  - Tier 2: More in-depth testing to refine cond. indices

Hydropower Asset Management Partnership (HydroAMP)

- Condition indices assessment guide on Hydropower Gateway – BMPs tab
- hydroAMP database developed to allow projects to input condition data into single database in standardized format
  - Real time, web accessible
  - https://secure.bpa.gov/hydroAMP/
  - Need to request access at hydroamp@bpa.gov
    - Send name, e-mail address, phone number and plants you are requesting access
- Guides for nine major components completed

Relative Risk

Microsoft Excel Worksheet

O&M Cost Benchmarking

- USACE benchmarking all 75 power plant in inventory
- Russell Davidson, HAC, is lead for CoE
- CEFMS data input into system for O and M cost data
- Benchmarking against many other utilities
- Are we comparing apples to apples?
- Will be good in long run
- Need to standardize charging practices
  - Do maintenance personnel always charge to maintenance accounts?

Facility Equipment Management (FEM) Implementation

- We operate and **maintain** power facilities
- Preventative Maintenance (PM)
- Could move to predictive maintenance
- Breakdown maintenance
- This is the tool (maximo) to track your efforts
- Tool to use toward Asset management – BPA likes

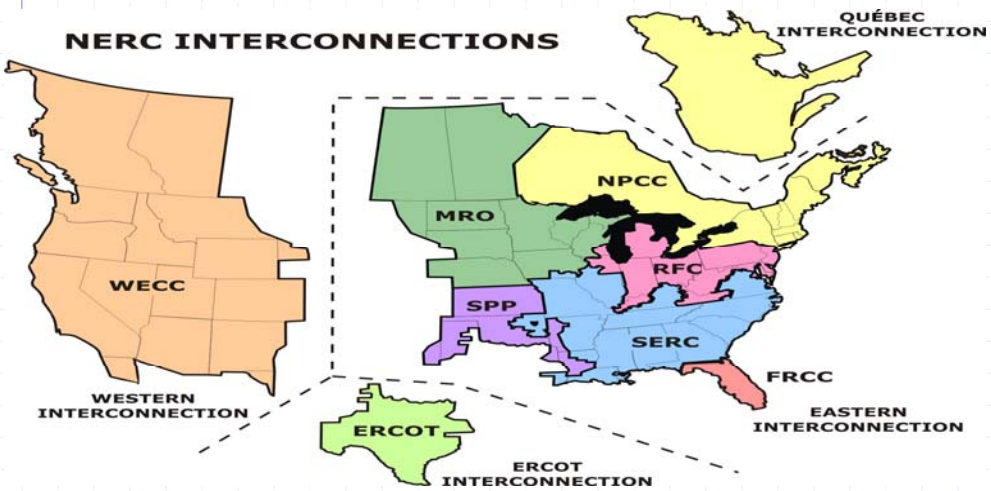
Reliability Standards (NERC)

- National Electric Reliability Council (NERC)
  - Private entity
  - Electric reliability organization
- Has entered into agreements with Regional Reliability Organizations that will implement the reliability system in their geographic area
- Many districts are being registered as transmission owners as well as generator owners and generator owner operators

Regional Reliability Organizations

- NERC has now entered into agreements with Regional Reliability Organizations (RROs) who will implement the reliability system in their geographic areas.
  - Western Interconnection – WECC
  - Texas – ERCOT
  - Eastern Interconnection – MRO, NPCC, RFC, SPP, SERC

Reliabilty Organizations (Cont.)



Registration

- All entities subject to the reliability system are required to register with NERC through the RRO.
- The RRO can register those Entities that do not voluntarily register.
- Registration is subject to appeal to NERC and then FERC/Federal Circuit Court of Appeals.

Reliability Standards

- Currently FERC has approved 83 of the NERC proposed 121 standards and FERC has given recommendations on what needs to be fixed in the remaining proposed standards
- Approximately 28 could apply to the Corps if it is subject to the reliability standards as a generator owner or generator operator
- The 28 standards contain approximately 136 different requirements plus RRO supplemental requirements
- Additional standards could apply if Corps is considered to meet requirements for transmission owner, operator etc. because of ownership of substations.

Monitoring Process

- Compliance Audits
- Self-Certifications
- Spot Checking
- Compliance Violation Investigations
- Self-Reporting
- Periodic Data Submittals
- Exception Reporting
- Complaints/Investigation Process

FERC / NERC Penalties and Fines

- Based on FERC and NERC Regulations
- No express exception for Federal Entities, i.e., TVA, BPA, WAPA, SWAPA etc.
- Penalties Can be Assessed up to 1 million dollars per day for each violation
- Penalties assessed by RRO can be appealed to NERC, FERC and then Federal Circuit.

Applicability to the Corps

- Does this Program Apply to the Corps?
  - Stockdale Memorandum Dated July 7, 2006
    - Corps is not part of the bulk power system
    - Even if subject to 2005 EPAct, not subject to fines/sanctions as no express waiver of sovereign immunity.
    - However, as a matter of comity, comply to the extent possible
- FERC Staff/NERC/RRO have indicated intent to include Corps in system and subject Corps to fines penalties for noncompliance. (Conf. Call 2/21/07)
- Other Federal Entities are registering and participating in program, i.e. PMAs, BOR, TVA.
- Corporate Compliance Plan should be approved by August 2009

Corps Cost Impacts

- HQUSACE is budgeting costs to comply with Reliability Standards in current or future budgets.
- May be substantial costs to comply with standards and monitoring processes, i.e., recordkeeping and reporting requirements.
- Physical changes to projects and software to support requirements may be required.

Corps Cost Impacts (Cont.)

- WECC and the other RROs expect Entities to Establish Compliance Enforcement Programs and Appoint Reliability Standards Program Managers
- Some Federal Entities are dedicating several FTE to respond to regulatory compliance (EPA, NERC, NEPA, ESA, etc.), i.e. BPA 5 FTE plus senior manager.
- Program will also require delegation of requirements to existing staff.
- Other costs are not yet known, collecting data/equipment testing, automating reporting system, data storage and compliance with RRO monitoring program.

Nearest Tanks

- Registration Process – RRO have indicated involuntary registration letters to Corps (some have already been received and forwarded to HQ).
  - Corps needs determination whether we will register or contest registration through appeals to FERC.
- First set of Reliability Standards were approved by FERC and became effective 4 June 2007
- Fines and Penalties could be assessed for non-compliance
  - Non compliance letters have been sent to District Commanders
- Focus for fines/sanctions is aimed at the highest risk requirements

Current Status of Compliance

- Stockdale Memorandum recommends that Corps comply to the extent possible
- ASA(CW) Memo
  - Comity statement
- Self Assessments
- Self Certification efforts on-going
- Mitigation plans submitted in many cases
- All Corps Divisions positioning to comply
  - Some it has been easier due to funding from Power Marketing Agency and past informal participation in earlier voluntary programs, i.e., Reliability Management System in NWD.

Recommendations

- Discussions are ongoing at ASA-CW level with FERC/OMB and/or DOJ to determine scope of Corps participation in program
- Possible legal action against the Corps
- Corps Districts/Divisions/HQs should submit compliance cost through normal budget process
- Consider alternate strategies, i.e. transferring transmission assets (substations) where feasible to PMAs.

Corps Strategic Themes

- Collaboration in a leadership or support role
- Sustainable, comprehensive and integrated solutions
- Innovative technologies and acquisition methods
- Ready, capable, flexible and deployable asset with a Global expeditionary presence
- Technical knowledge

Hydropower Program President's Budget History

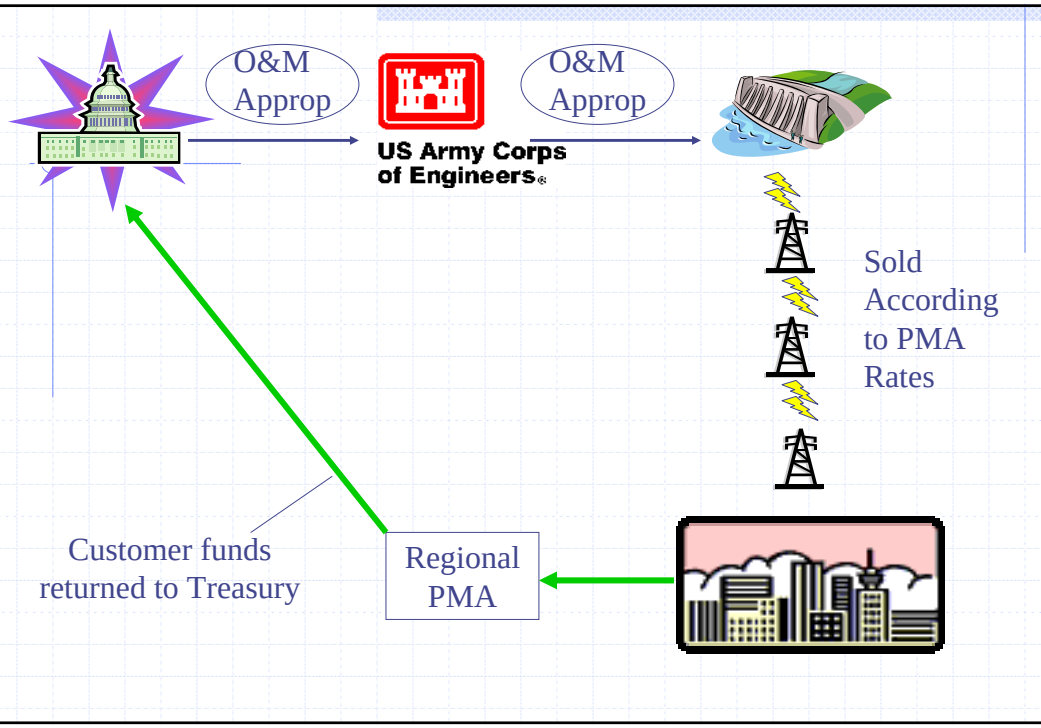
FY07 - $ 285M
Construction - $ 24M
O&M - $ 255M
RI - $ 6M
FY08 - $ 291M
Construction - $ 41M
O&M - $ 244M
RI - $ 6M
FY09 - $ 319M
Construction - $ 39M
O&M - $ 274M
RI - $ 6M

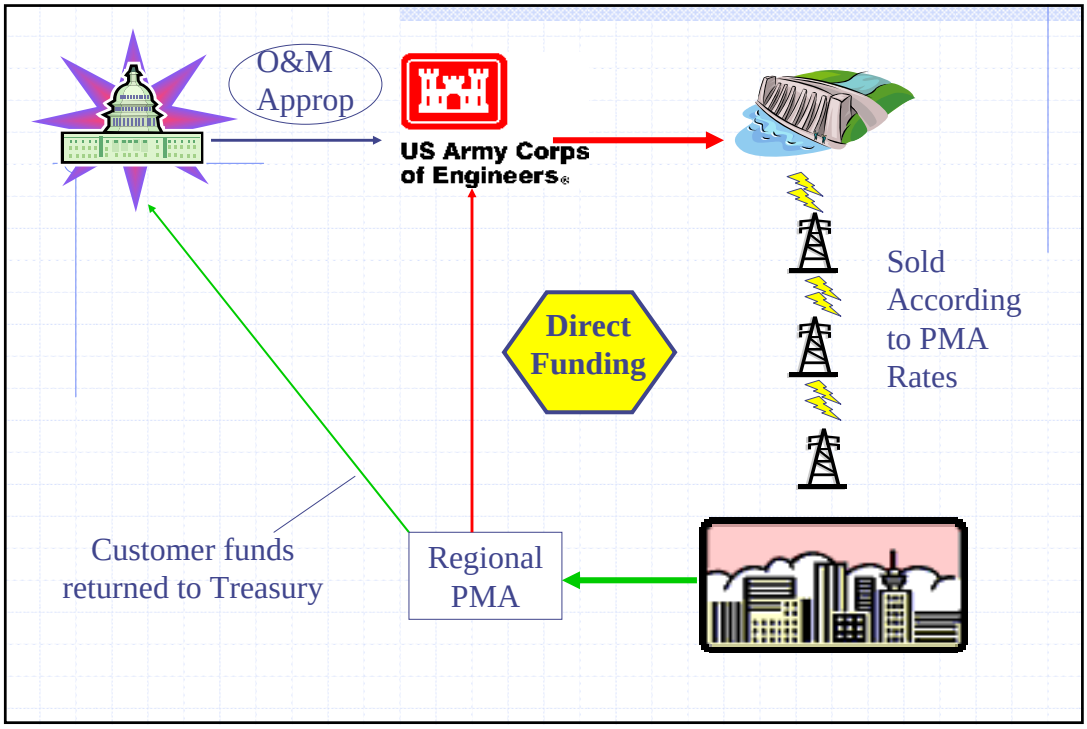
Non-Appropriated Funding

- Preference Customer Funding
  - Applies to SWPA, SEPA, WAPA regions.
  - MOAs in effect with Corps, PMAs, and customers
  - Authorized by WRDA 2000
  - Customer provide funds directly to Corps for agreed upon hydropower activities
    - Each item has its own sub-agreement in most cases
  - Customers are reimbursed through net billing and bill crediting with their PMA
    - Usually repaid within a few days
- Direct Funding

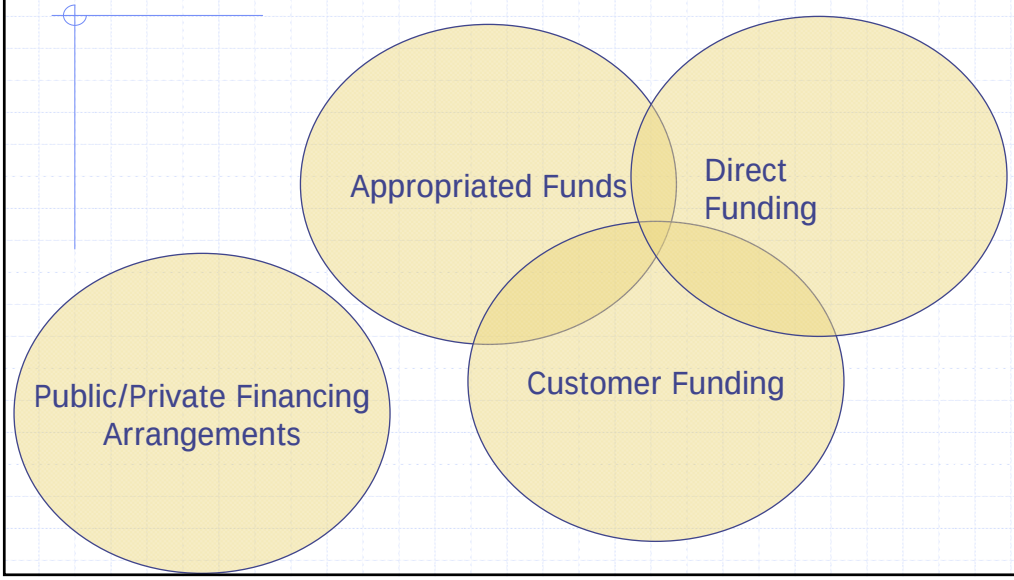
Non-Appropriated Funding

- Direct Funding – BPA
  - Authorized by Energy Policy Act of 1992
  - Funds all HP costs
    - Routine O&M (specific & joint) - approx $137M for FY
    - Small capital - funding threshold of $9.5M per yr
    - Large capital – Funded separately per sub-agreement
- Direct Funding – SEPA, SWPA, WAPA
  - Proposed in at least 3 legislatures through WDRA or Appropriation Bills
  - Included in President's FY06 Budget – failed due to WAPA opposition
  - Issues – Joint costs, Small capital, Budget Scoring
  - Possibility for future WRDAs





The Future of HP Funding

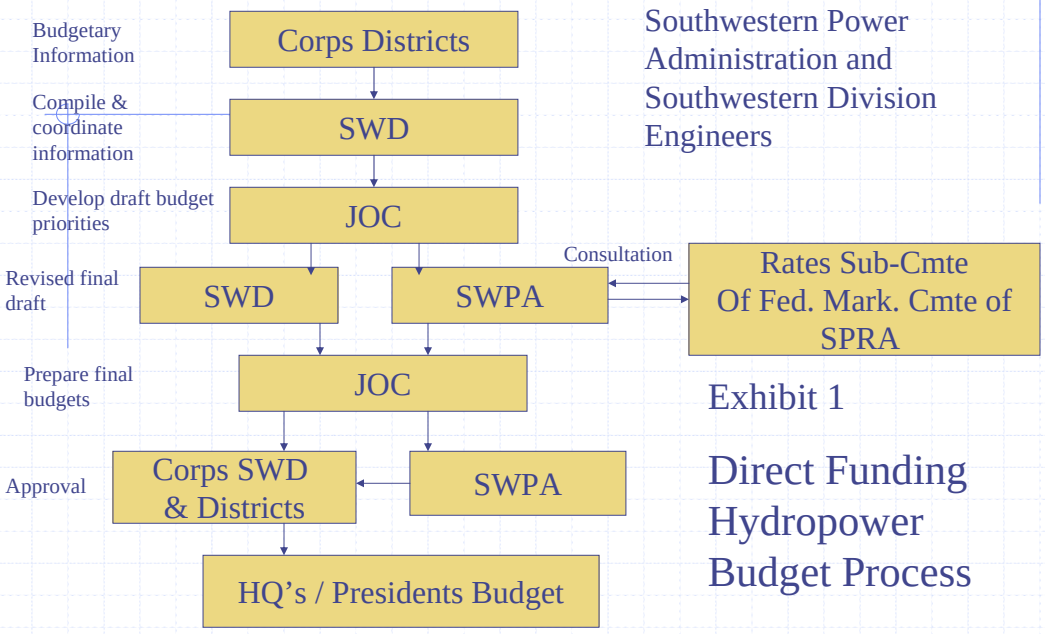


Changes Driven by Customer & Direct Funding

- Performance plans will have PMA and customer input
- Budget meetings in the May/June timeframe
- Will have significant impacts on all your funding
- Hydropower funds will NOT be able to be moved to other business lines such as recreation, etc
  - Can only be used for hydropower
- Will need 5 year work plans – at least
- Funds will probably not have the high expenditure goals
  - In fact, could get rewarded for saving money
- Funding will probably not come all at once
- Joint funding – in or out?
  - Where will the non-hydropower portion of joint come from?

New relationships and what they mean to an OPM

- Relationships with PMA's and Customer groups will be key to your success in this business line
- Being on the same page with them will be essential
- Working together we can make this hydropower "team" a model for the future
- Efficiencies and execution in our program will ensure their trust
- Trust will ensure future support and funding



Southwestern Power Administration and Southwestern Division Engineers

Exhibit 1

Direct Funding Hydropower Budget Process

New Initiatives

- Hydropower Equipment Exchange
- Developing a national "Toolkit": Program Plan and strategic guidebook for the "Hydro Community of Practice" for the future
- Hydropower Modernization Initiative
- Communicatons Strategy

Measuring Performance

- Drivers
- Performance measures
- OMBIL and Hydropower

Performance Metrics Drivers

- **Government Performance and Results Act (GPRA)**
- **OMB Program Assessment Rating Tool (PART)**
- **Commander's Critical Information Report**
- **PMA performance measures – mainly BPA for now**
- **Performance-based budgeting**

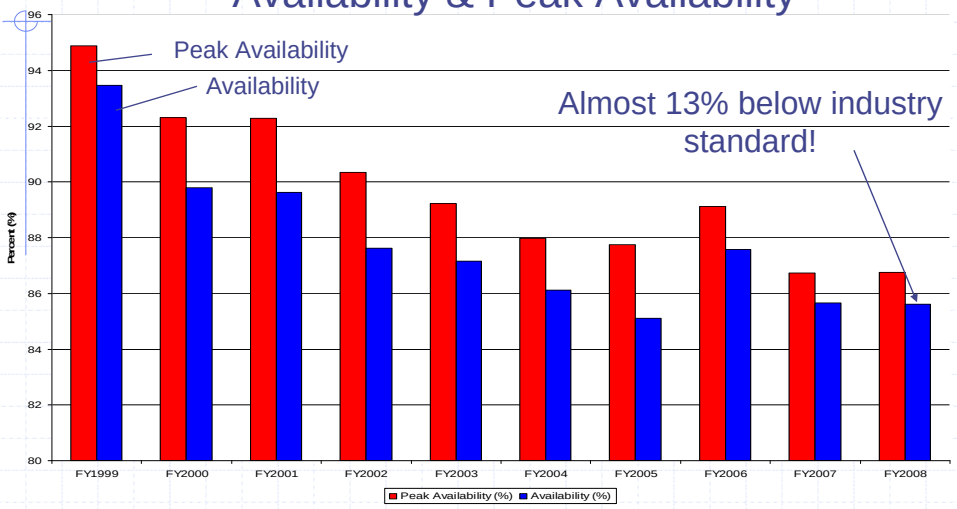
Measuring Performance

- Maintain reliable hydroelectric generation at Corps multi-purpose reservoir projects
  - Forced Outage Rate – Goal < 2%
  - Peak Season Availability – Goal 98%
  - Annual availability – 95%
- All current measures are reliability and efficiency based
- Performance-based budgeting will be discussed later

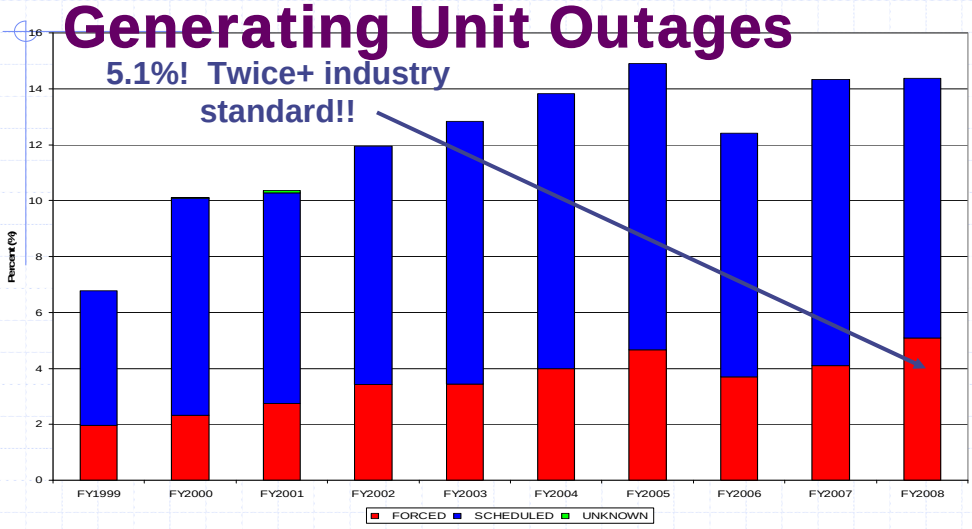
PART Performance Metrics

- Percent of time hydroelectric generating units are available to the Power Marketing Administration's interconnected system during daily peak demand periods
- Annual forced outage rate (in percent) of hydropower units
- Percent of generating capacity that has a major generator/turbine related component rated in poor condition
- Perform a comprehensive periodic review or annual power review at each required hydropower plant
- Operation and Maintenance (O&M) costs for power, expressed as $/MWh
- Meet or exceed Federal Energy Regulatory Commission (FERC) and the National Electric Reliability Council (NERC) approved electric reliability standards that applies to generator owners and operators in the bulk power system

Availability & Peak Availability



Generating Unit Outages



OMBIL and Hydropower

- Data for entry into ranking system directly out of OMBIL
- OMBIL data increasingly being used in the budget process
- Entering data into OMBIL accurately is very important!
- Standardizing input is very important
  - Unavailable vs Standby

Programming, Budgeting, and Executing

- Business Line Budgeting
- Performance-based budgeting
- Major Rehab
- FEM

Alignment of CW Strategic Plan Objectives, Performance Measures & Budget Ranking Criteria

Program Objectives	Performance Measures	Ranking Criteria
1. Invest in hydropower rehabilitation projects when the benefits exceed the costs.	- Remaining BCR (project specific measure).	- Remaining BCR.
2. Future: Invest in environmentally sustainable hydropower infrastructure improvements where economically justified.	- To be developed in the future.	- Unit Life Extension. - Restored Generation Capacity of De-Rated Unit.
3. Provide reliable power. 4. Provide peaking power. 5. Maintain capability to provide power efficiently. 6. Projects perform to meet authorized Purposes and evolving conditions	Forced Outage Rate (FOR). Physical condition/failure risk index.	- FOR. - Peak Season Availability. - Units De-Rated.

Performance-Based Ranking Criteria

- Annex IV in Budget EC 11-2-187
- FY 11
  - Requirement to avoid legal, treaty or ESA violation in BY
  - Requirement to avoid public safety item at project
  - Requirement to avoid forced facility closure
  - Justification / funding argument
  - Project Baseline Recurring Costs
- What you do not see is as much statistical analysis such as availability rates, forced outage rates, etc

Performance-based Programming

Program Increments (O&M, General):

- Increment 1 – Minimum Level – critical routine activities
  - Avoid maintenance staff reductions to a level to preclude basic routine PM
  - Public/Worker Life Safety.
  - Court Orders, Legal (ESA, CWA, Etc.); Treaty.
  - Avoid Forced Facility Closure.
- Increment 2 – Minimum Level – critical non-routine activities
  - Insure project safety
  - Required to keep project operating and delivering benefits
- At MSC level, combination of 1 and 2 should not exceed 75% of 5-year average
- Increment 2.5 – NERC Reliability Compliance Activities
  - Required to voluntarily meet reliability standards
  - Ranked separately, but part of 75%, special funding consideration in budget wedge
- Increment 3 – Additional O&M Activities
  - Necessary but not critical to minimum O&M of facility
  - Restore critical generating unit that is in forced outage status
  - Restore de-rated capacity
  - Improve Condition indices
  - Extend the life of unit
- Increment 4 – Capability
  - O&M that doesn't meet above criteria

Ranking Criteria

Specific Information Provided:

- Regional Ranking & Budget Increment
- Account (GI, CG, O&M)
- Total BCR (CG)
- RB/RC (CG)
- Annual Net Benefits (CG)
- Peak Season Availability
- Average Unit Age
- Number of Units De-Rated
- Life Safety, Legal; Closure Items
- Benefit from Life Extension & Capacity Restoration Items

Inherent Ranking Considerations:

- Balance Among Missions
- Watershed System Perspectives
- Regional Role of Project
- Consequences of Lost Service
- Consequence of Violations
- Probability of Failures/Relative Risk
- Stakeholder Input & Support
- Agency Commitments
- Workforce Capability Needs
- Other Priority Enhancing Needs Captured in Remarks

Major Rehab Program

- Study costs out of Civil O&M
  - Can cost $1.5M
- Construction General (CG) funding????
  - Can be $100M-150M
- Complete rehab of power plants
- Switchyards included (if managed by CoE)
- Some PMA's are willing to incrementally fund rehabs

Facility Inspections

- Facilities Instructions, Standards and Techniques (FIST) Manuals
- Bureau of Reclamation manuals which pertain to the O&M of hydroelectric equipment
- Corps moving toward using this tool
- Can be found at www.usbr.gov/power/data/fist_pub.html

Ensuring a Capable Workforce

- HP training program
- Knowledge management
- Mentoring
- Cross training
- Good hiring practices

Leadership

- Power plant manager is key member of project leadership team
- Need to promote quality leaders
- Budgets, schedules and people
- Need strong communication skills
- Can't continue to promote for technical reasons only

Potential Problem Areas

Safety

- Hazardous Energy Control program
  - Lock out/Tag-out
  - Safe clearance program
- Confined Space program
- Hearing Conservation
- Arc Flash Protection
  - Flash resistant clothing
  - New Safety Manual – negotiating with Unions
- Crane Safety

ERGO Program

- Having current spill prevention plans
  - The Dalles spills got ASA(CW) attention
    - 54 page comprehensive review report
      - Numerous recommendations
  - Strategic planning in this area is a necessity
- Important part of project Environmental Management System (EMS)
  - EMS implementation should be complete
  - Peer reviews
  - On going system management

NERC – Compliance Enforcement Program

- Maintenance Issues
  - Relay test plans, Governor Droop, Voltage regulator protection, Power System Stabilizers, Synchronizer
- Verification of Unit Capability curves
- Facility Review
  - Requirement to verify ratings and coordination of all power train components every 5 years
- System Restoration
  - Black Start capability – test 1/3 of units every three years
- Reporting Requirements
  - OMBIL
  - Unit interruption reports

Equipment Failures

- Type “U” bushings on equipment
  - Prone to violent failures
  - Contain PCB’s
- Transformer failures
- The Dalles was significantly sited for not doing enough Preventative maintenance
- Lack of Non-deferrable funding has created a situation where the potential of failures has increased

Planning for the Future

- Staffing to meet future needs
  - Hiring qualified employees
- Clearly communicate needs
  - Within CoE
  - PMA
  - Customers
- Equipment replacements
  - Everyone can't wait for major rehabs
- Could/Should be very solid program in future

Key Take Aways

- Leadership in the business line will be key to project success
- Understanding performance measures and making sure you understand them
- CoE needs to get a better handle on reliability requirements
- PMA funding will stabilize your funding, but reduce your project flexibility
- Building good relationships with PMA and customers groups will be important

QUESTIONS??