How to Retain Critical Knowledge

Bill Christman, P.E. — Chelan County PUD

Pump Storage/Hydro Operations Collaboration - November 2006

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Rocky Reach

Rock Island

Lake Chelan

Chelan County Public Utility District

- 3 Dams
- 2000 MW of Generating Capacity
- Second largest non-Federal hydroelectric producer in the U.S.

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Capturing knowledge before it walks out the door

(succession planning)

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Why does this matter?

An industry-wide issue

- **50% to lose 50% in 5 years**
  - 50% of utilities are faced with 50% or more of their workforce retiring
    in the next five years
- **90% have a problem...30% have a plan**
  - Of 21 energy companies interviewed, over 90% report attrition as an important or emerging issue...Over 30% report having a plan to
    address the issue
- **Ample anecdotal evidence**
  - Including explicit plans to recruit replacements from other utilities

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Knowledge Retention Process

- Identify critical skills and knowledge at risk
- Assess consequences of losing that knowledge
- Prioritize and plan for capturing knowledge
- Evaluate strategies to transfer critical knowledge

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Gap Analysis: Attrition Forecast

- Focus on required critical skills and where those skills reside
- Identify a way to prioritize critical skills and assess those in danger of being lost through attrition
- Two and five year forward look at organizational impact

NOTE: Often the least well understood tasks, because of difficulty or lack of standardization
are most at risk from attrition by a few specialists in that area.

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What are we doing?

1. Workforce assessment

(April 2004)

- 614 full-time employees
- 156 (25%) eligible to retire

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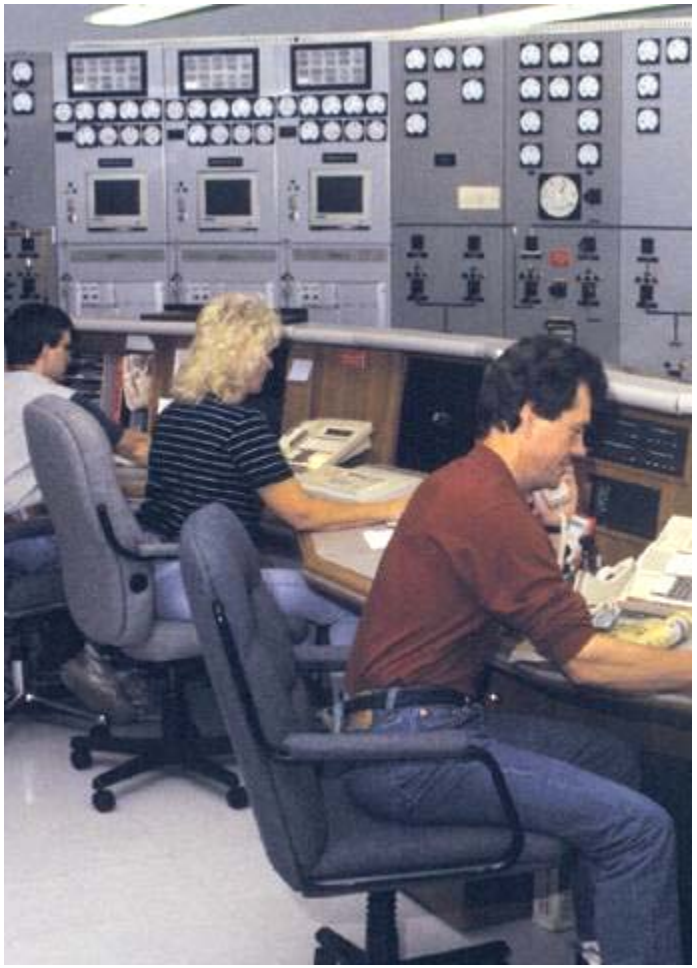
What are we doing?

2. Identify knowledge or skills that could be lost

- Necessary for reliable and/or safe hydro operations
- Not uniformly common knowledge
- Currently undocumented



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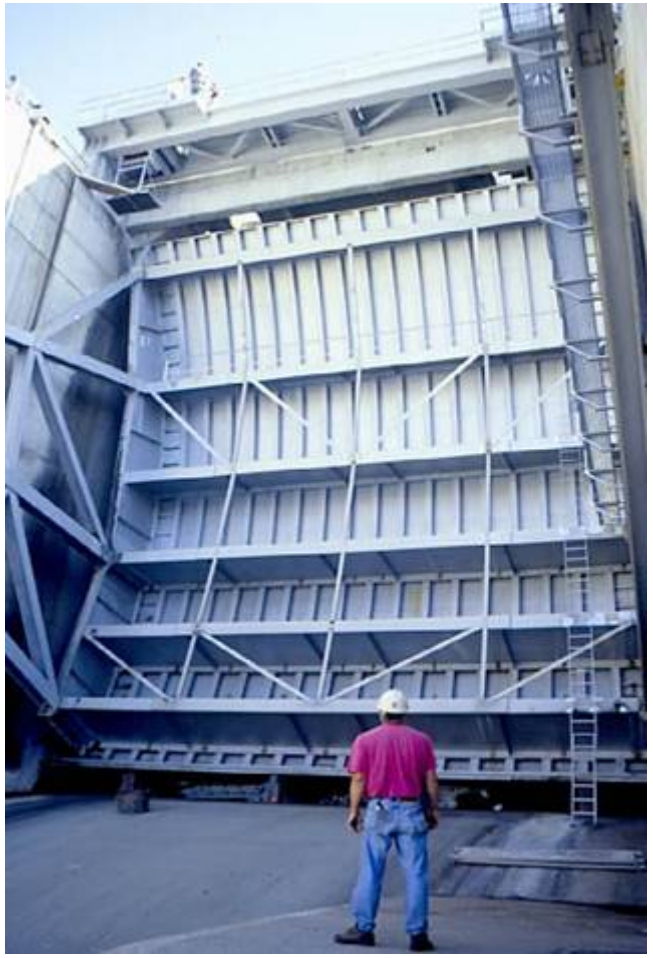
What are we doing?

3. Capture and deliver that knowledge

- Operational and Maintenance Instructions (OMI's)
- Standard Operating Procedures (SOP's)
- Job Plan and work notes database (Maximo)



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Operational and Maintenance Instructions

Web-based

Chelan PUD Internal Web Site

The Generation Technical Library is a collection of information designed to ensure knowledge transfer while promoting the safe and efficient operation and maintenance of the District's hydro projects.

OMI Library

A collection of plant manuals in PDF format:

Rocky Reach
Rock Island
Chelan Hydro

Standard Operating Procedure Library

A collection of specific operational, maintenance and emergency procedures for each of the District's hydro projects.

Image Library

Take a look at our test site for searching for images. It's small—but growing

Rock Island Modernization

A resource for the documentation process associated with Rock Island modernization

WHAT'S NEW

9/22—RI PH2 Unit Startup Checklist (revised
9/21—McKenzie/Alcoa One-Line Diag.
9/21—RI PH1 Brush Maintenance
9/20—RR Switchyard MOD #1
9/20—RR Switchyard MOD #2
9/18—McKenzie Switchyard MOD 3-9
9/18—McKenzie Switchyard MOD ITE
9/12—RI BRZ Entrance
9/05—McKenzie MOD illustration
9/05—RI PH1 Evacuation maps
8/30—RI Hub Oil Inspection/Drainage
8/20—Rocky Reach Image Library
8/17—Spill Prevention page
8/15—Rock Island Image Library
8/08—Hydro Operations training videos
7/26—RR C8-11 Startup Check List
7/17—Switchyard Emergency Lighting
7/06—RR C8-11 Unit Start Up

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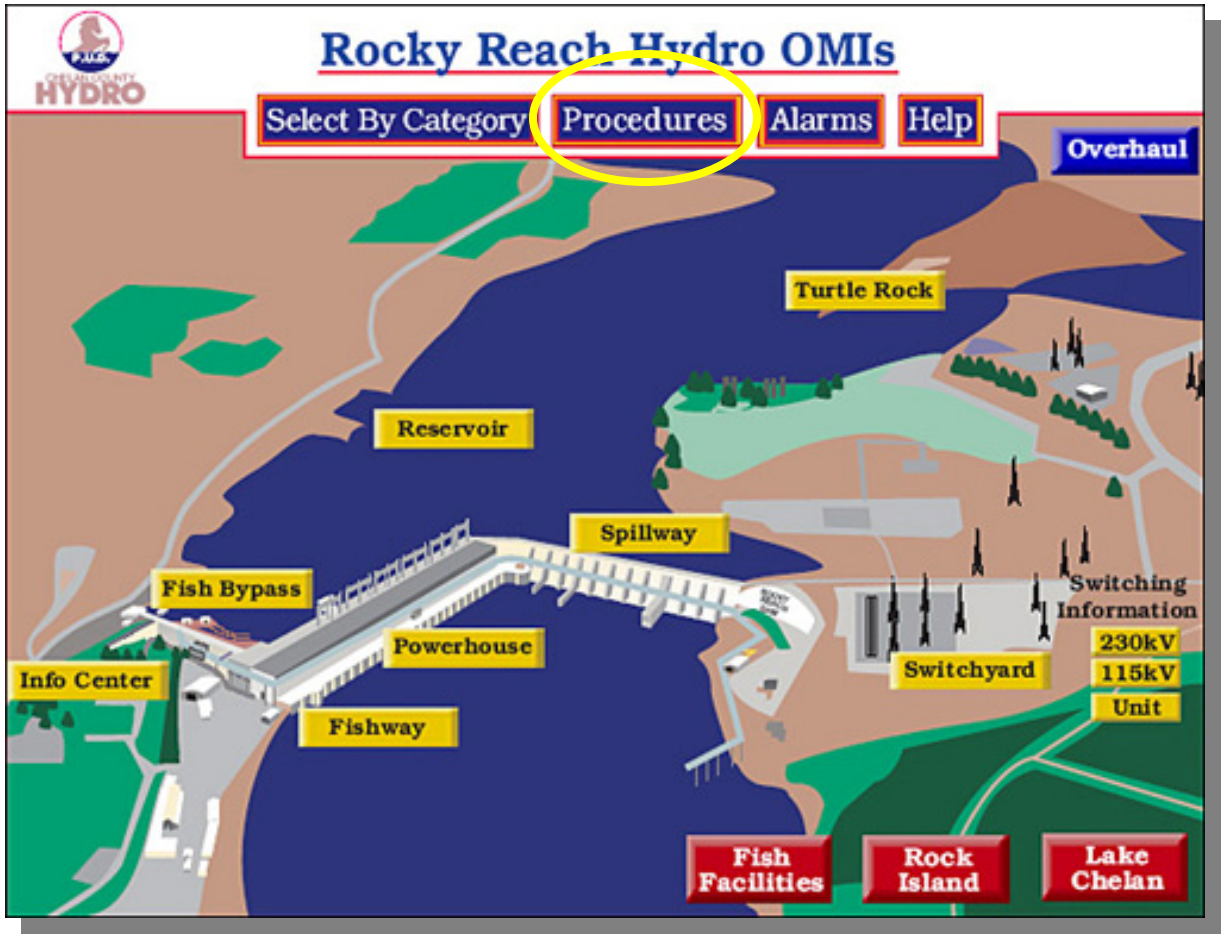
Operational and Maintenance Instructions

Web-based



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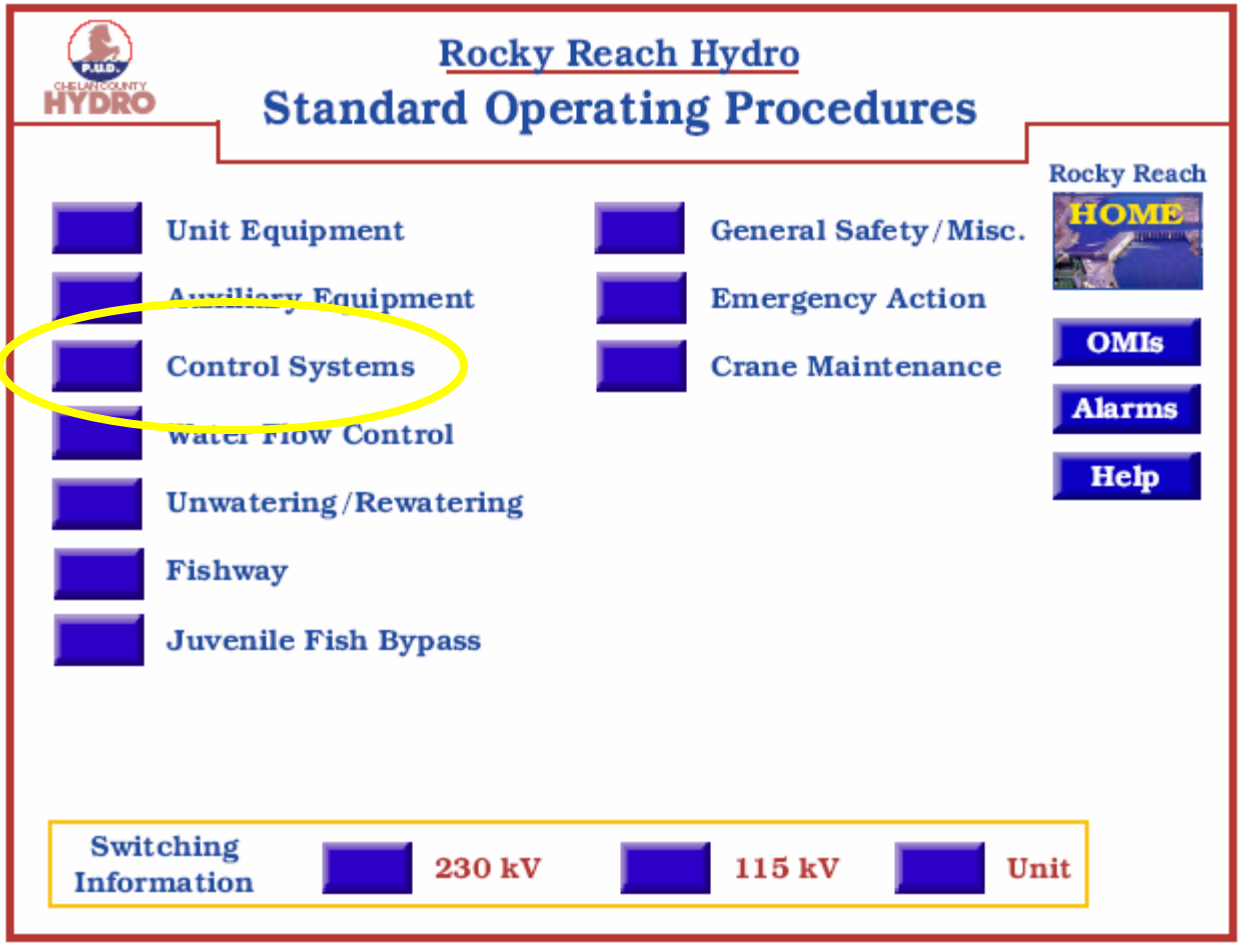

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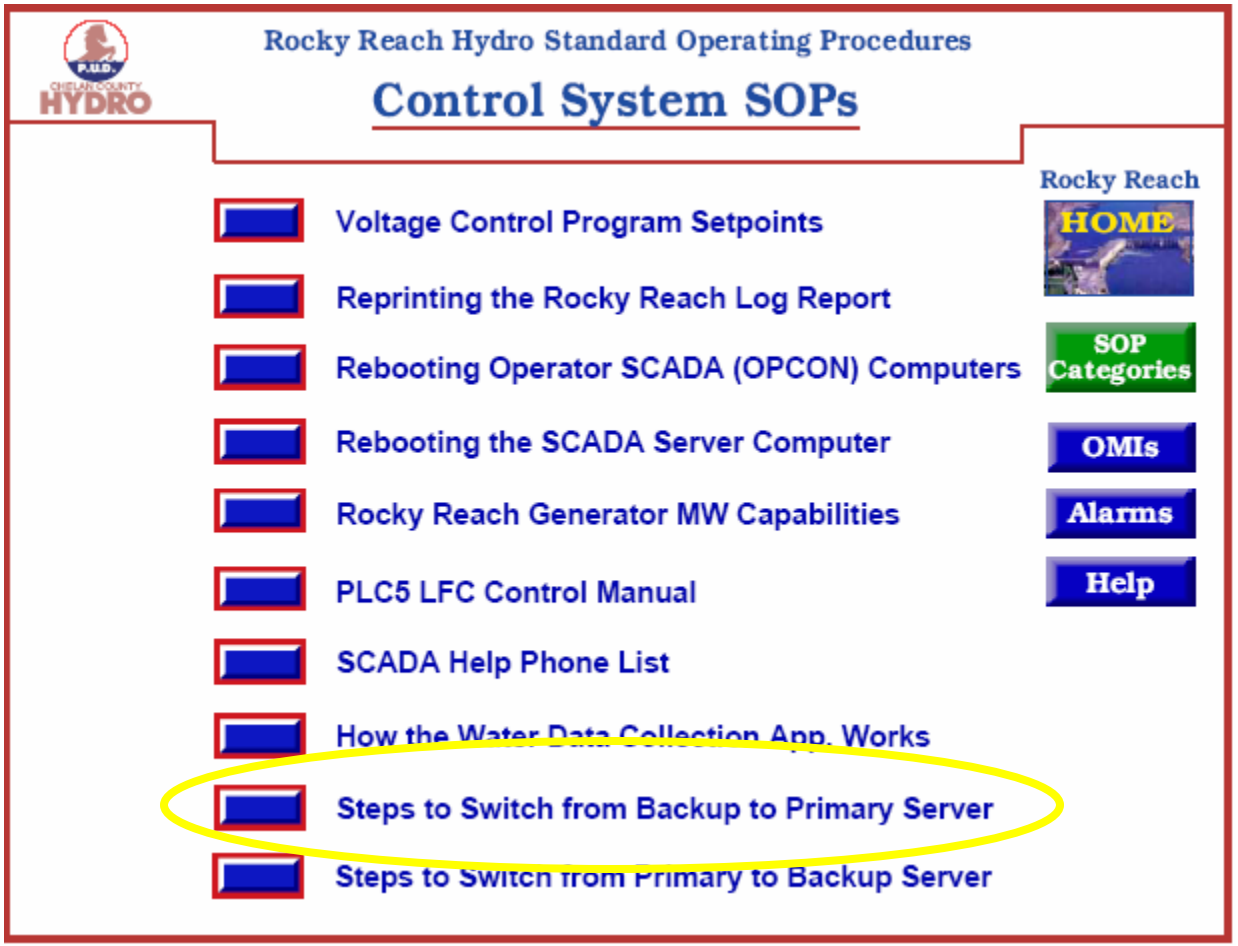

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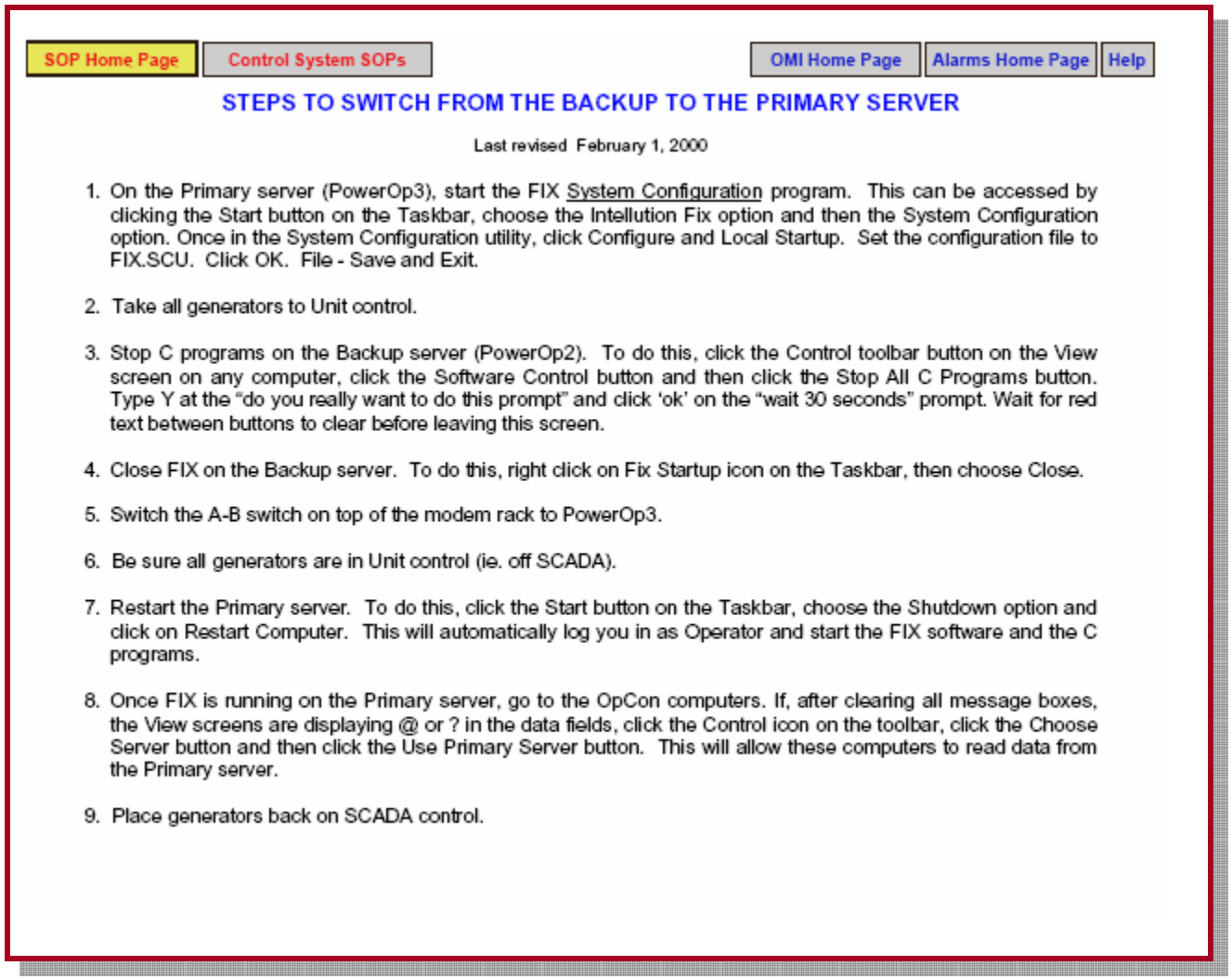

SOP Home Page | Control System SOPs | OMI Home Page | Alarms Home Page | Help

STEPS TO SWITCH FROM THE BACKUP TO THE PRIMARY SERVER

Last revised February 1, 2000

1. On the Primary server (PowerOp3), start the FIX System Configuration program. This can be accessed by clicking the Start button on the Taskbar, choose the Intellution Fix option and then the System Configuration option. Once in the System Configuration utility, click Configure and Local Startup. Set the configuration file to FIX.SCU. Click OK. File - Save and Exit.
2. Take all generators to Unit control.
3. Stop C programs on the Backup server (PowerOp2). To do this, click the Control toolbar button on the View screen on any computer, click the Software Control button and then click the Stop All C Programs button. Type Y at the "do you really want to do this prompt" and click 'ok' on the "wait 30 seconds" prompt. Wait for red text between buttons to clear before leaving this screen.
4. Close FIX on the Backup server. To do this, right click on Fix Startup icon on the Taskbar, then choose Close.
5. Switch the A-B switch on top of the modem rack to PowerOp3.
6. Be sure all generators are in Unit control (ie. off SCADA).
7. Restart the Primary server. To do this, click the Start button on the Taskbar, choose the Shutdown option and click on Restart Computer. This will automatically log you in as Operator and start the FIX software and the C programs.
8. Once FIX is running on the Primary server, go to the OpCon computers. If, after clearing all message boxes, the View screens are displaying @ or ? in the data fields, click the Control icon on the toolbar, click the Choose Server button and then click the Use Primary Server button. This will allow these computers to read data from the Primary server.
9. Place generators back on SCADA control.

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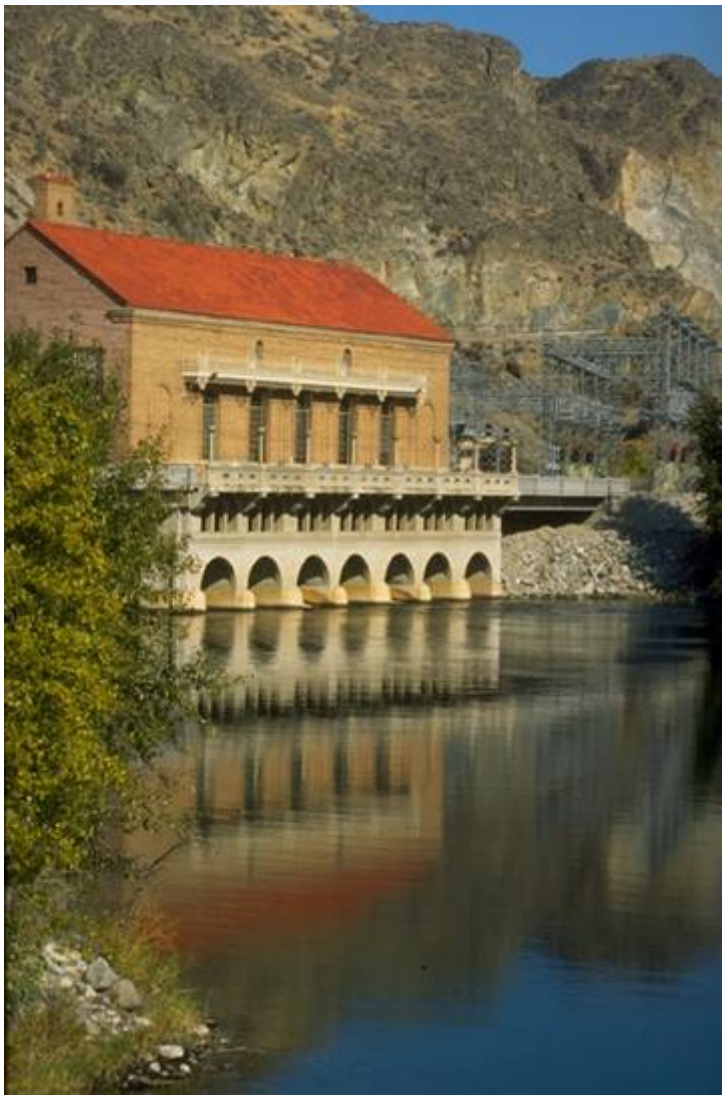
Summary

- Commit leadership and resources to the initiative
- Devise a plan
- Obtain the tools
- Obtain workforce commitment
- Prioritize
- Get started



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Questions?

If you want to know more, contact me:

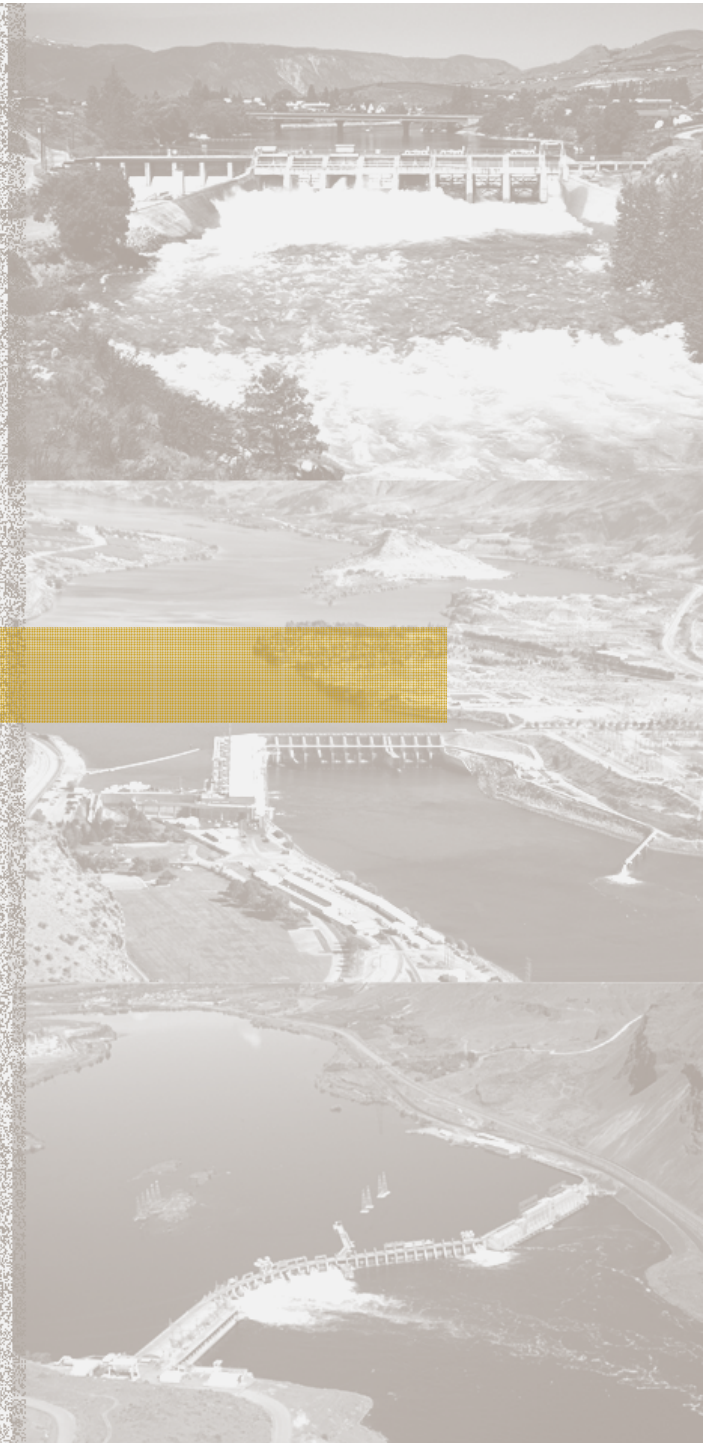
Bill Christman

Chelan County PUD

509-661-4283

billc@chelanpud.org

Chelan's Project Prioritization Strategy

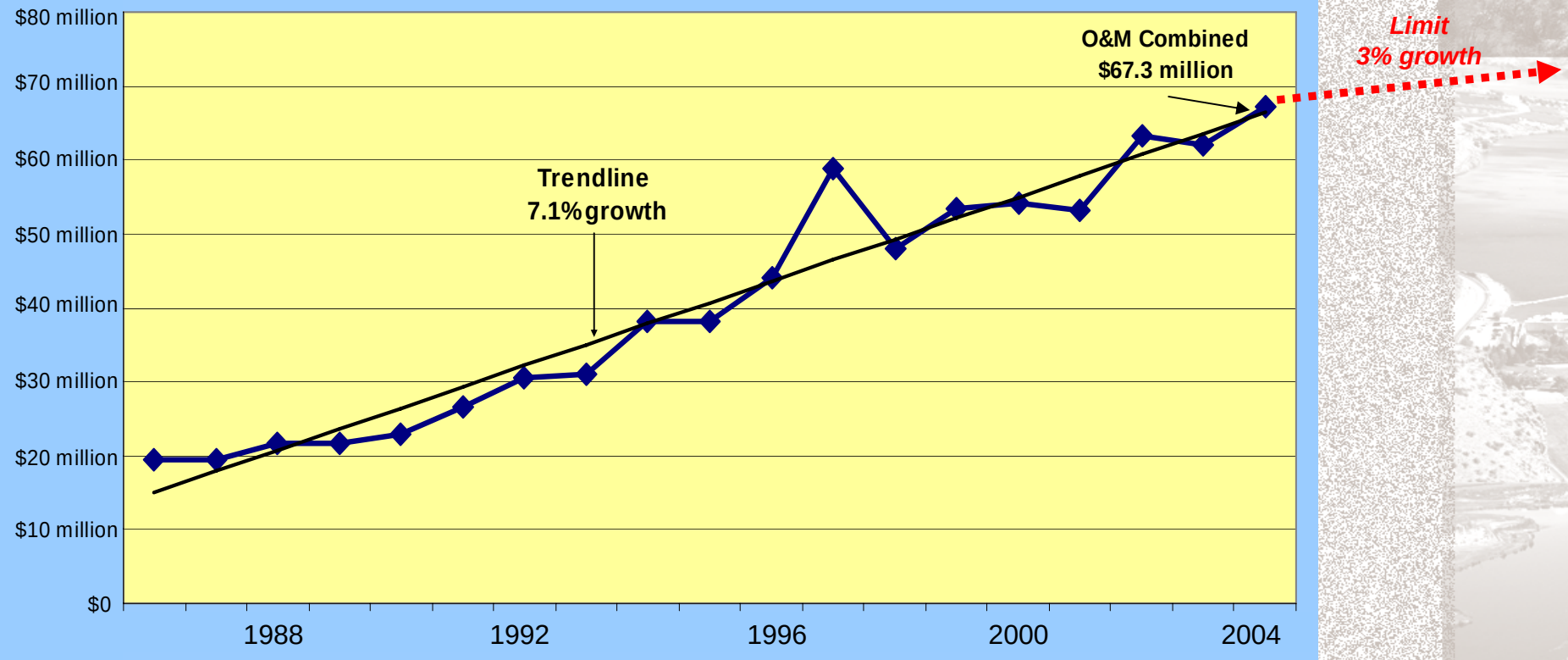


Project Prioritization Strategy

Objective: to ensure critical infrastructure needs (i.e. dam safety and preservation of assets) don't fall through the cracks as a result of rate pressures and increasing competition for available resources.

- Endangered species protection
- Security
- Recreational interests and demands
- Increasing customer expectations

Chelan PUD's O&M Cost Pressures



Prioritization Strategy - Corporate

- Chelan County PUD Goals

  Strategic Initiatives

  - Initiative No. 1 Safety (dam safety, personnel, public)
  - Initiative No. 2 Disaster Recovery and Business Continuance

  Critical Success Factors

  - Safety (including operational reliability)
  - Operational Excellence
  - Environmental Stewardship
  - Customer Service
  - Community Responsiveness

Prioritization Strategy - Projects

Priority 1: Projects that must be expedited to:

- **Comply with safety, environmental or FERC regulations;**
- Avoid loss of life or property;
- Avoid loss of production, distribution, water supply, communications or network capability

Priority 2: Projects that:

- Provide a significant, positive impact on the reliability of services

Priority 3: Projects that:

- Provide a positive impact on the cost of power;
- Preserve essential equipment

Priority 4: Projects that:

- Enhance functionality;
- Have value or benefits that can't be quantified;
- Have a low return on investment

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Prioritizing O&M Projects

- Prioritized and reviewed closely by Department Managers.
- Budget targets are set annually to achieve District's cash reserves and cover ratio goals.
- Highest priority projects are budgeted first
  (i.e. structure monitoring, CFR 18 Part 12 recommendations)
- Non-critical projects may be re-evaluated.

Example: Projects at Rocky Reach

Pre-prioritization Project List

Post-prioritization Project List

Feasibility Report and Portfolio Committee review

Daroga Boat Launch Ramp	3	RR Switchyard Fall Restraint	1
Daroga Park Accretion Control Replacement	3	RR Turbine Blade Isolation Valves	1
Lincoln Rock Park Safety Upgrades	1	Beebe RV Hookups	4
Orondo Park Irrigation System	3	Beebe/Chelan Falls-boat launch replacement	1
Chelan Falls Fish Hatchery Wastewater Pump	3	**RI Dam Safety and FERC Compliance**	**1**
Rocky Reach - stability analysis update	**1**	Daroga Park boat launch repair	1
Rocky Reach Tainter Gate analysis	**1**	RR Head gate Overhaul	2
RR Boat Passage Modifications	2	Lincoln Rock Swim Beach Seawall	1
RR C1-C7 Turbine Guide Bearing Oil Filter / Cool	1	RR Park Roof Replacements	4
RR Headworks Gantry Crane Runway Grout Cap Repair	1	RR Garden Area	4
RR Oil Spill containment (tunnel cleaning & cleanup resp.)	1	RR Grounds Shop-Stairwell, Crew Locker Room	1
RR Re-conductoring RR Spillway	1	**LC Stability Analysis Update**	**1**
RR Replace seals on 2 tainter gates	2	RR Fabricate Swing Arm & Crowder	1
Tainter Gate Painting Program	3	RR - Tailrace Forebay Season Support	1
Security RR East Bank Switchyard	**1**	RR RI Hydrophone Install remove	1
RR Tainter Gate 12 Trunnion Bearing Replacement	**1**	RR - WWTF Design and Construction	1
RR Transient Fault Recorders	2	RR C1-C7 Generator Rehabilitation Project	2
RR Forebay Safety Security Boom with Access Gate	2	RR Fishway PIT Tag detectors	1
RR Oil Containment Program	1	**RI Movement Monitoring – Concrete Testing**	**1**
Chelan Fall Hatchery Raceway Refurbishment	2	Tennis Court Resurface	3
Beebe Bridge Park Storage Building	3	Daroga Park boat swim area erosion	1
RR 230kv Spare Circuit Breaker	2	RR C1-C7 Governor Oil Filtration	1
RR Keyhole Notched Gates @ Fishway Entrances	3	RR C8-C11 Turbine Guide Bearing Oil Filter/ Cool	1
Security - RR - Barrier Arms	4	Upgrade the relaying on the White River Line	2

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Prioritization for Projects

Projects	2004	2005
Total # of projects pre-prioritization	195	161
Total # of projects post-prioritization	162	116

Justifying Civil Works Safety Investments

- Clear understanding and respect for regulatory dam safety requirements
- Organizational goals
- Prioritization process
- Assign priority and justification
- Review by portfolio committee
- **Ensures critical infrastructure needs are met**

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Discussion