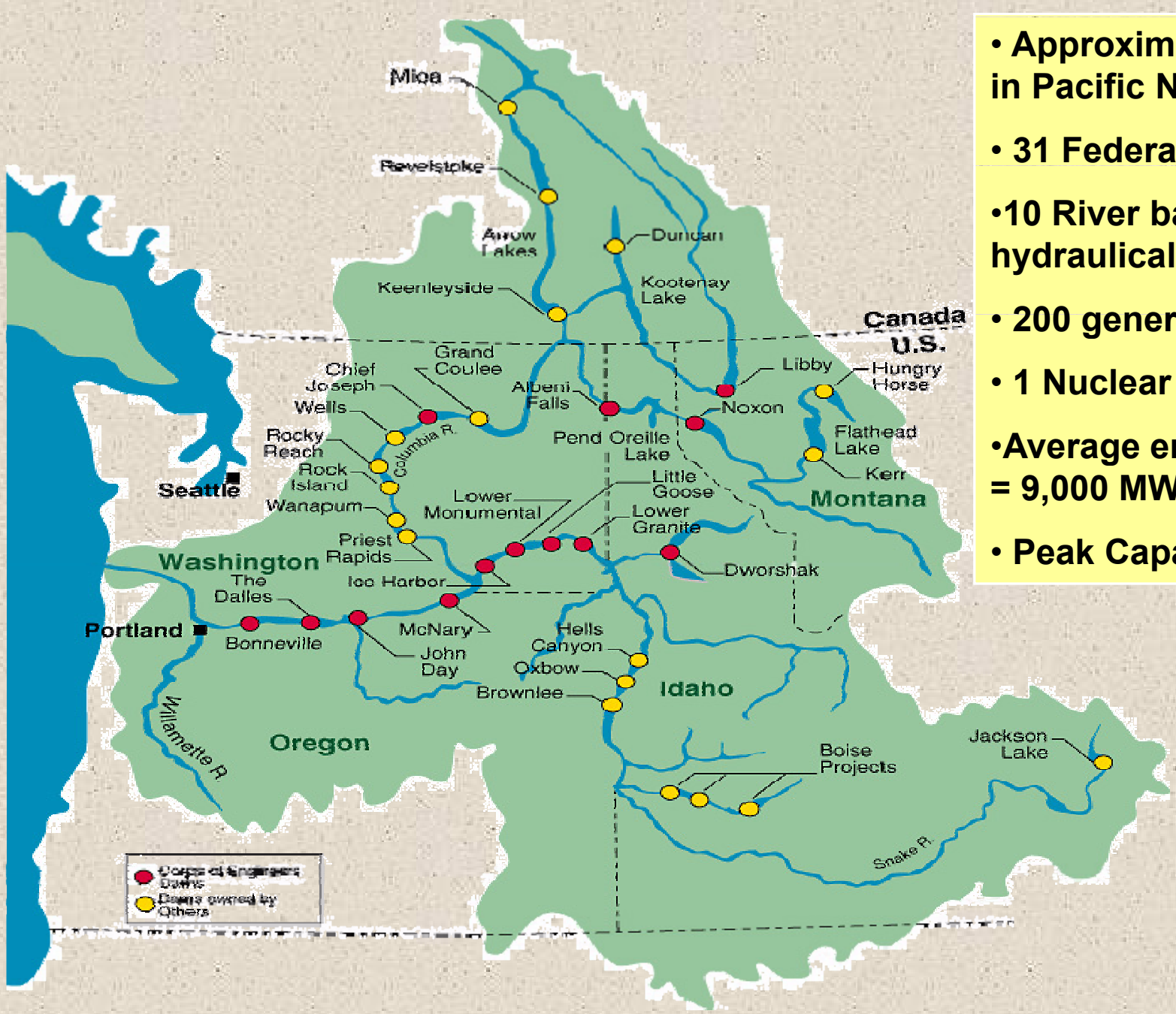
Research and Development in Power Services

The Federal Columbia River Hydro System



- Approximately 250 dams in Pacific Northwest
- 31 Federal Hydro Projects
- 10 River basins- hydraulically connected
- 200 generating units
- 1 Nuclear Plant
- Average energy generation = 9,000 MW
- Peak Capacity: 21,000 MW

The three agencies work together to operate the hydro system

BPA performs the scheduling and marketing, while the Corps and Reclamation operate and maintain the hydro projects

Figure 9: Power Services Technology Roadmap
Targets, Needs, Technology Features, and Technologies

Targets

- Target 1: Enhance the future FCRPS reliability, operation, and maintenance for an increasingly complex operation
- Target 2: Design operational and maintenance improvements to reduce costs
- Target 3: Maximize existing asset use and extend the useful life of assets
- Target 4: Decrease the FCRPS environmental footprint
- Target 5: Increase generation efficiency

Needs

- N1: Intelligent Scheduling system tying hydro operation, marketing, and optimize action together
- N2: Provide Generation Products to support Tx system
- N3: Online, real time analysis for scheduling/ operations
- N4: Schedule water and flow with optimization in real time
- N5: Increased plant and unit efficiencies
- N6: Reduce impacts of FCRPS on environment
- N7: Technologies that reduce the costs of new equipment
- N8: Enabling technologies that reduce expenses and offset construction costs
- N9: Optimize the transition of new technologies into aging FCRPS

Technology Features

- TF1: Data systems compatible with GDACS, AGC, and SCADA
- TF2: Advanced Turbine Modeling
- TF3: Real time, systemwide data measurement, collection, analysis, dissemination, and display
- TF4: High speed, secure, reliable, interoperable communication systemwide
- TF5: Open source PLC technology and coding
- TF6: Neural Network Technology
- TF7: AGC control system compatible
- TF8: Interative and instructional displays
- TF9: Verifiable and demonstratable environmental benefits
- TF10: LAB verification scale up functions available
- TF11: Integration of new and existing equipment based on condition, life cycle, end of life identification
- TF12: Prototype verification
- TF13: Advanced Hydro Generation Technology

Technologies

- T1: Advanced Maintenance and Diagnostics
- T2: Advanced Optimization
- T3: Coating Technologies
- T4: Energy Storage
- T5: Asset Management Programs
- T6: Data Visualization Tools
- T7: Advanced Forecasting
- T8: Real Time Monitoring and Measurement Technology
- T9: Generation Equipment Technology
- T10: Electrical Measurements
- T11: Hydraulic Measurements
- T12: Turbine Runner Technologies
- T13: Cavitation Technologies
- T14: Real Time Operations Software
- T15: SCADA Control Systems Technologies
- T16: Communication Technologies
- T17: Automated Tools for Scheduling and Operation
- T18: Lubrication technologies
- T19: In River Fish Sampling and Testing
- T20: Invasive Species
- T21: Generation Forecasting
- T22: Alternative Energy Generation

Projects in Recent Years

- Installing Columbia Vista
- Installing NRTO (real time system and plant optimizer)
- Developing a gate/blade optimizer for Kaplan generating units
- Weather forecasting improvements

Projects Under Consideration

- Open Architecture Machine Condition Monitoring System (1st Phase platform completed by Reclamation)
- Determination of Generating Unit Cycling Cost (negotiations on scope/costs initiated with Voith-Siemens
- Full Scale Demo Integrated Power System at Bonneville Dam (incl. Wind , PV, Fuel Cell, batteries, and Flywheel energy storage)

Projects Under Consideration (cont)

- Feasibility of Enhancing Pump Storage at Grand Coulee
- Increasing the accuracy of wind forecast
- Investigation into Zebra Mussels- Preventative Antifouling Coatings, Habitat Assessment and Growth Rates

Since we share common problems. We might be able to get together and stretch our research dollars