



Waterpower R&D Program Activities: 2009+

Doug Dixon
Waterpower Program Manager
HP Committee: NHA 2009

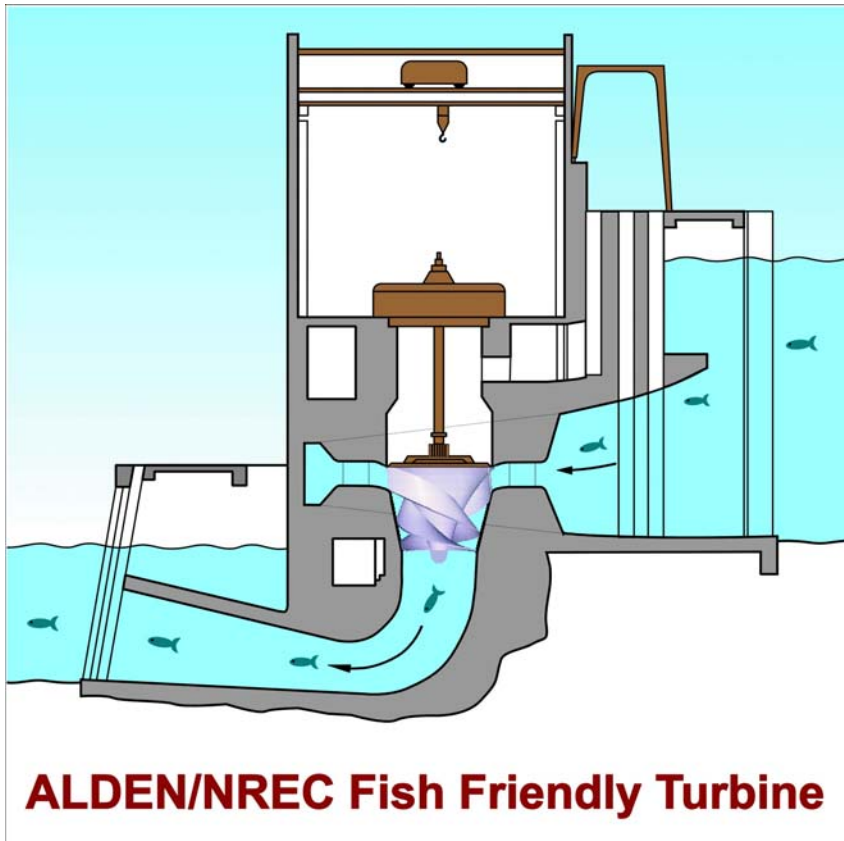


EPRI Research Topics for Review

- Advanced Turbine Research
- Green House Gas Research
- EPRI October 2008 R&D Conference & Report
- EPRI Waterpower Potential & Development Needs: 2009 Update
- Ocean Energy Research



Fish-Friendly Turbine Development Next Steps: Conceptual to Design Engineering



ALDEN

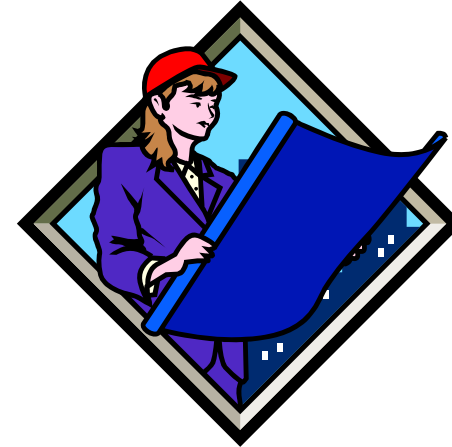
Solving flow problems since 1894



How Do We Build It? Will It Work?



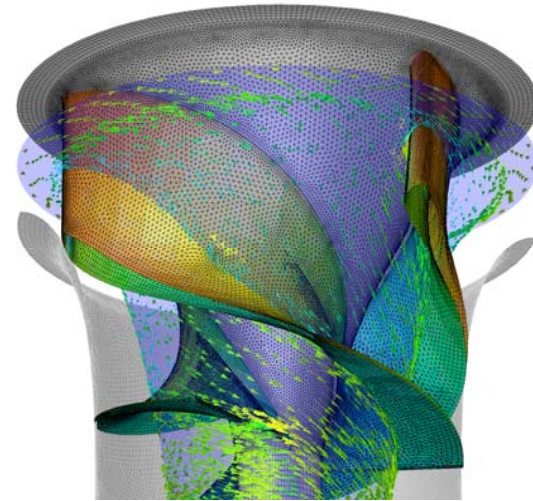
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EPRI Advanced Turbine Research



- 2009 - Year 1 of EPRI-DOE-Industry Program: **design engineering**
- 2010 – Year 2 of EPRI-DOE-Industry Program: **model testing and final design engineering**
- 2011 – **Deploy**
- 2012 – **TEST**



EPRI Needs DOE Matching Funds!



Where Could This Turbine Be Used?



- New development
- Added capacity at existing dams
- Powering non-powered dams
- Fish bypasses
- Minimum flow releases
- Spillways
- Unit replacement/upgrades (1,000-1,600 cfs; 40-100 feet head) [least likely because of civil improvements required]





ELECTRIC POWER
RESEARCH INSTITUTE

ACT Development is True Research:

“Transformative Technology”



It's risky...

It's the only conventional research in town

It may work

We may discover things on the journey

**Research inspires thought...we are not
a mature industry**

Why Support This Project?



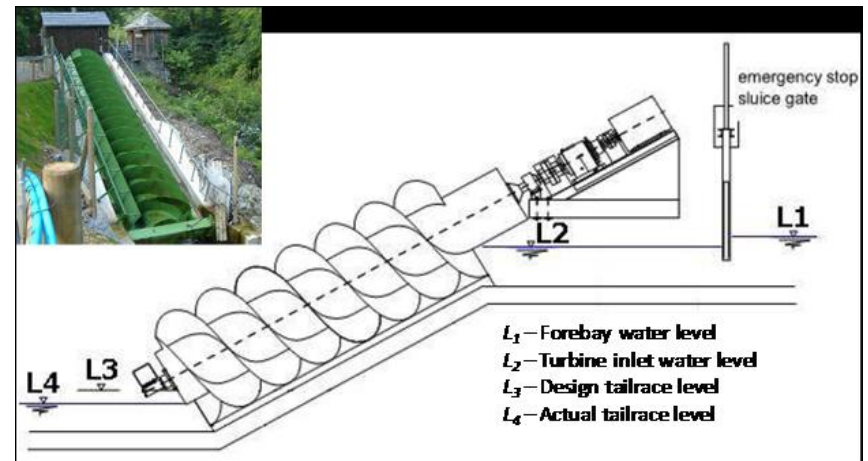
- #1 industry R&D topic
- Your company may need this turbine
- The hydropower industry (Canada, U.S., Europe, developing nations) needs this turbine
- Carbon constrained world presents new opportunities for hydropower growth and this turbine can help (think “renewable” or “green”)
- **Stewardship – it’s the right thing to do!**



New Chapter (#25) EPRI Fish Passage Manual: Advanced Hydropower Turbines

<http://www.epri.com/FishPassageAndProtection/>

- Minimum gap runner (modified Kaplan)
- Alstom Vortex Turbine
- Alden/Concepts NREC turbine
- Very low head turbines (VLH)
- Archimedes screw turbine
- Vaneless axial flow turbines



EPRI Report: Assessment of Waterpower Potential and Development Needs

Updated Report, June 2009

Briefing Papers

- Overview of the waterpower industry
- Waterpower potential
- Technology development needs (RDD&D, economic incentives, and regulatory issues)
- Achievable capacity and efficiency gains
- Waterpower's relevance to U.S. energy needs including other renewables

~40,000 MW by 2025



FREE Public Download at:
www.epri.com

EPRI Waterpower R&D 2008 Workshop Report (June 2009)

Conventional Priorities:

- Advance turbine development
- Technology deployment and testing
- Fish passage and protection (downstream protection)
- Hydro GHG emissions
- Optimization & efficiency improvement research
- Resource assessment updates
- Wind-hydropower integration
- Pumped-storage

Ocean & Hydrokinetic Priorities:

- Technology development
- Technology deployment and testing
- Environmental impact research
- Development of international standards for design, testing, performance metrics, etc.

GHG Research: Phase 1 - Literature Synthesis

Is This a U.S. Issue?

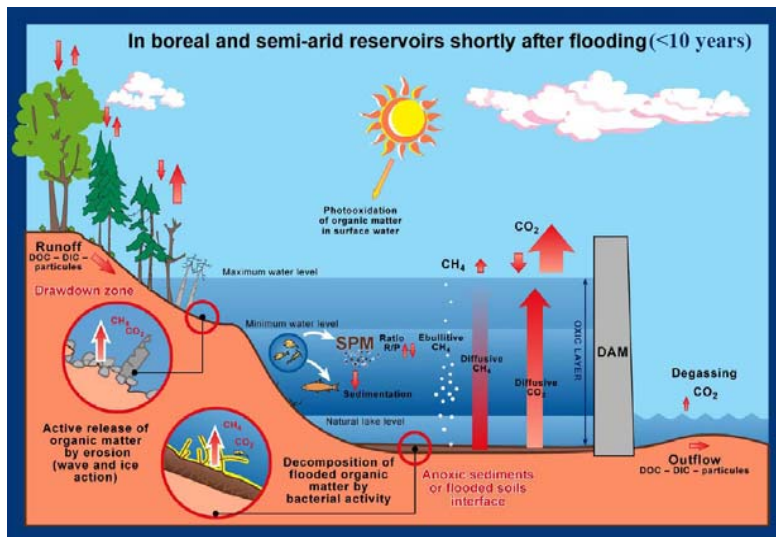
Phase I:

- Assessment of peer-reviewed publications 1990-present
- Conceptual model of altered (net) carbon cycling through reservoirs
- Science gaps for reservoir carbon cycling assessment
- Phase I Report: June 2009

Phase II (2010) -

DOE/EPRI/Industry/IHA collaboration:

- Sampling protocols & equipment
- Reservoir sampling



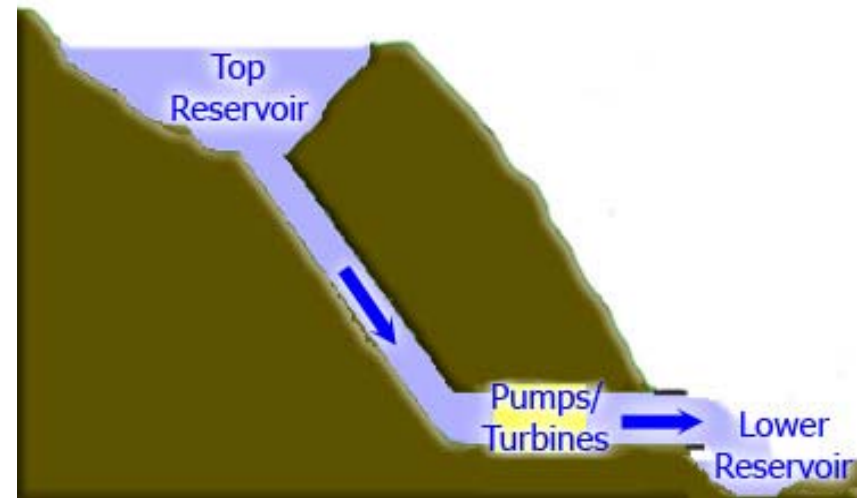
Why Study This Issue?

Potentially at risk:

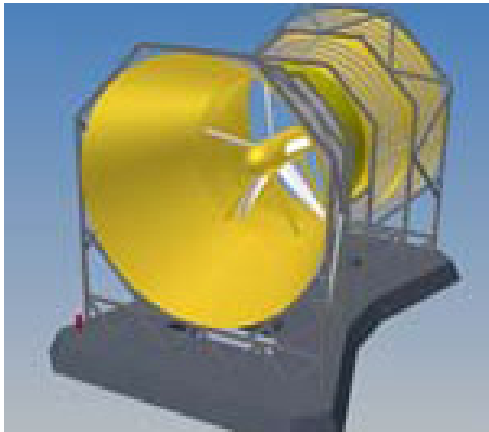
- Licensing
- Green certifications and power pool computations
- Tradable emissions credits
- National GHG emissions inventories
- Production Tax Credits
- Inclusion of large and incremental hydro in RPS
- Utility investments in hydro expansion
- Operational flexibility
- **Maintaining the renewable/clean/green-energy perception of hydropower**

Pumped-Storage Technology Round-Up

- EPRI's 1989 Pumped-Storage Guide was industry standard – but now out of date (U.S. lags behind world development of pumped-storage)
- Review cost estimating standards
- Valuing benefits and ancillary benefits
- Affects on ecological/aquatic resources
- Bench-marketing studies



Marine and Hydrokinetic Research



- DOE U.S. Wave Energy Resource Assessment
- Marine & Hydrokinetic Energy Interest Group
- 2009 – Business Service Agreements:
 - Siting studies including resource characterization
 - Technology characterization
 - System definition, design, performance, cost and economic assessment-feasibility studies
 - Environmental impact assessments and mitigation-avoidance studies

EPRI Waterpower Advisory: WATERPOWER 2009



- Tuesday, July 28, 2009: 8:00 am to noon
- Detailed program review:
 - Advanced turbine research
 - GHG research progress
 - Technology round-up reviews (pumped-storage)
 - New ideas for future

Questions or Need Information

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