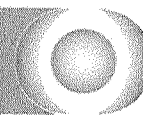


State-Federal RPS Collaborative Webinar

Hydropower and Renewable Portfolio Standards

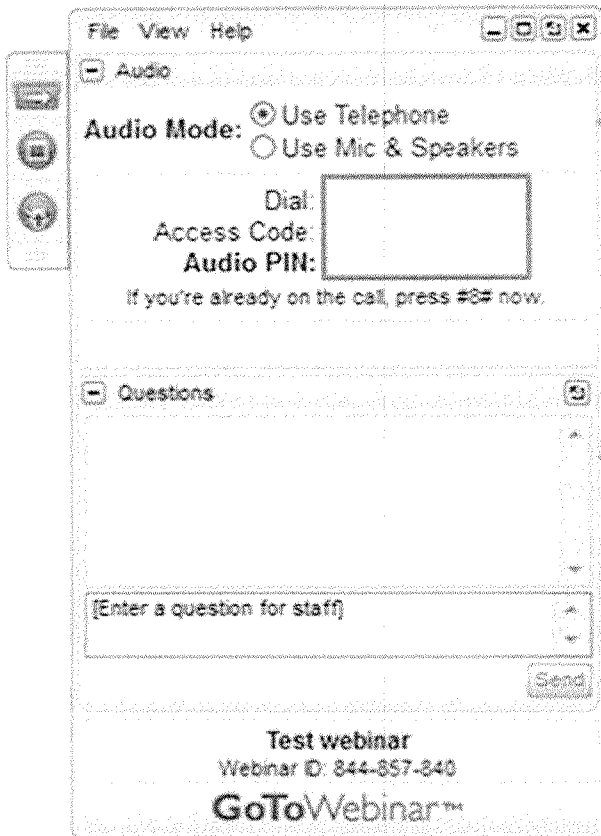
Hosted by
Warren Leon, Executive Director, CESA

February 2, 2016



CleanEnergy
States Alliance

Housekeeping



All participants are in “Listen-Only” mode. Select “Use Mic & Speakers” to avoid toll charges and use your computer’s VOIP capabilities. Or select “Use Telephone” and enter your PIN onto your phone key pad.

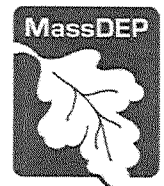
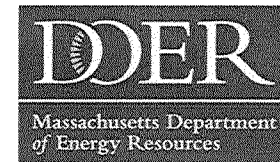
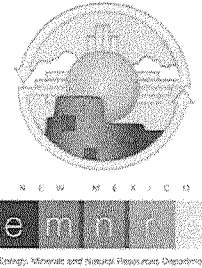
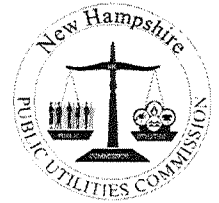
Submit your questions at any time by typing in the Question Box and hitting Send.

This webinar is being recorded.

You will find a recording of this webinar, as well as all previous CESA webcasts, archived on the CESA website at

www.cesa.org/webinars

Clean Energy States Alliance (CESA) is a national nonprofit coalition of public agencies and organizations working together to advance clean energy.



State-Federal RPS Collaborative

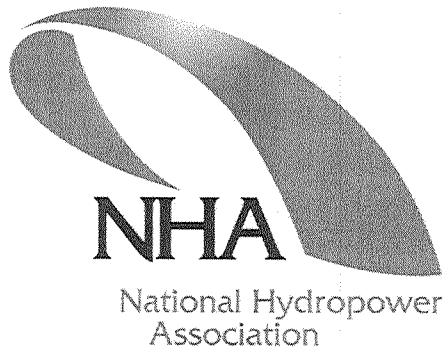
- With funding from the Energy Foundation and the US Department of Energy, CESA facilitates the **Collaborative**.
- Includes **state RPS administrators, federal agency representatives**, and other stakeholders.
- Advances dialogue and learning about RPS programs by **examining the challenges and potential solutions** for successful implementation of state RPS programs, including **identification of best practices**.
- To sign up for the Collaborative listserv to get the **monthly newsletter** and announcements of **upcoming events**, see: www.cesa.org/projects/state-federal-rps-collaborative

Today's Guest Speakers

David Zayas, Senior Manager of Regulatory Affairs and Technical Services, National Hydropower Association

Dana Hall, Deputy Director, Low Impact Hydropower Institute

Tim Welch, Hydropower Program Manager, Wind and Water Power Technologies Office, US Department of Energy



U.S. DEPARTMENT OF
ENERGY



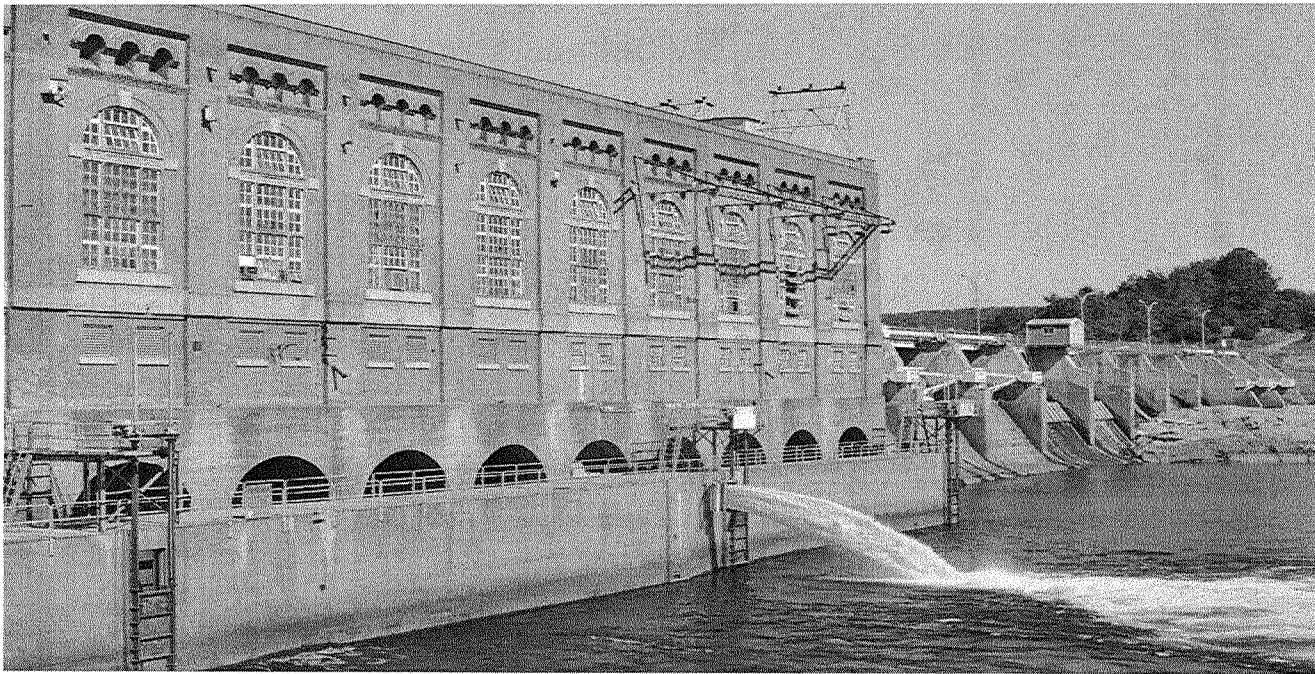
Available.

Reliable.

Affordable.

Sustainable.

Hydropower & Renewable Portfolio Standards



**National Hydropower Association
February 2, 2016**



Available.

Reliable.

Affordable.

Sustainable.

Presentation Outline

- **About NHA & Industry Overview**
- **State RPS Activity & Hydro Eligibility Requirements**
- **Hydro Resource Assessments & Growth Opportunities**
- **Clean Power Plan Eligibility**
- **State Initiatives Advancing Hydro**
- **Key Takeaways**



Available.

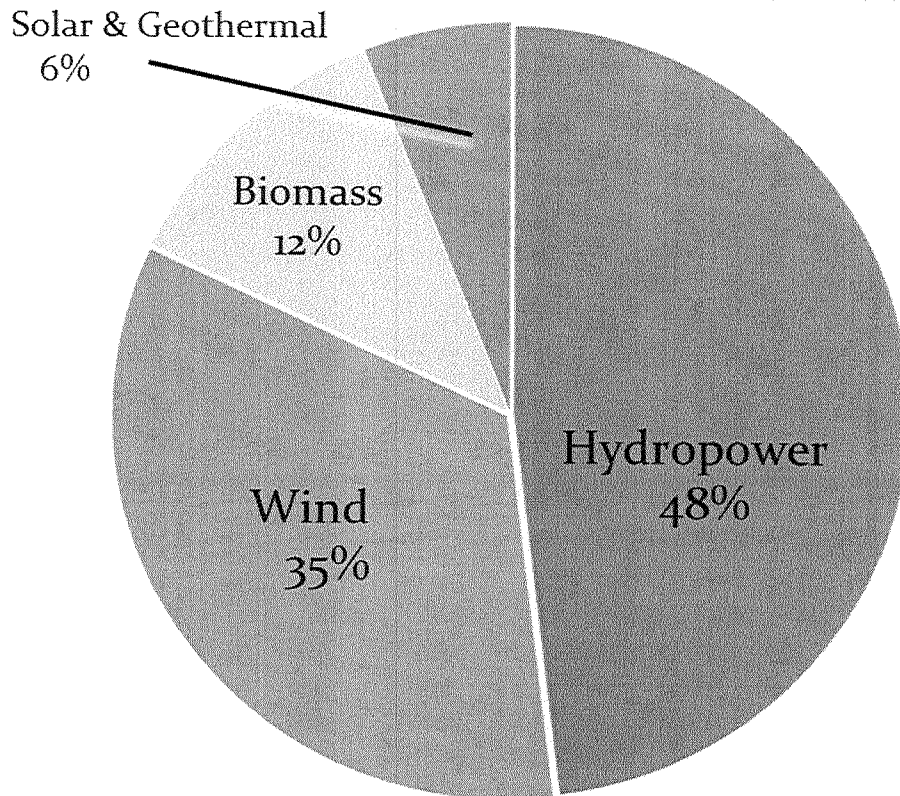
Reliable.

Affordable.

Sustainable.

Industry Overview

U.S. Renewable Electricity Generation 2014 (TWh)



Key Statistics

- America's largest source of RE – 2,198 plants
- 7% of overall electricity generation and the majority of renewable electricity in 2014
- Approximately 100 GW of installed capacity, including 22 GW of pumped storage.
- 50/50 capacity split between public/private and federal (Army Corps, TVA, Reclamation)
- Ownership: federal 8%, 27% public/state/coops, 65% private (IOUs/ IPPs)
- Societal benefits: flood control, irrigation, water supply, recreation – 84% of fleet provides one or more



Available.

Reliable.

Affordable.

Sustainable.

State RPS Activity

- RPS Policies in 29 States & DC
- Between 2013-2015 over 250 RPS bills introduced across the country:
 - The majority of the activity relates to modifications and revisions to existing policies:
 - Significant revisions include: Hawaii 100% by 2045; California and New York 50% by 2030, among others.
 - *Increasing interest in expanding hydropower's eligibility.*
 - Numerous states have considered new RPS policies, one passed (VT)
 - Some rollbacks and repeals: West Virginia (repeal), Kansas (mandatory to voluntary)

Hydro's Treatment & Observations

- Hydro's treatment and eligibility in RPS's varies: capacity limitations (<50 MWs), placed in service restrictions, resource and technology limitations (i.e. existing infrastructure; no new dams; capacity uprates or efficiency improvements) explicit environmental and operational criteria, among others. Other findings include:
 - Conduits: Only 1 state (CA) explicitly mentions conduit technology.
 - Pumped Storage: 7 states recognize pumped storage as an eligible technology; 5 states explicitly prohibit pumped storage.
 - MHK: 20 states recognize MHK as an eligible renewable resource. An additional 3 states (NH, MI, HI) allow for electricity generated from "currents"
 - Canadian Hydropower: 9 states consider Canadian Hydropower to be eligible, with a focus in the Northeast (PA, NH, MN, MA, ME, CT, VT, RI, MI).
 - Similar treatment in voluntary markets



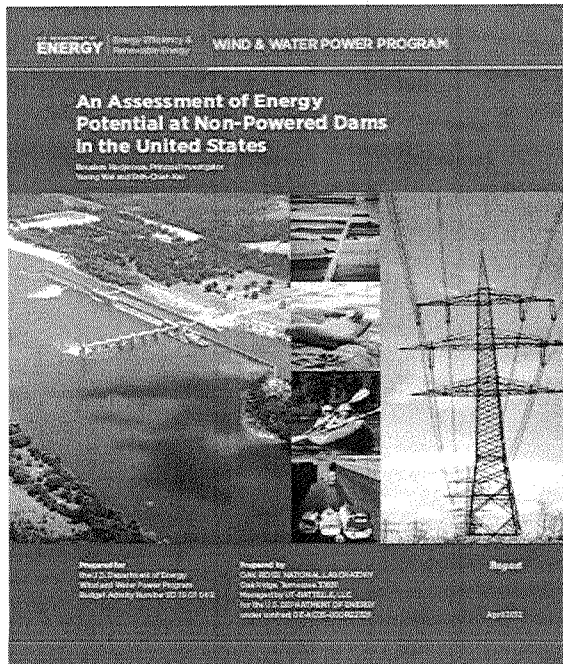
Available.

Reliable.

Affordable.

Sustainable.

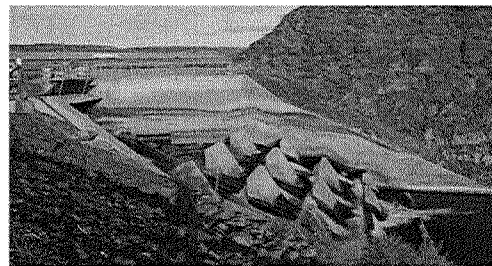
Hydropower Resource Assessments



RECLAMATION *Managing Water in the West*

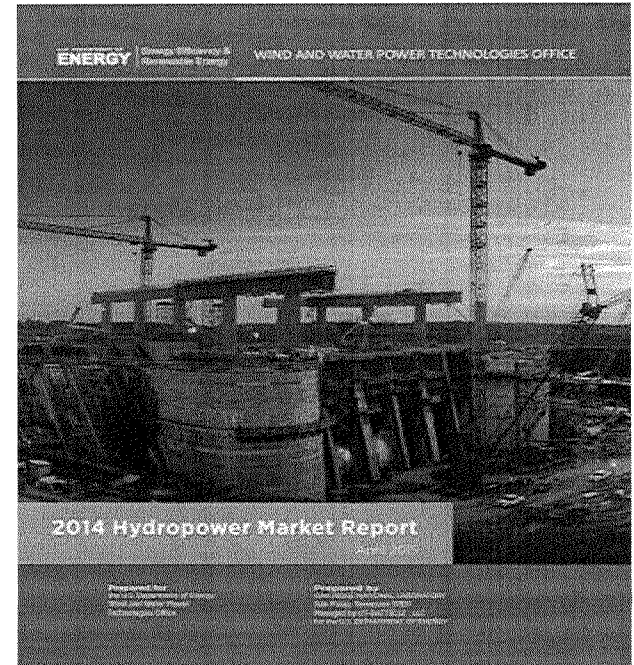
Site Inventory and Hydropower Energy Assessment of Reclamation Owned Conduits

Supplement to the "Hydropower Resource Assessment at Existing Reclamation Facilities Report"



U.S. Department of the Interior
Bureau of Reclamation
Power Resources Office
Denver, Colorado

March 2012



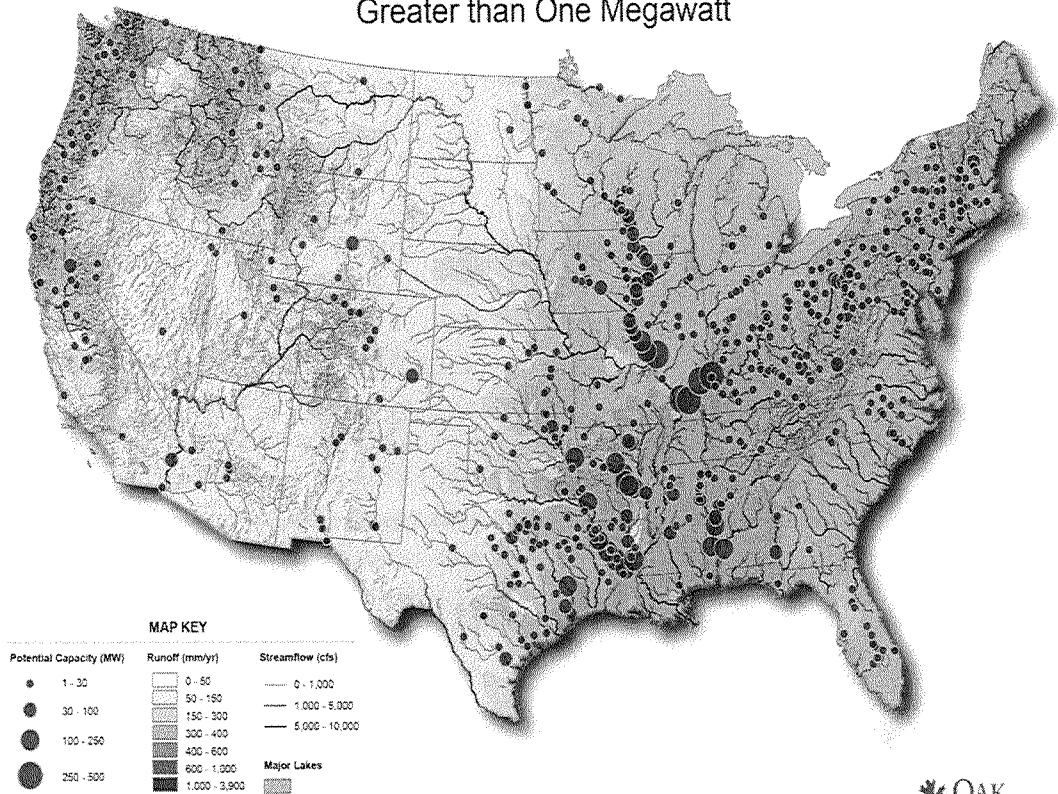
12 GW at over 54,000 NPDs

80,000 dams nationwide – only 3% are equipped with power generation.

8 GW in top 100 sites

81 of top 100 sites are dams owned by the U.S. Army Corps of Engineers

U.S. Non-powered Dams with Potential Capacity Greater than One Megawatt



Note: This map has been generalized for cartographic purposes and some streams associated with non-powered dams are not displayed.

Author: Eirena Eirod - November 7, 2012

This map was produced by Oak Ridge National Laboratory for the U.S. Department of Energy



Available.

Reliable.

Affordable.

Sustainable.

Top 10 states with most NPD potential

State	Potential Capacity (MW)
Illinois	1269
Kentucky	1253
Arkansas	1136
Alabama	922
Louisiana	857
Pennsylvania	679
Texas	658
Missouri	489
Indiana	454
Iowa	427

Source: NPD Report, p. 25 (Table 4)



Available.

Reliable.

Affordable.

Sustainable.

Table 4. Summary of NPD Assessment by State Totaling 12 GW of Potential (P.25)

State	Potential Capacity (MW)	State	Potential Capacity (MW)	State	Potential Capacity (MW)
AL	922	ME	19	OH	288
AZ	80	MD	48	OK	339
AR	1136	MA	67	OR	116
CA	195	MI	48	PA	679
CO	172	MN	186	RI	13
CT	68	MS	271	SC	38
DE	3	MO	489	SD	12
FL	173	MT	88	TN	40
GA	144	NE	7	TX	658
ID	12	NV	16	UT	40
IL	1269	NH	63	VT	17
IN	454	NJ	33	VA	50
IA	427	NM	103	WA	85
KS	92	NY	295	WV	210
KY	1253	NC	167	WI	245
LA	857	ND	31	WY	45



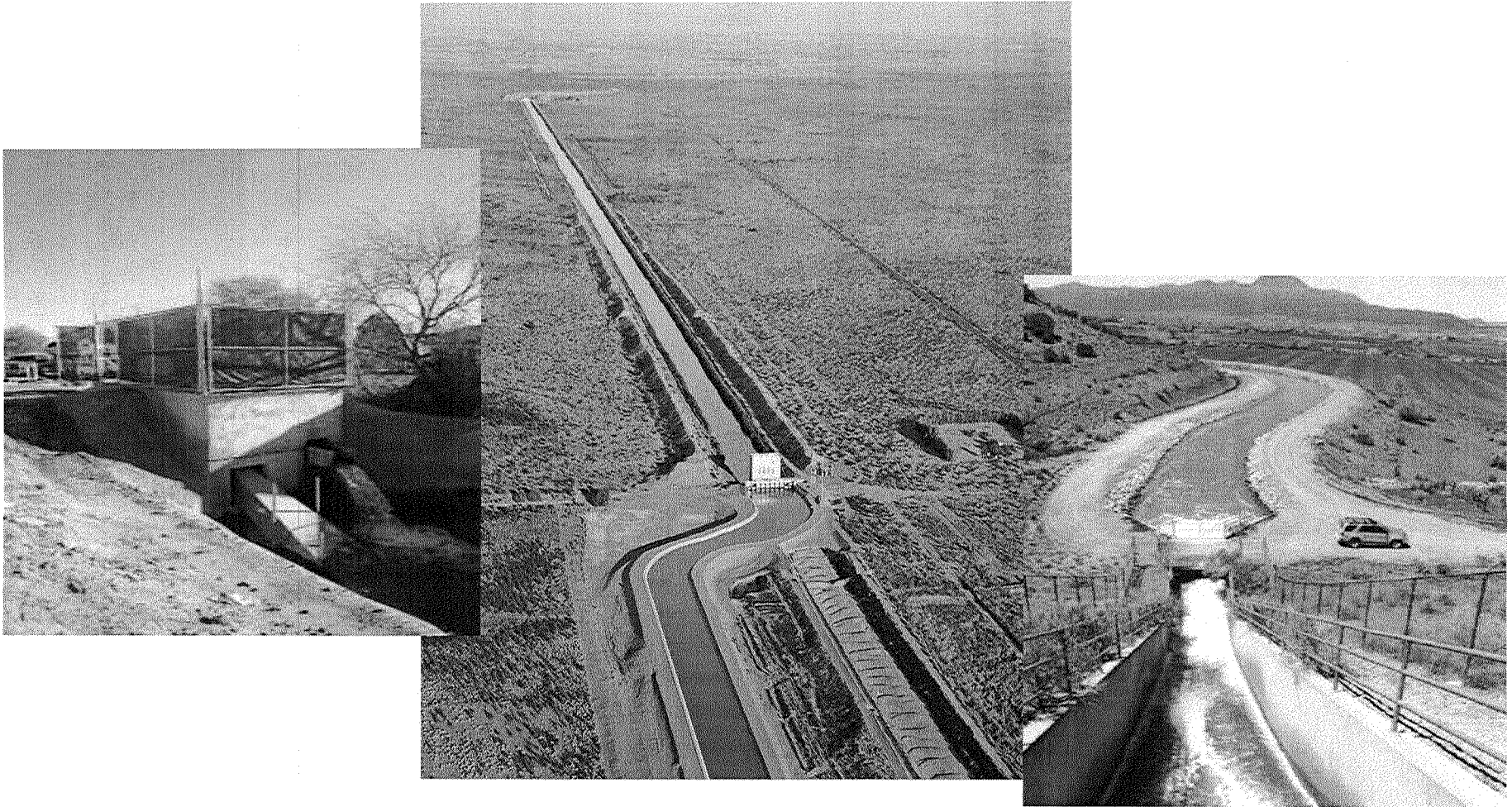
Available.

Reliable.

Affordable.

Sustainable.

Conduits & Canals





Conduits & Canals Continued

- The Hydropower Regulatory Efficiency Act of 2013
 - Removed “qualifying conduit facility” from FERC jurisdiction. Developer only needs to submit a *Notice of Intent to Construct a Qualifying Conduit Hydropower Facility with the Commission*. See - <http://ferc.gov/industries/hydropower/indus-act/efficiency-act/qua-conduit.asp>
 - Significant use: 57 projects have received “qualifying conduit” status, representing over 24,000 kW’s

- Bureau of Reclamation *Lease of Power Privilege (LOPP)* – Gaining Momentum
 - Reclamation has approved a number of projects representing over 49,000 kW’s
 - Reclamation resource assessments have identified hundreds of potential sites and thousands of additional kW’s



Capacity Additions & Efficiency Improvements

- Some RPS's recognize efficiency improvements similar to hydro's eligibility under the Production Tax Credit: *Incremental production gains from efficiency improvements or capacity additions to existing hydroelectric facilities placed into service after August 8, 2005 and before January 1, 2017* (including recent extension)

- As of December 31, 2015, FERC has certified:
 - 149 projects
 - 1,804,782.24 MWhs (avg. 12,112.63 MWh)
 - Average of 9.45% generation increase per project

 - Available at: <http://ferc.gov/industries/hydropower.asp>



Clean Power Plan Final Rule & Hydro Eligibility

- “Existing RE is not counted in setting state goals. Rather, when establishing BSER, EPA examined the potential for utility-scale RE in each of the three interconnect regions (Eastern, Western, and Electricity Reliability Council of Texas) that is both feasible and cost-effective. Onshore wind, utility-scale solar photovoltaic, concentrated solar power, geothermal and hydropower are the RE technologies included as part of the BSER... State RPS requirements are not a factor in quantifying the amount of cost-effective RE that is part of the goal setting in the final rule.” (emphasis added)
- “Consistent with other types of RE, new hydropower generating capacity installed after 2012 is eligible to states to help meet their goal. Existing hydro that makes an uprate can also be used for compliance.” (incremental generation)
- Energy storage **may not** be directly recognized as an eligible measure that can be used to adjust a CO₂ emission rate, because storage does not directly substitute for electric generation from the grid or avoid electricity use from the grid.
 - EPA concerns about double counting if both input and output recognized.
 - EPA recognized storage as an enabling measure that facilitates greater use of RE & ancillary benefits.



Available.

Reliable.

Affordable.

Sustainable.

State Hydro Initiatives & Activities

- **Colorado** – Passed hydro legislation and signed MOU w/ FERC to streamline and simplify the authorization of small hydro projects.
- **California** – Signed MOU w/ FERC on coordinating the pre-application activities for non-federal hydro project proposals.
- **AK, ME, MA, RI, WY, and VT** have all passed laws or created administrative /legislative workgroups to examine ways to grow their hydro resources. Governors' Energy Offices are also taking the lead.
- **WI** developing a systematic approach for evaluating fish passage at dams statewide.
- Including/revising treatment of hydropower in state Renewable Energy Standards.
- Providing developers with tax incentives or access to low-interest loan programs.



Available.

Reliable.

Affordable.

Sustainable.

Key Takeaways

- **Current RPS policies have provided some value to the hydropower industry, but eligibility requirements are limiting participation and new development.**
- **REC revenue would incentivize new development (existing infrastructure, capacity uprates, efficiency improvements), and provide key project financing.**
- **Hydropower eligibility and recognition will provide an important source of renewable and carbon-free electricity for states in future RPS and CPP compliance.**
- **States are revisiting RPS/ RE policies to include hydropower.**
- **Energy landscape is changing compared to when first RPS's were passed over a decade ago, which is reflected in recent activity to modify and revise existing policies, and federal legislation (HREA of 2013, WRRDA of 2014).**



Available.

Reliable.

Affordable.

Sustainable.

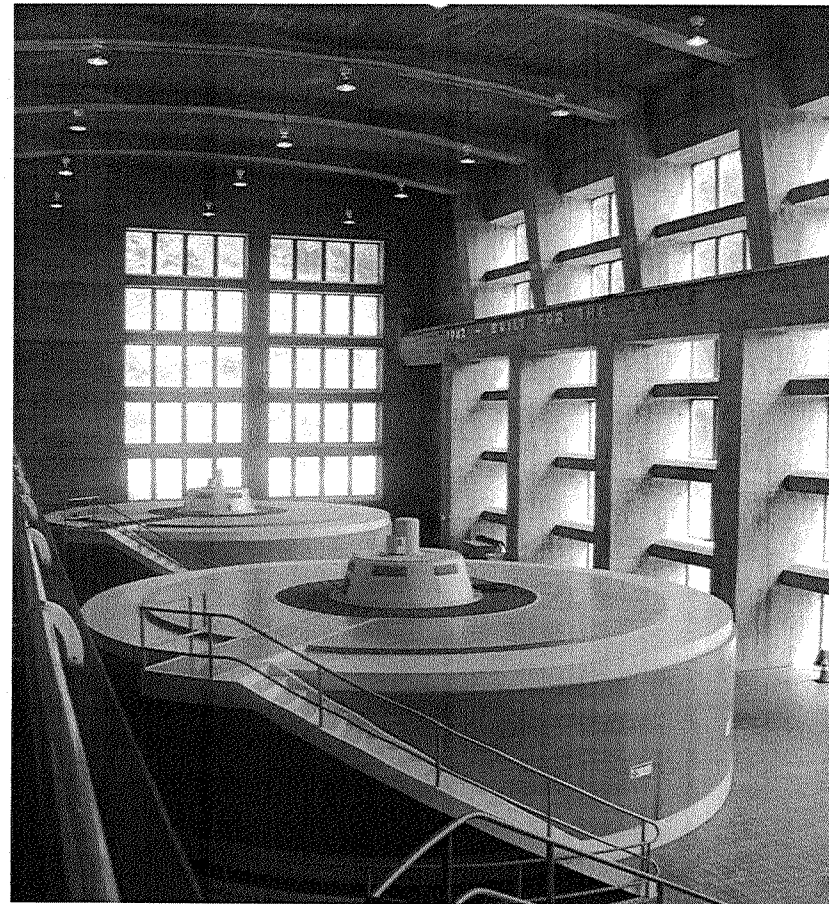
Contact

David Zayas

**Senior Manager of Regulatory
Affairs & Technical Services**

202.750.8406

david@hydro.org



Visit us on the Web

www.hydro.org



NatlHydroAssoc



@NatlHydroAssoc

Questions?

LIHI Purpose (1999 Articles of Incorporation):

- To set criteria for characterizing hydropower facilities as “low impact”
- Conducting a program to certify facilities that meet these criteria with the goals of:
 - Reducing the environmental impacts of hydropower generation
 - Creating a credible and accepted standard for consumers to use in evaluating hydropower
- Making information about the environmental effects of power generation available to the public

LIHI Mission Statement: “*The Low Impact Hydropower Institute (LIHI) is a non-profit 501(c)(3) organization dedicated to reducing the impacts of hydropower generation through the voluntary certification of hydropower projects that have avoided or reduced their environmental impacts.*”

LIHI governance includes a diversity of perspectives

By-laws require minimum 50% board representation from Environmental NGOs

PLUS representatives from industry, government and the private sector

Lowimpacthydro.org/governance

[Union of Concerned Scientists

The Nature Conservancy 
Protecting nature. Preserving life.™

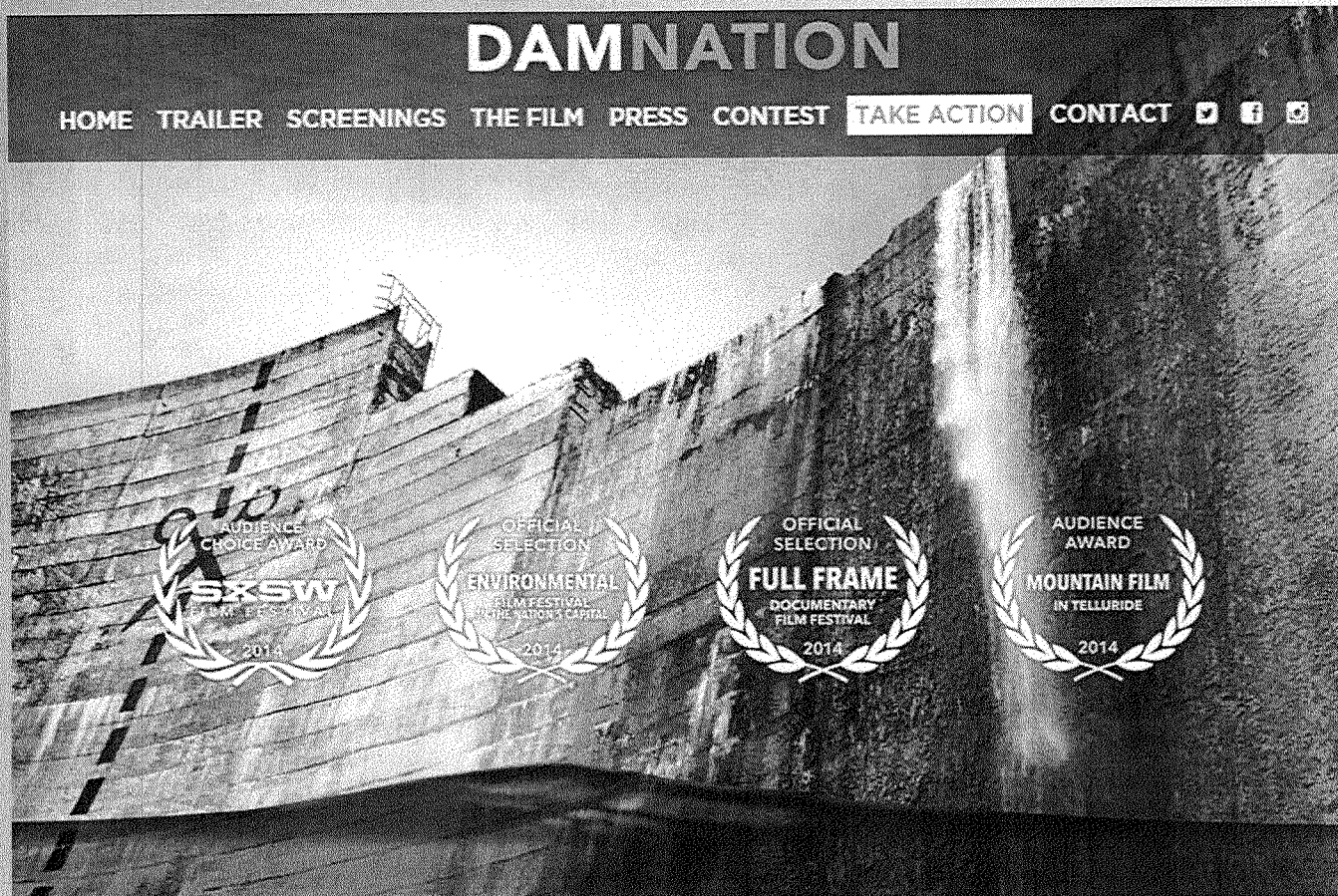


 American Rivers
Thriving By Nature

 CRS | center for resource solutions

 **LOW IMPACT
HYDROPOWER
INSTITUTE**

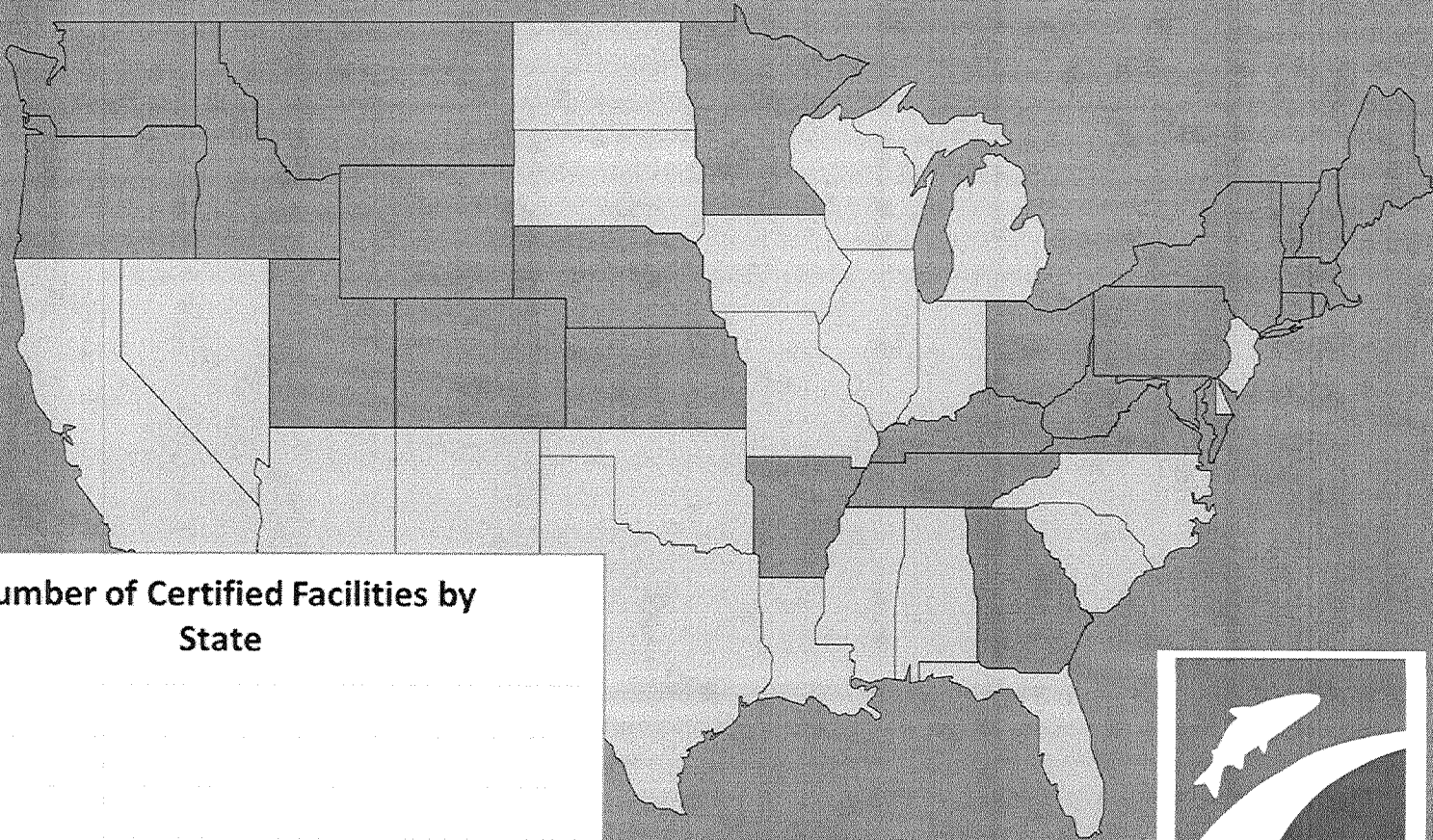
Why certify hydropower?



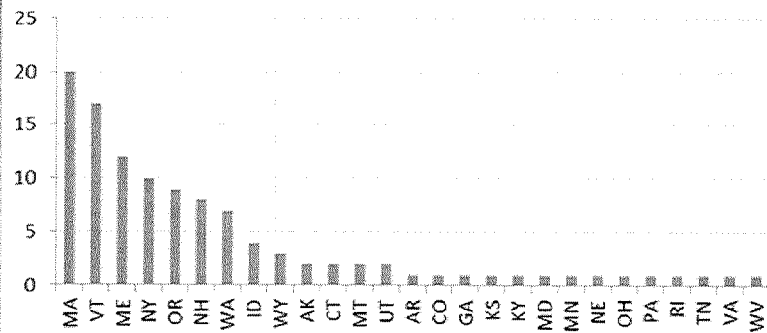
Yes, some DAMS can have devastating impacts,
But there are also LOW IMPACT projects of all sizes

LIHI is a nationwide program

States with LIHI-Certified Facilities

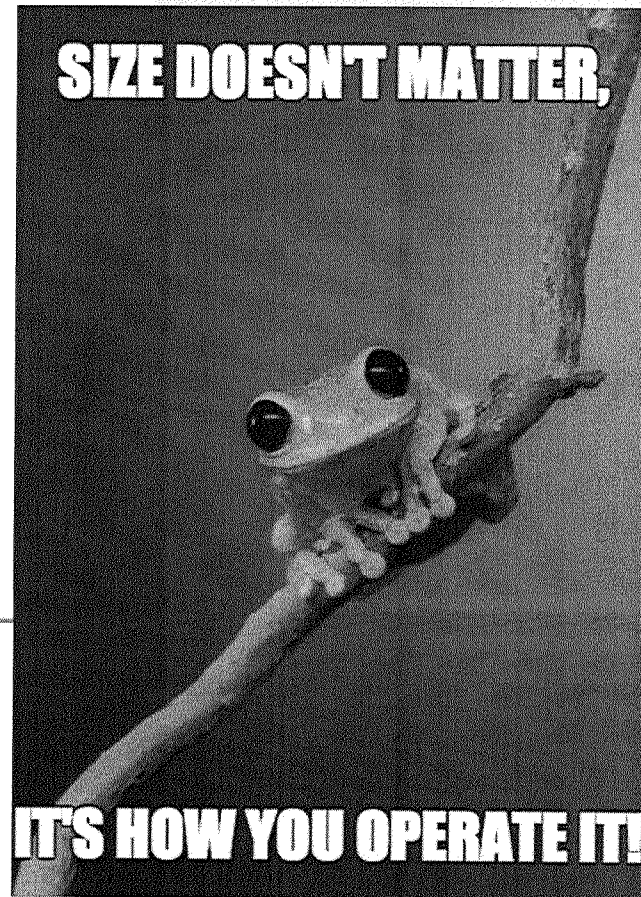
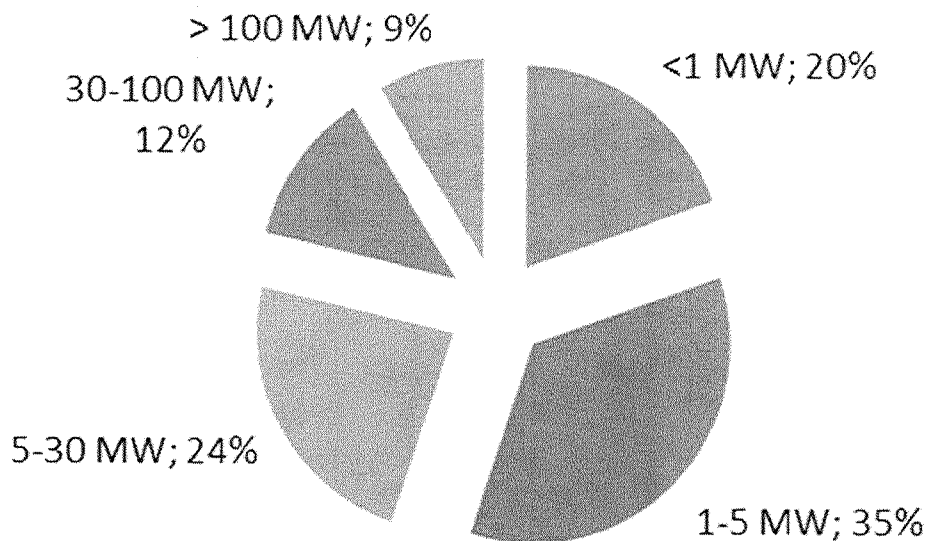


Number of Certified Facilities by State



123 certifications, ~170 dams, 28 states. Total capacity = 4.4 GW.

Low-impact facilities are both big and small (% of certifications to date)



LIHI's Low Impact Criteria

- Flows
- Water quality
- Fish passage and protection
 - Downstream and Upstream
- Watershed protection
- Protection of threatened and endangered species
- Cultural resource protection
- Recreation

All Criteria
must be
satisfied for a
certificate to
be issued



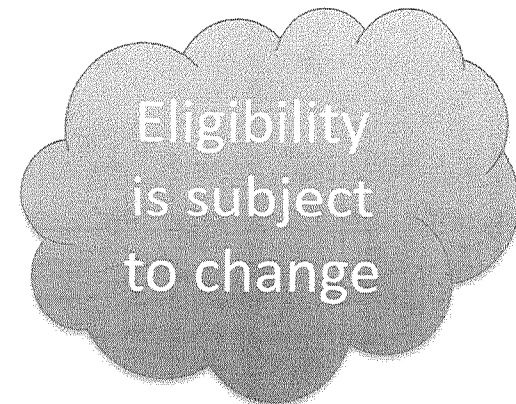
What kinds of projects are eligible?

Primarily Focused on Existing US Resources:

- LIHI encourages facilities of all ages to apply
 - *GOAL: Reducing the environmental impacts of hydropower generation*
- LIHI **does** certify new generation installed on dams in existence prior to August 1998
 - new capacity, incremental additions

Ineligible for LIHI Certification:

- Facilities outside the United States
- Marine Hydrokinetic technology
- Pumped Storage
- Facilities on dams constructed after August 1998
- Facilities on dams recommended (by resource agencies) for removal



Our certification process involves multiple steps

- ***Intake Review*** – informal consultation to assist in preparation of the full application
- ***Formal Application*** – reviewer evaluation of Questionnaire, public comment period, and recommendation to Board
- ***Certification Decision*** – Governing Board action or delegated to Exec. Dir./Tech. Comm.
- ***Annual Reporting*** – status check on any special conditions, plus annual fee payment
- ***Recertification*** – re-examination of all criteria after 5 to 8 years, including public comments

LHI certification process is transparent and accessible

- ***Public Notice and Comment*** – all Certification Applications are posted for 60 days, and open for public comment on the LHI Criteria
- ***State Resource Agencies*** - Fish and Game, Wildlife, Environmental Protection, Historic Preservation, Watershed Management, etc...
- ***Local Community Groups*** – Tribes, river protectors, local recreation, historic and cultural groups, environmental groups, concerned neighbors

LHI certification results in commitments by Facility Owners

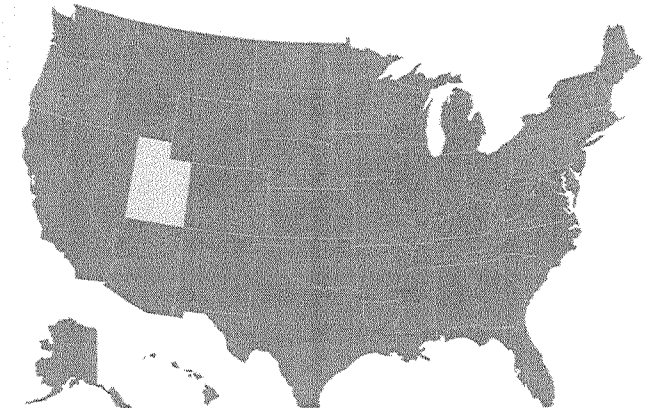
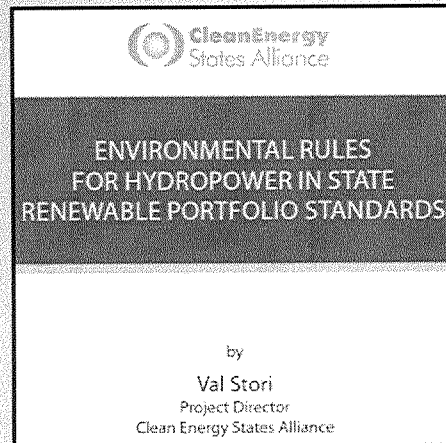
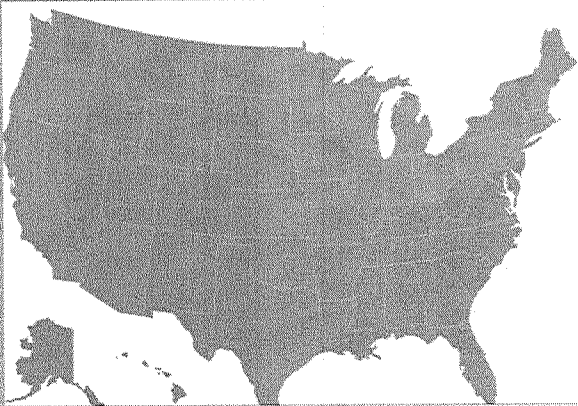
- ***Conditions on Certification*** - when additional measures are necessary to satisfy a LHI criterion – facility-specific conditions are imposed
- ***Accountability*** - LHI's annual compliance process requires owners to report each year on continued satisfaction of criteria, and to self report any changes

Current certification fees are modest

- ***Intake fee*** = flat \$950 fee
- ***Application fees*** = range from \$3,000 - \$10,000
- ***Annual fees*** = based on average generation with \$1,000 min and \$30,000 cap
- ***Condition fees*** = range from \$0 to \$1000
- ***Recertification fee*** = flat fee \$2000 for phase 1, if there is a phase 2 it is TBD (\$0 - \$5,000)

RPS and Hydropower

AZ, CA, CT, DE, ME, MA, NH, NJ, NY, OH, OR, and PA
impose environmental criteria for hydroelectric eligibility

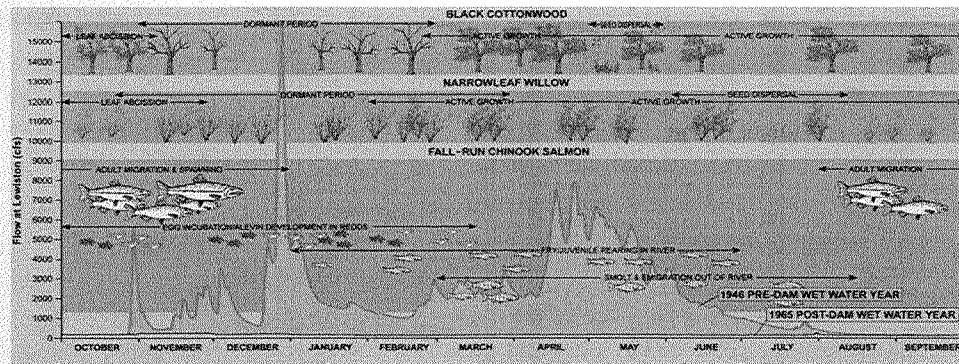
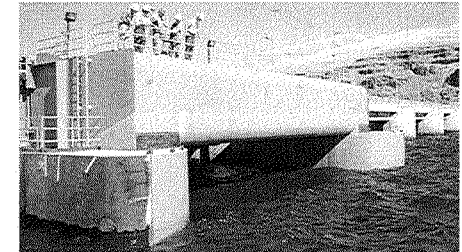
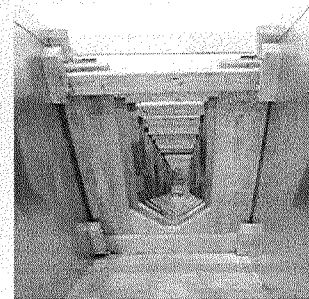
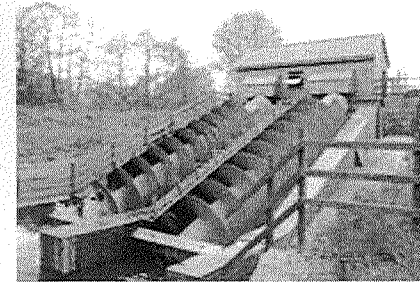
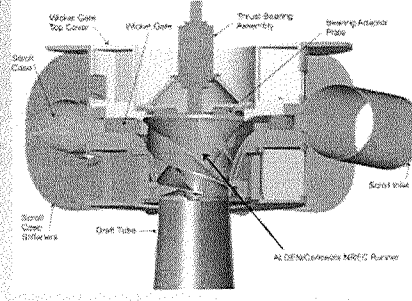
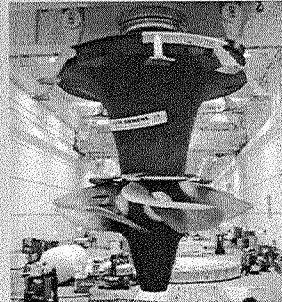


DE, MA, OR, and PA require LIHI certification in at least one RPS tier.
UT requires LIHI certification for its voluntary Renewable Portfolio Goal.

<http://www.cleanenergystates.org/assets/2013-Files/RPS/Environmental-Rules-for-Hydropower-in-State-RPS-April-2013-final.pdf>

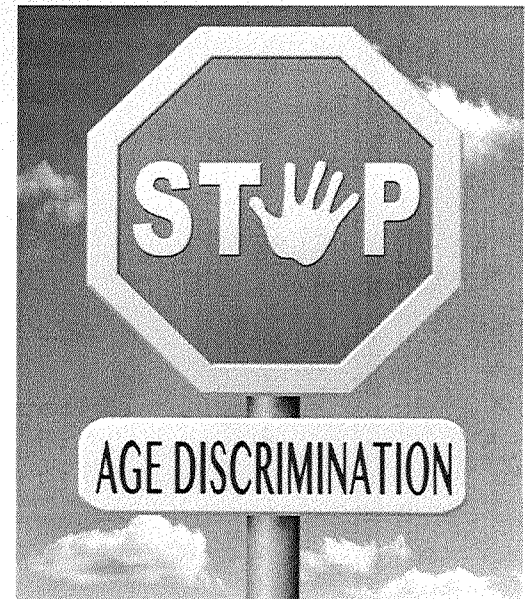
Advanced technology can make hydropower more GREEN

- *Aerating and fish friendly turbines*
- *Better fish passage and protection*
- *Better flow regimes*



Investing in Rivers, Enhancing the Legacy

- **External Environmental Benefits**
- healthy fish populations, protected watersheds, and public access
- **Historic Treasures** - *100+ year old infrastructure with cultural significance and beauty*
- **Economic Development** –
investments in existing hydro both preserves and creates jobs in our communities

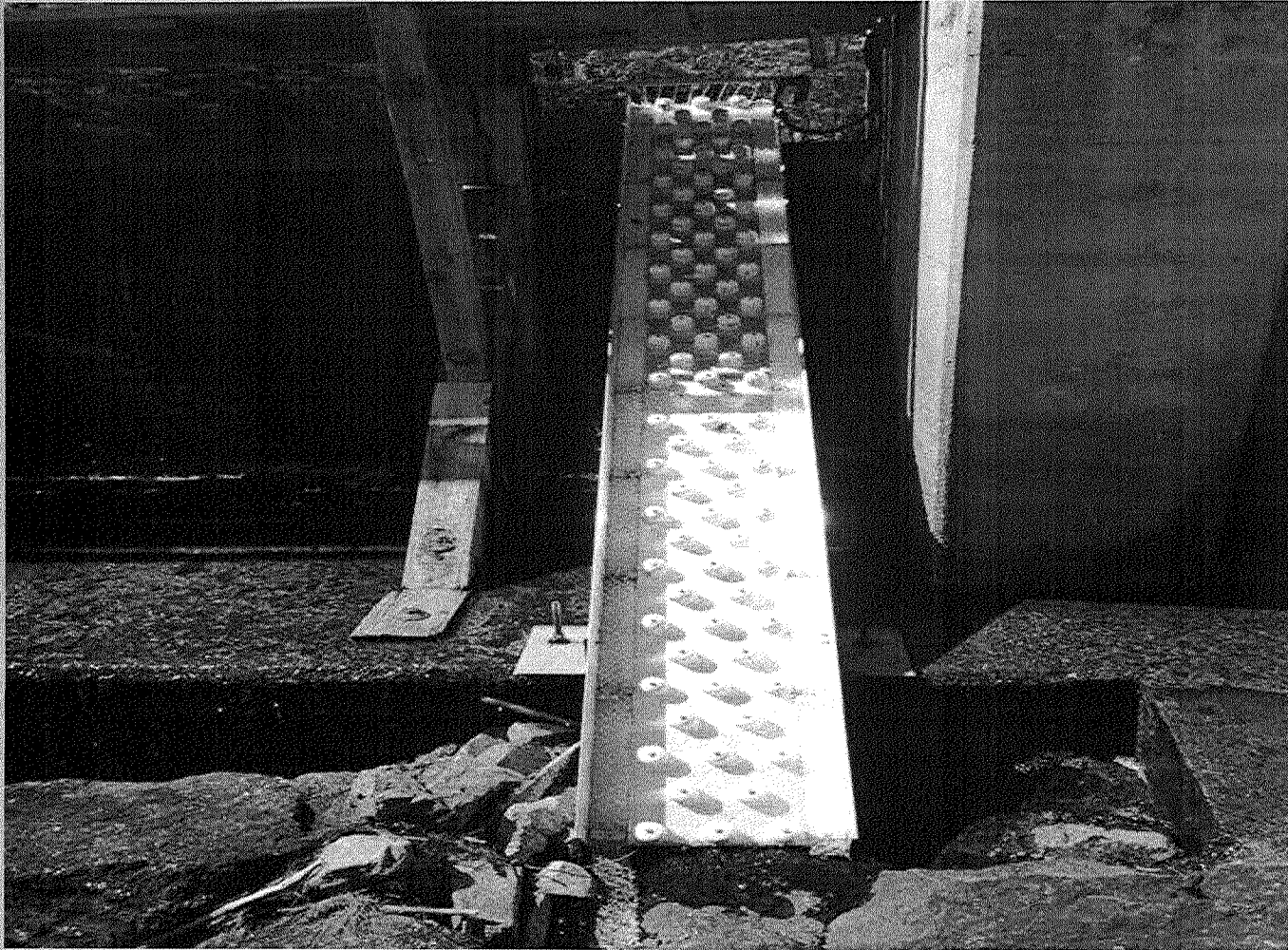


The proof is in the pudding

Certificate No. 100 – South Milton Facility (NH) –

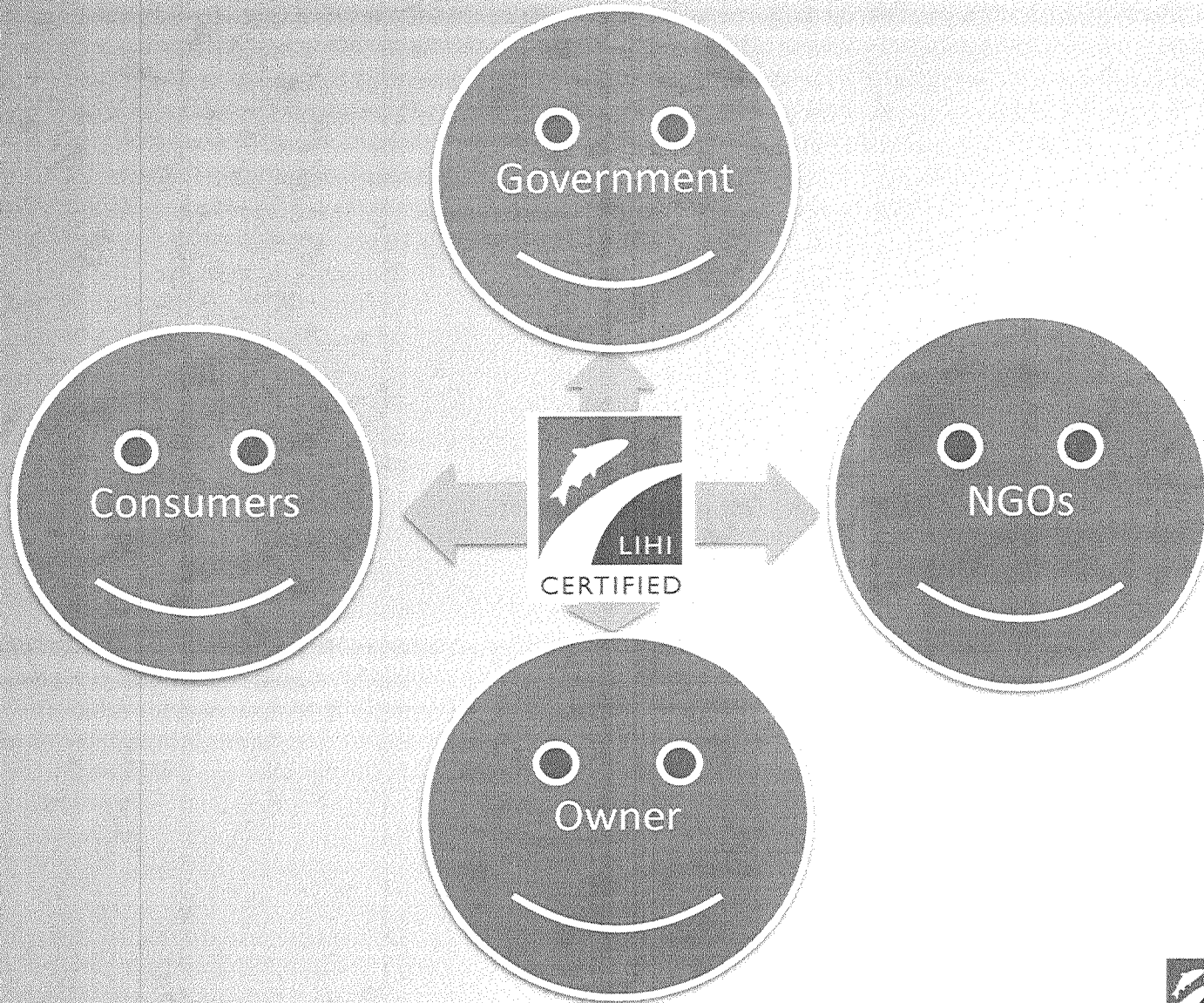
“By October 1, 2013, (owner) shall enter into, and provide LIHI with a copy of, an agreement reached between the USFWS, the New Hampshire Department of Fish and Game, and (owner) for providing both interim and permanent downstream passage and permanent upstream passage, that are safe, timely, and effective, for American eel, including a description of the planned passage and protection measures and the implementation schedule for design, installation, and operations... [which] shall be in place and operational by August 1, 2015”

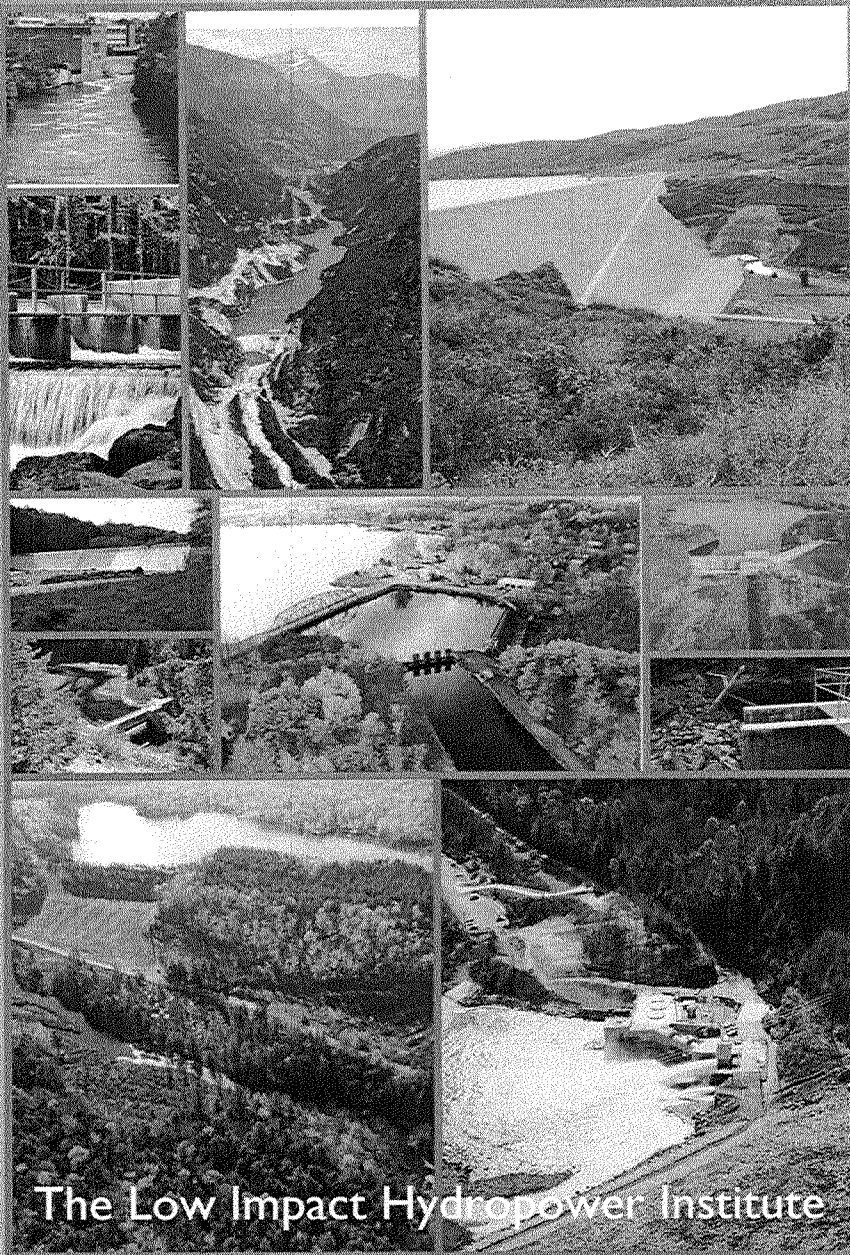
The proof is in the pudding



Eel Passage installed in 2015 at South Milton (NH) LIHI Cert No. 100

LIHI Value Statement





The Low Impact Hydropower Institute

Thank You for Listening!

Dana Hall , LIHI Deputy Director

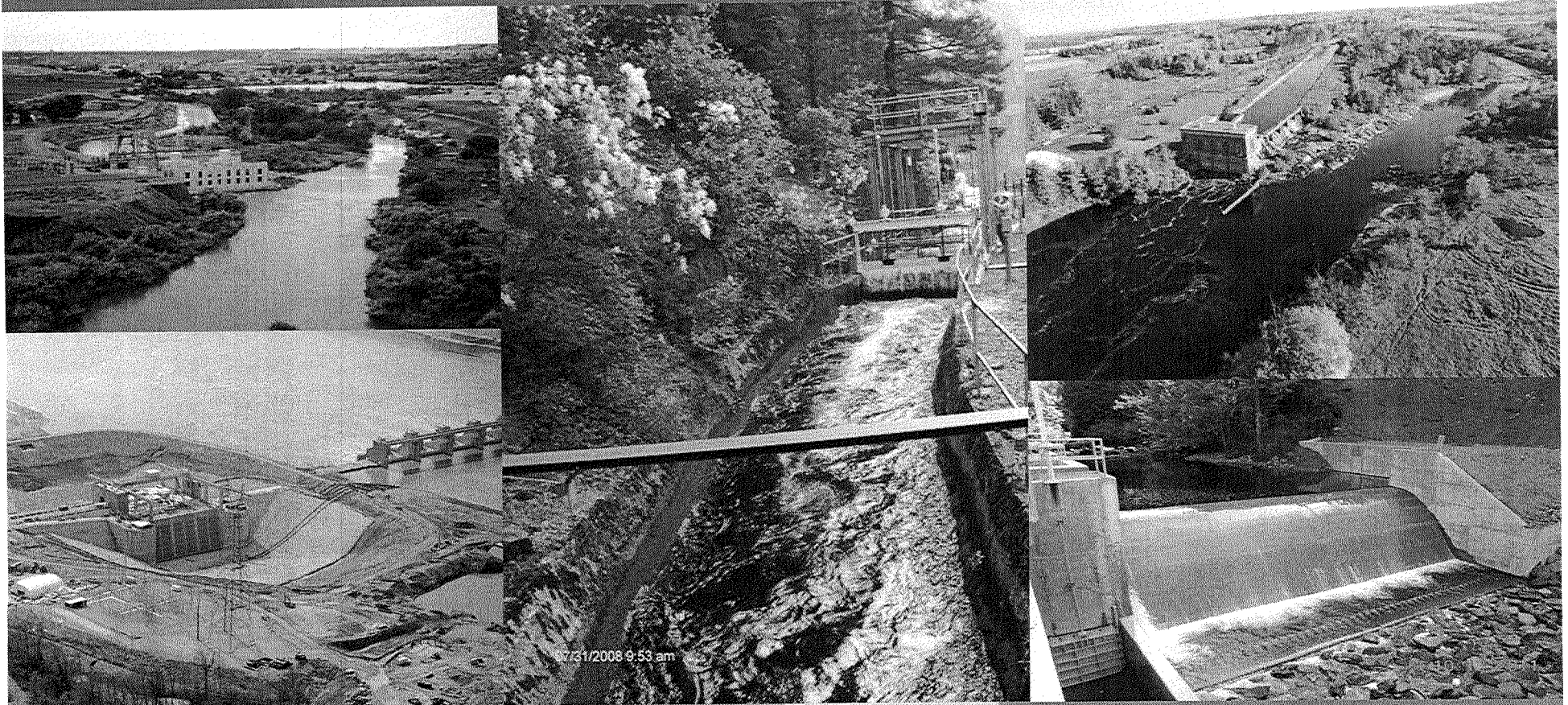
dhall@lowimpacthydro.org

(201) 906-2189



DOE's Hydropower Program

U.S. DEPARTMENT OF
ENERGY | Energy Efficiency &
Renewable Energy



Hydropower Overview & Hydropower Vision

Timothy Welch
Hydropower Program Manager
Wind and Water Power Technologies Office

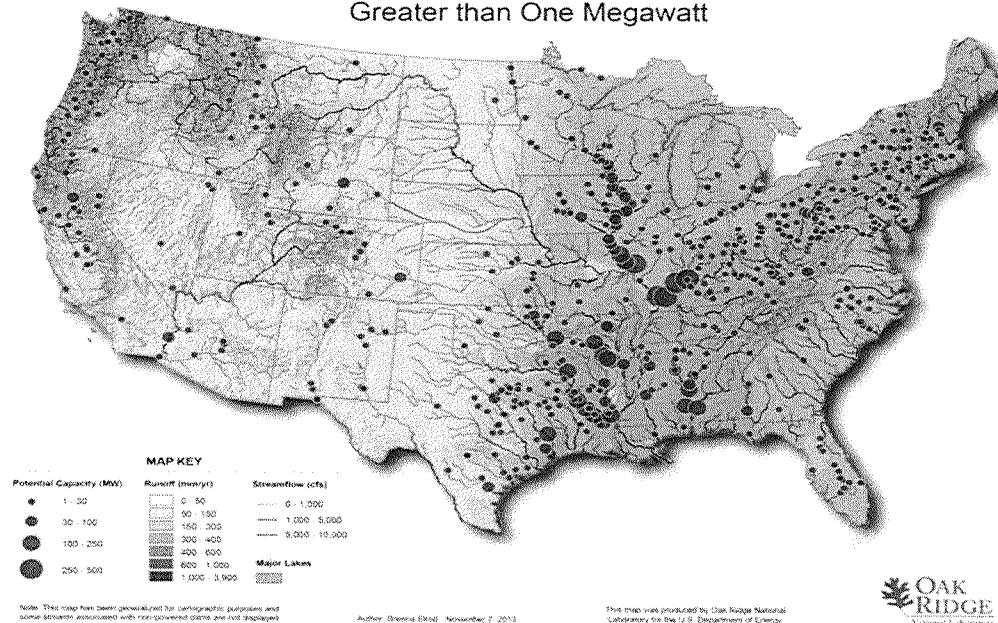
February 2, 2016

- DOE's Hydropower Resource Assessment
- HydroNEXT initiative for new hydropower technologies
- *Hydropower Vision* Report

Existing Non-powered Dams (NPD)

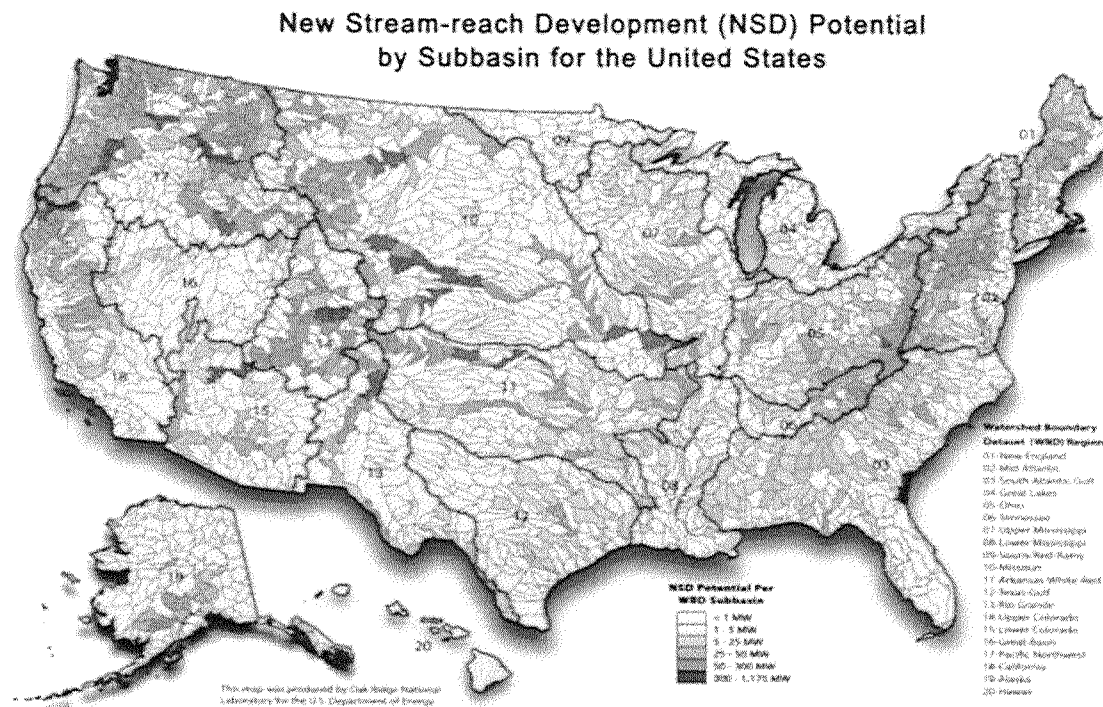
- Only 3% of existing dams produce power
- Existing U.S. non-powered dams have potential to generate up to **12 gigawatts (GW)** of clean, renewable hydropower capacity from 50,000 suitable non-powered dams.

U.S. Non-powered Dams with Potential Capacity Greater than One Megawatt



New Stream-reach Development

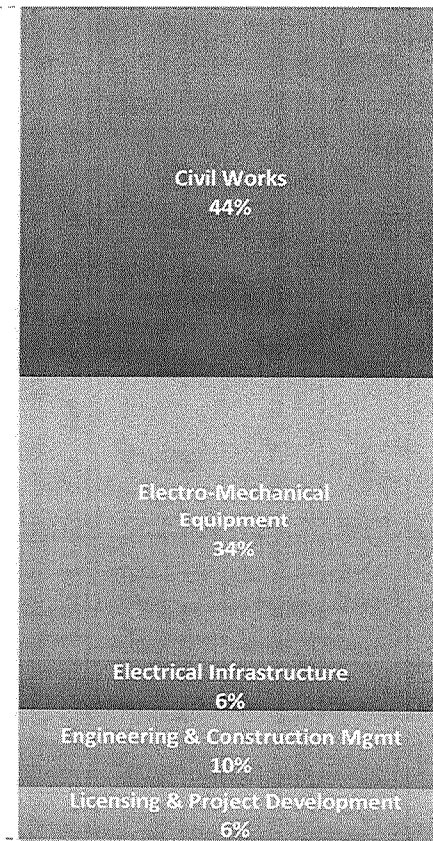
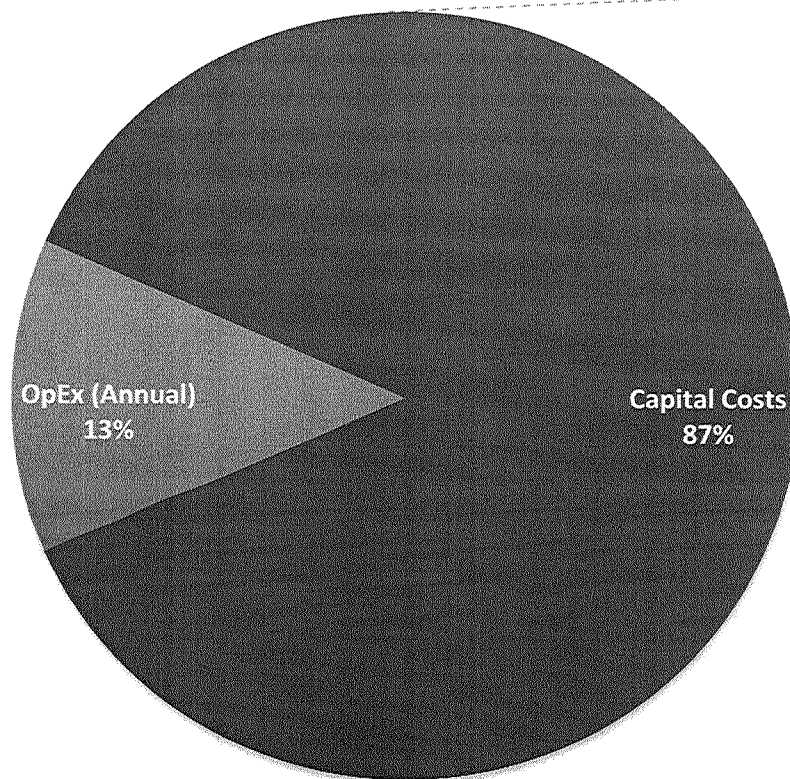
- When federally protected waters are excluded, potential hydropower development opportunities in U.S. rivers and streams are approximately **65 GW of capacity**.



DOE Hydropower Program HydroNEXT Strategy

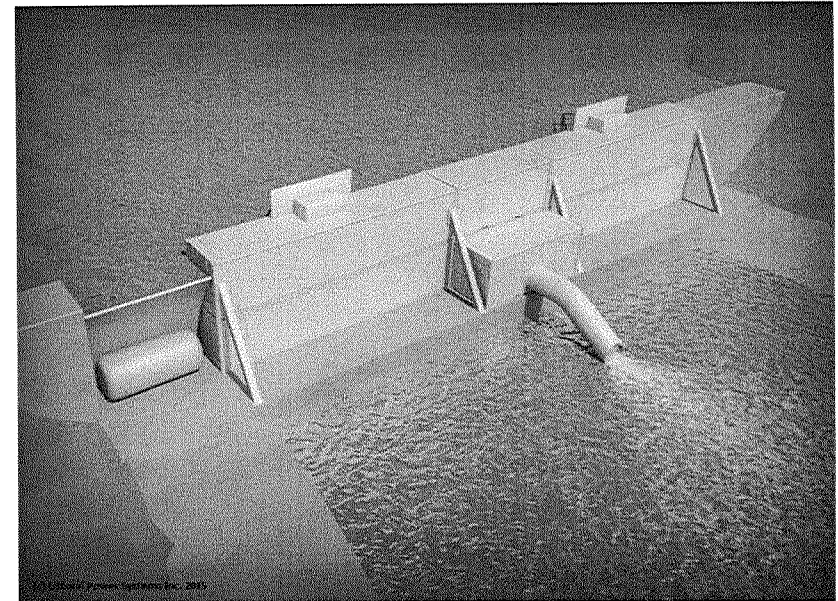
- DOE's Hydropower Program's **HydroNEXT** initiative invests in innovative technologies for **existing non-powered dams and new stream reach development** that dramatically change the way we think about hydropower by:
 - **Lowering costs**
 - **Promoting environmental stewardship**

Cost Breakout



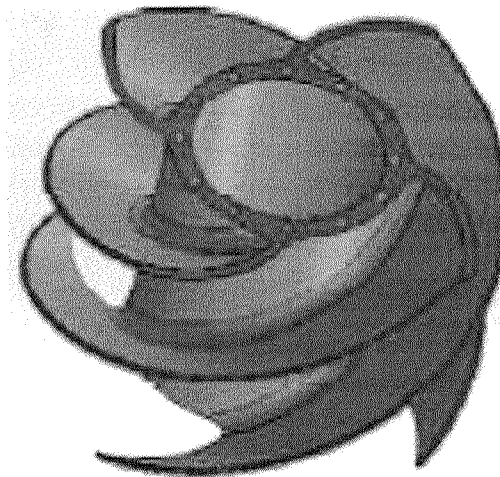
- **Civil Works**

- Using modular, pre-fabricated containers (shipping containers) as dams
- “Pre-Cast” concrete modules constructed in factory



- **Powertrains**

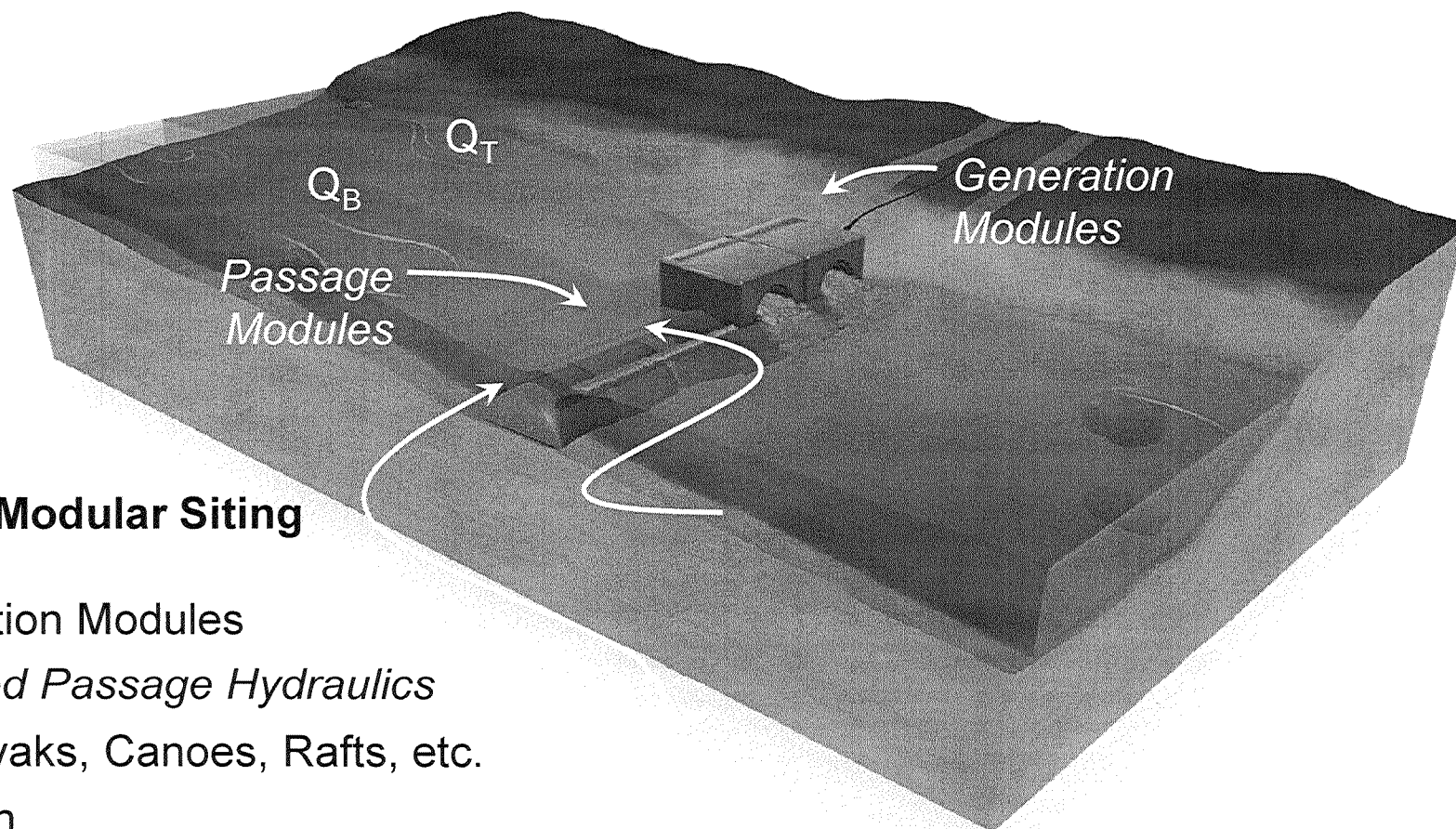
- Turbines made from lightweight, composite materials that can be “3-D printed”



- **Standard Modular Hydropower**

Standard modular hydropower is a design concept that optimizes both cost and environmental impact by:

- Ensuring fish passage and stream connectivity
- Innovating technology for remote operation and environmental monitoring
- Providing consistent flows and hydraulics for recreationists
- Using advanced materials and manufacturing techniques



Standard Modular Siting Protocols

- Generation Modules
- *Validated Passage Hydraulics*
 - Kayaks, Canoes, Rafts, etc.
 - Fish
 - Sediment and Debris
 - Water Quality

A New Vision for United States Hydropower

The U.S. Department of Energy Water Power Program is looking toward the future of the hydropower industry by developing a long-range national *Hydropower Vision*. This landmark vision will establish the analytical basis for suggested stakeholder actions that could usher in a new era of growth in sustainable domestic hydropower over the next half-century. Included in this effort are:

- A close examination of the **current the state of the hydropower industry**;
- A discussion of the **costs and benefits to the nation** arising from additional hydropower; and
- A **roadmap** addressing the challenges to achieving higher levels of hydropower deployment within a sustainable national energy mix.

The Vision Pillars

- **Maintenance and Growth of the Existing Fleet**
 - Preserve and optimize (e.g. O&M, efficiency improvements, rehabilitations, upgrades) the value and generation contribution of the existing hydropower fleet within the nation's energy mix into the future
- **New Hydropower Growth**
 - Define credible yet visionary scenarios with options to power non-powered dams, develop new stream-reaches, and build PSH through 2050
- **Sustainability**
 - Ensure the Water-Energy system, with its multiple uses and values – economic, social, environmental – continues to function and improve

Vision Report Outline: Chapters Overview

- 1. Executive Summary (+/- 20 pages)**
 - *Condensed version of all report chapters, including key talking points and graphics; quick reference to entire Report*

- 2. Vision for Hydropower's Future Contributions (+/- 20 pages)**
 - *Where we can go in 2030 and 2050?*

- 3. State of Hydropower in the U.S. (+/- 200 pages; 10-25 per section)**
 - *Where we are today – state of technology, development, environment. Sets baseline for Vision. Defines barriers to growth and current trends in hydropower*

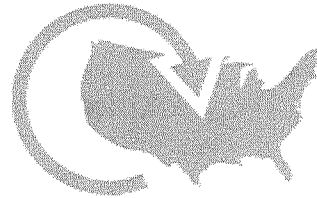
- 4. Impacts of a Robust Hydropower Vision (+/- 80 pages; +/- 10 per section)**
 - *Benefits of achieving vision – reduction in GHG, water savings, grid stability, economic development, price stability*

- 5. Roadmap for the Hydropower Vision (+/- 60 pages)**
 - *Actions needed to achieve the Vision*

Technology Advancement



Sustainable Planning and Siting



Revenue and Market Structures



Regulatory Process Improvement

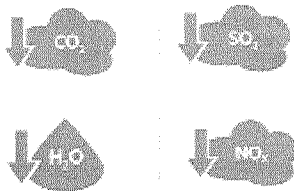


HYDROPOWER VISION

Collaboration, Education, and Outreach



Multiple Uses and Benefits



Performance and Reliability

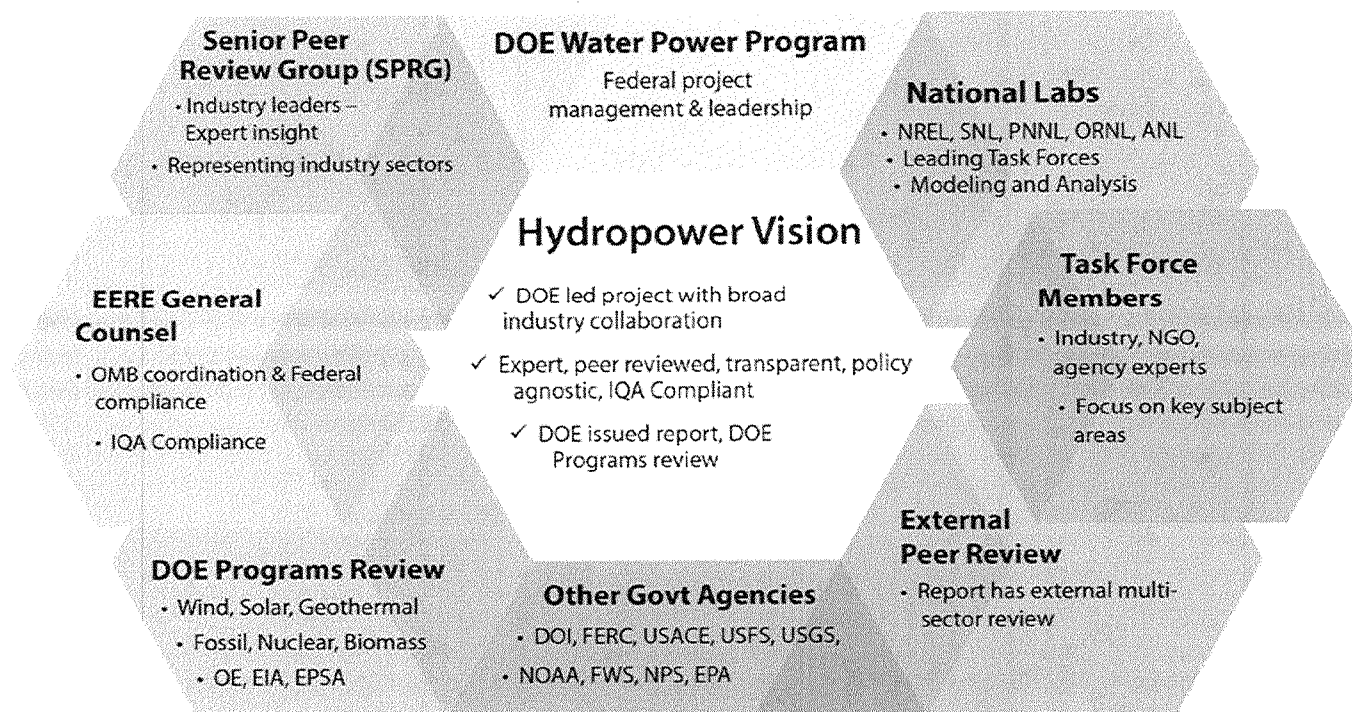


Workforce Development



Vision Process Core Principles and Organization

- Consistency
- Referenceable data
- Transparent & replicable
- Objective, unbiased & high integrity
- Discipline in communications
- Ten task forces totaling **300 experts from over 130 organizations**
- **Broad stakeholder engagement: proponents and opponents**
- Technical & business peer review



- **DRAFT Report to External Peer Review: February 2016**
 - Draft report to OMB, SPRG, Task Forces, PMAs, MOU Agencies, Resource Agencies, DOE Offices for comments

- **DOE Internal Review: April 2016**

- **Report Release: July 26, 2016**
 - HydroVision Conference (Minneapolis, MN)

Thank You!

Timothy Welch
Hydropower Program Manager
DOE Wind and Water Power Technologies Office

For more information please visit:
water.energy.gov

Thank you for attending our webinar

Warren Leon

RPS Project Director, CESA Executive Director

wleon@cleanegroup.org

Visit our website to learn more about the State-Federal RPS Collaborative and to sign up for our e-newsletter:

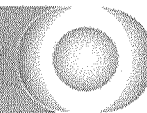
<http://www.cesa.org/projects/state-federal-rps-collaborative/>

Find us online:

www.cesa.org

[facebook.com/cleanenergystates](https://www.facebook.com/cleanenergystates)

@CESA_news on Twitter



CleanEnergy
States Alliance