



Available.

Reliable.

Affordable.

Sustainable.

THE ENERGY AND WATER NEXUS WATER AS A FUEL SOURCE

Linda Church Ciocci
Executive Director
April 9, 2013
NCAC

Dispelling the Myths

Hydro's Availability

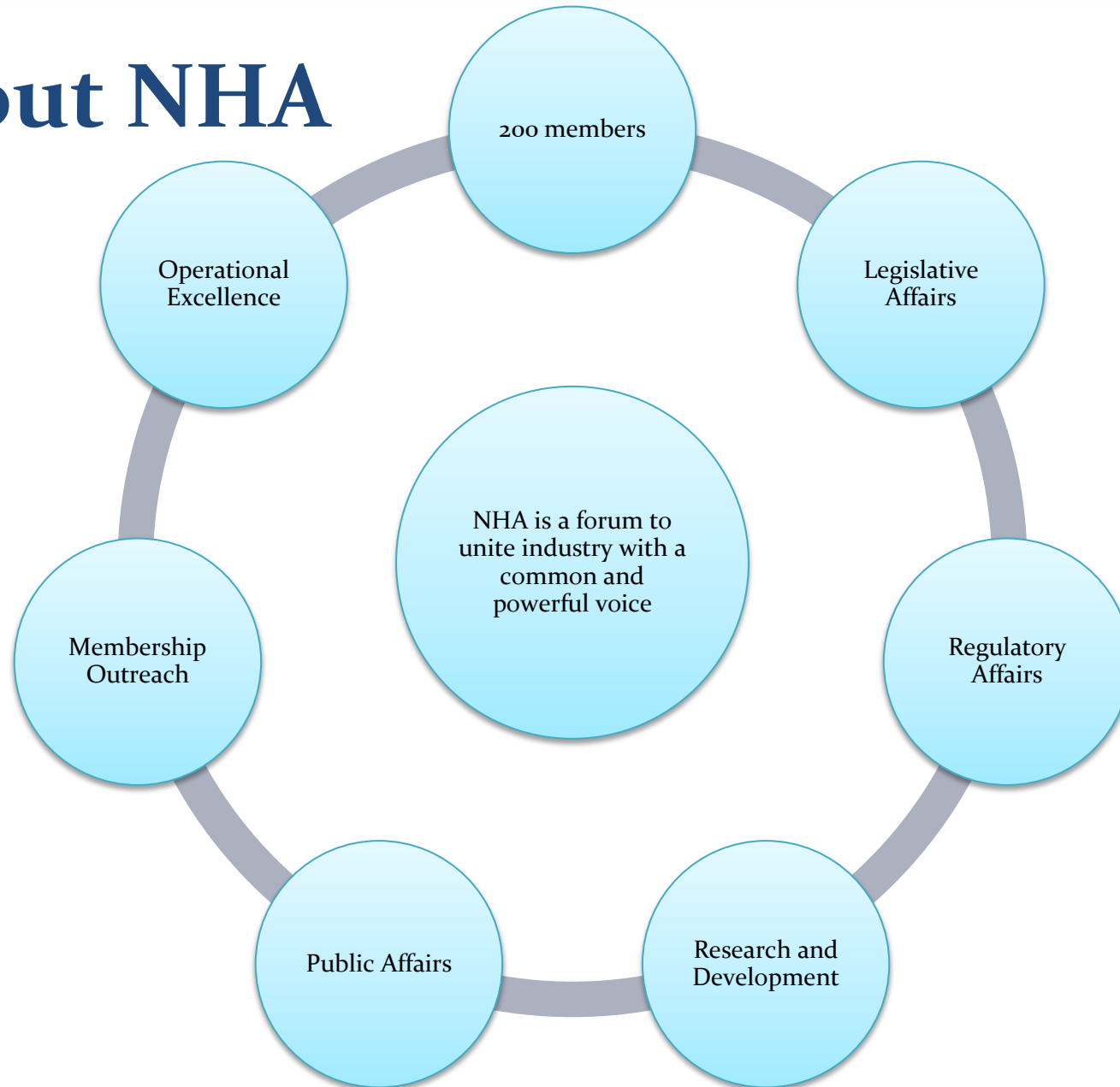
Regional vs. National
Growth

Relevance to Today's Energy Needs

Technology of Yesterday?

Sustainability

About NHA



NHA: Looking to the Future

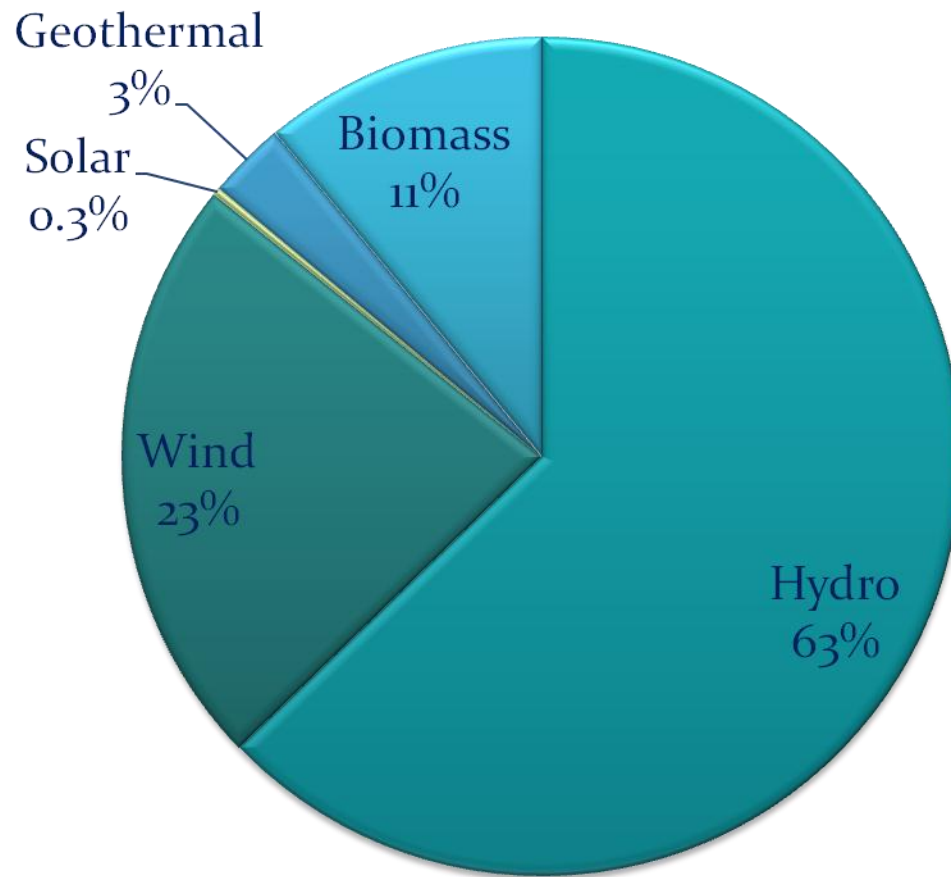
Vision

- **Double** America's largest renewable energy resource – hydropower – in support of a sustainable and secure clean energy future.

Mission

- Champion hydropower, **in all of its forms**, as America's premier clean and renewable energy resource.
- Focus on **growth, operational excellence** and **environmental stewardship**.

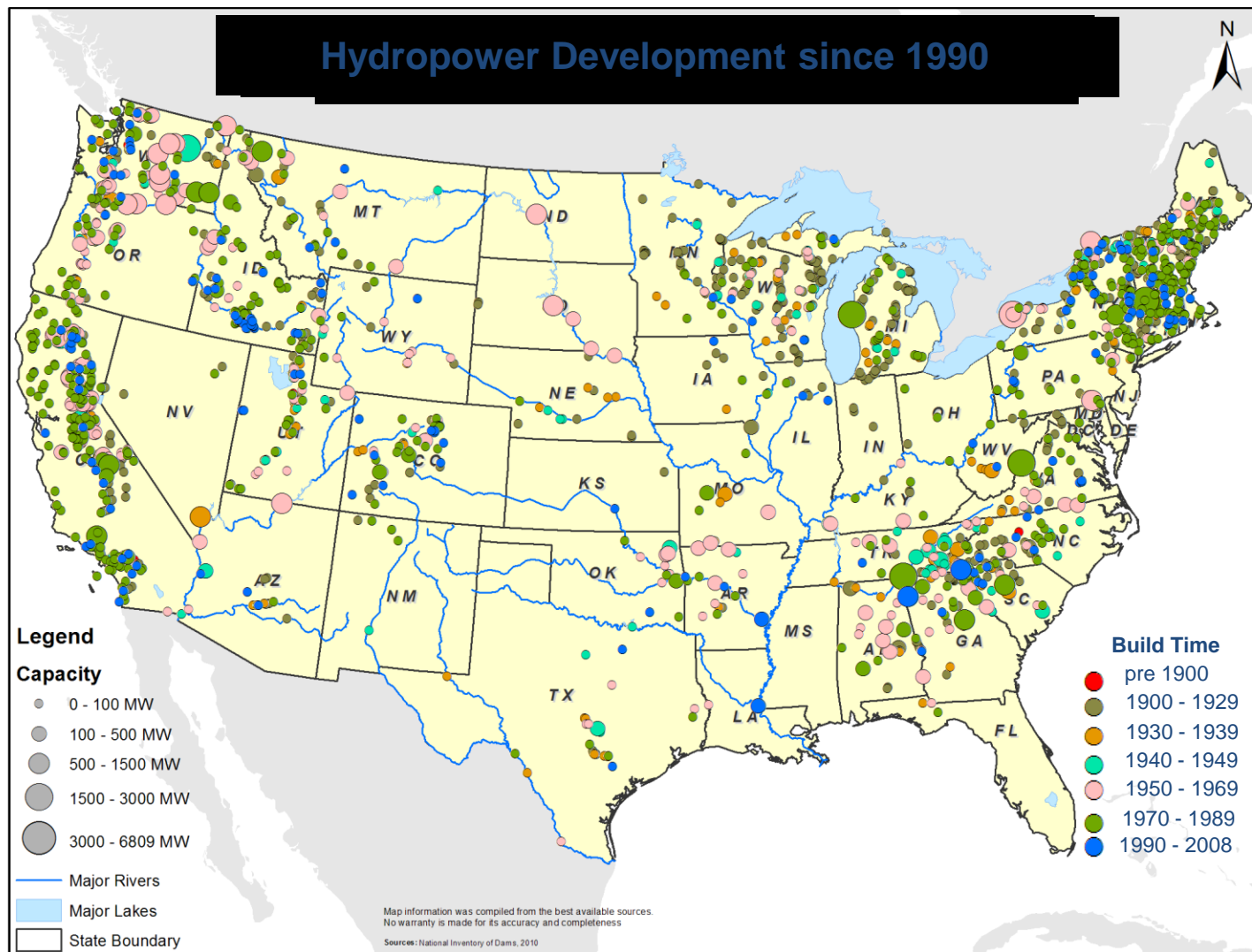
U.S. Renewable Electricity Generation 2012



Hydropower is available.

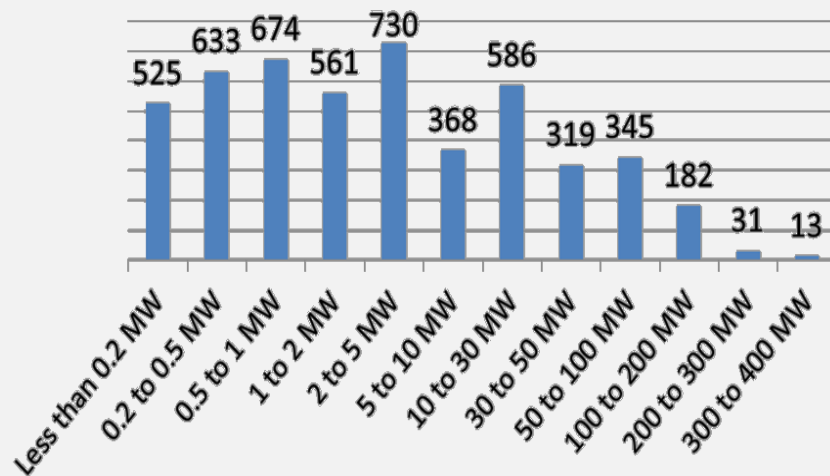
It is the largest source of renewable electricity in the U.S., and made up 8% of overall electricity generation and close to two thirds of renewable electricity in 2012.

Approximately 100GW of existing capacity, includes 22GW of pumped storage.



Key Characteristics of the Hydro Fleet

Size (Capacity) Distribution of Currently Operating Units



Only 3% of the 80,000 U.S. dams generate electricity – there is significant room for growth.

Hydropower is generated in every region and benefits every state, employing up to **300,000** workers around the U.S.

62% under 5 megawatts

Unique Industry

Federal Operators

- 51 percent of generation is produced by federal owners
- Federal projects tend to be larger (Hoover and Grand Coulee)
- TVA, BuREC, and USACE

State and Locally owned projects

- Consists of state agencies like New York Power Authority
- Municipals
- Electric Cooperatives
- Joint Action Agencies

Investor owned and IPP's

Consists of companies like PG&E and Southern – ranging from a small percentage of hydro generation to fairly significant percent of their energy generation portfolio

U.S. Hydropower Supply Chain Snapshot

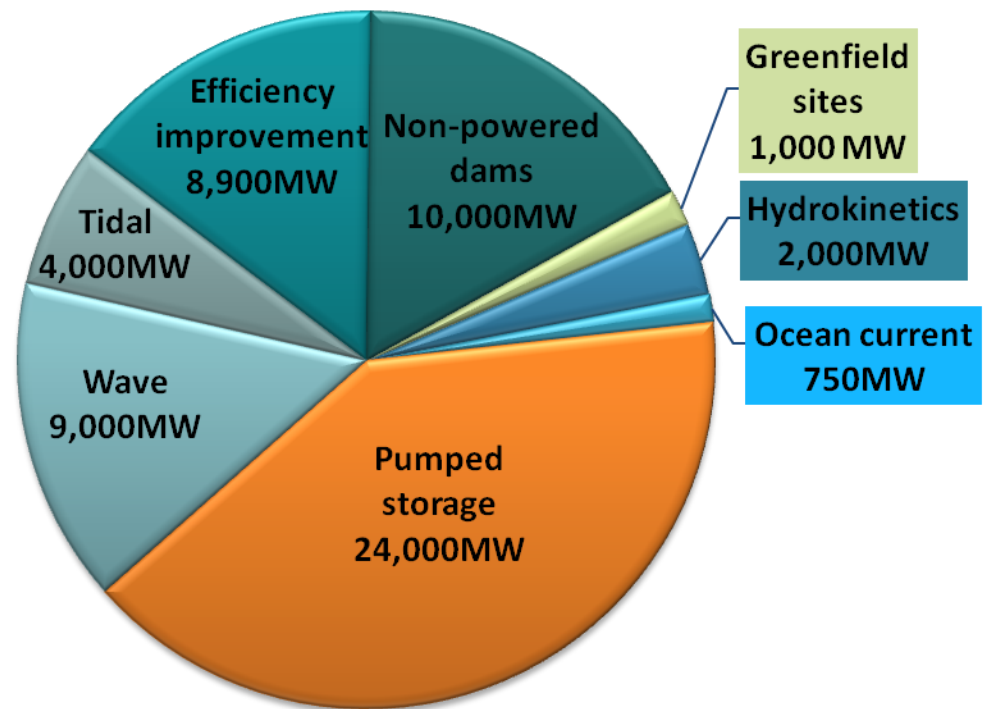


Future availability

With the right policies in place, the U.S. could add 60,000 MW of new hydro capacity by 2025, much of which can be created by maximizing existing infrastructure or with low-impact projects.

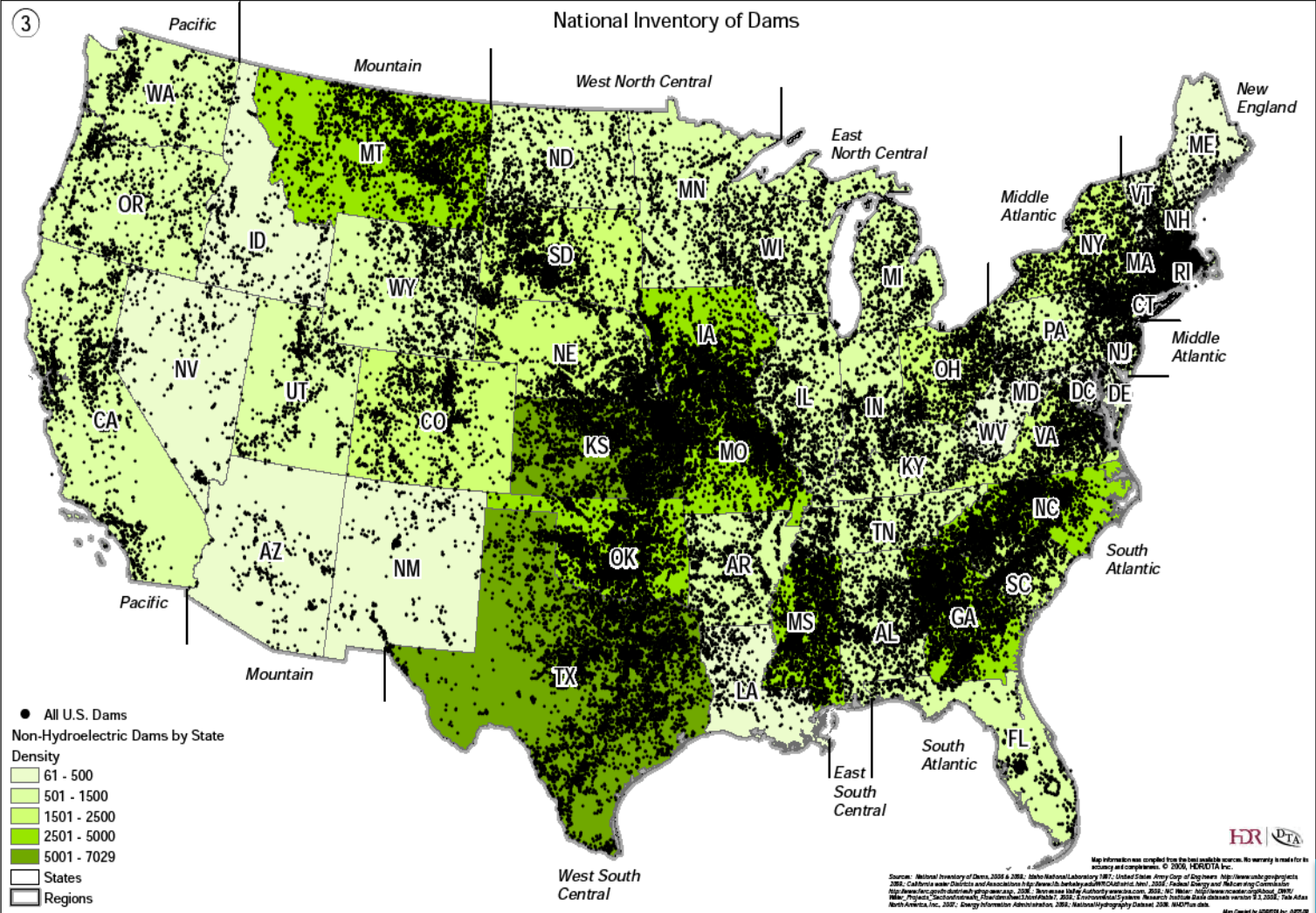
There are also some greenfield project opportunities.

Hydro Capacity Growth by Technology



Navigant Consulting Study, 2009

80,000 Dams Across the U.S.



Hydro Projects In Line

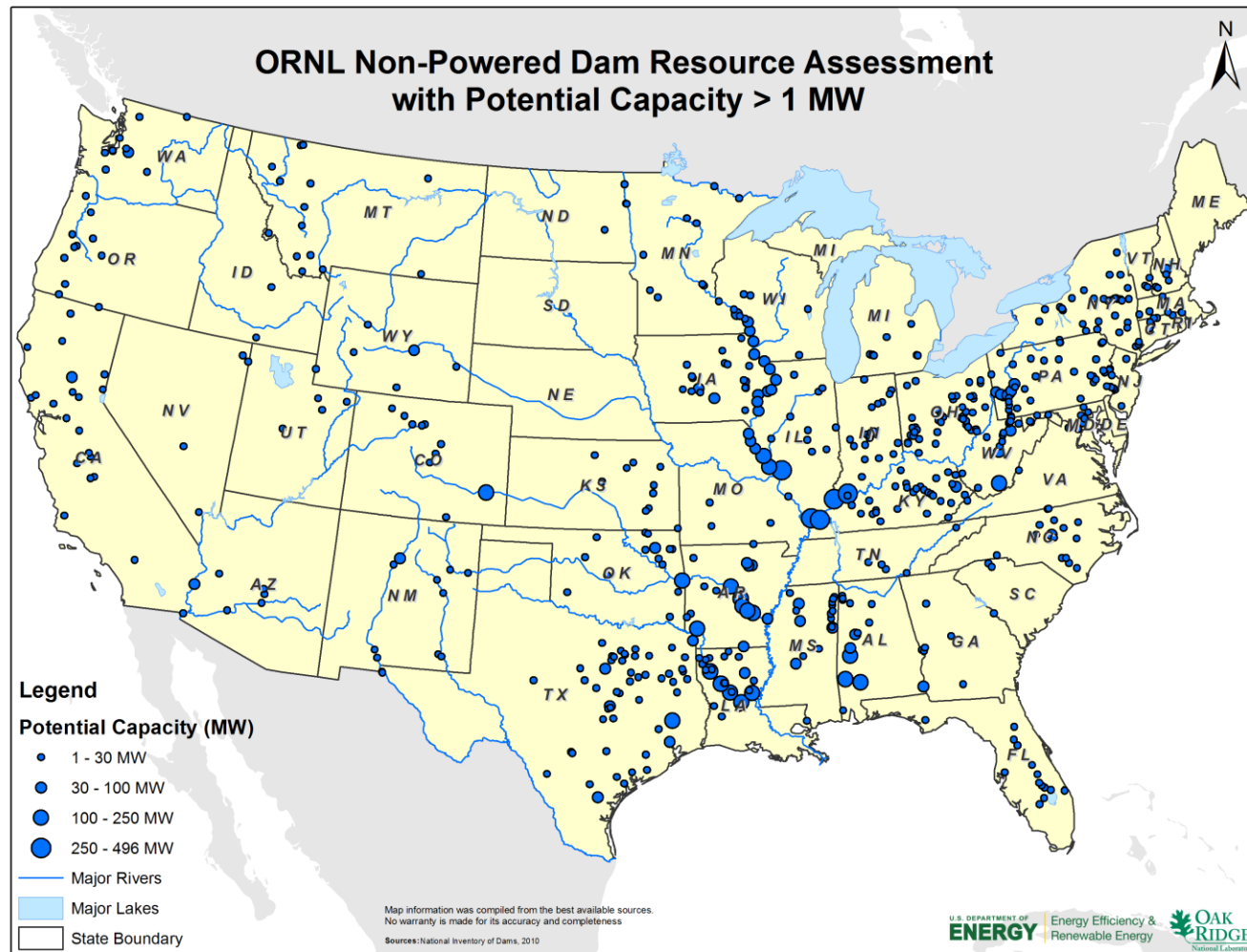
**The FERC
pipeline tops
81,000 MW
across 564
projects**

- **Pending Licenses/Relicenses/
Exemptions: 113 projects, 15,000+
MW, 36 states**
- **Preliminary Permits Issued: 382
projects, 62,000+ MW, 47 states**
- **Preliminary Permits Pending: 69
projects, 4400+ MW, 22 states**

DOE/ORNL: 12 GW at over 54,000 sites

8 GW in top 100 sites

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

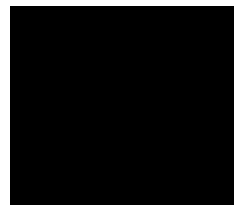


Conventional Hydro Growth – Upgrades at Existing Facilities

The potential for new conventional hydro generation is not just about adding capacity at non-powered dams.

Existing hydro facilities are expanding through upgrades and efficiency improvements with an estimated **12** GW's of potential new power.

In fact, since EAct 2005 and the inclusion of hydro in the production tax credit (PTC), almost **110 projects** have received PTC certification. These projects have seen, on average, **over a 10 percent gain in generation.**



Conduit Power

Existing tunnels, canals, pipelines, aqueducts and other manmade structures that move water are fitted with electric generating equipment.

Conduit projects are often small hydro, and are able to extract power from water without the need for a large dam or reservoir.

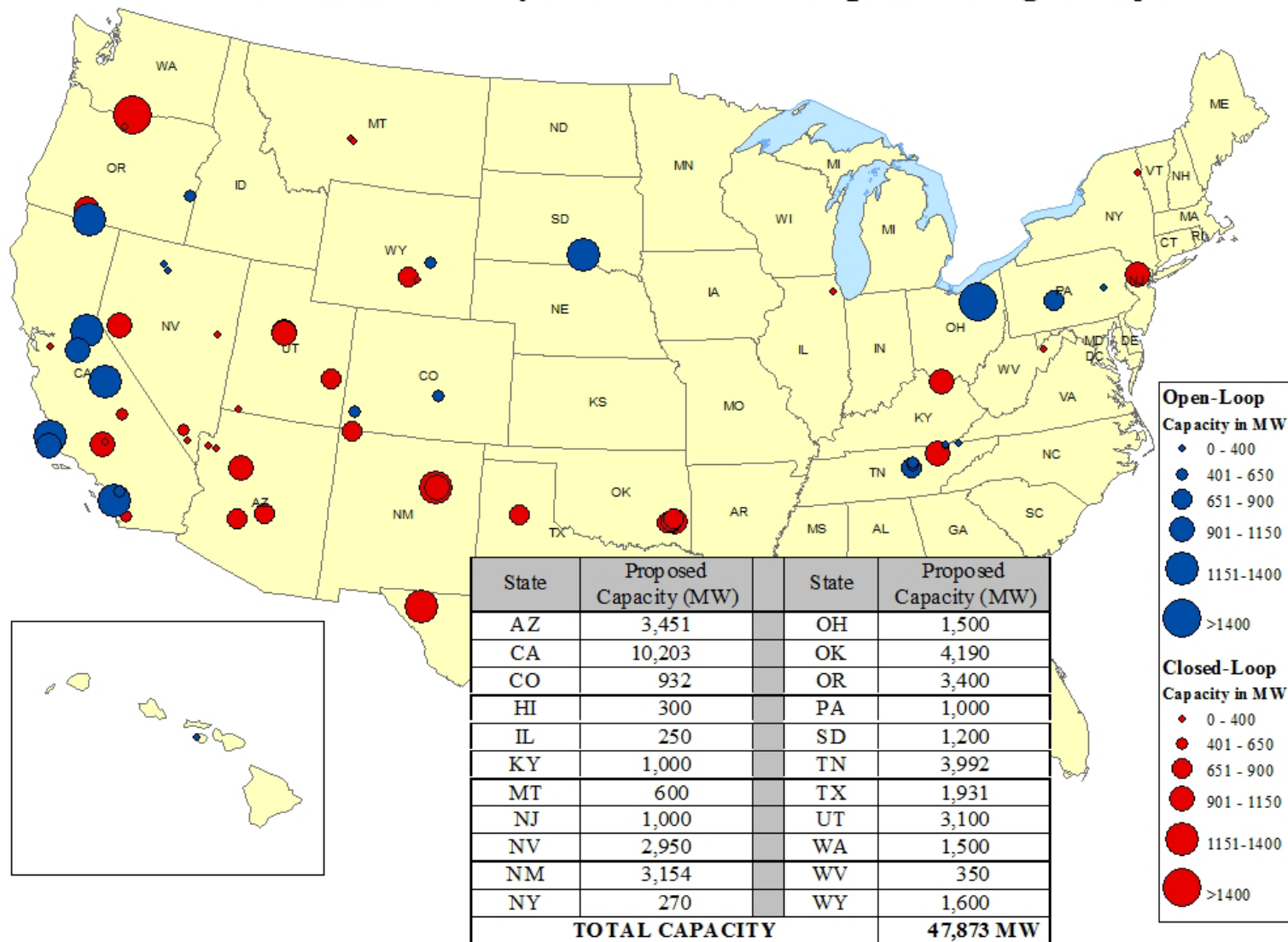


BuRec: Conduit Opportunities

Region	Canal Sites	Potential Installed Capacity (kW)	Potential Annual Energy (kWh)
GP	175	38,525	122,204,196
LC	28	5,239	29,283,867
MP	39	4,392	17,550,289
PN	74	22,755	85,385,703
UC	57	32,717	110,794,792
Total	373	103,628	365,218,846

Enough electricity for approximately **33,000** homes

Issued Preliminary Permits for Pumped Storage Projects



Source: FERC Staff, January 1, 2013

We are an industry that is Growing – BUT

Long development lead times

- Permitting and licensing can take over 5 years, followed by construction.
- Incentives generally extended on short-term basis.
- Numerous stakeholder involvement can add to time and cost
- Hard to attract investment

Large up-front capital investment required

- In addition to licensing costs, study costs, projects can require significant up front capital. (New pumped storage projects - \$1-2 billion).
- Projects economic over long-term, but have high immediate start-up costs.

Uncertainty re: support, incentives, and regulatory policy

- Financial community concerned that incentives for hydro may not be renewed before project comes online.
- Affects both utilities and small developers abilities to pursue projects (conventional and new).

NHA's Policy Priorities

NHA supports the goal to significantly increase generation of America's electricity from clean and renewable energy – **a goal achievable only with a significant role for hydropower.**

What it will take:

A more efficient regulatory process

Market valuation for hydro's benefits

Economic incentives to **support project development**

A national clean and renewable electricity standard that recognizes hydro

Research and development

We are a Changing Industry

Tremendous Investment in Environmental Applications

- Years of study in fish behavior and facilities impact - more informed decision-making
- Developing new environmental approaches to project development and licensing
- More stakeholder engagement
- Greater fish passage today – 98 percent

Changing Water Management and Operations

- Greater competition over water required new management approaches to share the resource
- Created greater efficiencies
- Maximizing the benefits of projects

New Technology Deployment

- New turbine designs are being deployed
- Creating More energy using less water
- Environmental attributes included in new turbine design.

Current R&D Initiatives – conventional hydro

- Fish Passage
 - Advanced Hydro Turbine System
 - Minimum gap runner
 - Fish friendly turbine design
- Dissolved Oxygen
 - Aerating runners
 - Turbine aeration systems

Minimum Gap Runner



- Improved fish survival through the turbine
- Installed at Grant County PUD's Wanapum Project

Aerating Turbines



- Aerating turbines, like this one from Voith Siemens, injects oxygen through the machine into the discharge to improve aquatic conditions downstream of the hydro project

Water/Energy Nexus and Hydropower

It's our fuel source – we care about it!

Water fuels our projects; serves multi-purpose – flood control, water supply, irrigation, and recreation – it's a shared resource

Hydropower is a non consumptive use

Water that flows thru the turbines is returned to the river virtually unchanged

Water is a constrained resource –

Greater competition within & outside energy sector

Stresses of Climate Change

Industry has focused on Adaptability

Experience in adapting project operations to drought

Collaboration in Planning

Flexibility in operations

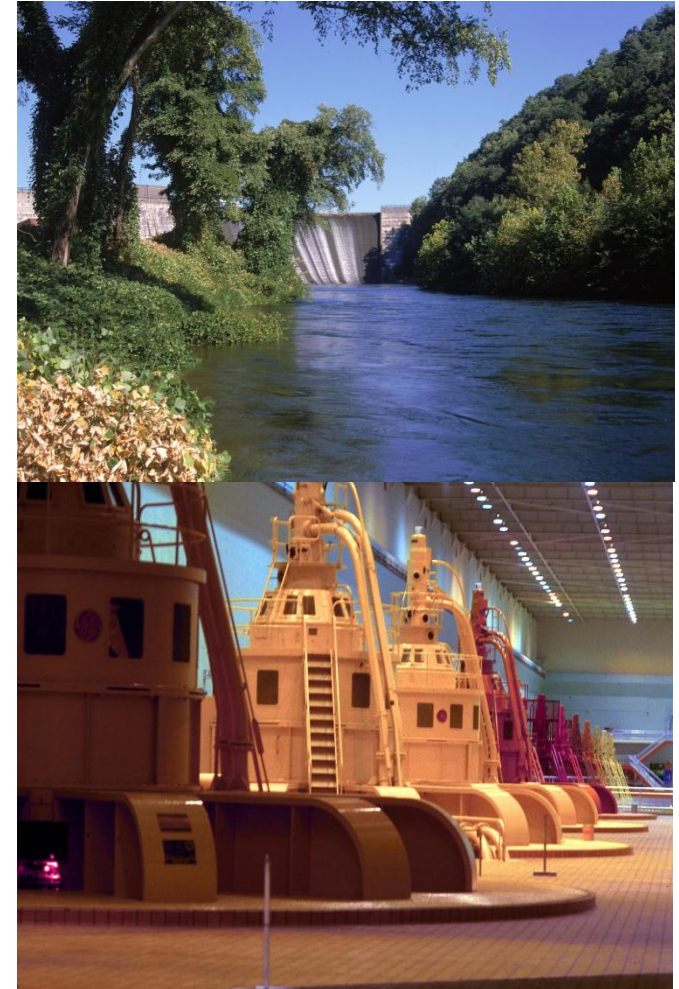
Operational Excellence

New initiative undertaken in 2012 by NHA

Goal: Promote enhanced project stewardship by voluntarily sharing O&M issues and their solutions through an Event Reporting system

Focus: Promoting safety (employee, public, dam) and being responsive to environmental issues

Industry-wide involvement, including the federal government



Thoughts for Consideration

Water is a shared resource – we need to *better understand the inter-relationships and work more closely together* to ensure that it will continue to be there for the many purposes it serves;

Hydropower is an important part of our energy portfolio now and into the future - with *tremendous room to grow* – it is not all about “Hoover” – is about small development; *it’s adaptable for today’s needs*, but we need to do a *better job in setting policy* to recognize it and incentive that growth;

For the most part, **dams in the U.S. are multi purpose** and studies that report on the energy and water nexus needs to understand that role and *recognize the non – consumptive nature* of the power generation itself;

While we have challenges ahead, **cooperation, collaboration, education and planning** will go a long way in helping us address this important issue.

Contact

Linda Church Ciocci
Executive Director
202.682.1700 ext. 22
linda@hydro.org



Visit us on the Web

www.hydro.org



NatlHydroAssoc



@NatlHydroAssoc

Questions?