LOW IMPACT HYDROPOWER INSTITUTE

What can we do about hydropower ?!?

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LIHI Executive Director

Roundtable on Science and Technology
For Sustainability
National Academy of Sciences
Washington, DC – 12/10/14

LIHI Certification inspires environmentally responsible hydropower and contributes to a green energy future.

Today's presentation in 3 parts

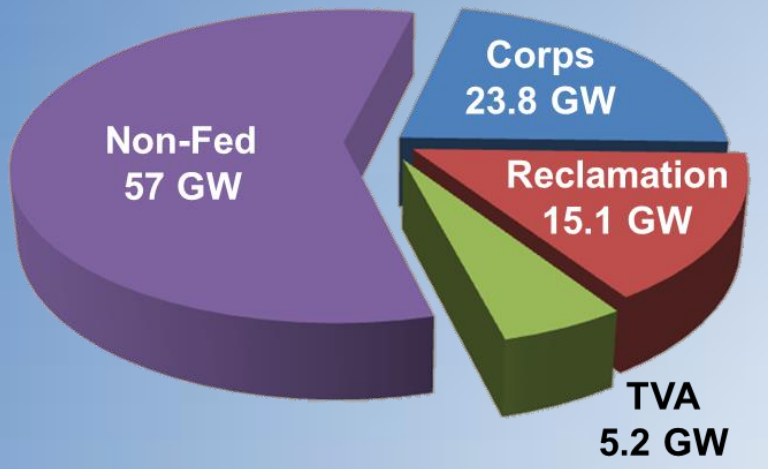
- Hydropower is important:
  - As renewable energy
  - As part of U.S. water sector
- Hydropower can be compatible with the environment
- The LIHI "experiment" works!

Which 'Rodney' is it?

Hydropower is well-established: the foundation of renewables

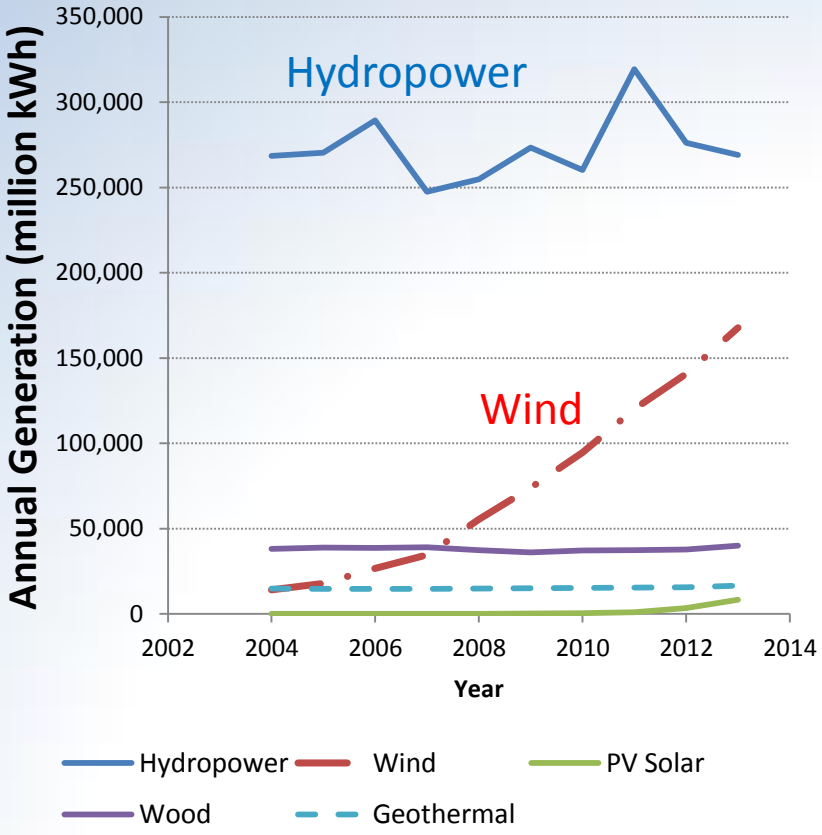
Conventional Hydropower

Rated Capacity



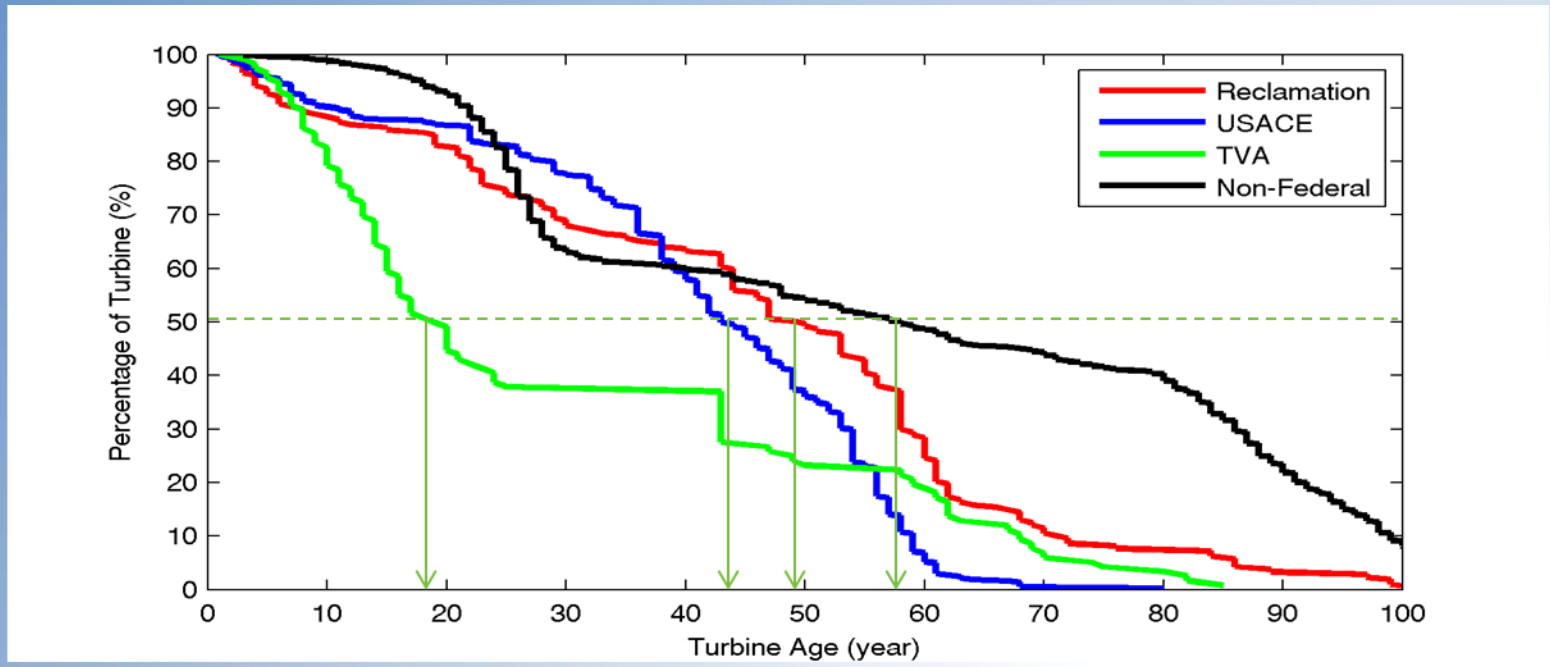
- Clean, renewable energy since 1880s
- > 2500 operating power plants in U.S.
- ~280 TWh average annual generation
- Significant ancillary benefits
- Largest water user in U.S.:
  - Mostly non-consumptive
  - > 3 trillion gallons/day !!!

Renewable Electricity

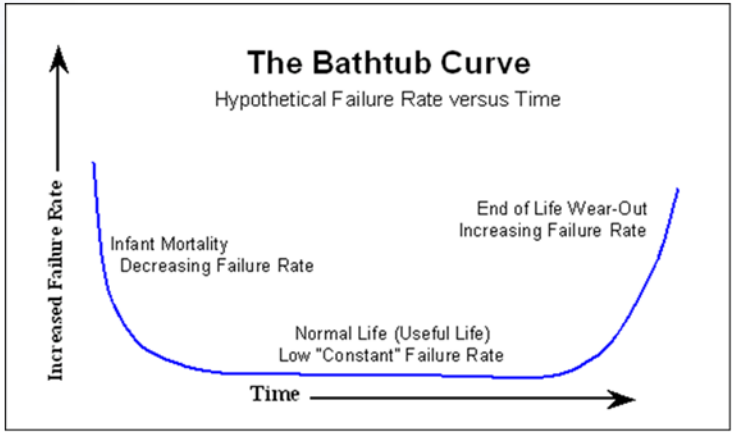


Source: http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_1_01_a

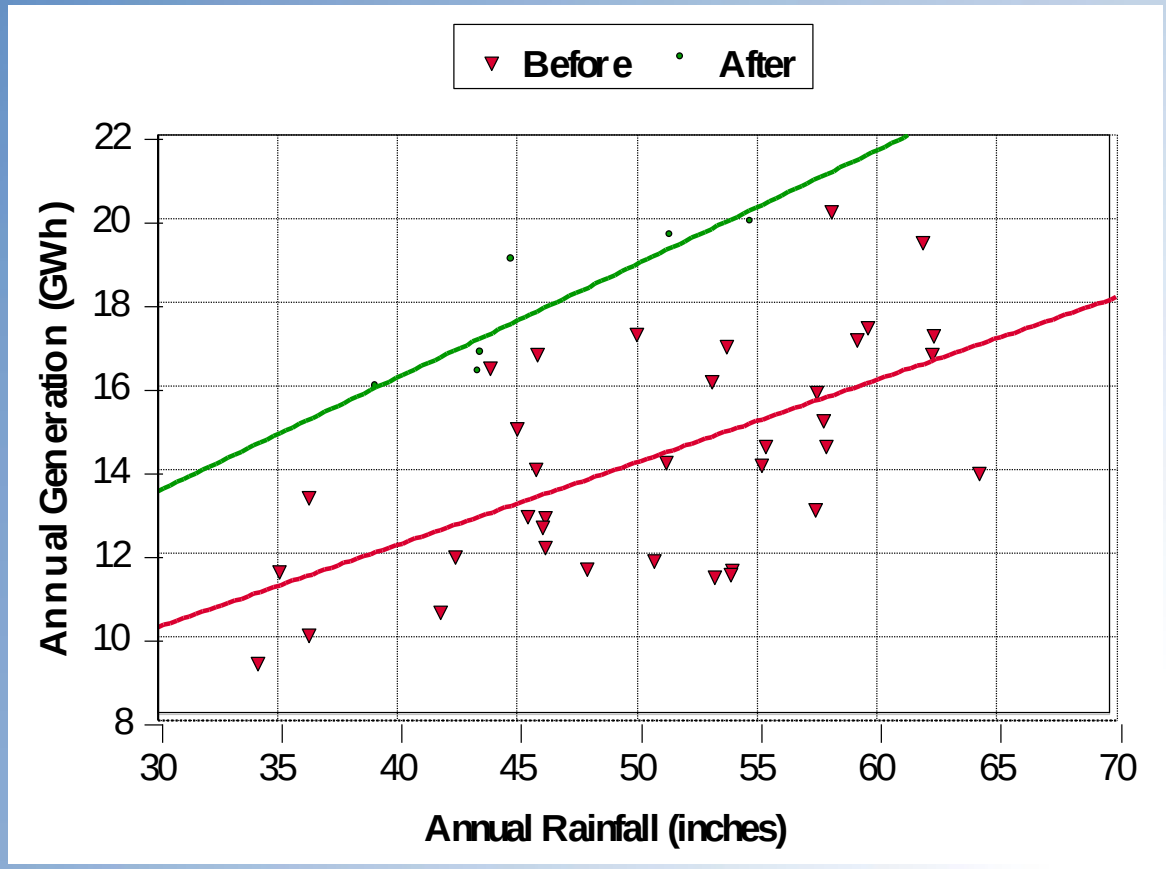
Hydropower is an "aging infrastructure"



	Median Ages
TVA	18
Corps	44
Reclamation	49
FERC-licensed	58



Hydro improvements payoff big for energy/water/environment



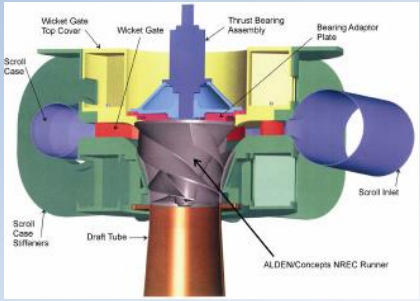
TVA's Lake Improvement Program (LIP) resulted in more energy and better environmental conditions

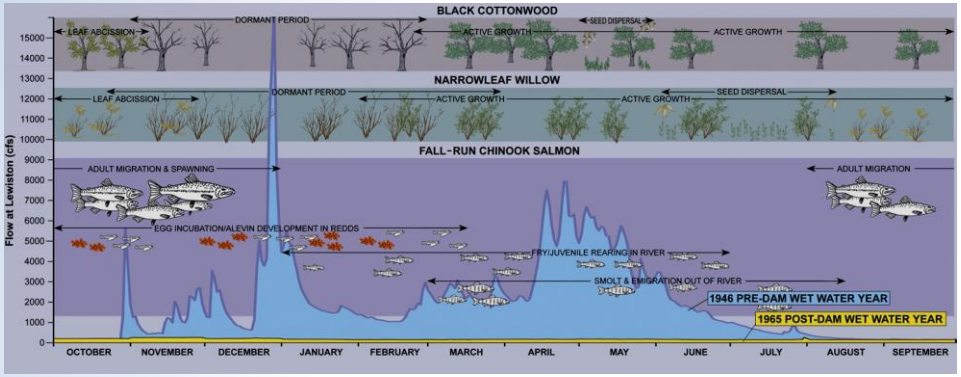
Before improvements: $G = 4320 + 197R$, $r_2=0.374$, $n=36$
After improvements: $G = 5340 + 272R$, $r_2=0.797$, $n=6$

Source: TVA data from 1956 to 1997, provided by Pat March

Advanced technology can make hydropower more acceptable

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





Markets can drive improvements: the LIHI example

- LIHI established in 2000 with leadership from CRS, Green Mountain Power, and environmental NGOs *
- ***Our Goal*** -- create an independent, objective, and transparent source of information for consumers to use in choosing green energy
- ***Our Strategy*** -- provide a market-based incentive to reduce the impacts of hydropower generation
- ***Our Vision*** -- achieve dual goals:
  - Enable more clean, renewable electricity
  - Stimulate investments in local rivers to improve environmental quality

* Lydia Grimm on LIHI Formation, 2002 http://alturl.com/cxrc4

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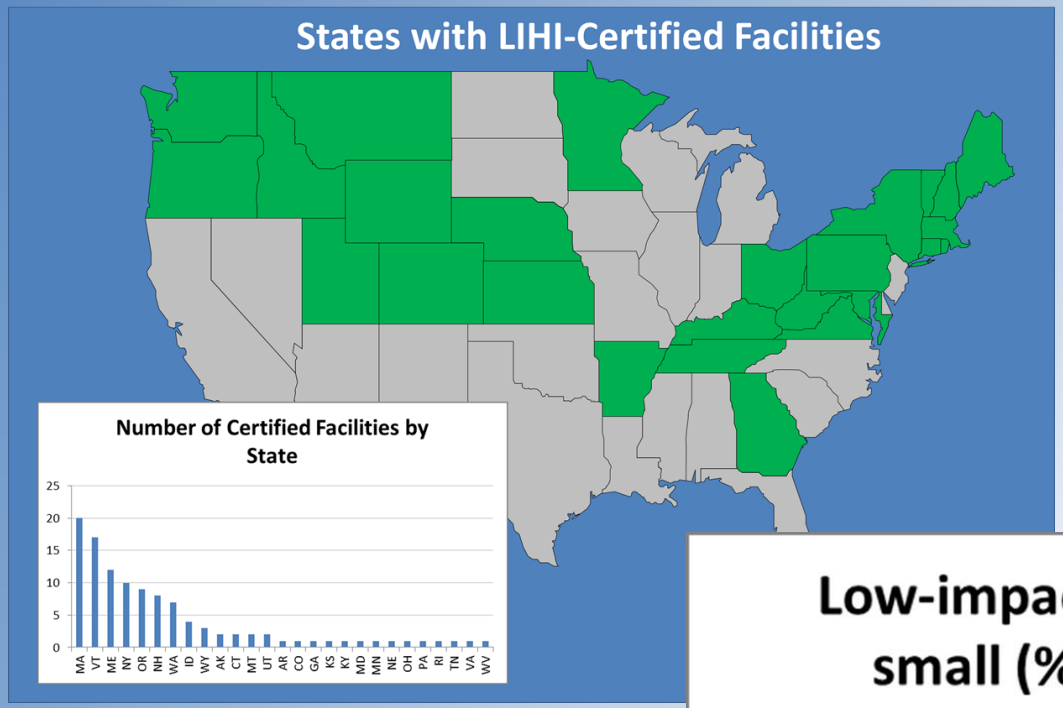
LIHI evaluates facilities against seven criteria

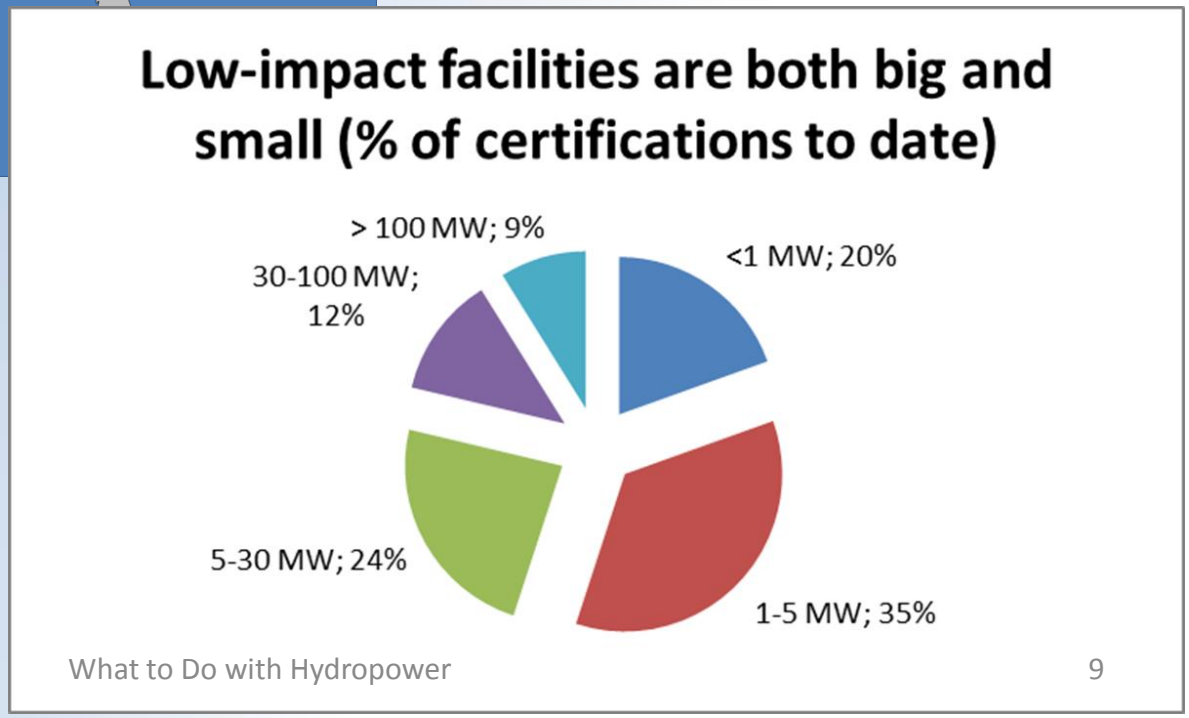
- ***Existing facilities and incremental new development at existing dams are eligible***
- ***Facilities recommended for dam removal and new dams or diversions built after 1998 are not eligible***
- ***Seven criteria must be satisfied on pass/fail basis:***
  - Flows
  - Water quality
  - Fish passage and protection
  - Watershed protection
  - Protection of threatened and endangered species
  - Cultural resource protection
  - Recreational resource protection

LIHI has been a success



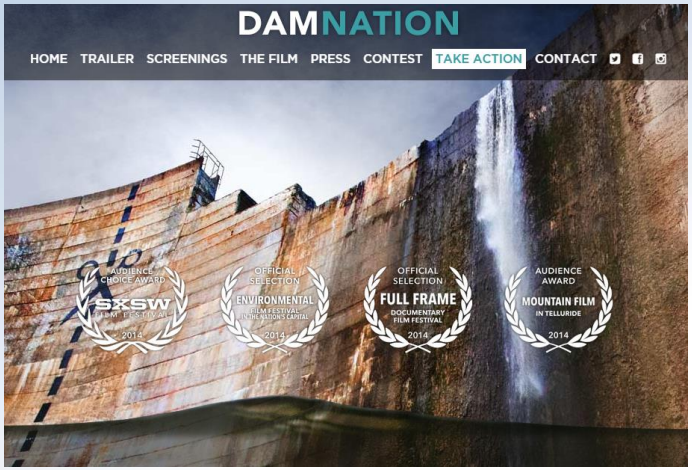
To date, we have 116 facilities certified, at ~180 dams, in 28 states.

The total capacity of LIHI-certified hydropower is now approximately 5 GW.



Conclusion: there is a middle way

- Excluding hydropower from RPS / CES programs results in lost opportunities
- Low-impact hydropower can be easily identified
- Market-based incentives work
  - Force engagement
  - Benefits to local environments
  - Benefits to the global environment



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Thank You for Listening!

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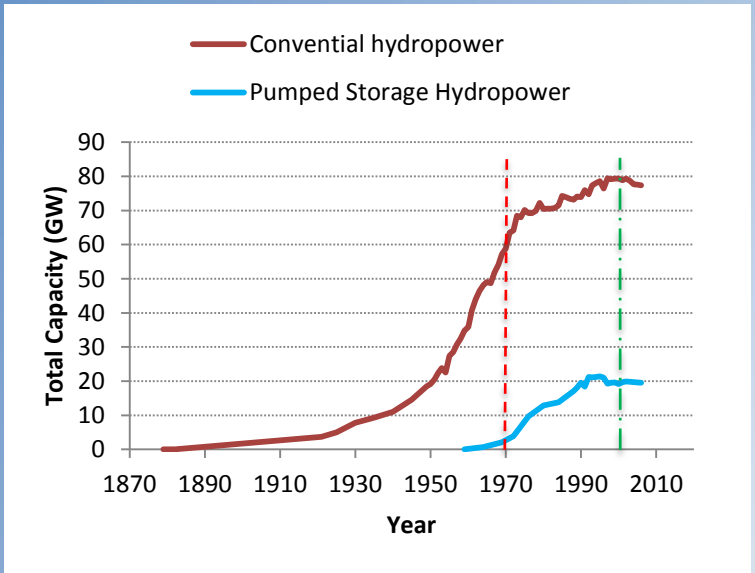
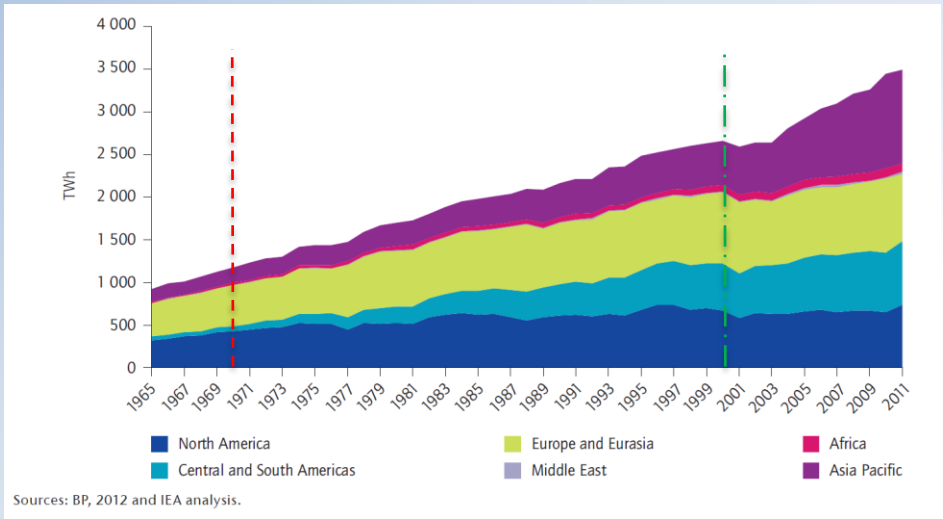
Hydropower in the U.S. is different than in the rest of the world

U.S. HYDROPOWER



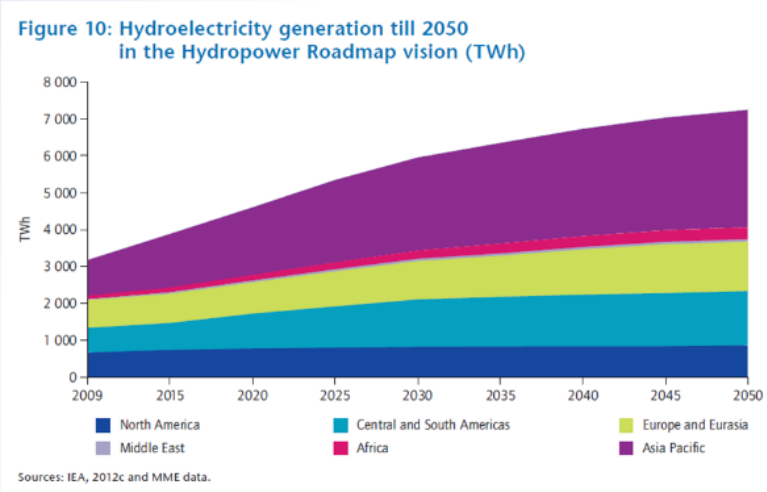
GLOBAL HYDROPOWER



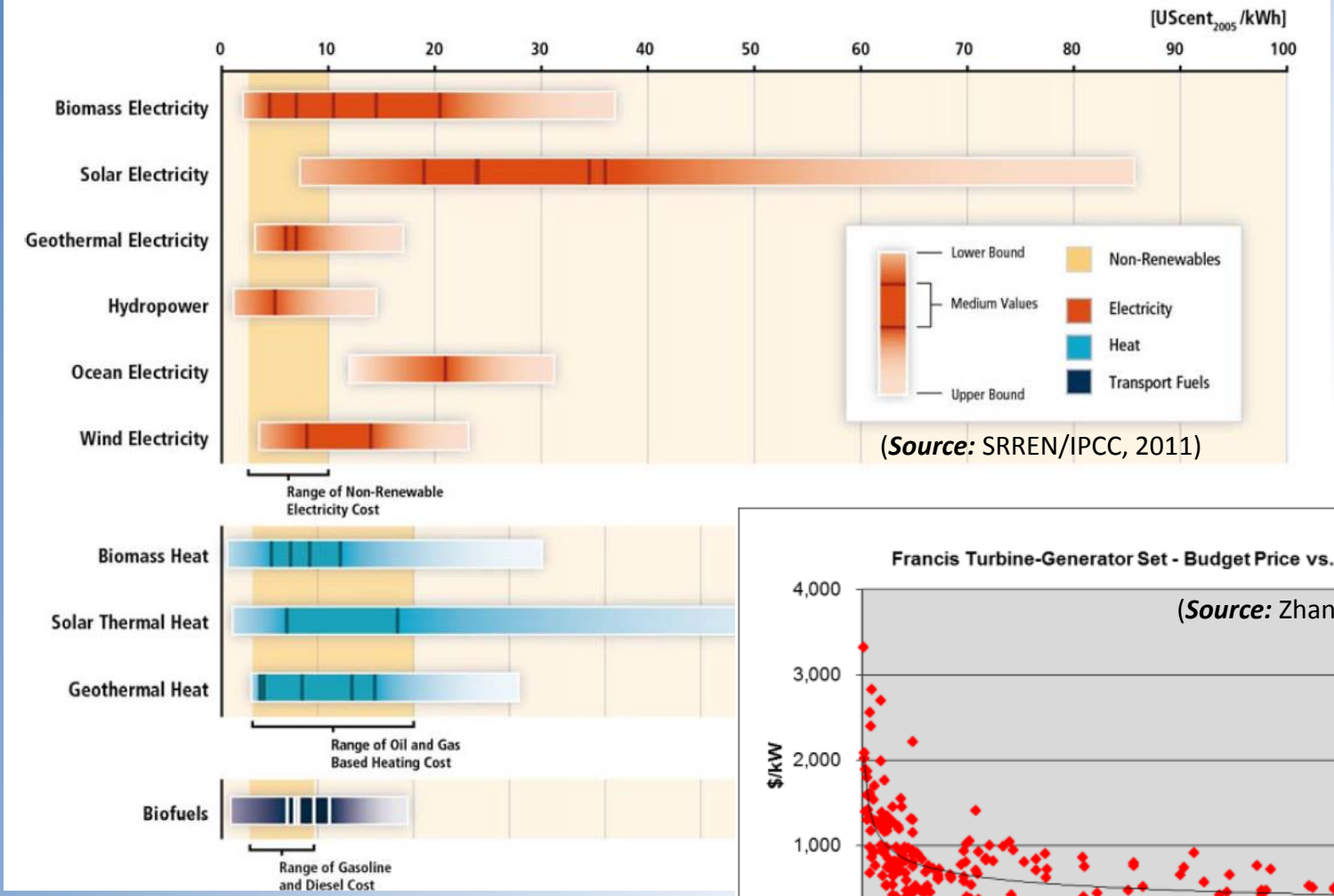
Technical growth potential in U.S.

Existing power plants:	~15 GW
Non-powered dams:	~13 GW
Water conduits:	~1-3 GW?
New-site development:	>50 GW
Pumped-storage hydro:	~10-20 GW

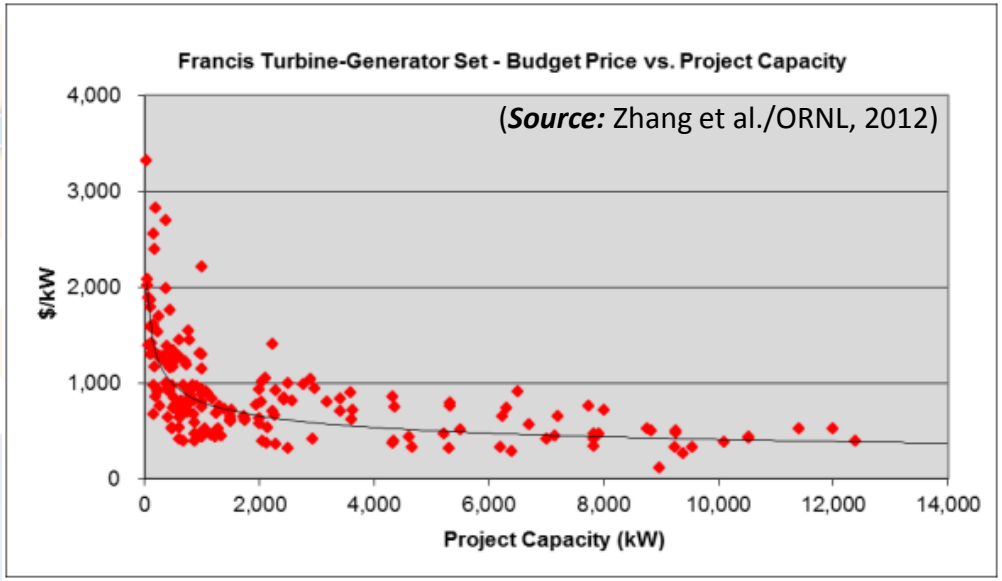
TOTAL = more than enough to DOUBLE



Economics are important



(***Source:*** SRREN/IPCC, 2011)



(***Source:*** Zhang et al./ORNL, 2012)