

What's the "Potential" for New Hydropower Development?

***Northwest Hydropower Association
February 16, 2010***



Potential Energy

- Energy stored within a physical system that has the *potential* to be converted into other forms of energy, such as kinetic energy

$$(kW) = \frac{\text{HEAD (feet)} \times \text{FLOW (cfs)}}{11.81}$$

11.81

Potential for New Hydropower Energy

(Navigant 2009)

Despite recently published reports and new studies that are underway, there is need for continued study of the U.S. hydro potential.

Research on U.S. Hydroelectric Potential	
Streams	DOE's 2006 and 2003 Idaho National Laboratory reports, as well as other studies, have been conducted in this area.
Constructed Waterways	DOE is currently examining the potential for developing hydro in constructed waterways in the U.S.
Tidal	<ul style="list-style-type: none"> • EPRI has estimated technical potential in 5 states and a more theoretical potential for Alaska. • Georgia Tech is working on an assessment of both available and effective tidal power densities in the U.S.
Wave	EPRI has estimated the theoretical potential for wave power in the U.S.
Ocean Current	An assessment of potential off the coast of the U.S. has not been undertaken. Potential off the coast of Florida has been estimated at 4 - 10 GW.
Ocean Thermal	No assessment of U.S. potential has been undertaken or is under way.
Ocean Salinity Gradient	No assessment of U.S. potential has been undertaken or is under way.

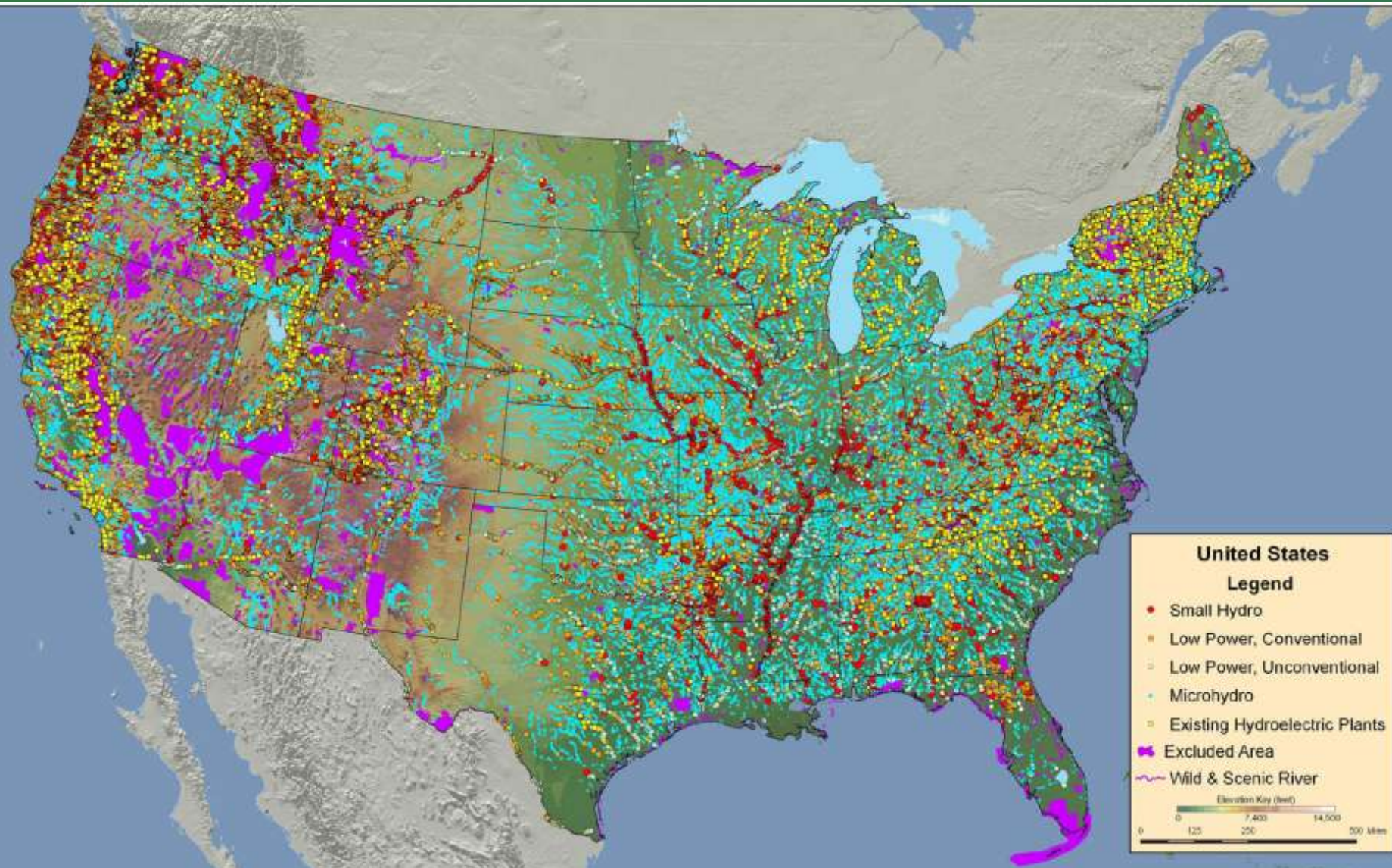
Key:

Existing research on U.S. potential, fairly comprehensive.

New research is underway/research exists, but further work is needed

No existing reports on U.S. potential.

Existing and Feasible Hydropower Projects in the US (Idaho National Labs 2006)



Technical Potential for Additional Hydropower *(Navigant 2009)*

- **Impoundment/Diversion 42,000 MW**
- **MicroHydro 6,000 MW**
- **Run of River 23,000 MW**
- **Hydrokinetic 3,000 MW**
- **Pump Storage not estimated**

- **43,000 MW of 74,000 MW estimated to be in western states**

Business as Usual vs. Accelerated Development (Navigant 2009)

- **Possible by 2025**

- Efficiency Improvements & New Capacity: 5,750 - 8,900 MW
- New facilities in existing dams without hydropower: 5,000 - 10,000 MW
- Greenfield Sites: 500 - 1,000 MW
- Inland Hydrokinetic: 500 – 2,000 MW

Business as Usual vs. Accelerated Development (Navigant 2009)

- **Possible by 2025 (cont'd)**
 - Pumped Storage 10,000-24,000 MW
 - Wave Energy 900-9,000 MW
 - Ocean Current 400-4,000 MW
 - Tidal, Instream 400-4,000 MW

 - Total = 23,300 – 59,650 MW

Business as Usual vs Accelerated Scenarios

- **Business as Usual = 10% Renewable Electricity Standards**
- **Accelerated = 25% Renewable Electricity Standards**

Premise: we get these hydropower capacity gains by changing market conditions

Factors Impacting Development Potential

- **Theoretical Potential**
 - Head
 - Efficiency
 - Flows
- **Regulation / Policy**
 - Preference
 - Statutory responsibilities
 - Efficiencies / Process
- **Economics**
 - Tolerance for risk and uncertainty
 - Existing infrastructure
 - Cost of capital
 - Demand (Load)
 - Externalities
 - Incentives and tax policy
- **Cultural and social values**
 - Wild and scenic values
 - Habitat (including access) values
 - Cultural heritage
 - Competing uses
 - Property rights
 - Water rights
 - Social justice
 - Energy policy
 - NIMBY

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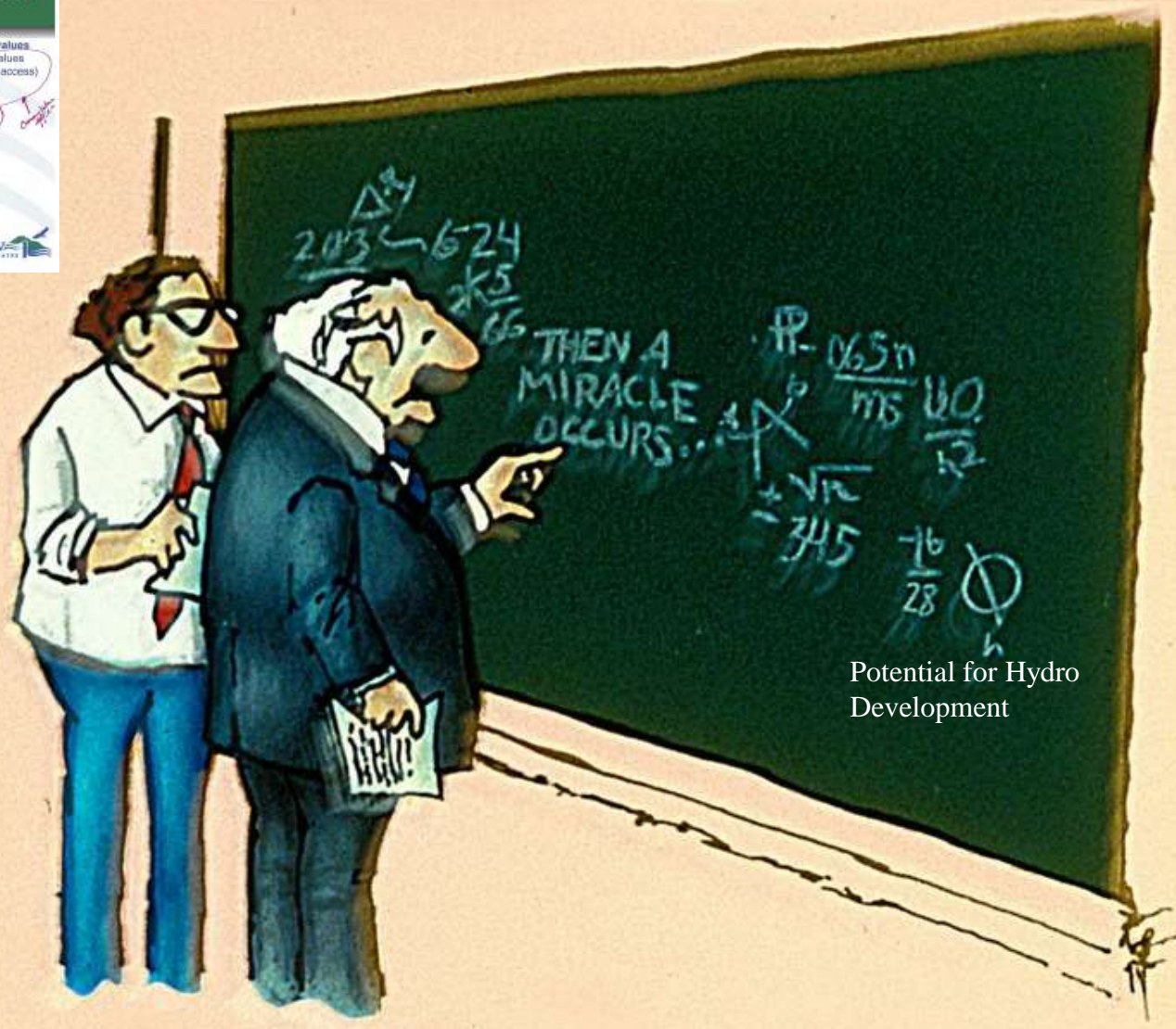
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Community office

Factors Impacting Development Potential



Potential for Hydro Development

"I think you need to be a little more explicit here in step two"

The “Miracle Team”

- **On the Ground Project Development**

- Kevin Crew (Black Rock Inc)
 - Agricultural and Conduit Exemptions
- Josh Thomas (Lucid Energy)
 - Kinetic in-Line Hydro: Demonstration Projects
- Bob Ross (Bureau of Reclamation)
 - Development on Federal Facilities
 - Working with Federal Agencies
- Stephen Hart (Hatch USA)
 - Incremental Hydro: Blue Lake Hydro Project, Sitka Alaska

- **Making the FERC Process Work**

- Jed Jorgensen (Energy Trust of Oregon)
 - Tools for the Process
- Gia Schneider (Natal Energy)
 - Proposed Changes
- Steve Hocking (FERC)
 - Working with FERC