Renewable Energy

Dr. Jan Hamrin

HMW International

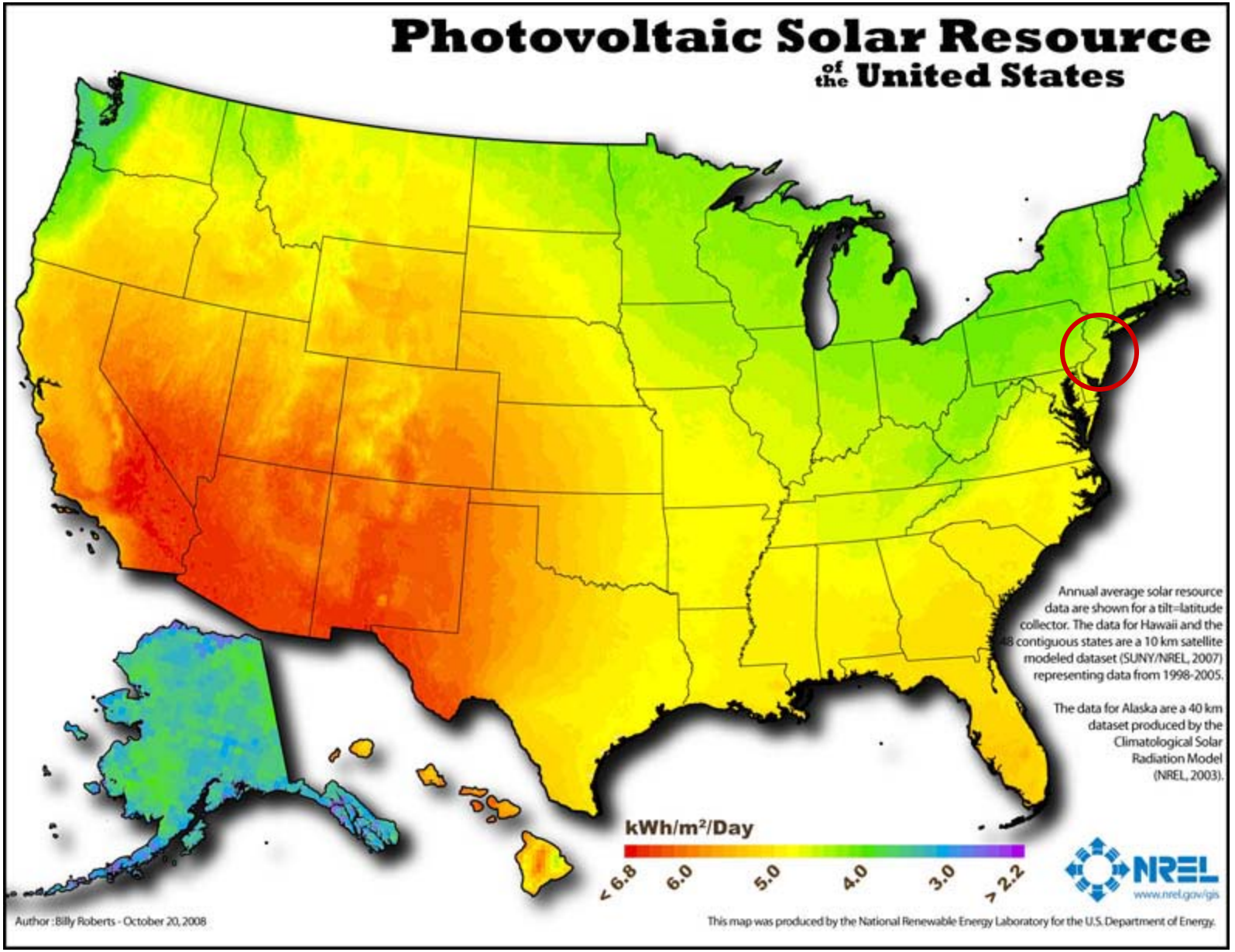
Washington DC

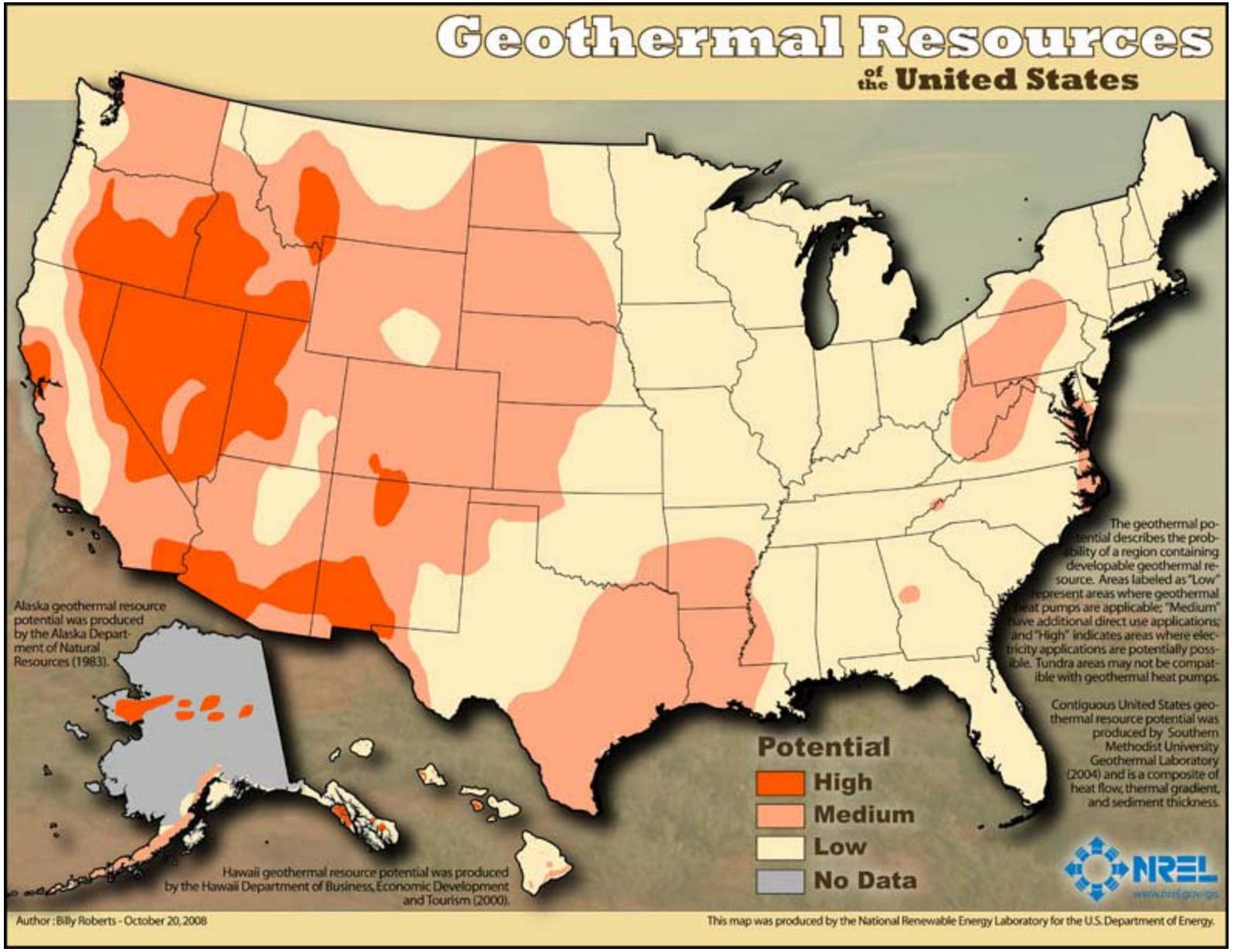
August 31, 2009

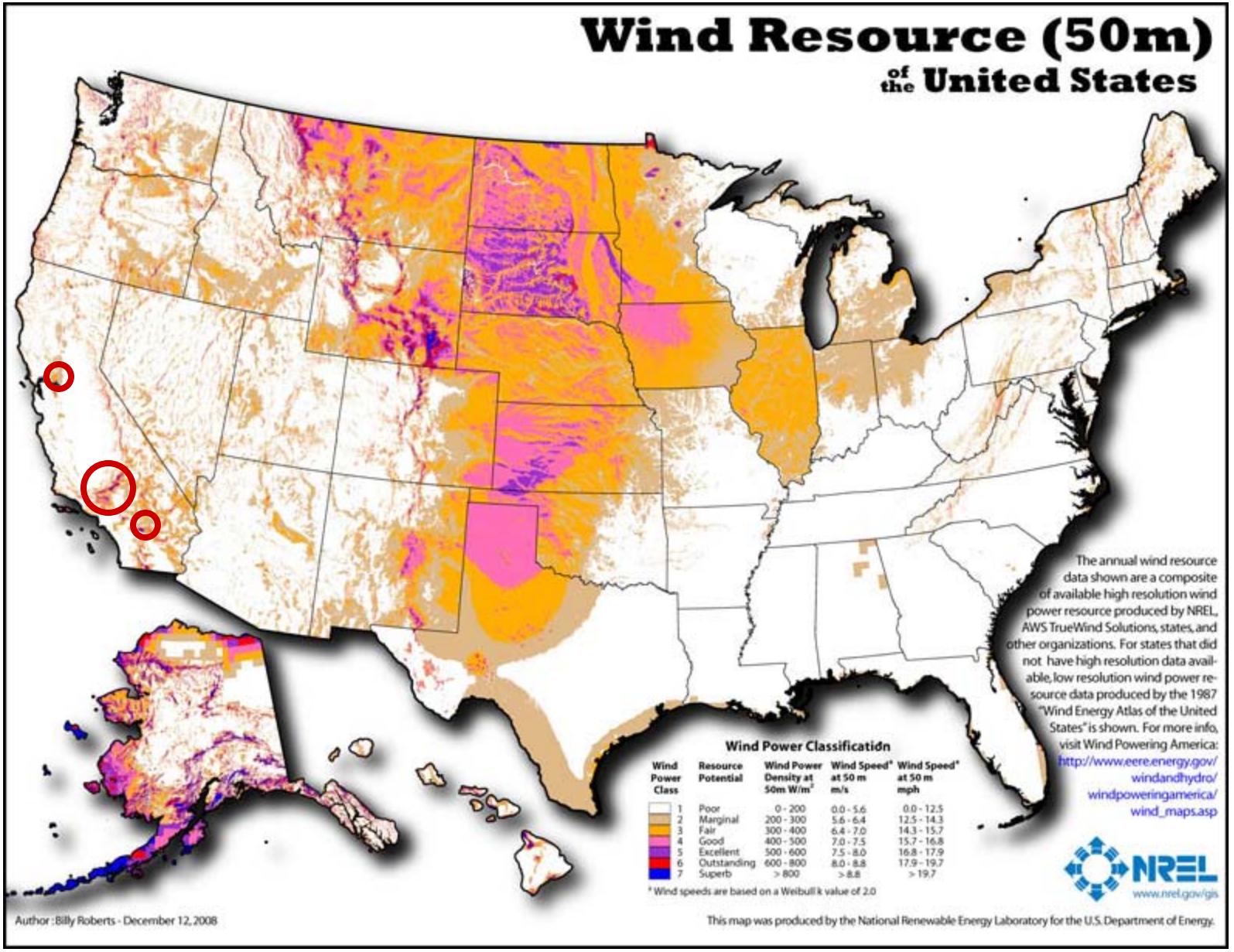
US Renewable Policies & Programs

- Federal Policies
- State Policies

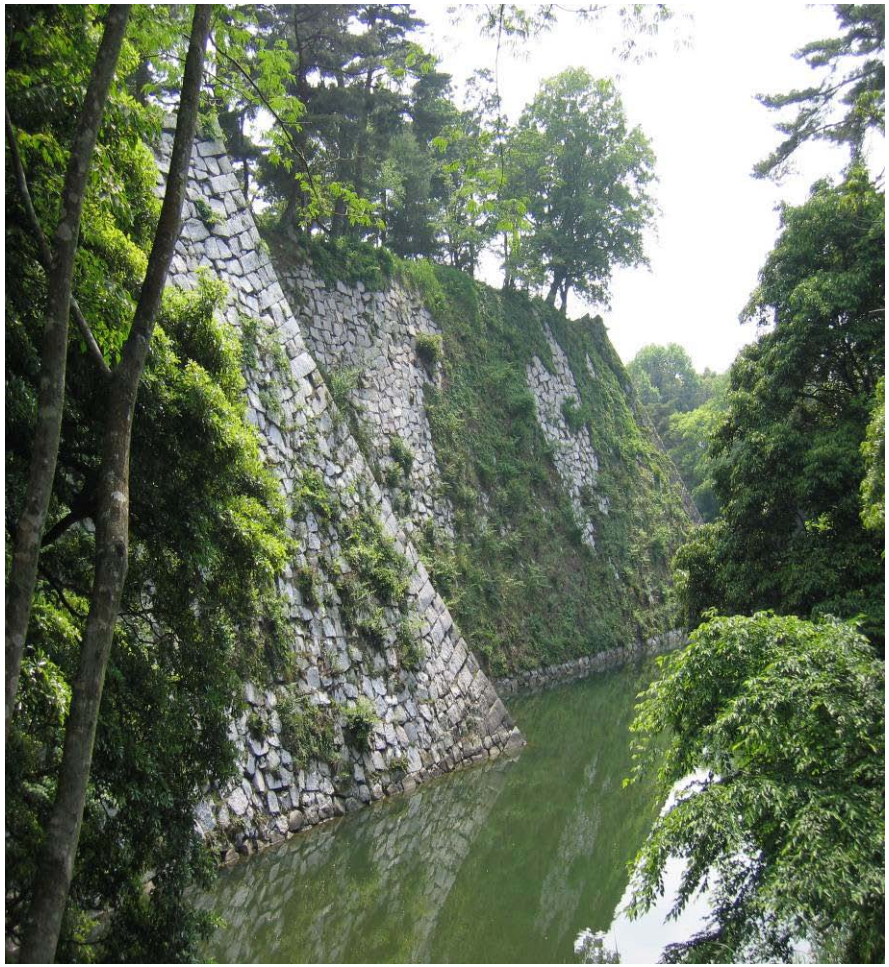
HMW INTERNATIONAL


Photovoltaic Solar Resource
of the United States
Annual average solar resource data are shown for a tilt=latitude collector. The data for Hawaii and the 48 contiguous states are a 10 km satellite modeled dataset (SUNY/NREL, 2007) representing data from 1998-2005.
The data for Alaska are a 40 km dataset produced by the Climatological Solar Radiation Model (NREL, 2003).
kWh/m²/Day
< 6.8
6.0
5.0
4.0
3.0
> 2.2
NREL
www.nrel.gov/gis
Author : Billy Roberts - October 20, 2008
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.


Geothermal Resources
of the United States
Alaska geothermal resource potential was produced by the Alaska Department of Natural Resources (1983).
Hawaii geothermal resource potential was produced by the Hawaii Department of Business, Economic Development and Tourism (2000).
The geothermal potential describes the probability of a region containing developable geothermal resource. Areas labeled as "Low" represent areas where geothermal heat pumps are applicable; "Medium" have additional direct use applications; and "High" indicates areas where electricity applications are potentially possible. Tundra areas may not be compatible with geothermal heat pumps.
Contiguous United States geothermal resource potential was produced by Southern Methodist University Geothermal Laboratory (2004) and is a composite of heat flow, thermal gradient, and sediment thickness.
Potential
High
Medium
Low
No Data
NREL
www.nrel.gov/gis
Author : Billy Roberts - October 20, 2008
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.


Wind Resource (50m)
of the United States
The annual wind resource data shown are a composite of available high resolution wind power resource produced by NREL, AWS TrueWind Solutions, states, and other organizations. For states that did not have high resolution data available, low resolution wind power resource data produced by the 1987 "Wind Energy Atlas of the United States" is shown. For more info, visit Wind Powering America: http://www.eere.energy.gov/windandhydro/windpoweringamerica/wind_maps.asp
Wind Power Classification
Wind Power Class | Resource Potential | Wind Power Density at 50m W/m² | Wind Speed* at 50 m m/s | Wind Speed* at 50 m mph
1 | Poor | 0 - 200 | 0.0 - 5.6 | 0.0 - 12.5
2 | Marginal | 200 - 300 | 5.6 - 6.4 | 12.5 - 14.3
3 | Fair | 300 - 400 | 6.4 - 7.0 | 14.3 - 15.7
4 | Good | 400 - 500 | 7.0 - 7.5 | 15.7 - 16.8
5 | Excellent | 500 - 600 | 7.5 - 8.0 | 16.8 - 17.9
6 | Outstanding | 600 - 800 | 8.0 - 8.8 | 17.9 - 19.7
7 | Superb | > 800 | > 8.8 | > 19.7
* Wind speeds are based on a Weibull k value of 2.0
NREL
www.nrel.gov/gis
Author : Billy Roberts - December 12, 2008
This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.

Key Barriers



- No market
- Utility culture & framework
- Lack of expertise
- Role of private sector
- Capital costs vs variable energy costs
- Transmission access & strength of grid

HMW INTERNATIONAL

Strategies to Overcome Barriers

- Build a Market
- Support utility RE procurement
- Training for RE design & operation
- Encourage private investment
- Value RE attributes
- Long-term contracts
- Open transmission access & grid expansion

HMW INTERNATIONAL

Climate Change: Resource Planning & Procurement

Concern about climate change is driving a reconsideration of electricity resource planning and procurement

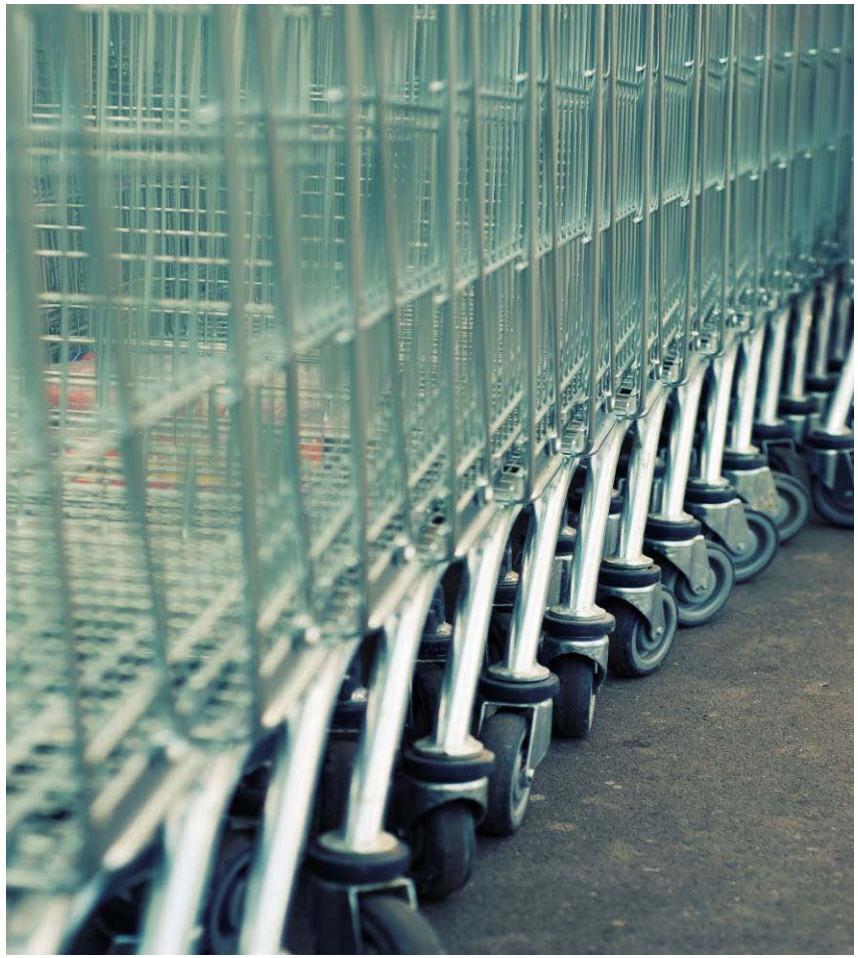
HMW INTERNATIONAL

Electricity Technology Development & Policy

Innovative Technologies	**Emerging Technologies**	**Mature technologies**
e.g. Ocean wave & tidal, some types solar & biomass	e.g. Solar, wind, geothermal, biomass	e.g. Hydroelectric
•Research & Development •Demonstration •Interconnection requirements & transmission rules •Public Education •Market & tax incentives •Tech Training	•Integrated energy planning •Market creation – Feed-in or Renewable Targets (RPS), Green Pricing, and Net Metering •Transmission access & construction •Tax & other incentive programs •Tariff & cost sharing •Job training	• Integrated energy planning •Appropriate tariffs •Transmission & interconnection •Public education •On-going policy support •Job Training

Types of RE Promotion Policies

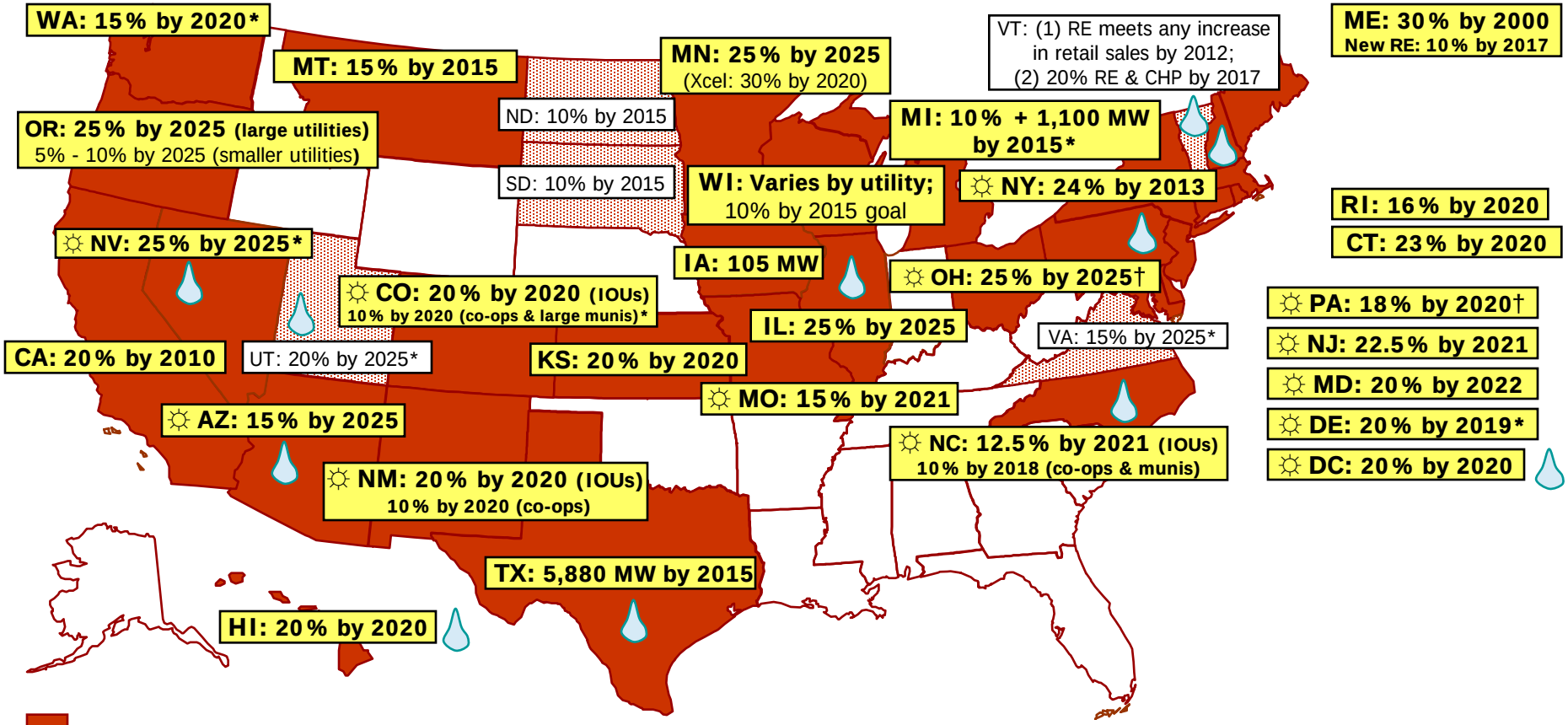
- Market Building Policies
  - Feed-in Tariffs (FIT)
  - Mandatory Targets (RPS/RES)
- Financial Incentives
  - Tax Policies
- Technology Specific Policies



HMW INTERNATIONAL

US State RPS Policies

www.dsireusa.org / June 2009



State renewable portfolio standard

State renewable portfolio goal

Solar water heating eligible

Minimum solar or customer-sited requirement

Extra credit for solar or customer-sited renewables

† Includes separate tier of non-renewable alternative resources

Financial Incentive Policies

Capital Subsidies

Grants

Rebates

Public Investment

Low-interest Loans

Loan Guarantees

Tax Credits

Tax Rebates

Tax Reductions

Accelerated Depreciation Allowance

HMW INTERNATIONAL

US Federal Incentive Policies: Summary

- Tax incentives
  - Production tax credit (10 years, 2.1 cents/kWh)
  - Investment tax credit (30%)
  - Accelerated depreciation (5 years)
- Loan guarantees and zero-interest loans
- Research and development funding

HMW INTERNATIONAL

Federal Incentive Policy (cont.)

- Economic stimulus bills
  - Extension of tax incentives
  - Temporary conversion of tax incentives to cash grants
  - New financing options (e.g., loan guarantees)
- Federal RPS and federal climate legislation under consideration

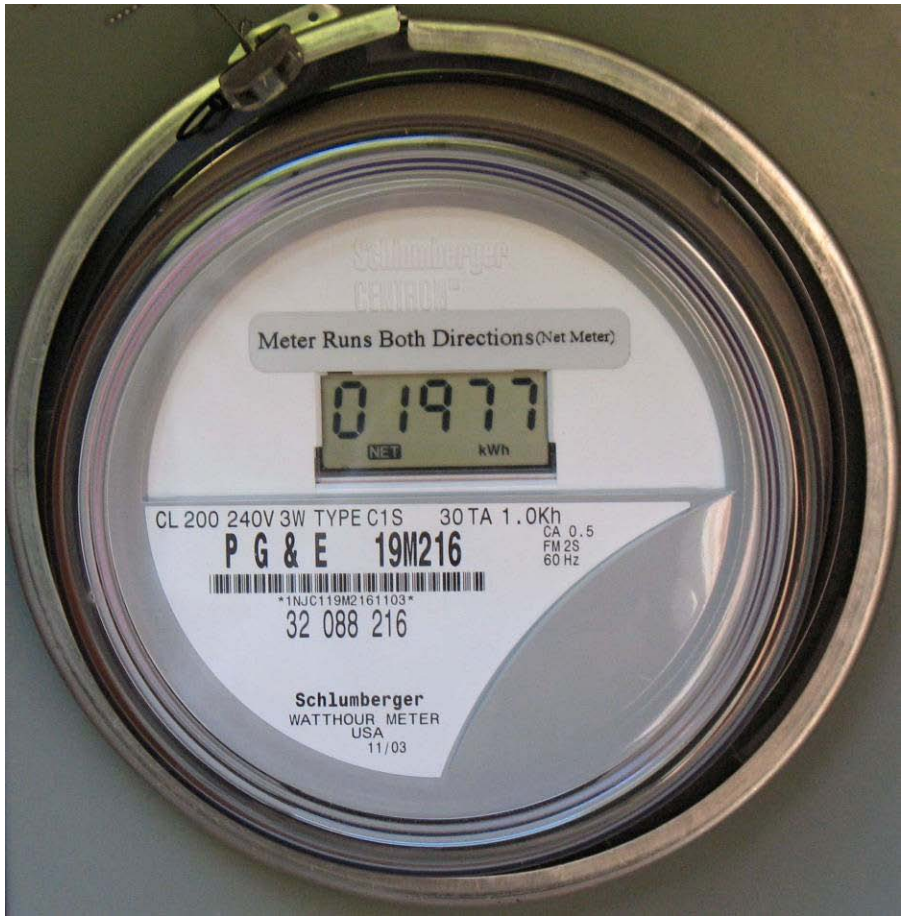
HMW INTERNATIONAL

US State Incentive Policies

- Primary Market Policies
  - Renewables portfolio standards (29 states + DC)
  - RE funds / rebate programs for distributed gen.
- Other Popular State Policies
  - Feed-in tariffs
  - State tax incentives
  - Integrated resource planning
  - Net metering
  - Carbon regulation and carbon taxes

HMW INTERNATIONAL

Technology Specific Policy: Net Metering

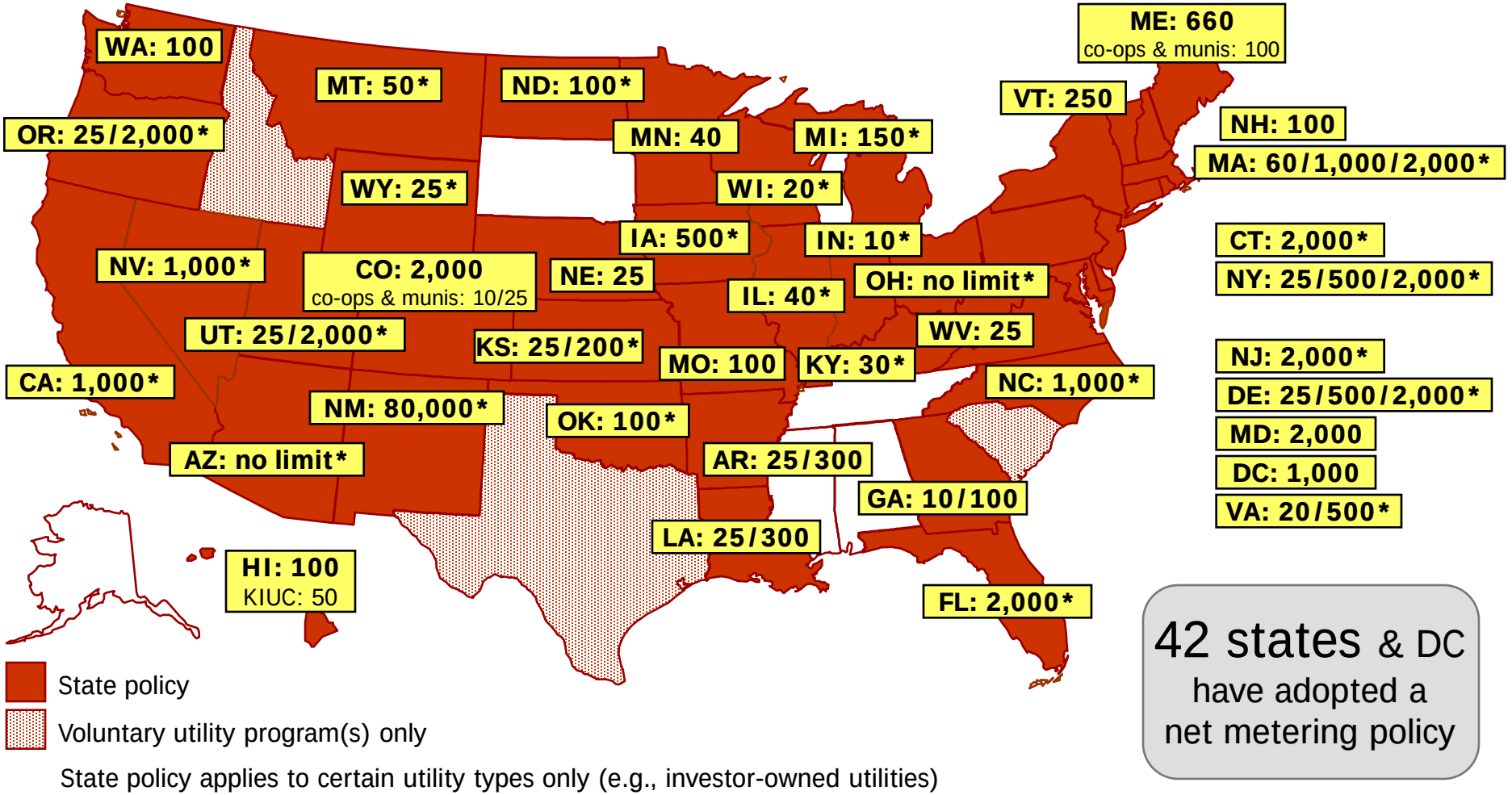


- A policy for on-site resources
- May be applied to commercial/industrial
- Most commonly used for PV but can apply to other RE technologies as well
- Benefits utility & customers

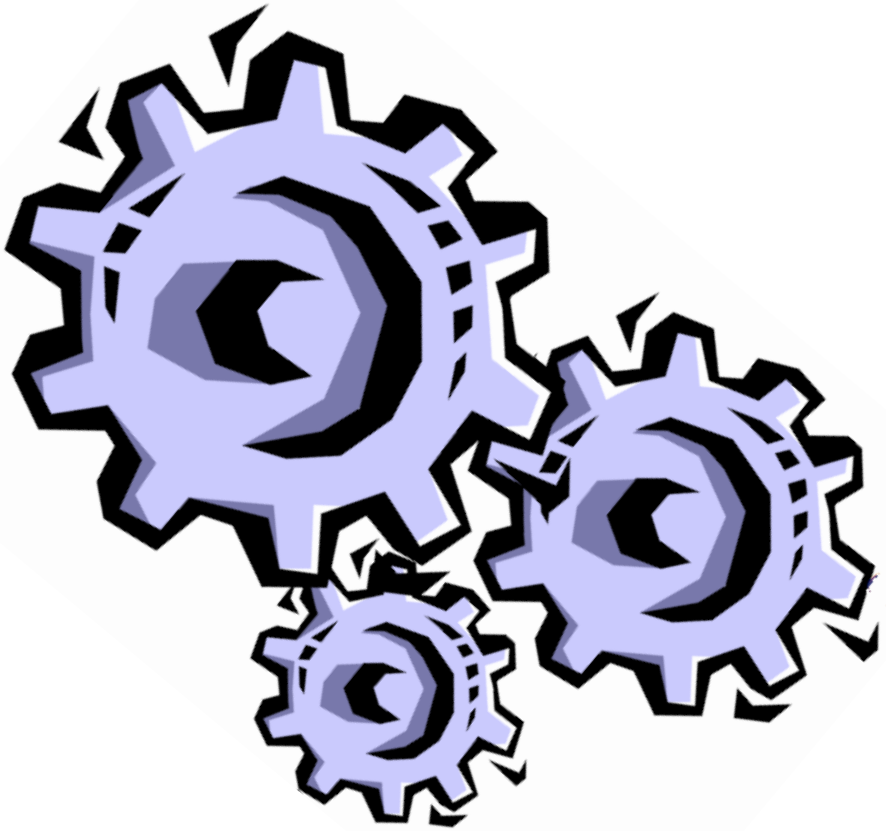
HMW INTERNATIONAL

US State Net Metering Tariffs

www.dsireusa.org / June 2009



Other Important RE Policies

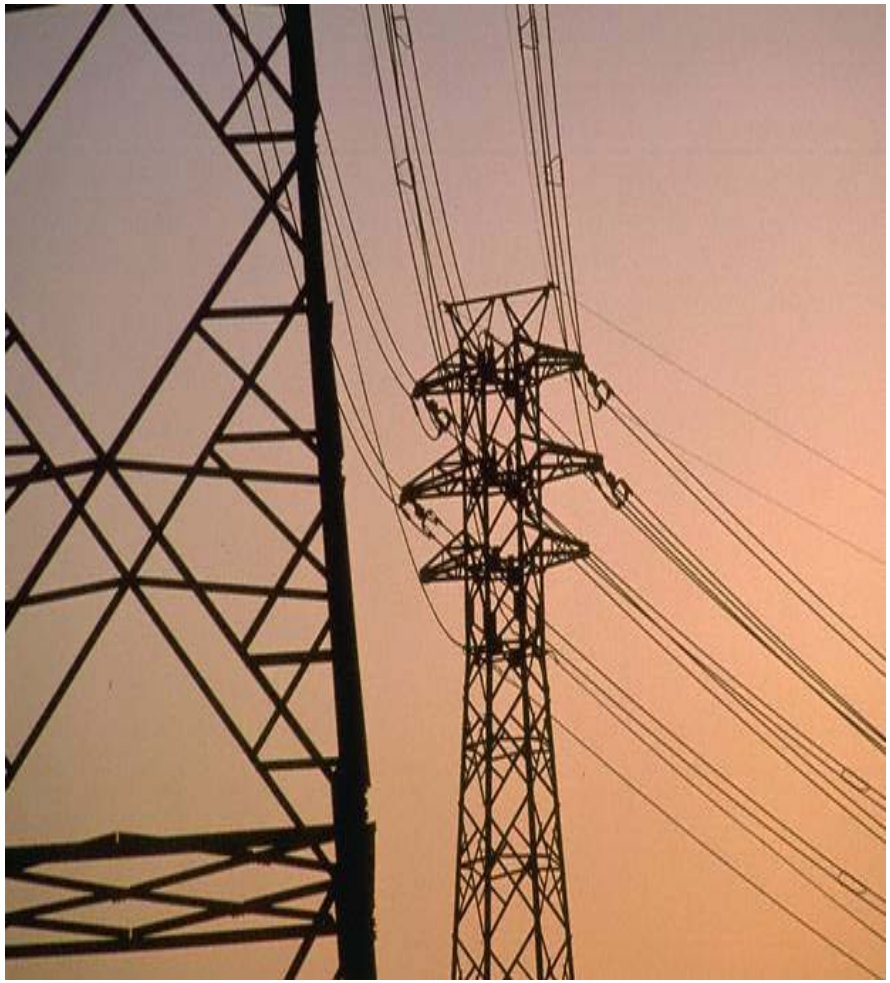


- Regulatory Policies
  - Resource Planning
  - Resource Procurement
  - Power Purchase Agreements
  - Greenhouse gas reduction
- Transmission Policies

HMW INTERNATIONAL

Transmission Issues

- Sufficiency
- Rules for access
- Cost allocation
- Grid Integration



HMW INTERNATIONAL

Contact:

Dr. Jan Hamrin, CEO

HMW International, Inc.

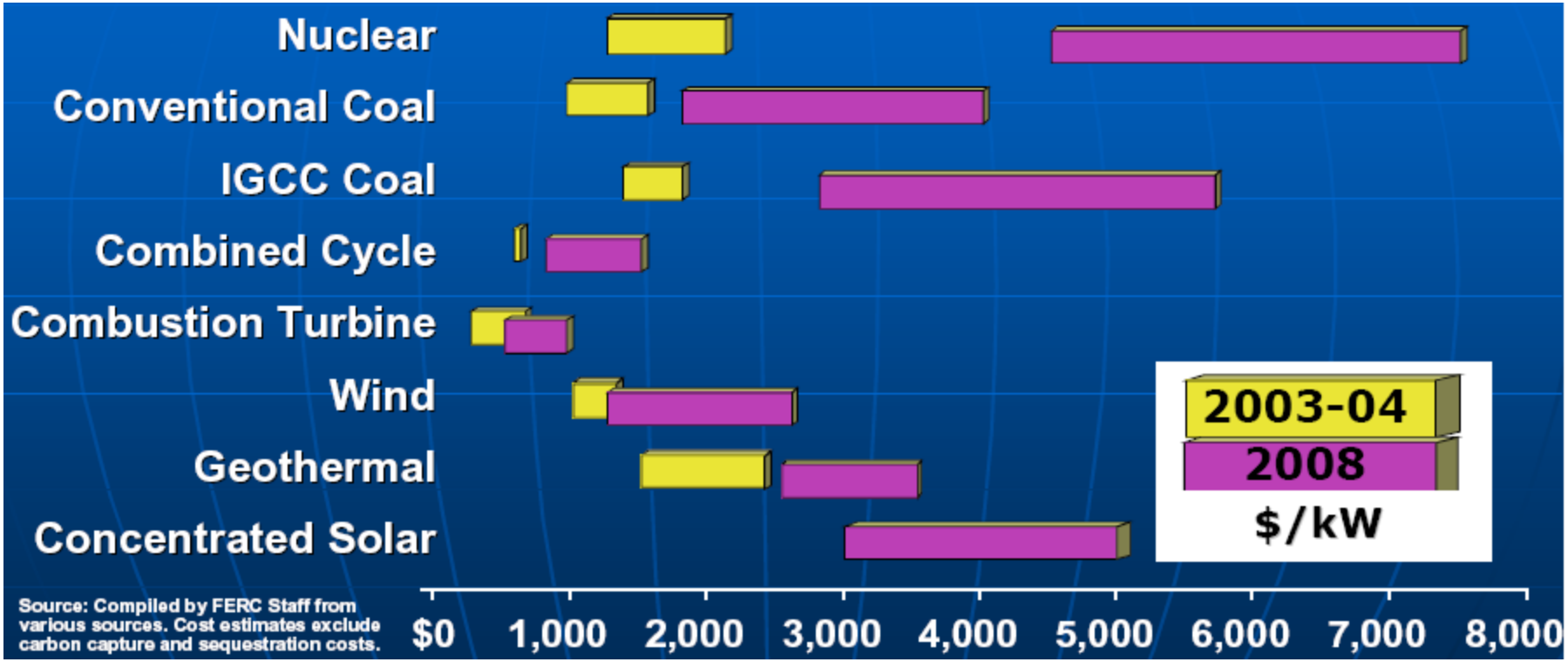
131 Camino Alto, Suite D

Mill Valley, CA 94941

Ph: 415/388-1352

JanHamrin@HMWInternational.com

Estimated Cost of New Generation



Source: FERC -- 6.08

HMW INTERNATIONAL

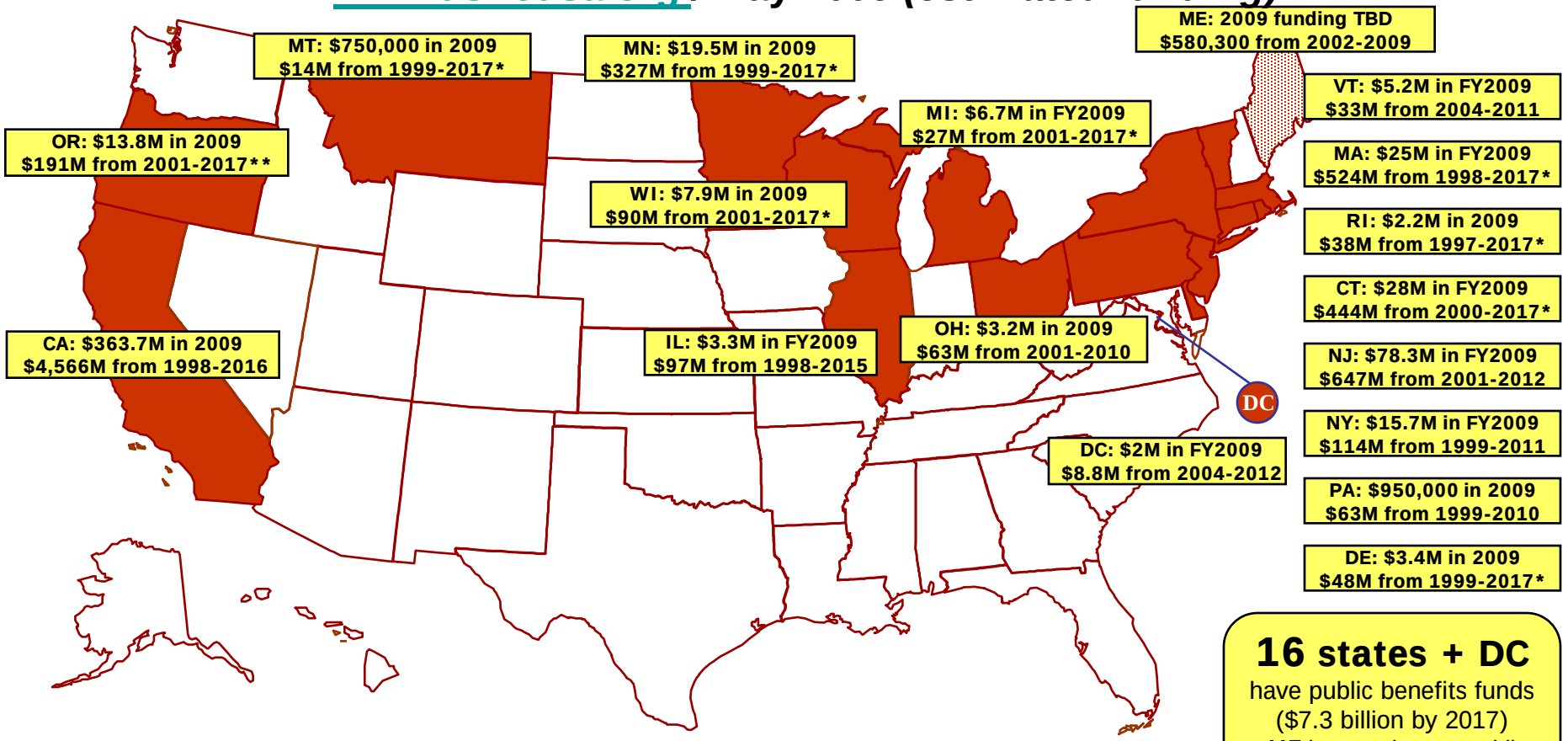
Levelized Renewable Energy Costs

	Levelized Energy Cost Range – 2009 (U.S. ¢/kWh)
Hydroelectric	1.8 ¢/kWh to 9 ¢/kWh
Wind	3 ¢/kWh to 6 ¢/kWh
Biomass	3.7 ¢/kWh to 6.6 ¢/kWh
Geothermal	5 ¢/kWh to 10 ¢/kWh
Solar	10 ¢/kWh to 20 ¢/kWh

* Represents commercially available technology applications

US State Public Benefit Funds

www.dsireusa.org / May 2009 *(estimated funding)*



16 states + DC
have public benefits funds
($7.3 billion by 2017)
***ME** has a voluntary public benefits fund*

State PBF

State PBF supported by voluntary contributions

* Fund does not have a specified expiration date

** The Oregon Energy Trust is scheduled to expire in 2025

Policies to Promote Local Industry Development

- Policies to support local industry development
  - * Local content requirements
  - * Preference or incentives for local content
  - * Favorable customs duties
  - Industry tax incentives
  - Export credit assistance
  - Certification and testing programs
  - Research, development and demonstration programs

* Some of these approaches may not be consistent with WTO and international trade agreements

Supportive Policies and Programs

- Research, Development & Demonstration
- Public Awareness & Information
- Capacity Building
- Technical Training
- Resource Maps
- Land-use Planning & Reform

HMW INTERNATIONAL