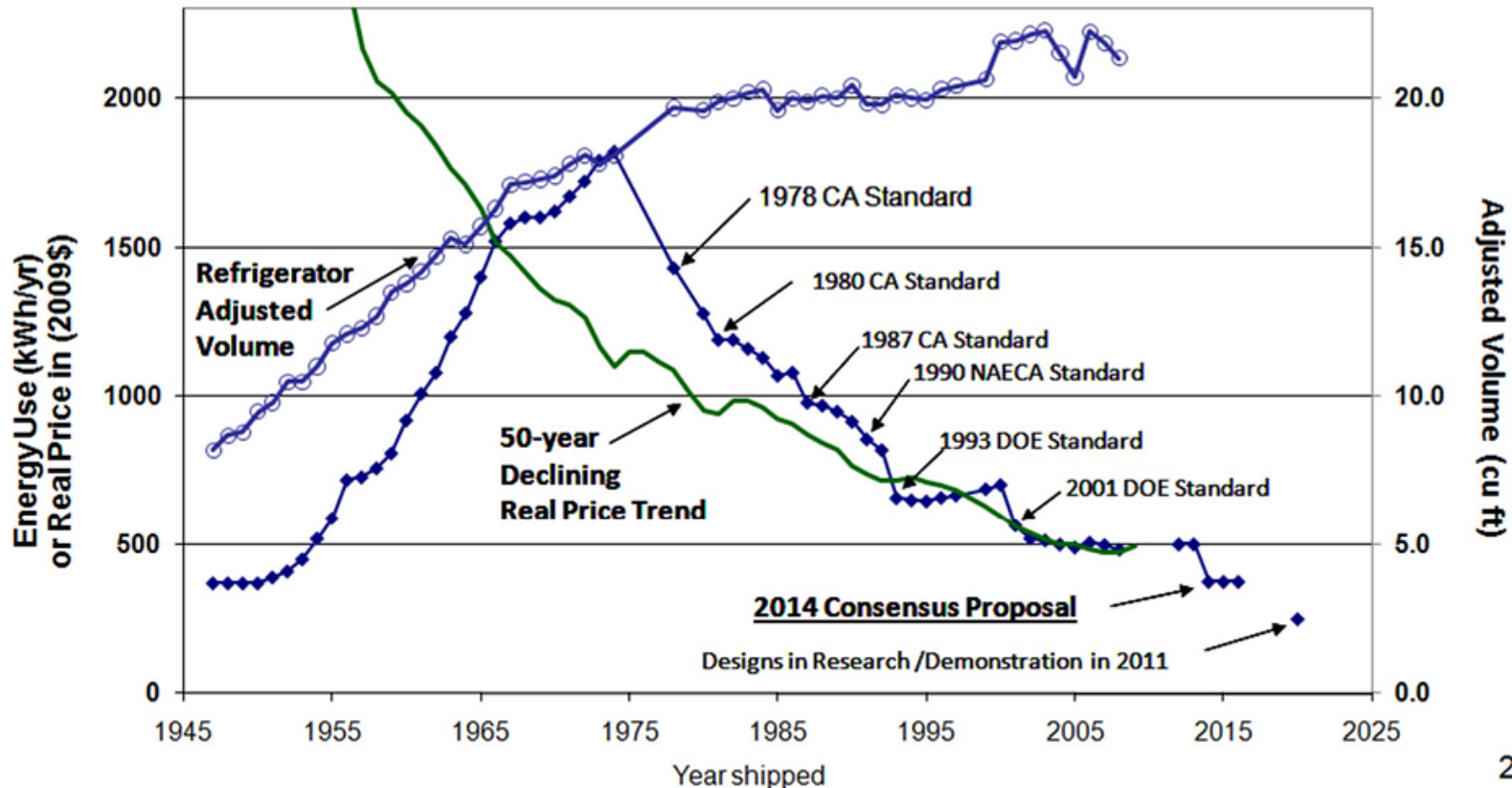


Refrigerator Performance

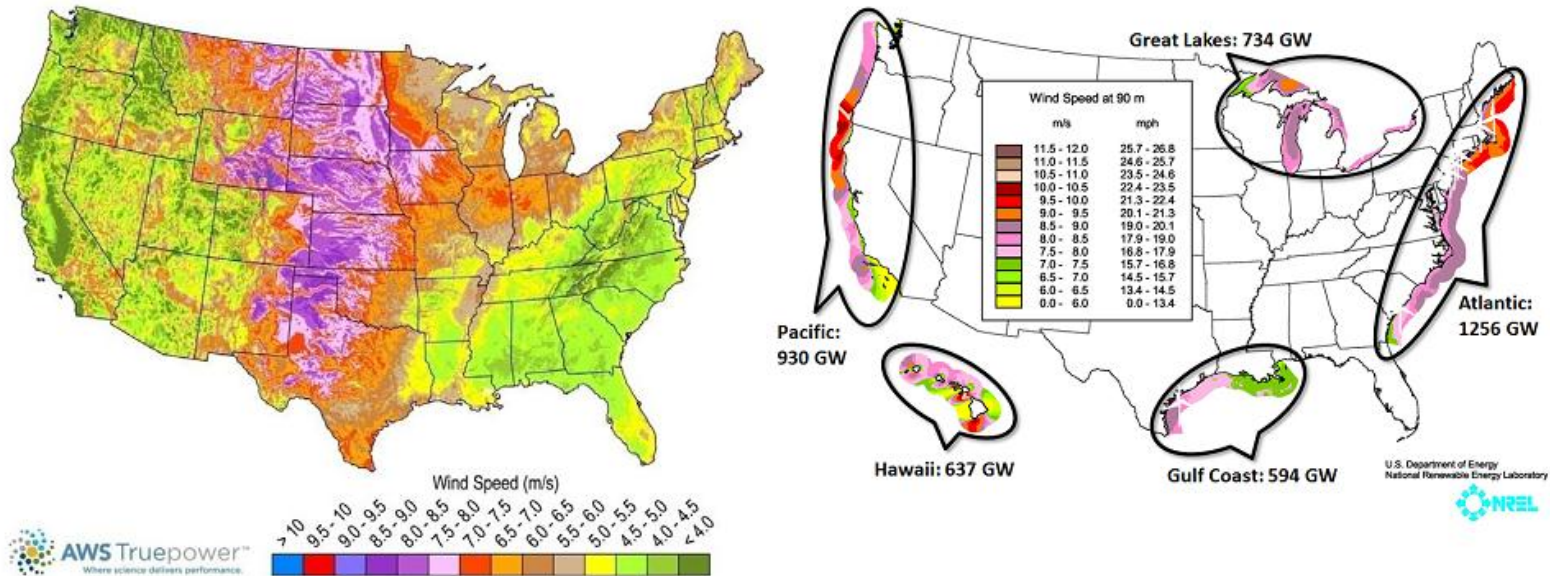
Savings: $\sim 1400 \text{ kWh/year} * \$0.10/\text{kWh} = \$140/\text{yr}$ per household
 $* 100 \text{ M households} = \14 B/year

Annual Energy Use, Volume and Real Price of New Refrigerators

Sources: AHAM Factbooks, Rosenfeld 1999 and Bureau of Labor Statistics



Wind Resources



- Highest quality wind resources are located in the Central states and offshore
- Fixed-bottom offshore wind resources also considered in RE Futures modeling
- Floating-platform offshore wind not considered in RE Futures modeling (focus on currently commercial technologies only)
- Combined onshore and offshore (fixed-bottom) resource is ~10,000 GW

Wind Power

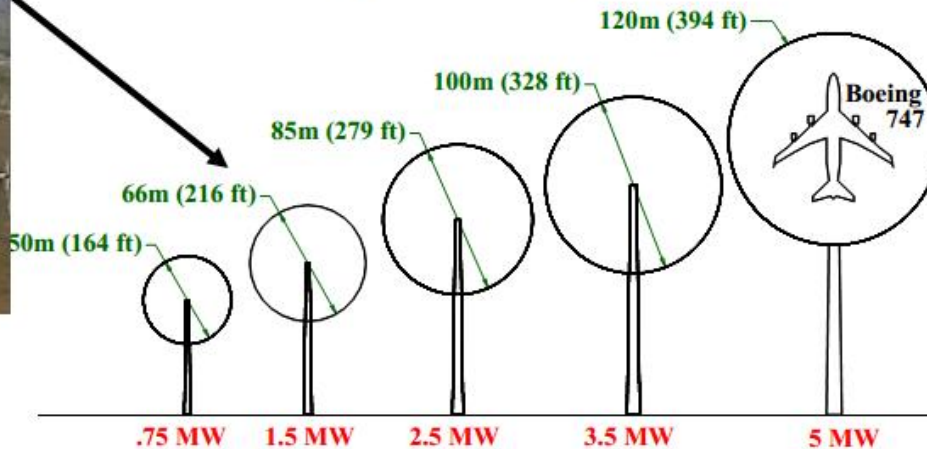


GE Wind 1.5 MW



- **"20% Wind Energy by 2030", 2008**
 - http://www1.eere.energy.gov/wind/wind_energy_report.html
- **"Eastern Wind Integration and Transmission Study", 2010**
 - http://www.nrel.gov/electricity/transmission/eastern_renewable.html
- **"Western Wind and Solar Integration Study", 2010**
 - http://www.nrel.gov/electricity/transmission/western_wind.html
- **Hawaii Renewable Integration and Transmission Study**
 - http://www.nrel.gov/electricity/transmission/oahu_wind.html

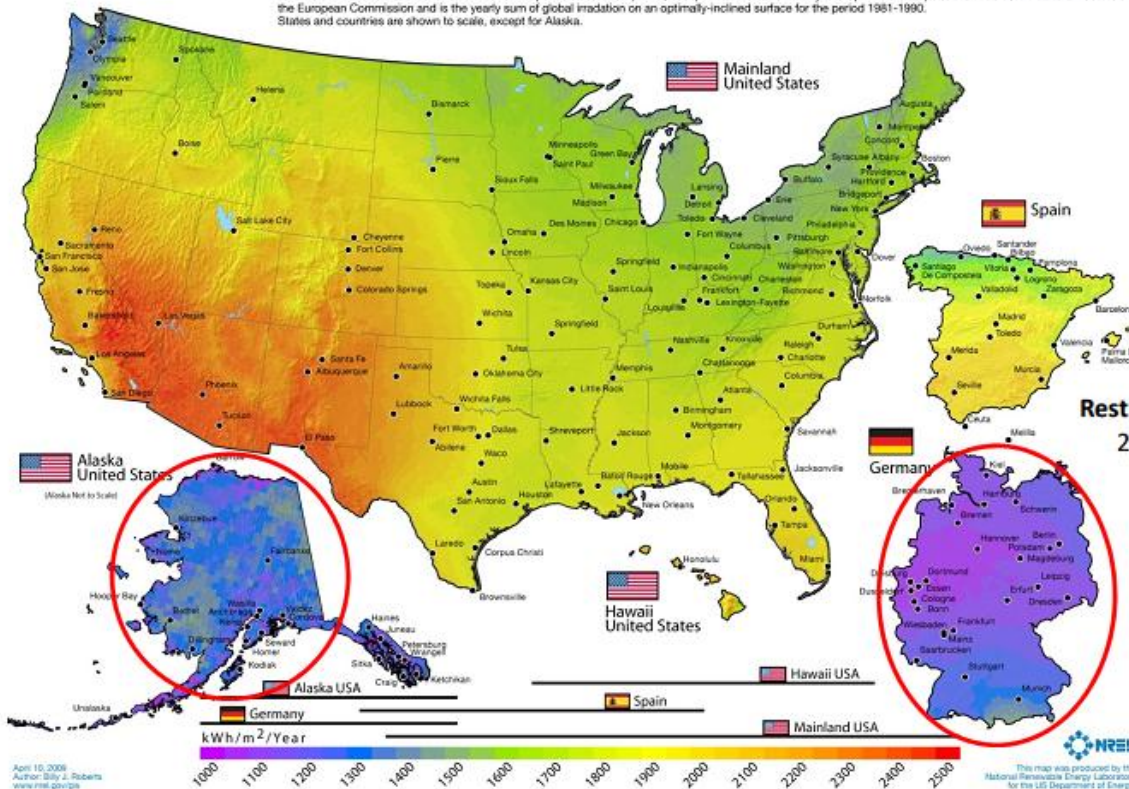
Typical Rotor Diameters



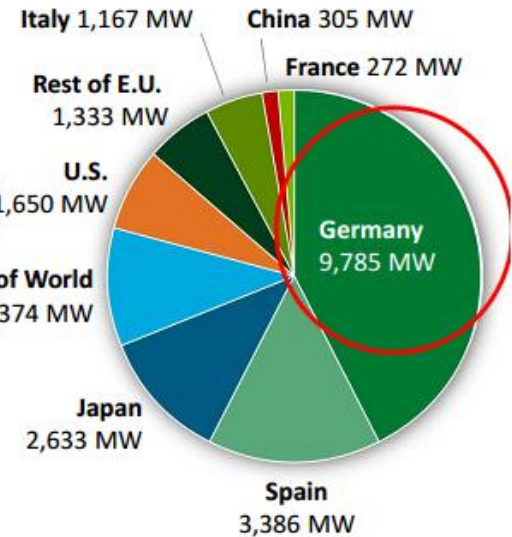
Can Solar Energy Meet the Challenge?

Photovoltaic Solar Resource: United States - Spain - Germany

Annual average solar resource data are for a solar collector oriented toward the south at a tilt = local latitude. The data for Hawaii and the 48 contiguous states are derived from a model developed at SUNY/Albany using geostationary weather satellite data for the period 1998-2005. The data for Alaska are derived from a 40-km satellite and surface cloud cover database for the period 1985-1991 (NREL, 2003). The data for Germany and Spain were acquired from the Joint Research Centre of the European Commission and is the yearly sum of global irradiation on an optimally-inclined surface for the period 1981-1990. States and countries are shown to scale, except for Alaska.



Cumulative Installed PV (through 2009)



Source: EERE/SETP, Goldstein

- Solar technologies have enormous resource potential: ~80,000 GW for utility PV, ~700 GW for rooftop PV, and ~37,000 GW for CSP