Renewable Energy Market Trends

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Renewable Energy

- Market drivers for renewable energy
- Solar energy
  - Photovoltaic (PV)
  - Concentrated Solar Power (CSP)
- Wind energy
- Biomass energy

Renewable Energy Project Drivers

- Renewable resource availability
- Environmentally-acceptable (approval/permits)
- Financially-viable

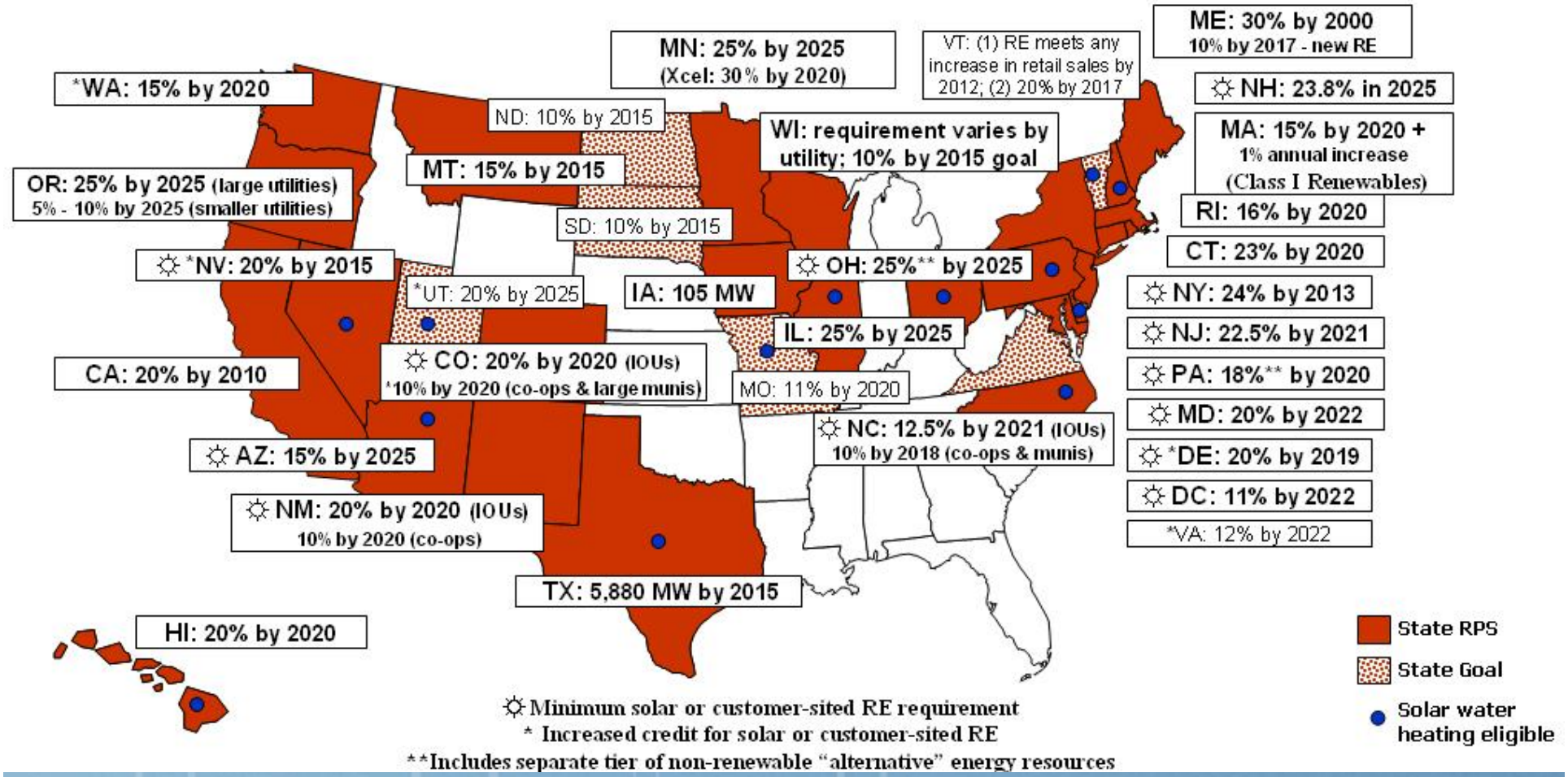
Top 10 Renewable Energy Market Drivers

- 2008 Election
- State RPS
- Economic downturn
- ITC and PTC, accelerated depreciation
- Energy prices
- Technology cost structure
- Project funding
- Carbon tax
- Hurdle rate of return for project acceptance
- Transmission Constraints

2008 Election

- The Obama-Biden comprehensive New Energy for America plan will:
  - Invest $150 billion over a decade in clean energy (wind, solar, and next generation biofuels), providing 5 million new jobs
  - Ensure that 10 percent of the nation's electricity comes from renewable sources by 2012 and 25 percent by 2025
  - Implement an economy-wide cap-and-trade program to reduce greenhouse gas emissions 80 percent by 2050

Renewable Portfolio Standards



Economic Downturn

- Lower energy usage
- Increased energy efficiency
- Absolute Renewable Portfolio Standards (RPS) targets in megawatt-hour (MWh) will be lowered as a result
- Reduction in size, number, and/or timing of RE projects could result
- Prices for several components have peaked

ITC and PTC

- 2008 Congressional action
  - 8-year extension of 30% solar investment tax credit (ITC)
  - Utilities can benefit from the ITC
  - Authorized $0.8 billion for clean energy bonds
- 2009 Congressional action - ARRA
  - 3-year extension wind production tax credit (PTC), 12/31/12
  - RE projects claim ITC or PTC
  - Additional $1.6 billion for clean energy bonds
- Accelerated depreciation over 6 years key revenue stream to RE projects

Energy Prices

- Fossil fuels increasingly more costly and volatile
  - DOE estimates 2009 average electricity price increase for U.S. as 9.9%, on top of increases of 24% since 2003
  - American Electric Power has asked to raise rates 45% for Ohio customers over the next three years, while the Tennessee Valley Authority has raised electricity rates 20%, its largest increase in 30 years
- RE projects seen as a price hedge against energy price hikes and carbon tax costs
- Energy convergence is coming, date unknown

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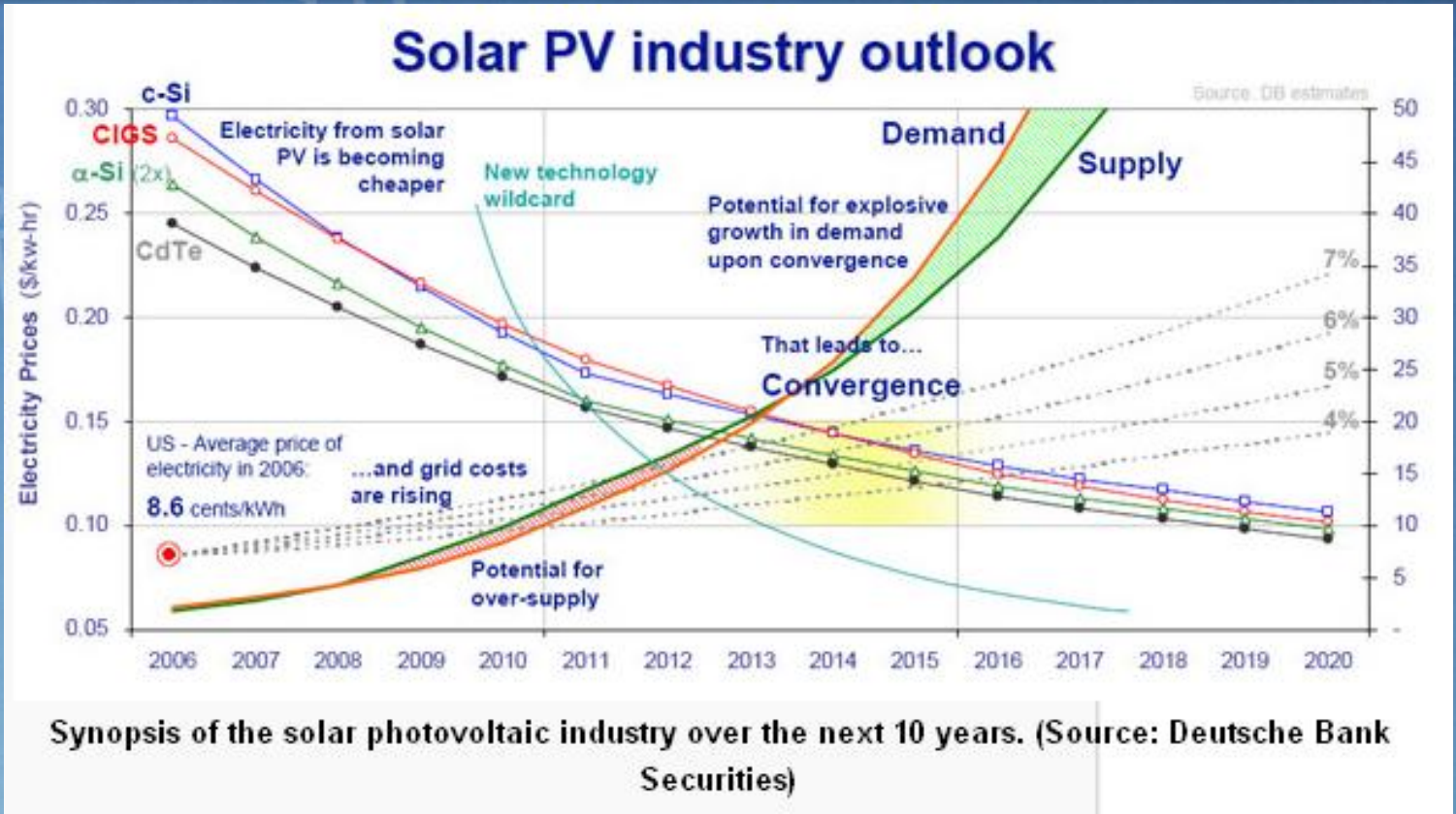
PV Price Convergence



Synopsis of the solar photovoltaic industry over the next 10 years. (Source: Deutsche Bank Securities)

Increasing price for fossil fuel generation (lower left) will meet declining cost for renewables (upper left)

Technology Cost Structure

- PV prices are declining with increased polysilicon supply into 2012
- Increased use of multiple light frequencies to generate additional energy per PV area will lower price/kWh
- Wind project capital cost in 2008 driven by:
  - High U.S. demand
  - Rising steel prices for turbine structures
  - Import of key components coupled with unfavorable exchange rate

Project Funding

- Capital markets constrained due to current financial crisis
- Lack of funding could adversely affect project development and implementation
- Inflation's impact could increase lending rates, thus reducing rate of return
- 2 MW PV - $12-14 M
- 150 MW wind - $300 M
- 250 MW CSP - $750 M - $1 B

Carbon Tax

- Carbon limits are coming – will partially or totally close the cost gap between RE and fossil fuel generation
- 88% of utilities surveyed recently feel carbon legislation at national level will occur in the 2012-2016 time frame
- Will be utility pass-through, increasing energy costs

Hurdle Rate - Project Acceptance

- RE developers looking for 5-6 year payback
- Coincides with end of federal accelerated depreciation benefits in project year 6
- Revenue stream for RE project developers:
  - Sale of energy
  - PTC or ITC from federal government
  - Sale of renewable energy credits to utilities
  - Accelerated depreciation (tax write-off)

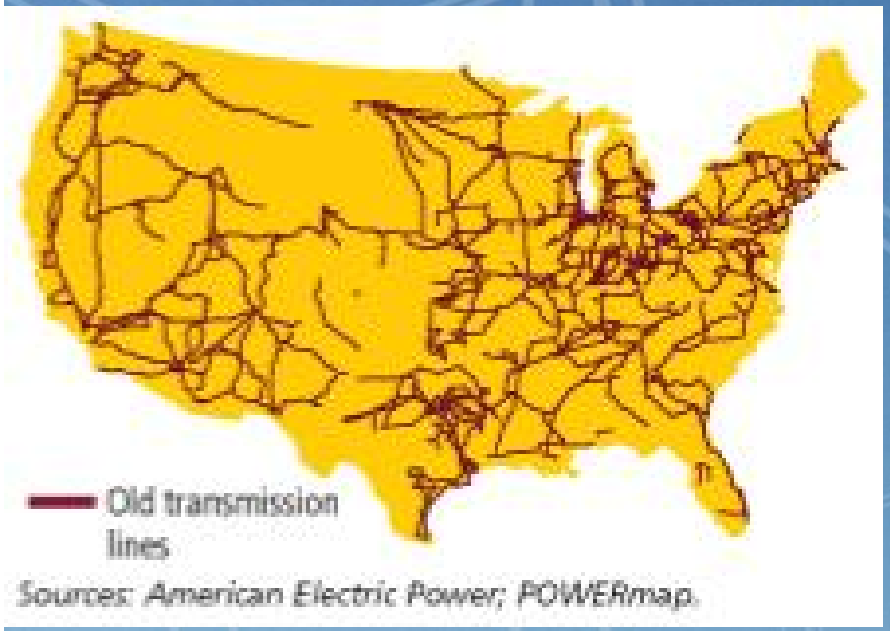
Transmission Constraints

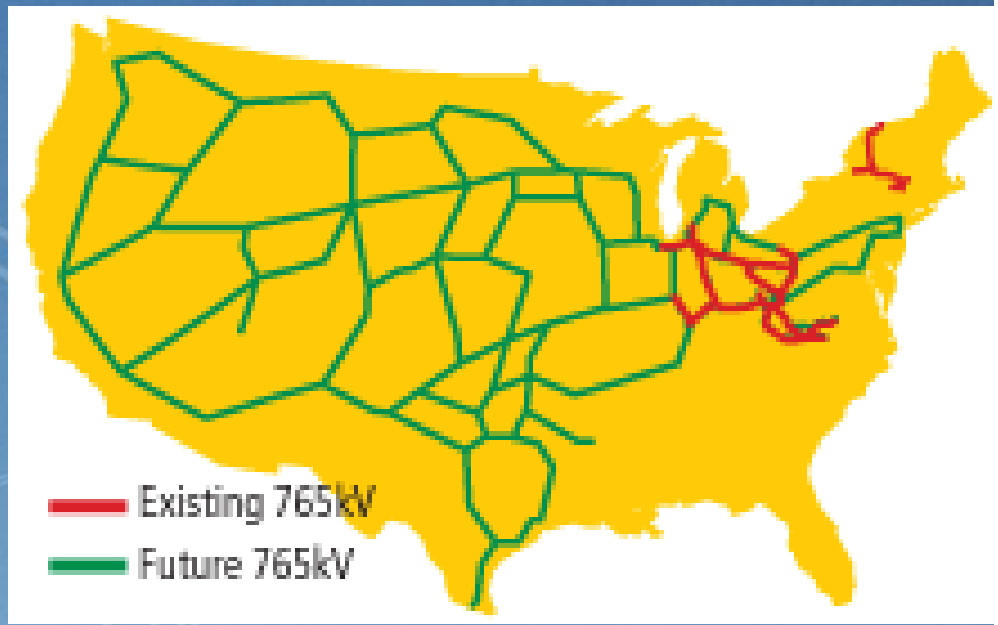
- According to North American Reliability Council (NERC), new generation supplies are forecast to outpace transmission development, constraining wind development especially with a planned 145,000 megawatts of capacity over the next 10 years
- Generation growth over 10 years: 21%
- Transmission line growth over 10 years: 10% with 1,700 circuit miles

Transmission Solutions

- Texas approved a $4.9 billion transmission system upgrade moving power from West Texas to major population centers in 4 years. Capable of transmitting 18,500 MW of wind power. Cost: $4/month/retail customer
- National upsurge in transmission investment ($8 billion per year) due to Congressional action to increase transmission project allowed rate of return

High-Voltage Transmission Needs In The Future

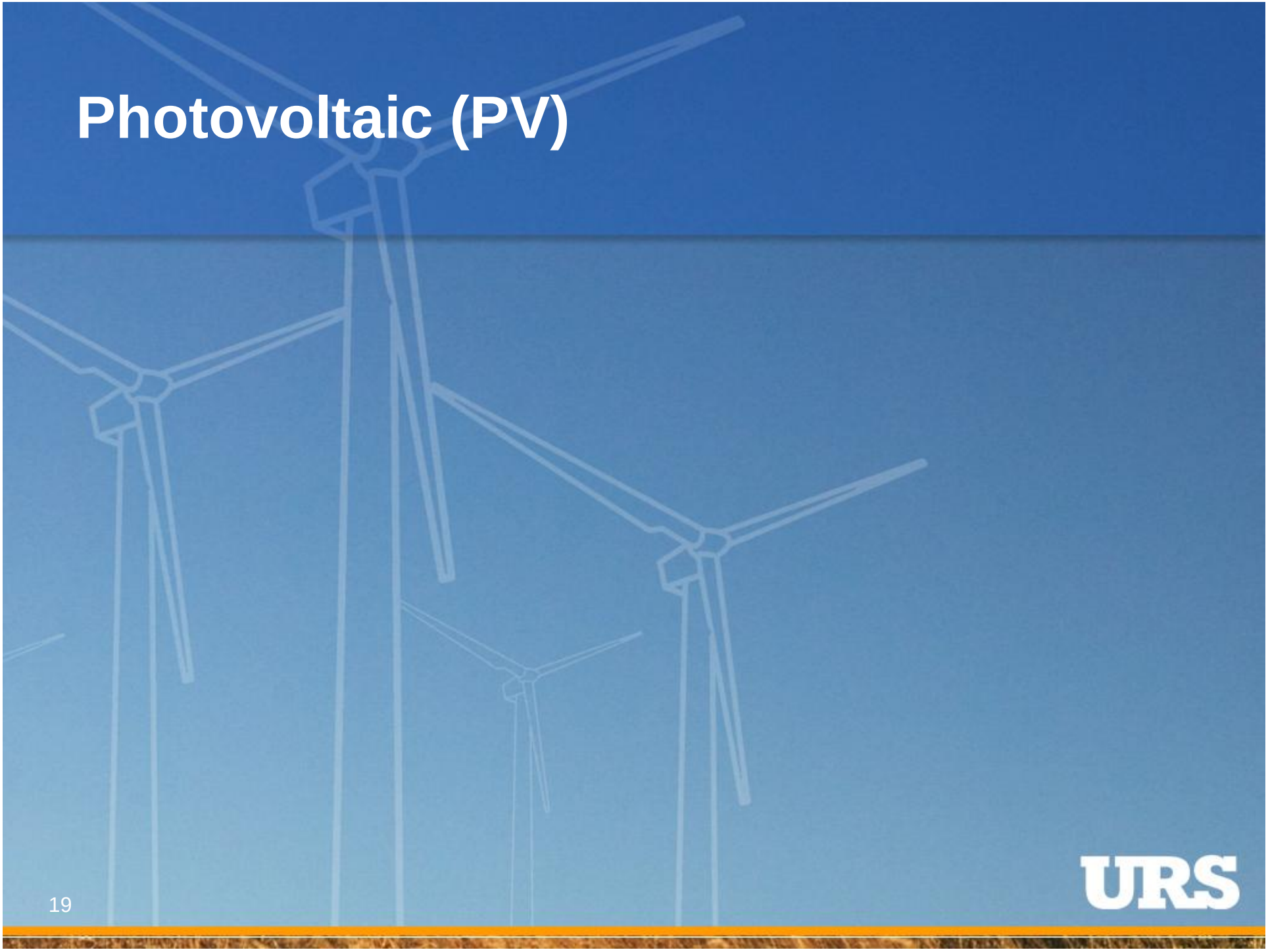




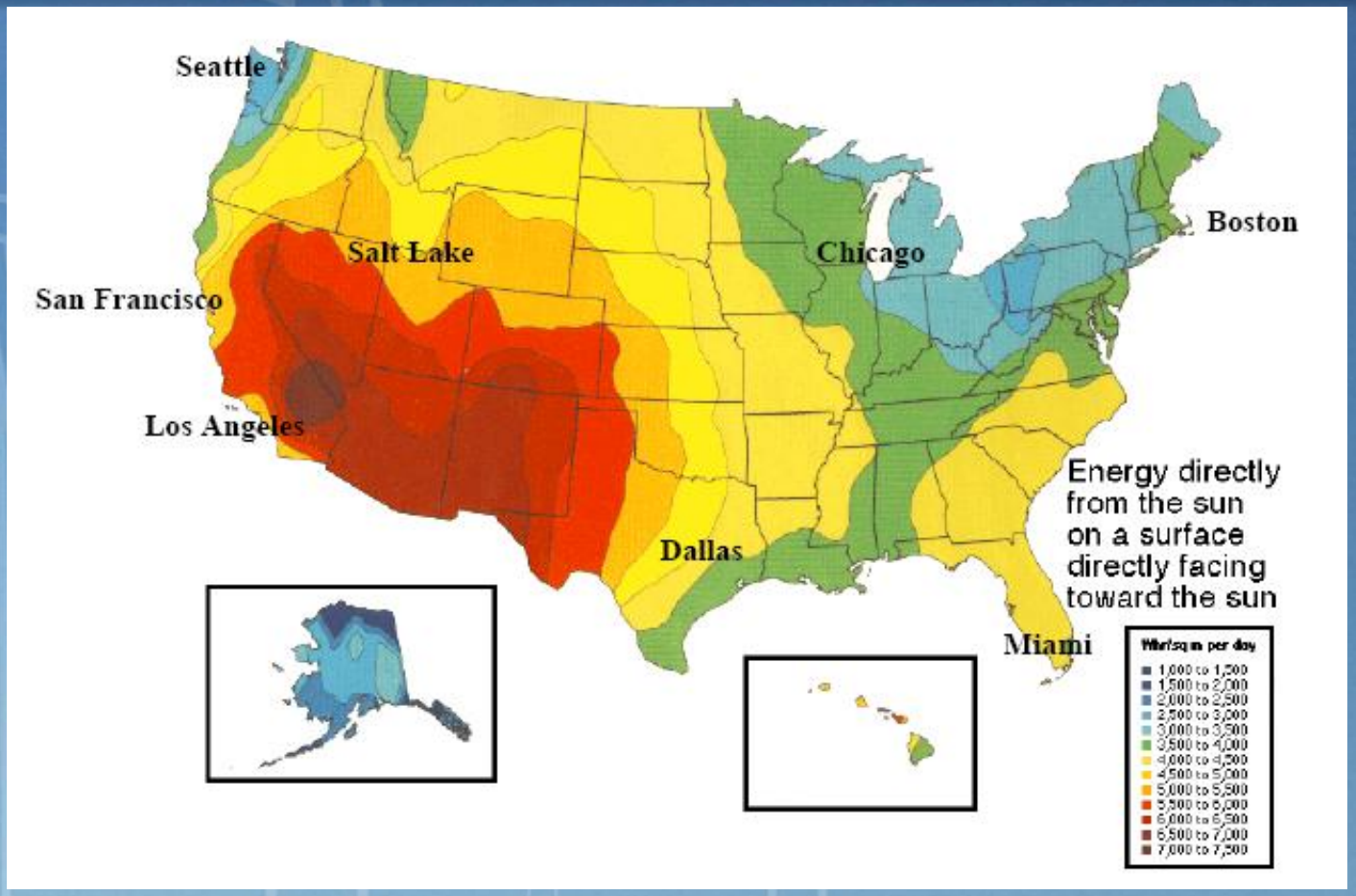
More high-voltage transmission lines needed to harness renewable resources in West

Solar Energy

Photovoltaic (PV)



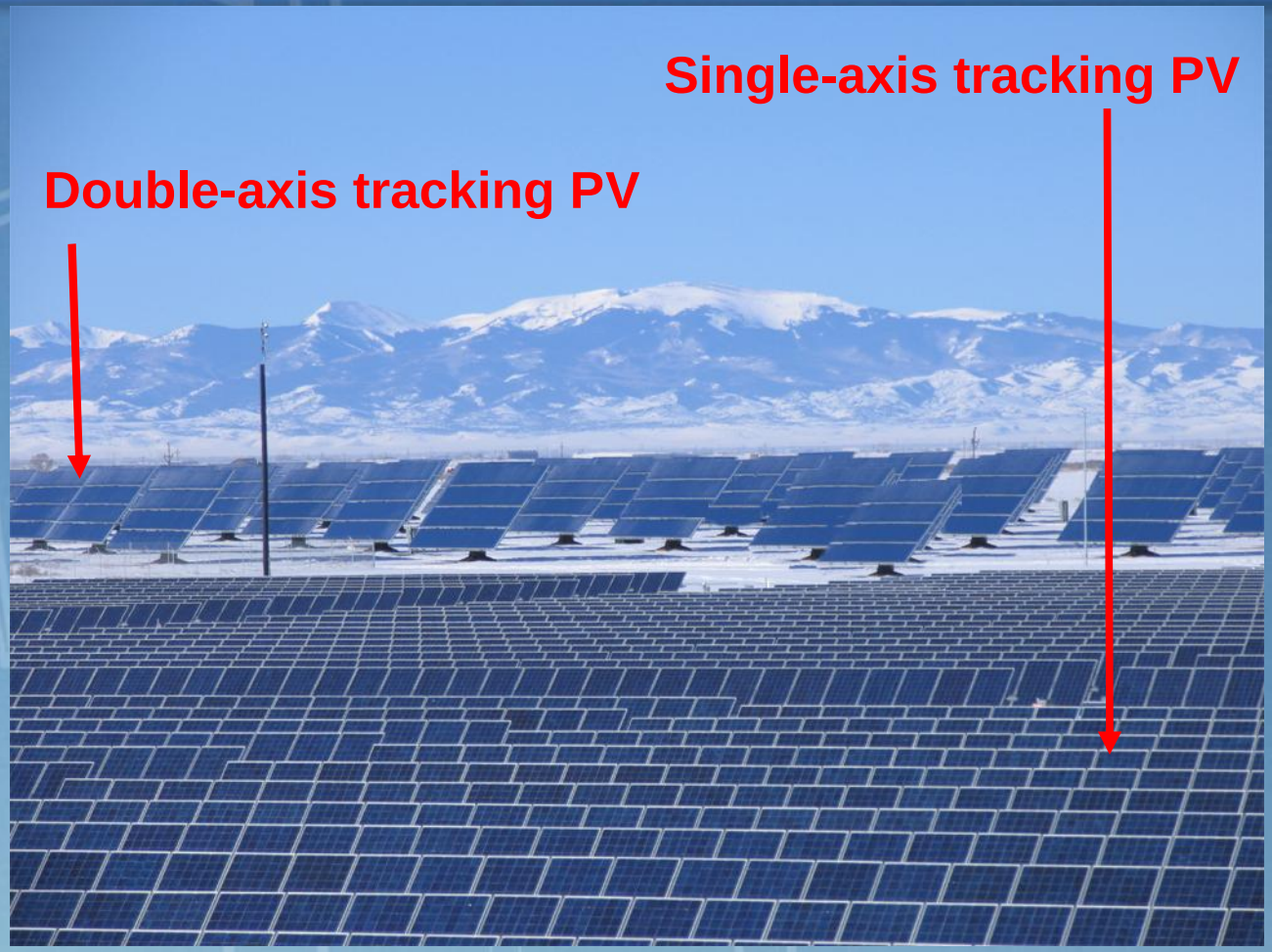
U.S. Solar Resources



PV Data

- 1 megawatt (MW) per 10 acres
- Installed price $6M – 8M/ MW
- 1 MW of PV capacity produces 1,500-2,100 megawatt-hour (MWh) per year in energy
- 1 MW PV provide average annual energy for 200-280 Colorado homes

Alamosa, Colorado 8.2 MW PV Plant



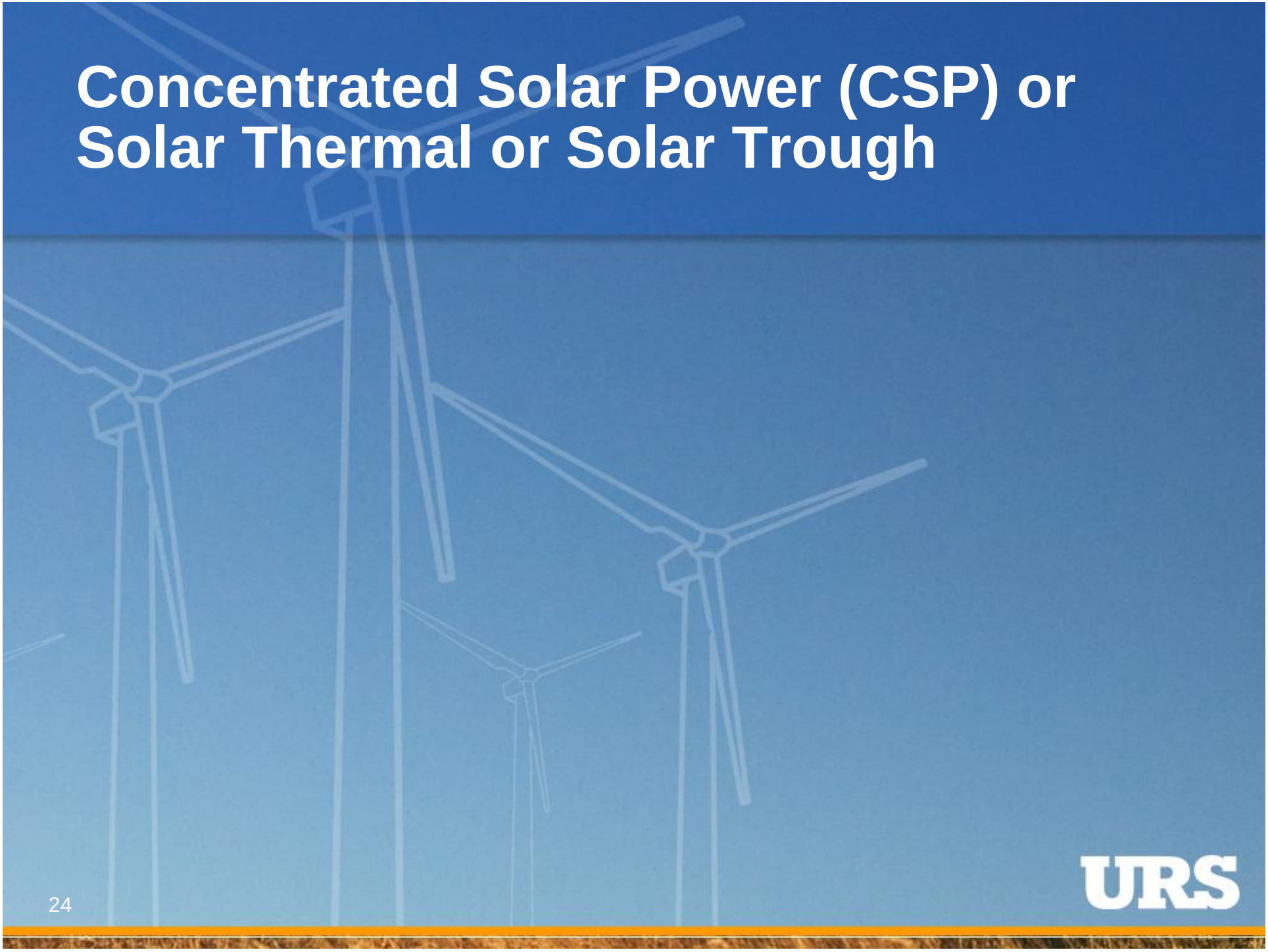
PV Project Size Increasing

Installation	Capacity	Installation Type	Location
Shenzhen International Floral Exhibition Buildings	1 MW	Built-in PV	Shenzhen, China
Alvarado Water Treatment Plant	1.1 MW	Rooftop	San Diego, California
Sierra Nevada Brewing	1.4 MW	Rooftop	Chico, California
Google	1.6 MW	Rooftop	Mountain View, California
Fort Carson	2 MW	Ground Mounted	Fort Carson, Colorado
Hall's Warehouse Corporation (SunEdison)	2 MW	Rooftop	South Plainfield, New Jersey
Springerville Generating Station	4.6 MW	Ground Mounted	Tucson, Arizona
Sharp Plant, Kaneyama	5.2 MW	Built-in PV	Kameyama, Japan
Alamosa Photvoltaic Solar Plant (SunEdison)	8.2 MW	Ground Mounted	San Luis Valley Alamosa, Colorado
Serpa PV Power Plant	11 MW	Ground Mounted	Serpa, Portugal
Nellis Airforce Base	14 MW	Ground Mounted	N. Las Vegas, Nevada
Solarpark "Waldpolenz"	14.7 MW	Ground Mounted	Brandis, Germany
Solarpark Beneixama	20 MW	Ground Mounted	Alicante, Spain
Hoya de Los Vincentes	23 MW	Ground Mounted	Murcia, Spain

Source: Clean Edge research including review of company press releases and public web sites.

3 large Colorado PV projects - Denver International Airport 2 MW ground-mounted PV, August, 2008

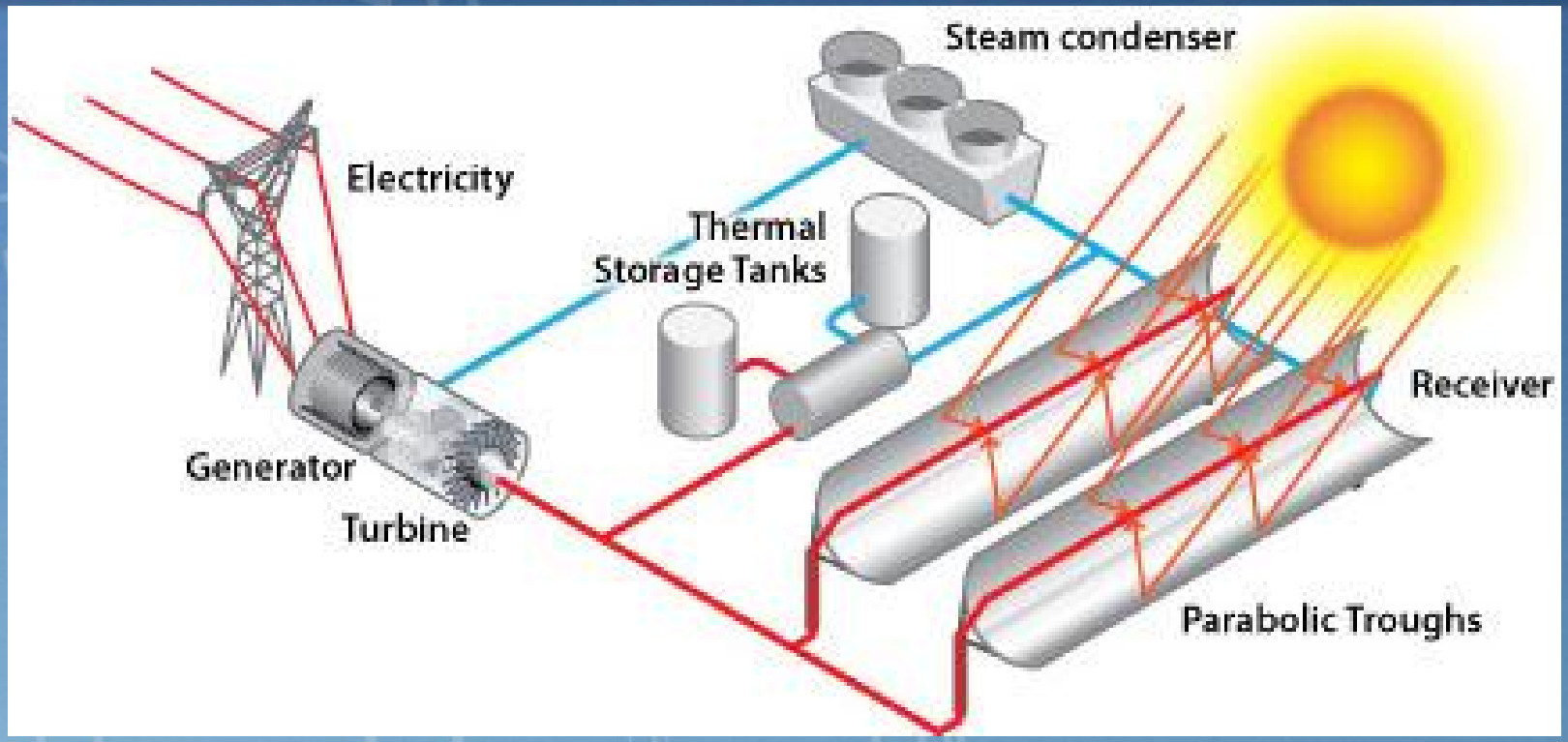
Concentrated Solar Power (CSP) or Solar Thermal or Solar Trough



CSP Data

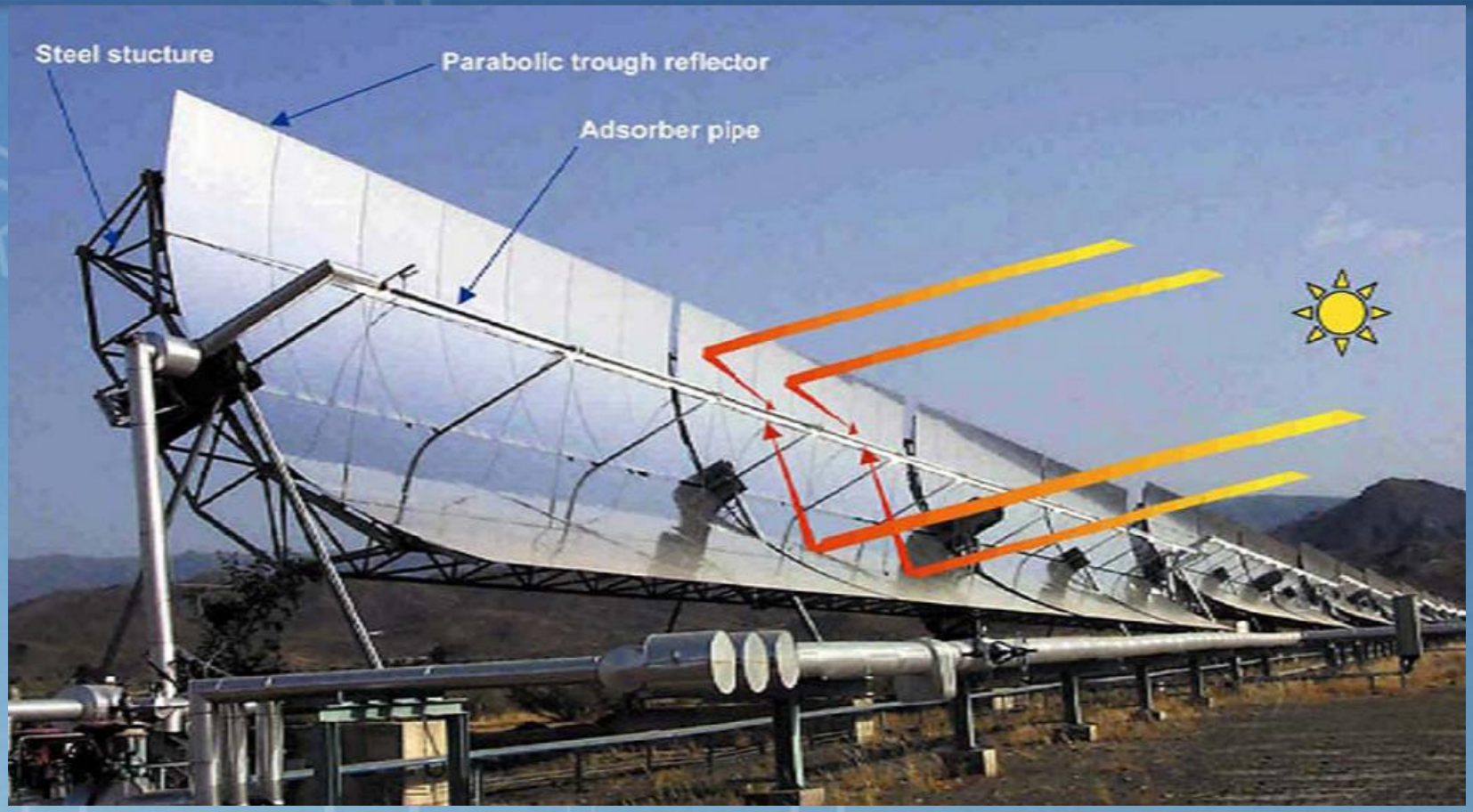
- 250 MW per 1,600 acres (1 MW per 6.5 acres)
- 250 MW with 3-hour storage per 2,000 acres
- Installed price $3.75M to $4.0M per MW
- 1 MW of CSP capacity produces 3,200 MWh per year in energy
- 1 MW CSP provide average annual energy for 425 Colorado homes

CSP Process Flow



Similar to conventional generation plants, except solar provides heat to make steam for turbine generator

CSP Collector Components



Absorber pipe receives heat from parabolic reflector, heating synthetic oil to 700-800 degrees F.

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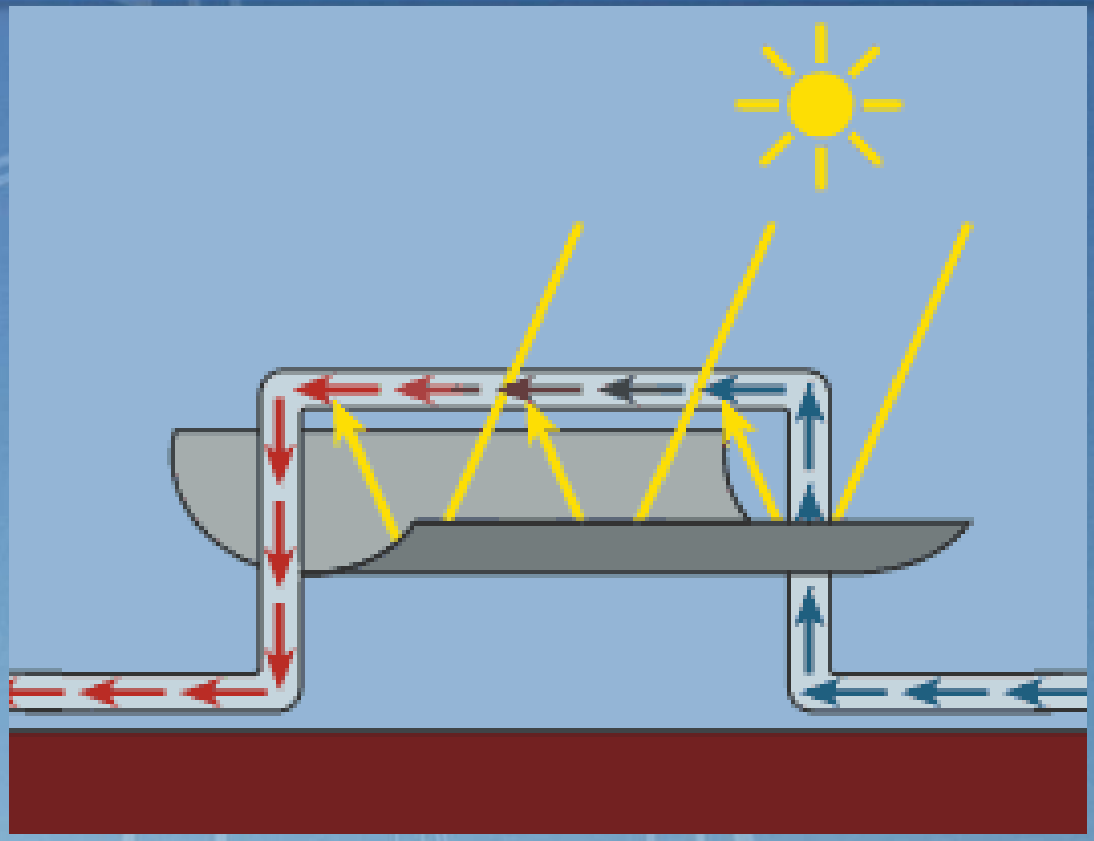
Solar Collector Operation



Synthetic oil is circulated through solar collector to make steam for turbine generator

Nevada Solar One

64 MW Trough plant built for Nevada Power in Boulder City, NV

CSP Growth Projection

Year	Annual CSP Installation (MW)	U.S. Cumulative CSP Installed (MW)	Annual CSP Electricity Production at Capacity (MWh)	CSP Share of Total U.S. Electricity Generation
2007	64	419	921,800	0.02%
2010	168	783	1,722,600	0.04%
2015	1,194	4,030	8,866,994	0.20%
2020	3,467	16,471	36,235,965	0.79%
2025	6,613	42,832	94,230,906	1.94%

CSP growth projected to 43,000 MW by 2025; water rights for cooling water could be governing factor

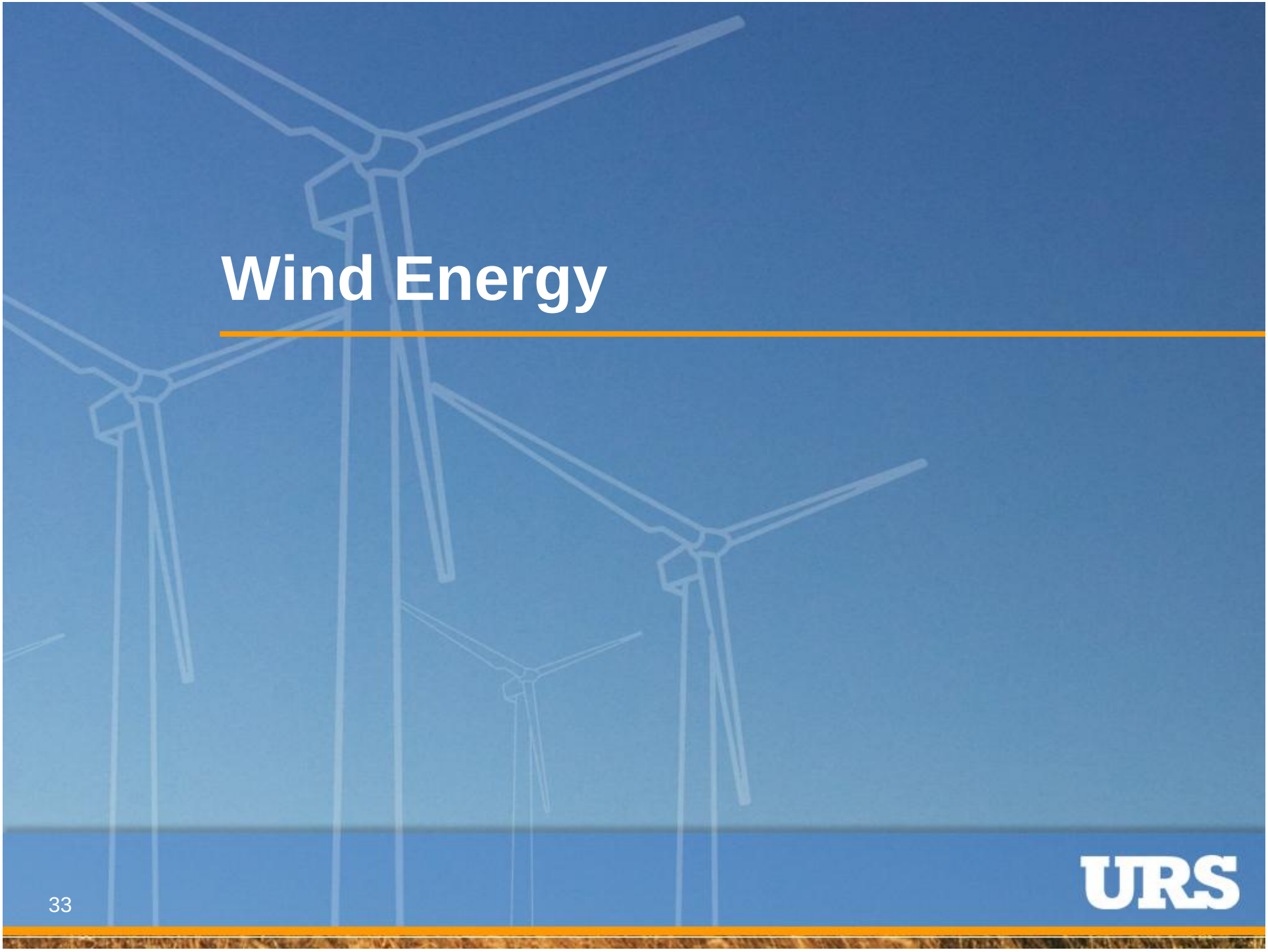
CSP Advantages / Trends

- Storage of energy (heat) addresses peak energy which is growing faster than base demand
- Reduces need for peaking plants
- Applicability in tandem with combined cycle combustion turbine operations
- Economies of scale driving unit cost down, as typical projects are 100 – 500 MW range

CSP Market for CSP in SW US

- Arizona: 2,000 MW
- Nevada: 1,500 MW
- New Mexico/West Texas: 1,000 + MW
- Colorado: 500 MW after 2010

Wind Energy



Wind Energy Statistics

- U.S. wind capacity grew 8,358 MW in 2008 with $17 billion investment
- Achieved in two years what had previously taken 2 decades (the 10,000-MW mark reached in 2006)
- U.S. passed Germany with 25,170 MW capacity as #1 wind producer in world
- 4,451 MW projects under construction 2009
- Top states: Texas, Iowa, California, Minnesota, Washington, Colorado, Oregon

Trends

- Wind power contributed 42% of all new U.S. electric generating capacity in 2008
- U.S. wind turbine manufacturing expanded; now >50% components made domestically
- Average size of wind projects grew significantly
- Average turbine size continued to grow
- Developer consolidation continues

Trends, cont'd.

- Upward pressure on wind power prices
- Project cost increased in 2008 as a function of turbine prices
- Solutions to transmission barriers emerging, but constraints remain
- Installed project costs continued to rise in 2008, after a long period of decline
- Policy efforts continued to affect the amount and location of wind development

21,000 MW Wind Capacity Impact

- Generate >60 billion kWh of electricity in 2009
- Serve over 5.5 million American homes
- Eliminate burning of:
  - 30.4 million short tons of coal (enough to fill two 1,000-mile-long coal trains)
  - 91 million barrels of oil per year
  - 560 billion cubic feet of natural gas (about 9% of the natural gas used for electricity generation)

Source: December 22, 2008 AWEA press release

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Biomass Energy

Biomass Issues / Concerns

- Increasing regulation of agricultural waste and environmental concerns
- Concentrated animal feeding operations face new costly regulations
- Increasing costs of MSW disposal
- A number of states are implementing a cap and trade system for greenhouse gases
- Federal legislative action to mandate more stringent greenhouse standards increased in pace and scope

Biomass Feedstocks

- Agricultural and forest residues
- Primary and secondary mill residues
- Municipal solid and urban wood waste
- Methane emissions from landfills, manure management, wastewater treatment plants
- Wood-processing residues
- Animal wastes

Biomass Products

- Electricity
- Heat
- Biogas
- Ethanol
- Biodiesel
- Hydrogen

Biomass Technologies

- Gasification
  - Thermal
  - Chemical
- Incineration
- Anaerobic digestion

Biomass Energy Advantages

- Diversion of waste from landfills, saving transportation costs
- Relatively-high capacity factor
- Distributed generation near energy demand, reducing transmission losses (7-10%)
- Process agricultural wastes to eliminate production of greenhouse gas (GHG)
- Largely carbon-neutral

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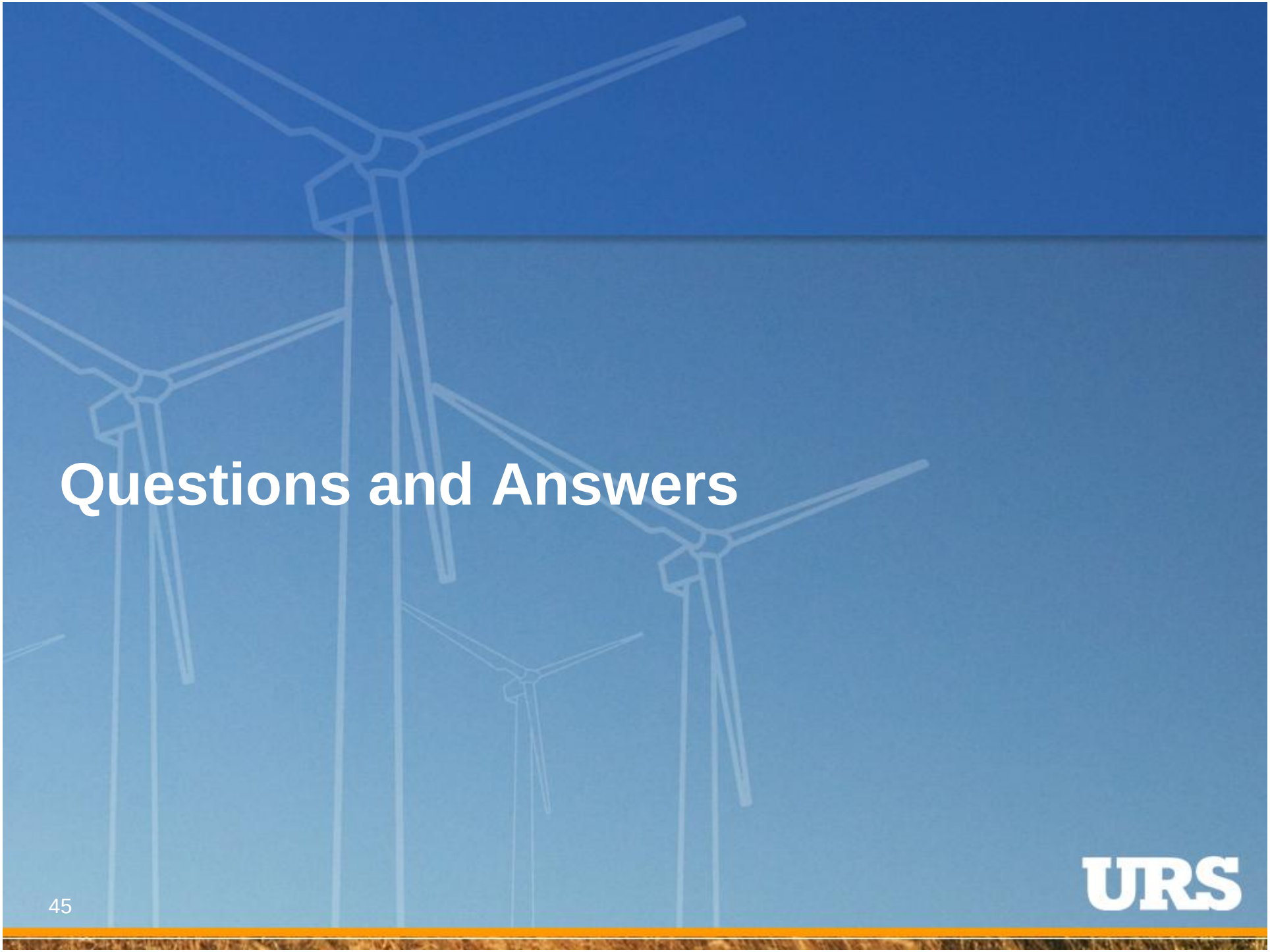
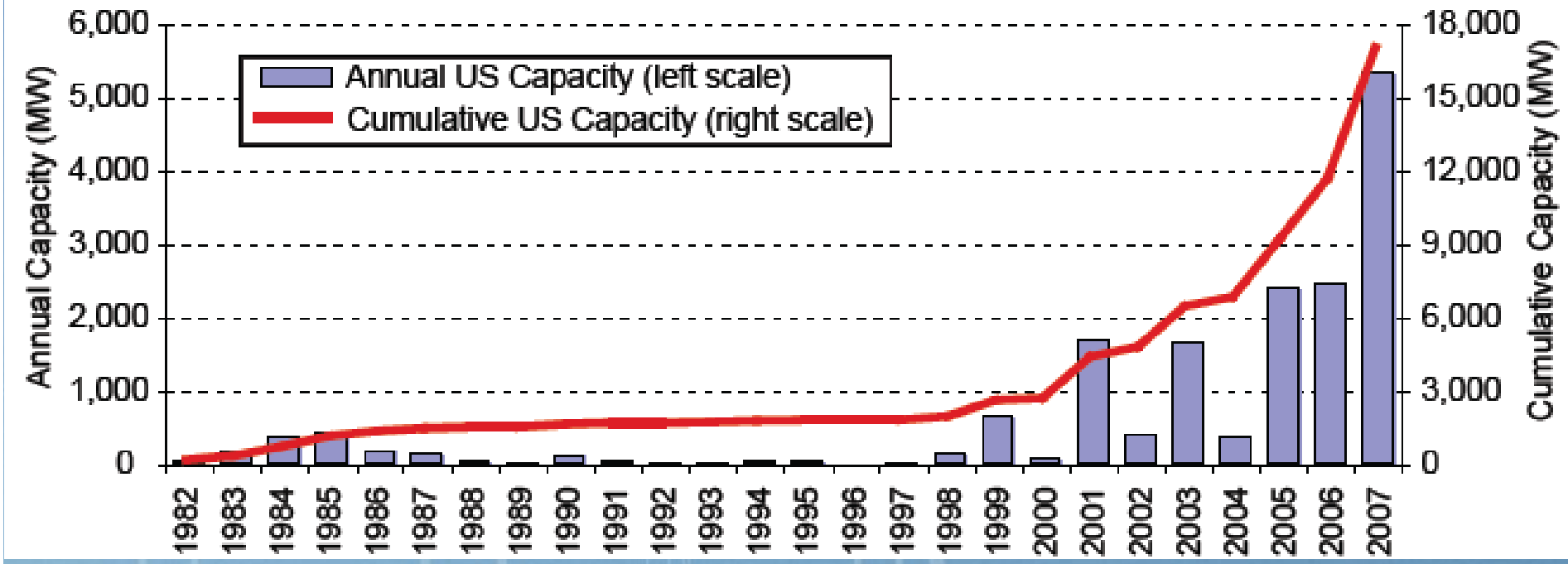
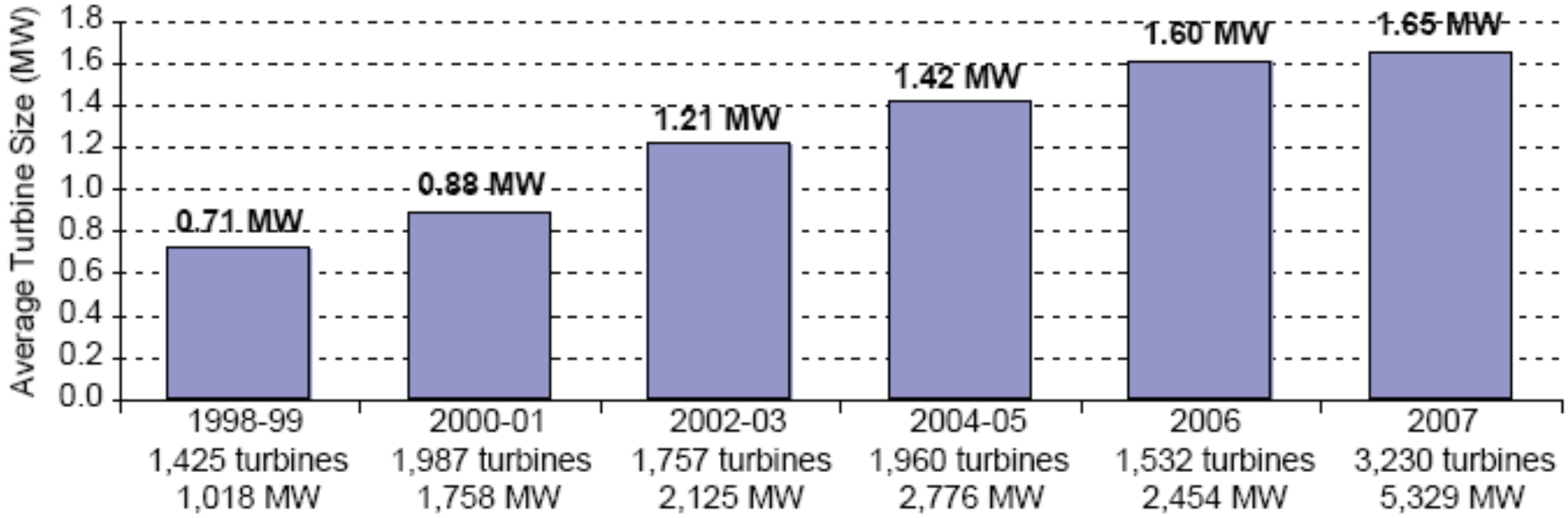


Questions and Answers

Growth In U.S. Wind Power Capacity

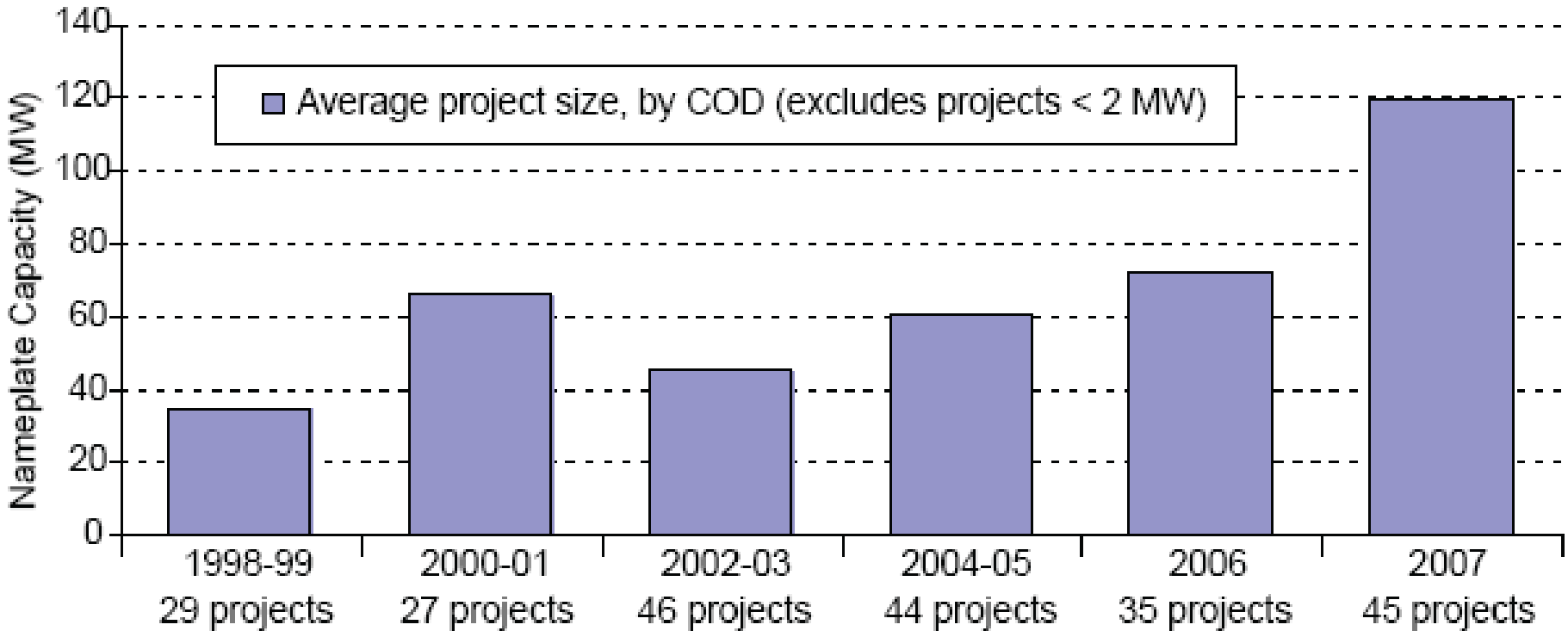


Average Turbine Size Growing



Source: AWEA project database.

Average Wind Farm Size Growing



Source: Berkeley Lab analysis of AWEA project database.

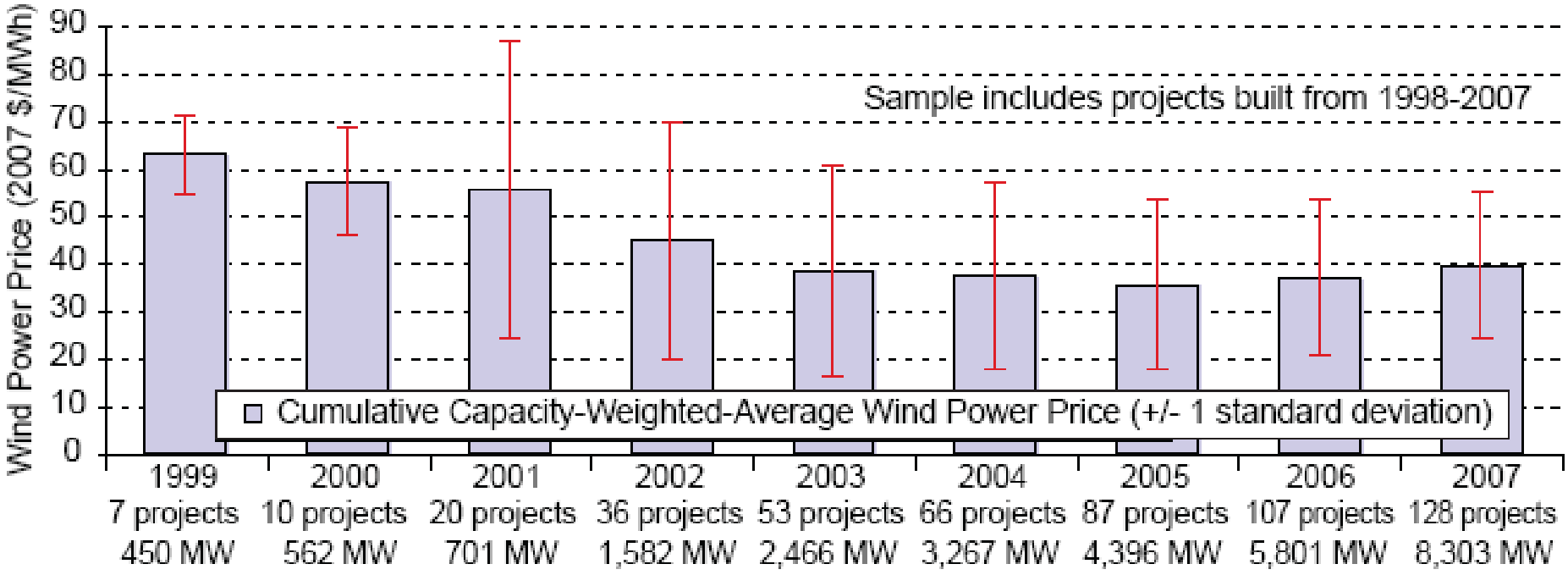
Wind Industry Consolidating

Table 6. Acquisition and Investment Activity Among Wind Developers*

Investor	Transaction Type	Developer	Announced
EDF (SIIF Energies)	Acquisition	enXco	May-02
Gamesa	Investment	Navitas	Oct-02
AES	Investment	US Wind Force	Sep-04
PPM (Scottish Power)	Acquisition	Atlantic Renewable Energy Corp.	Dec-04
AES	Acquisition	SeaWest	Jan-05
Goldman Sachs	Acquisition	Zilkha (Horizon)	Mar-05
JP Morgan Partners	Investment	Noble Power	Mar-05
Arclight Capital	Investment	CPV Wind	Jul-05
Diamond Castle	Acquisition	Catamount	Oct-05
Pacific Hydro	Investment	Western Wind Energy	Oct-05
EIF U.S. Power Fund II	Investment	Tierra Energy, LLC	Dec-05
Airtricity	Acquisition	Renewable Generation Inc.	Dec-05
Babcock & Brown	Acquisition	G3 Energy LLC	Jan-06
Iberdrola	Acquisition	Community Energy Inc.	Apr-06
Shaw/Madison Dearborn	Investment	UPC Wind	May-06
NRG	Acquisition	Padoma	Jun-06
CPV Wind	Acquisition	Disgen	Jul-06
BP	Investment	Clipper	Jul-06
BP	Acquisition	Greenlight	Aug-06
Babcock & Brown	Acquisition	Superior	Aug-06
Enel	Investment	TradeWind	Sep-06
Iberdrola	Acquisition	Midwest Renewable Energy Corp.	Oct-06
Iberdrola	Acquisition	PPM (Scottish Power)	Dec-06
BP	Acquisition	Orion Energy	Dec-06
Naturener	Acquisition	Great Plains Wind & Energy, LLC	Feb-07
HSH Nordbank	Investment	Ridgeline Energy	Feb-07
Energias de Portugal	Acquisition	Horizon	Mar-07
Iberdrola	Acquisition	CPV Wind	Apr-07
Duke Energy	Acquisition	Tierra Energy, LLC	May-07
Acciona	Acquisition	EcoEnergy, LLC	Jun-07
Babcock & Brown	Acquisition	Bluewater Wind	Sep-07
Good Energies	Investment	EverPower	Sep-07
E.ON AG	Acquisition	Airtricity North America	Oct-07
Wind Energy America	Acquisition	Boreal	Oct-07
Marubeni	Investment	Oak Creek Energy Systems	Dec-07

* Select list of announced transactions; excludes joint development activity.
Source: Berkeley Lab.

Wind PPA Energy Prices Increasing



Source: Berkeley Lab database.