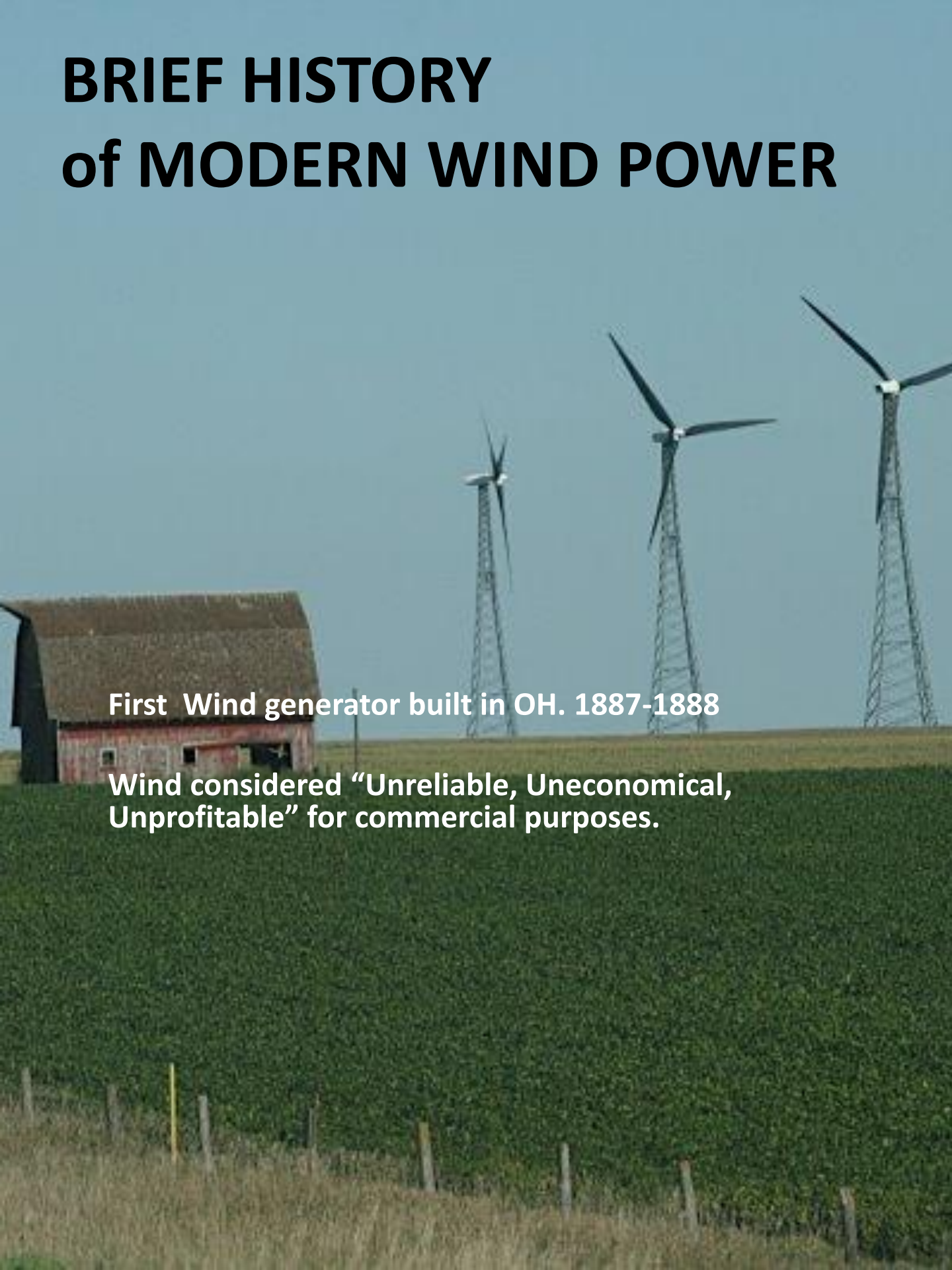
Alternative Power sources

WIND – SOLAR – AND ???

ENERGY FOR OUR FUTURE

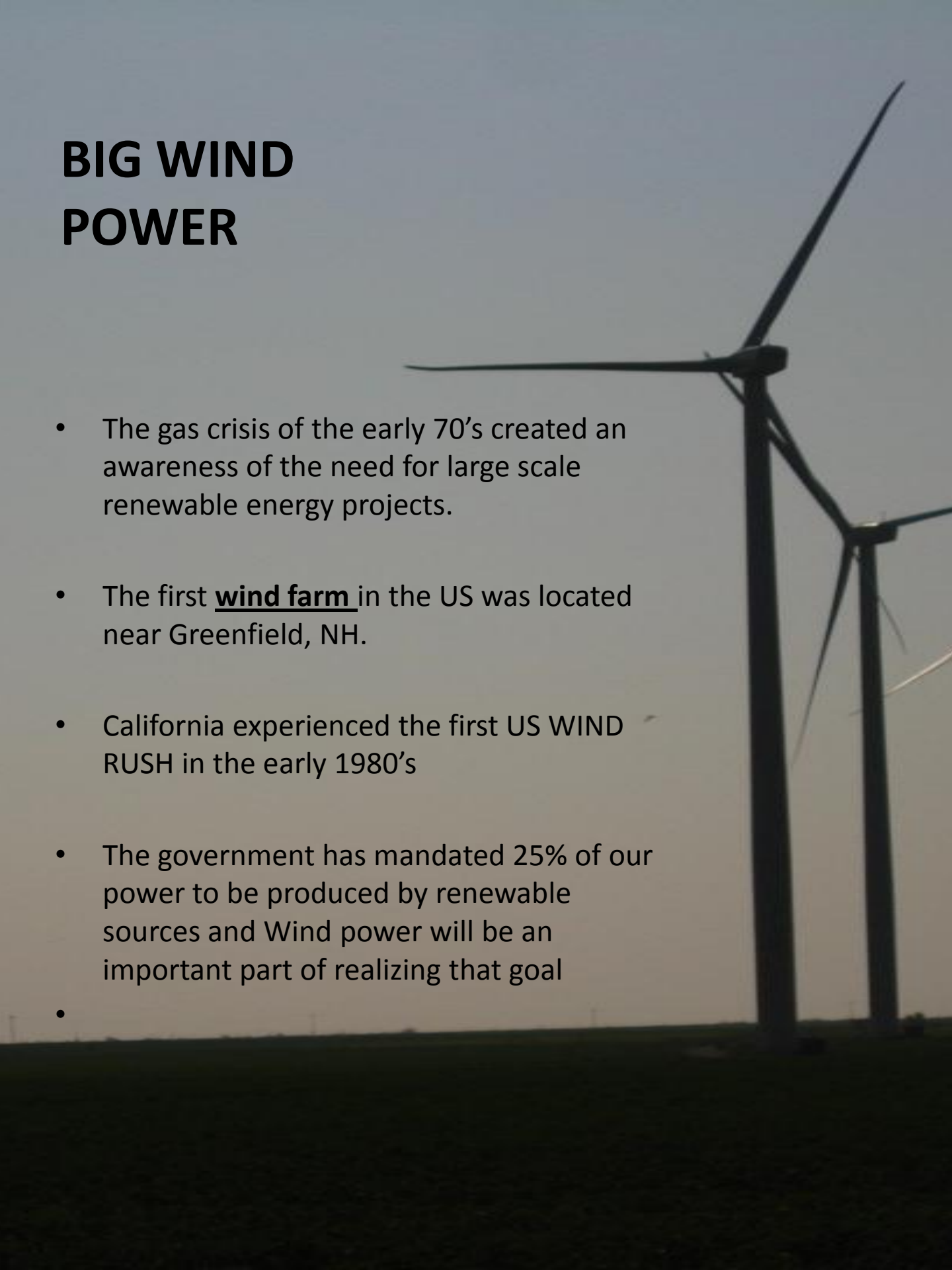
BRIEF HISTORY of MODERN WIND POWER



First Wind generator built in OH. 1887-1888

Wind considered “Unreliable, Uneconomical, Unprofitable” for commercial purposes.

BIG WIND POWER



- The gas crisis of the early 70's created an awareness of the need for large scale renewable energy projects.
- The first **wind farm** in the US was located near Greenfield, NH.
- California experienced the first US WIND RUSH in the early 1980's
- The government has mandated 25% of our power to be produced by renewable sources and Wind power will be an important part of realizing that goal
-

SMALL WIND

Generators of 50KW or less generally are considered “small wind”

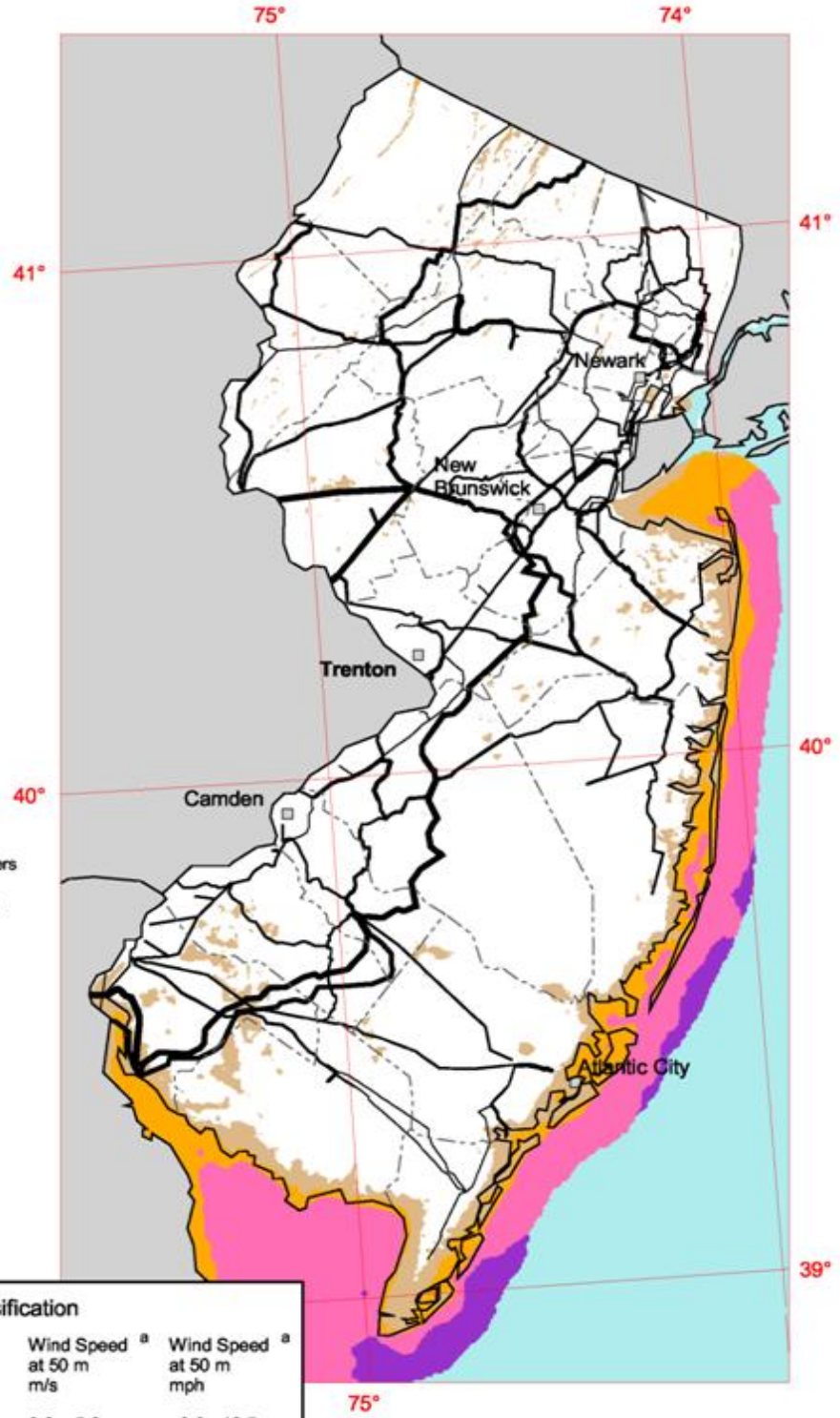
OFFSHORE WIND FARMS

Offshore turbines can be much larger than land based turbines

New Jersey

50 m Wind Resource Map

The annual wind power estimates for this map were produced by TrueWind Solutions using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.



15 0 15 30 45 Kilometers

10 0 10 20 30 Miles

Transmission Line*

Voltage (kV)

- 115 - 138
- 230
- 345
- 500

* Source: POWERmap, c 2002 Platts, a Division of the McGraw-Hill Companies

Wind Power Classification

Wind Power Class	Resource Potential	Wind Power Density at 50 m W/m ^{2}	Wind Speed [a] at 50 m m/s	Wind Speed [a] 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

[a] Wind speeds are based on a Weibull k value of 2.0

U.S. Department of Energy
National Renewable Energy Laboratory

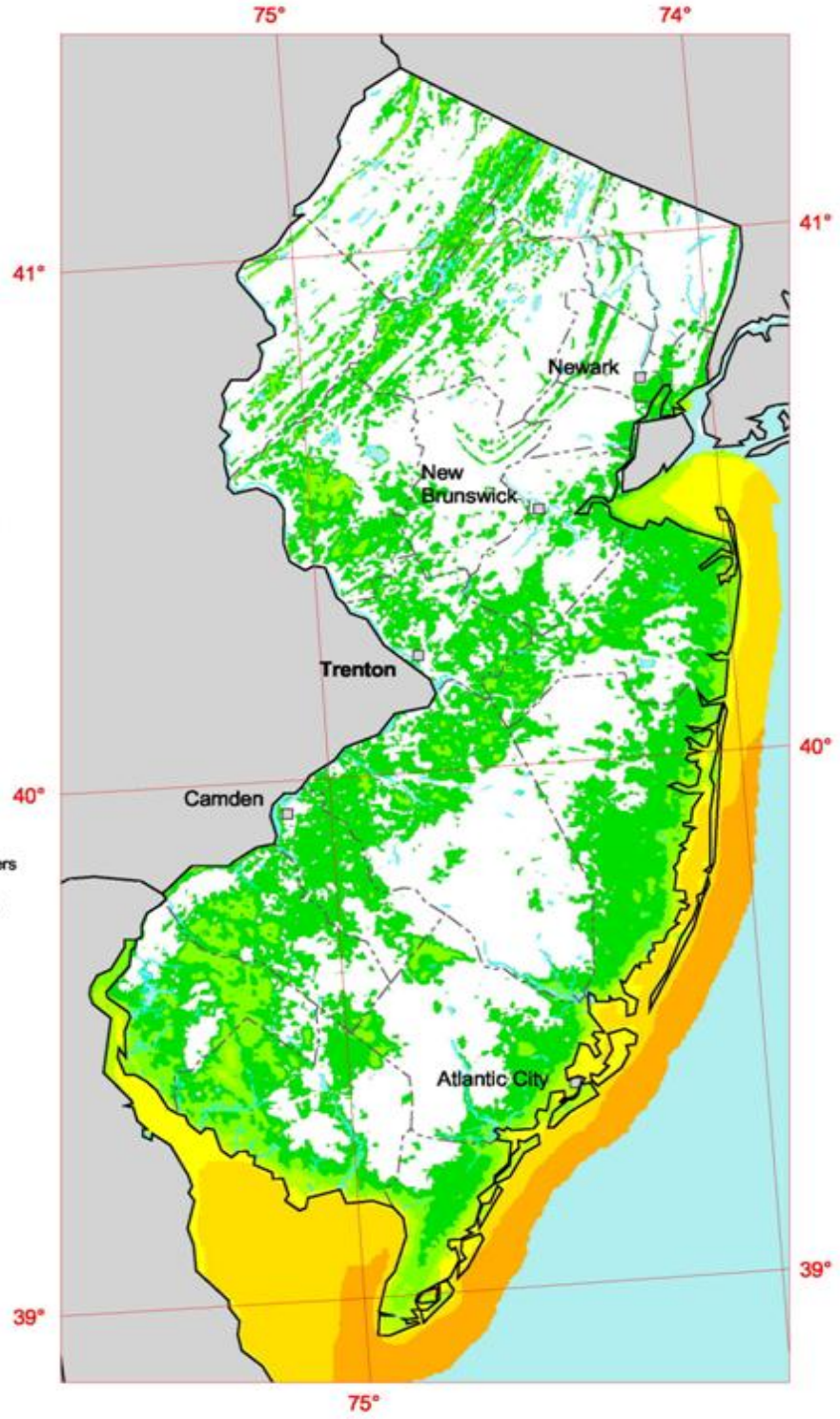
NREL

12-JAN-2003 1.1.7

New Jersey

30 m Wind Speed Map

The annual wind speed estimates for this map were produced by TrueWind Solutions using their Mesomap system and historical weather data. It has been validated with available surface data by NREL and wind energy meteorological consultants.



15 0 15 30 45 Kilometers

10 0 10 20 30 Miles

Wind Speed at 30 Meters
m/s

- < 4.5
- 4.5 - 5.0
- 5.0 - 5.5
- 5.5 - 6.0
- 6.0 - 6.5
- 6.5 - 7.0
- 7.0 - 7.5
- 7.5 - 8.0
- 8.0 - 8.5
- > 8.5

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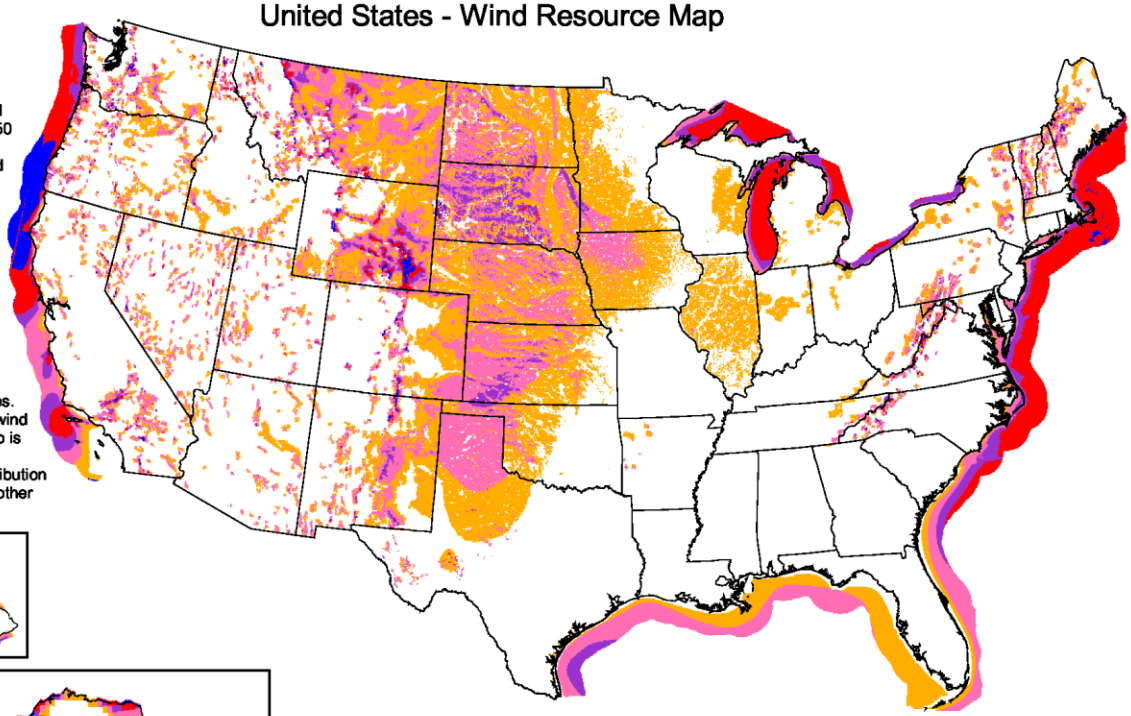
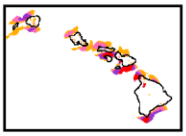
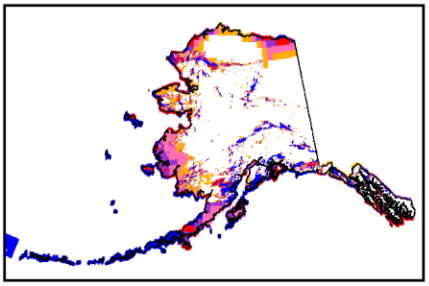
10-JAN-2003 1.1.8

United States - Wind Resource Map

This map shows the annual average wind power estimates at 50 meters above the surface of the United States. It is a combination of high resolution and low resolution datasets produced by NREL and other organizations. The data was screened to eliminate areas unlikely to be developed onshore due to land use or environmental issues. In many states, the wind resource on this map is visually enhanced to better show the distribution on ridge crests and other features.







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6	Outstanding	600 - 800	8.0 - 8.8	17.9 - 19.7
7	Superb	800 - 1600	8.8 - 11.1	19.7 - 24.8

[a] Wind speeds are based on a Weibull k value of 2.0

NREL

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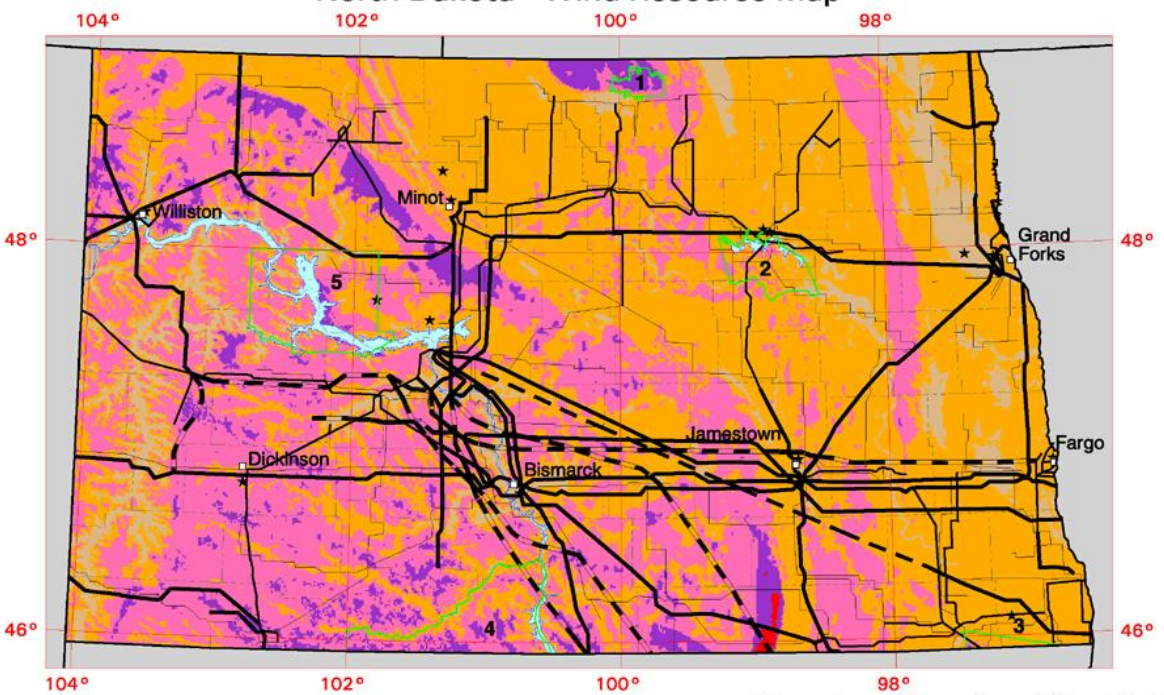
North Dakota - Wind Resource Map

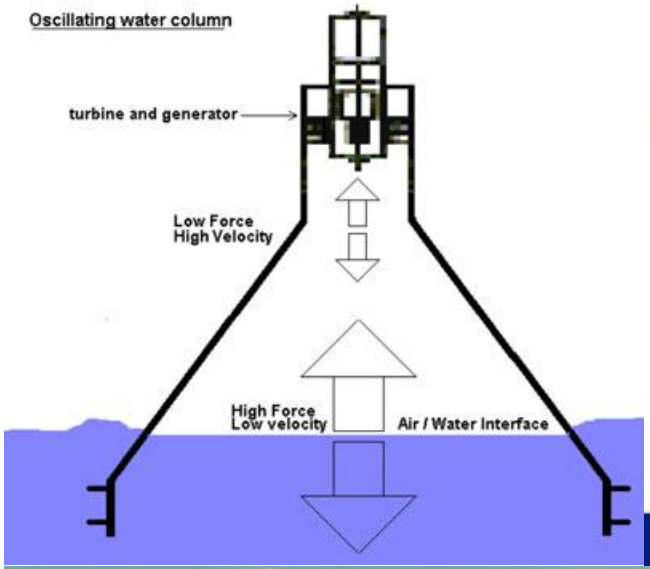


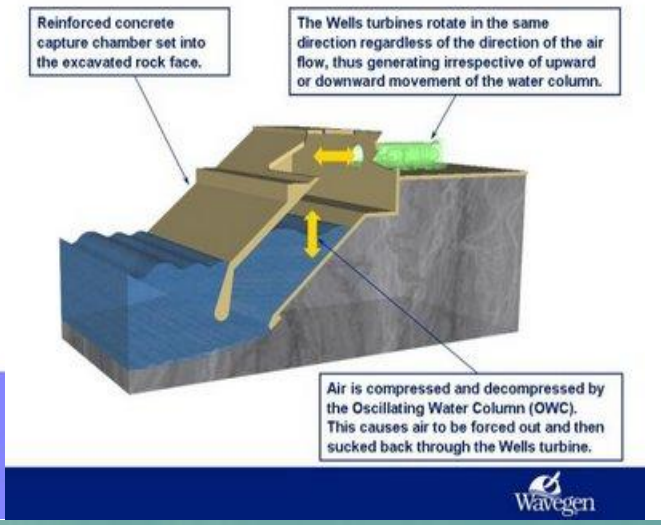
RESIDENTIAL SOLAR

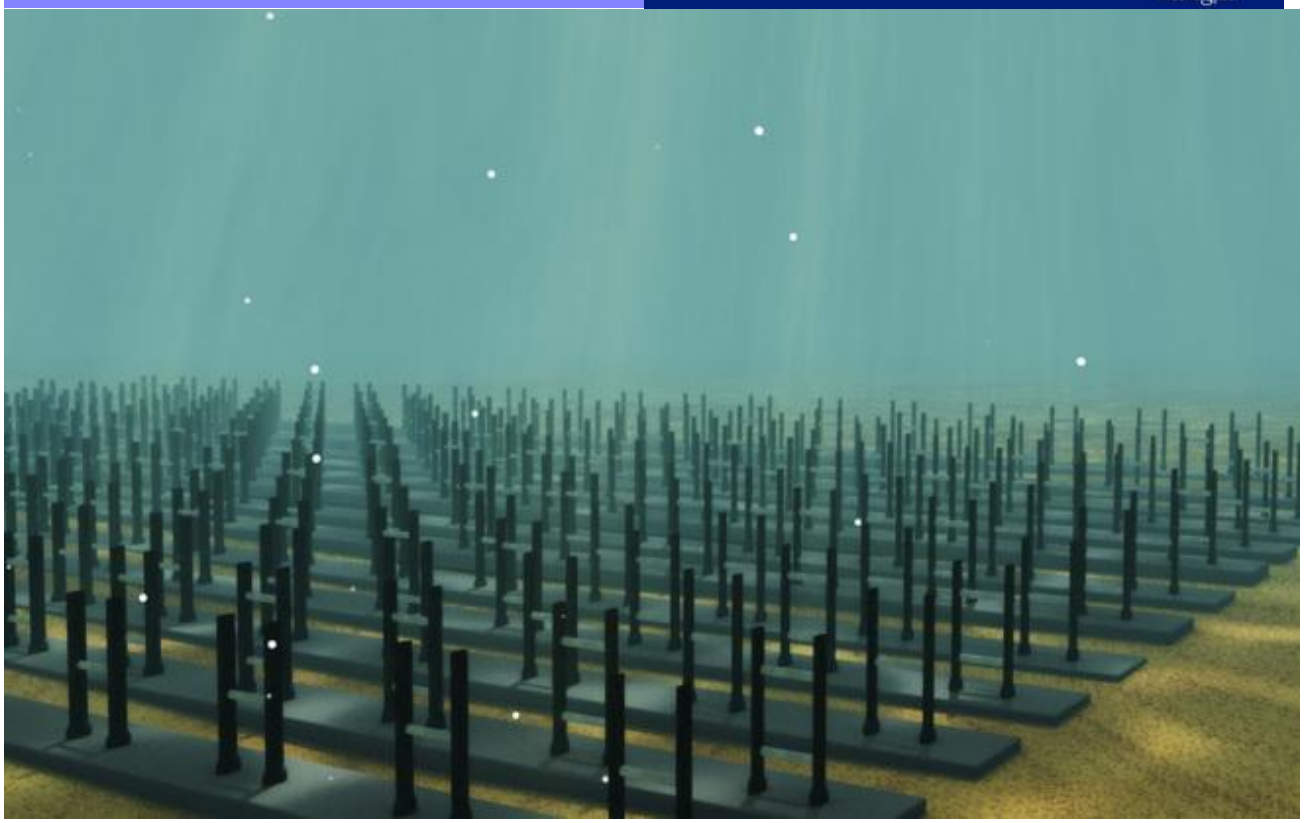
- Solar power is an ideal way for a homeowner to invest in “green” energy and see some savings on utility bills
- Residential solar can be as simple as heating water in a pool
- Residential Solar systems can provide 25% to 50% of home power needs
- Many incentives, rebates and Tax credits are available to New Jersey homeowners

COMMERCIAL SOLAR

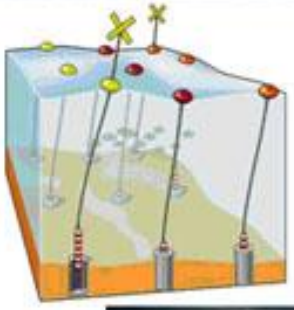
Hydro-Kinetic Energy

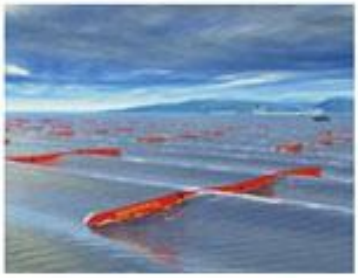


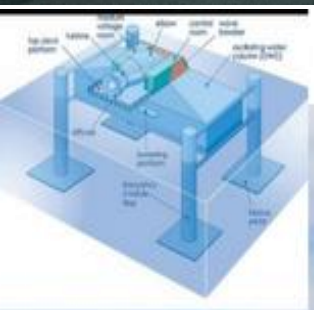


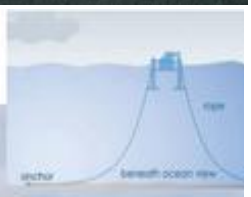


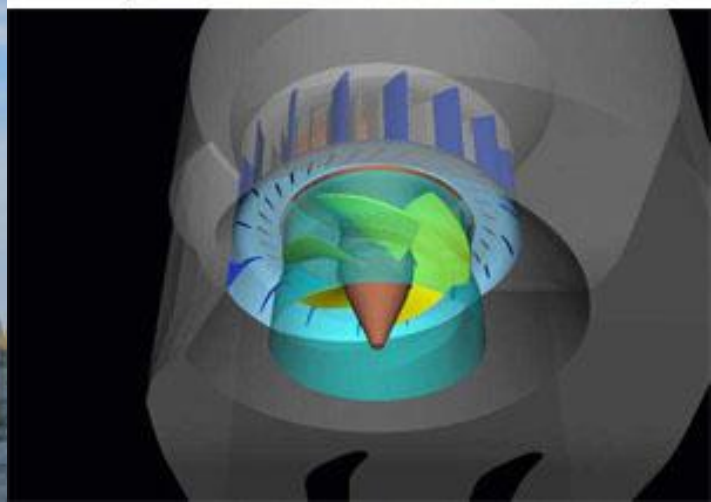
I added these because I Think they are great





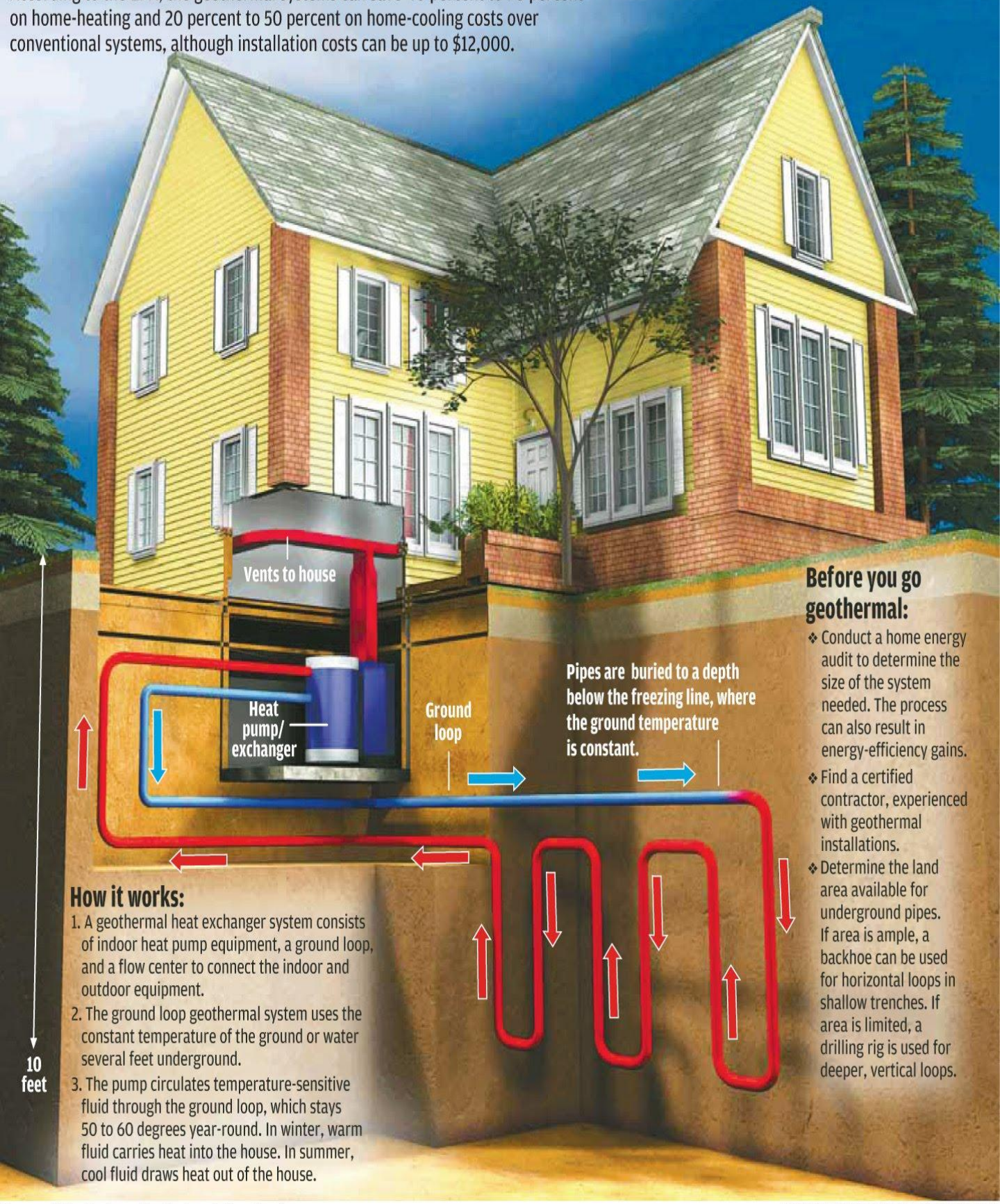






Tapping the underground

Geothermal heat pumps use stable ground temperatures for home heating and cooling. According to the EPA, the geothermal systems can save 40 percent to 70 percent on home-heating and 20 percent to 50 percent on home-cooling costs over conventional systems, although installation costs can be up to $12,000.



How it works:

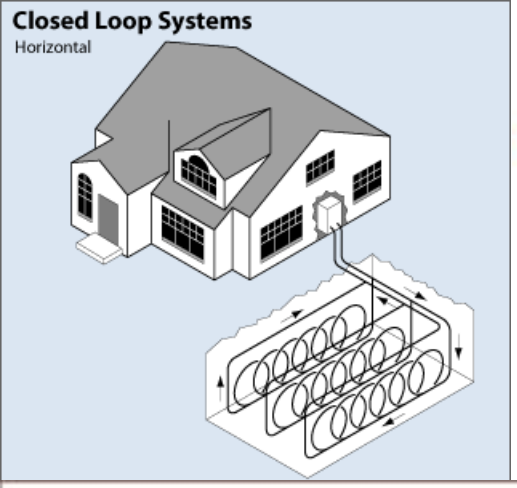
1. A geothermal heat exchanger system consists of indoor heat pump equipment, a ground loop, and a flow center to connect the indoor and outdoor equipment.
2. The ground loop geothermal system uses the constant temperature of the ground or water several feet underground.
3. The pump circulates temperature-sensitive fluid through the ground loop, which stays 50 to 60 degrees year-round. In winter, warm fluid carries heat into the house. In summer, cool fluid draws heat out of the house.

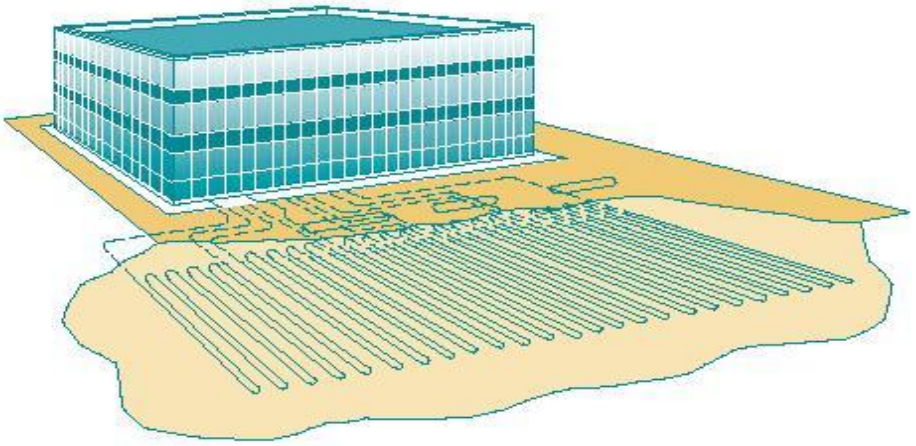
Before you go geothermal:

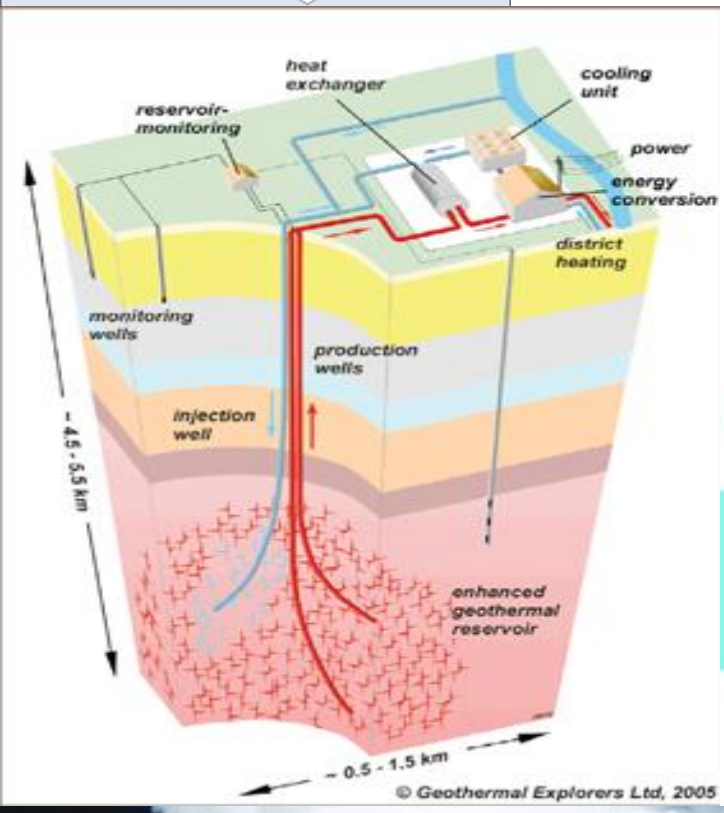
- Conduct a home energy audit to determine the size of the system needed. The process can also result in energy-efficiency gains.
- Find a certified contractor, experienced with geothermal installations.
- Determine the land area available for underground pipes. If area is ample, a backhoe can be used for horizontal loops in shallow trenches. If area is limited, a drilling rig is used for deeper, vertical loops.

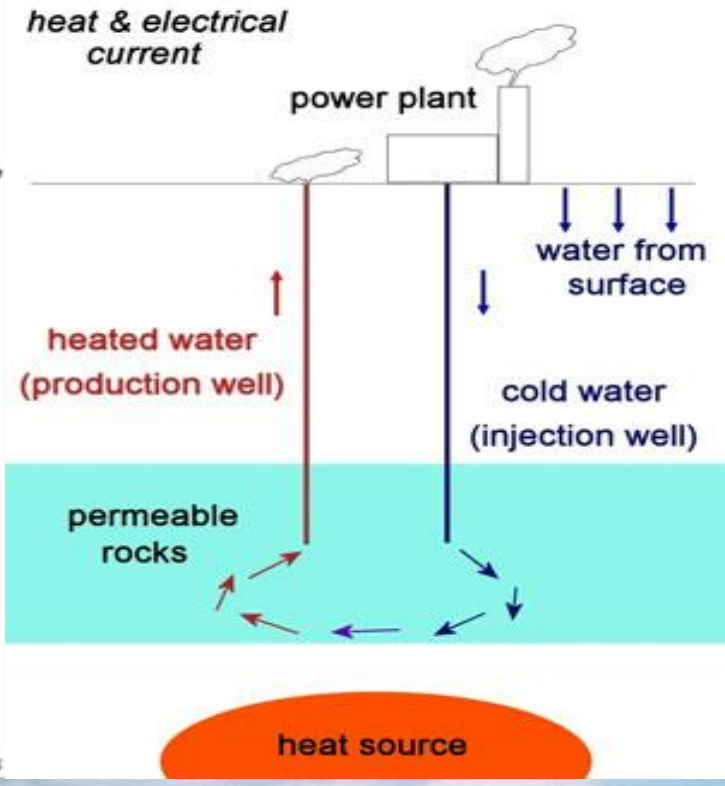
Sources: Delta-Montrose Electric Association, About.com

JONATHAN MORENO/THE DENVER POST


Closed Loop Systems
Horizontal




heat exchanger
cooling unit
reservoir-monitoring
power
energy conversion
district heating
monitoring wells
production wells
injection well
~ 4.5 - 5.5 km
enhanced geothermal reservoir
~ 0.5 - 1.5 km
© Geothermal Explorers Ltd, 2005


heat & electrical current
power plant
water from surface
heated water (production well)
cold water (injection well)
permeable rocks
heat source