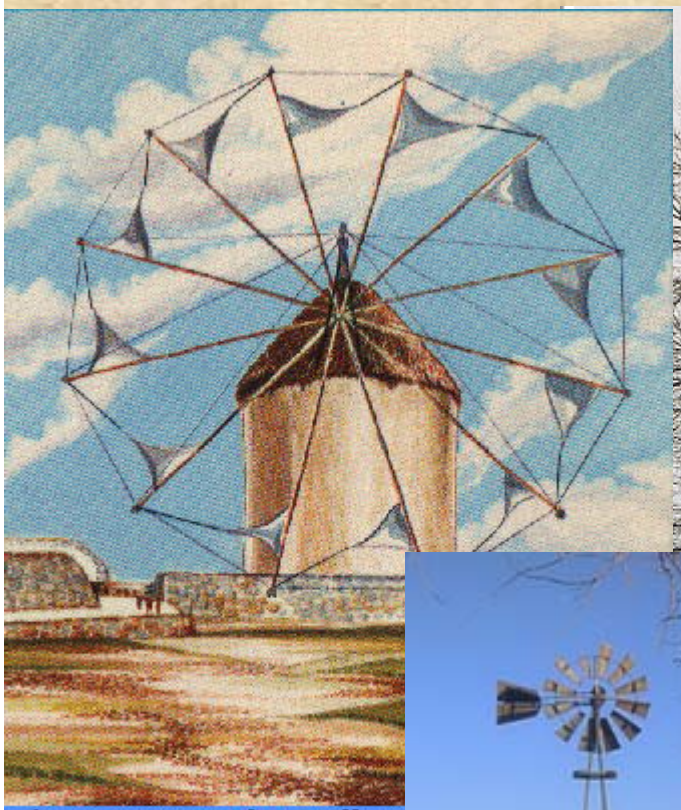
Regional Wind Conference

Buyers & Markets for Wind Energy

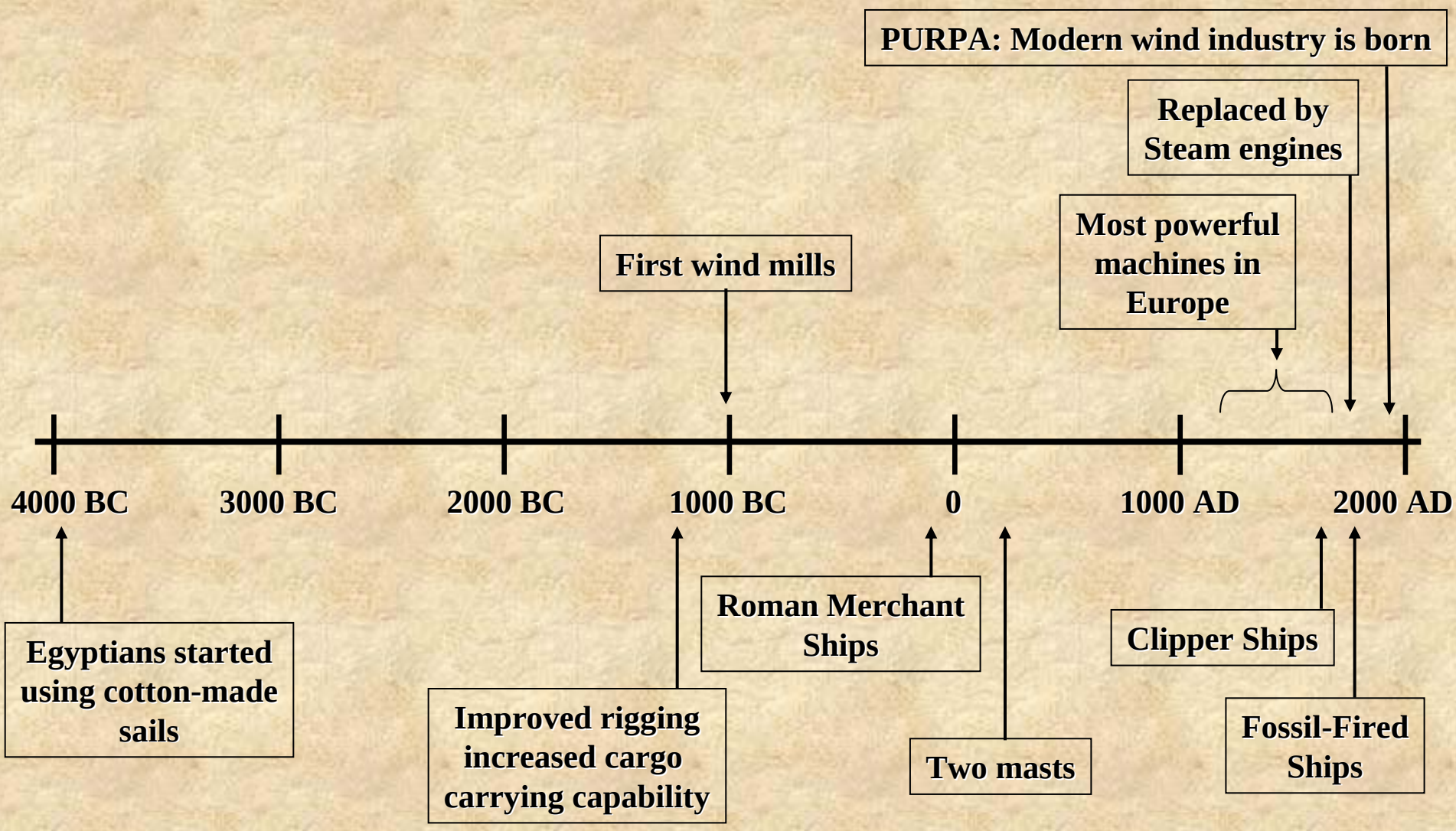
Brookings, SD

September 12, 2005

Wind Power
Buyers & Markets


An ancient grinding mill on island of Mykonos.

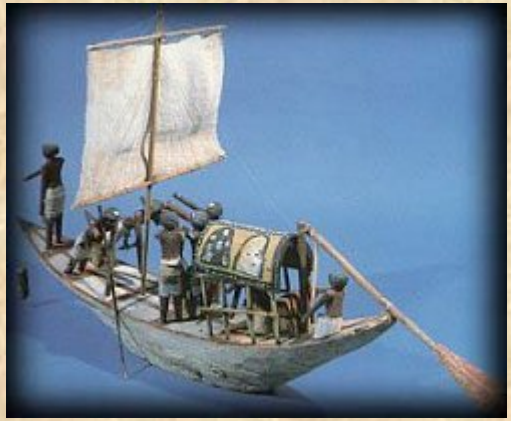
History of Wind Power



First Commercial Use of the Wind

Between 4000 – 3000 BC, the Egyptians starting using cotton-made sails.

Agricultural produce, troops, cattle, stone and funeral processions were all carried on the Nile and its canals.



Mediterranean Trade is Born (c 1,200 BC)

Argo, the ship of the Argonauts, on a Greek stamp

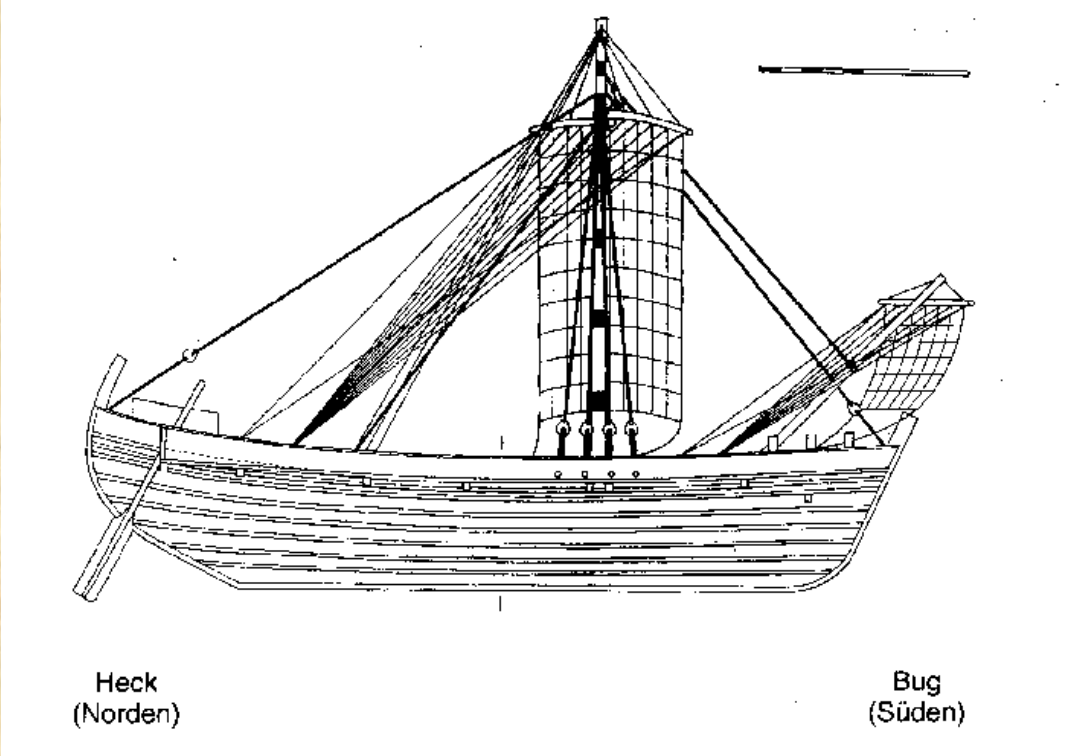
- Improved rigs increased the cargo carrying capability.
- Phoenicians and Greeks because seafaring merchants.

Iron Age
500 BC – 650 AD

Viking era long boat

- Two masted ships.
- Cargo Carrying capability up to 100 tons
- Specialization into merchant and war fighting vessels.

Roman Merchant Ship (c 100 AD)



Ships could carry up to 1,000 tons and 1,000 men

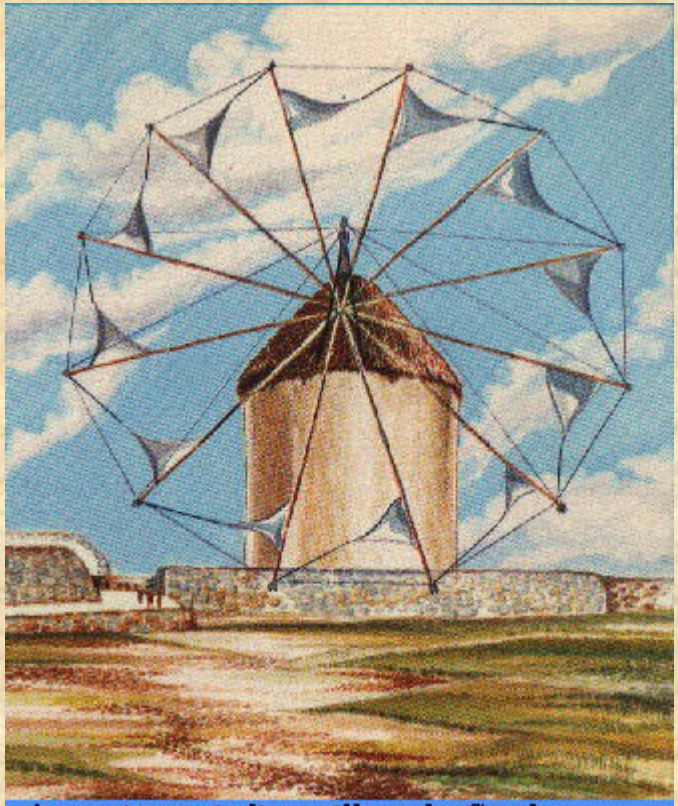
Romans became the rulers of the Mediterranean.

The Clipper Name

- The great clipper ships of the 19th century tied wind technology to practical needs and helped trade and migration flourish.
- Today, wind energy is again playing a critical role.

Clipper 2.5 MW “Liberty” Turbine
Medicine Bow, WY

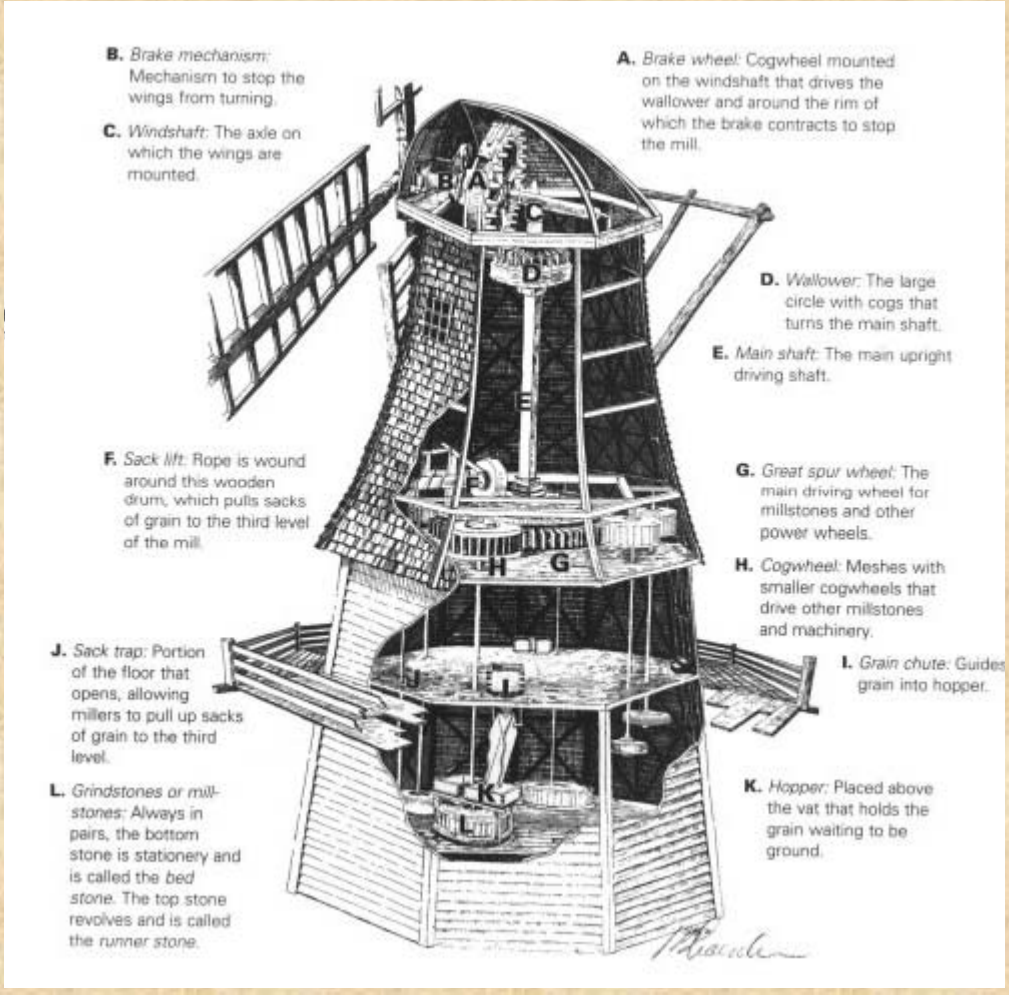
First Wind Mills



An ancient grinding mill on the Greek island of Mykonos.

Milling grain was the first mechanized use of on-shore wind energy

Windmills in Holland

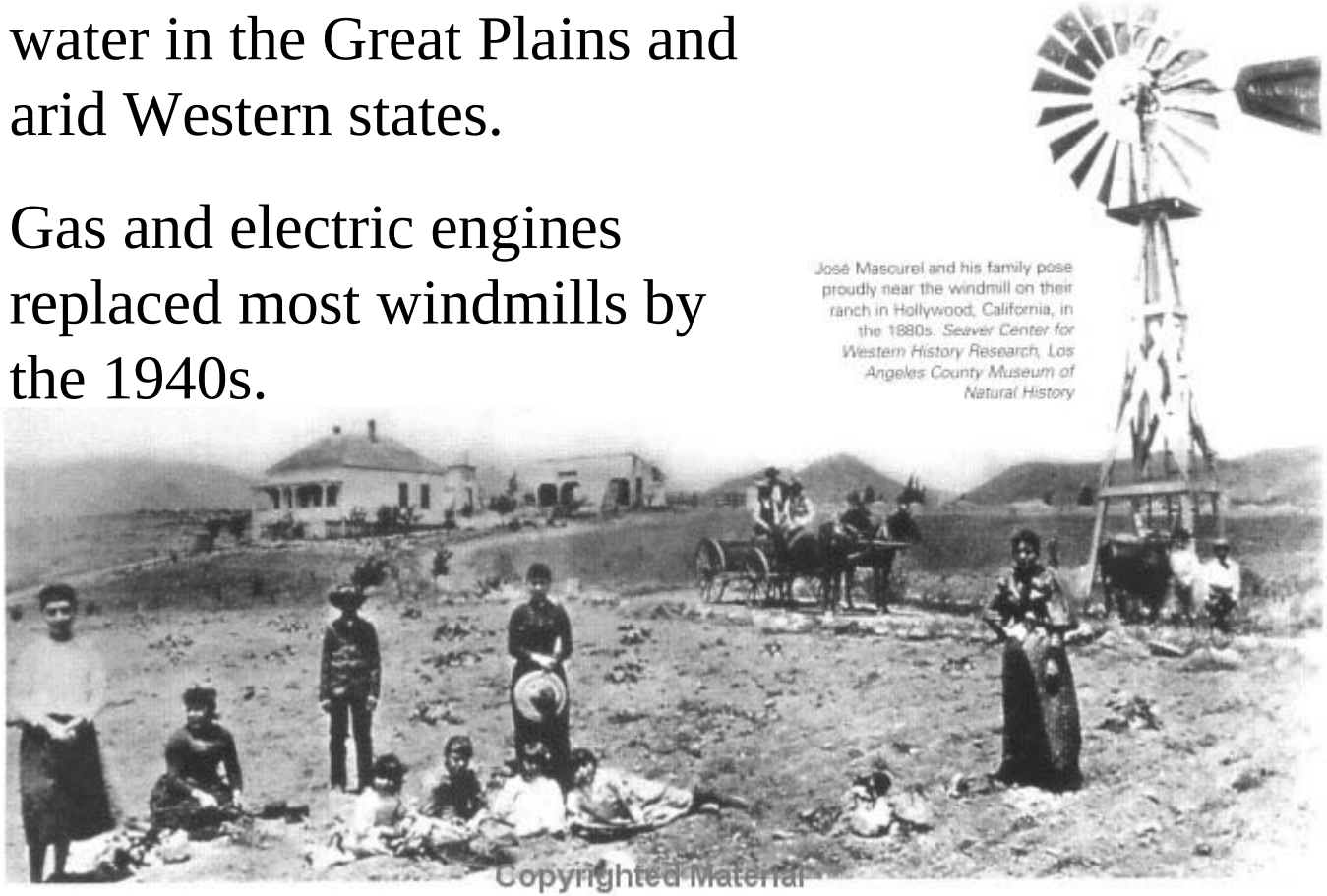


- From 1200 to the late 1800s, wind mills were the most powerful machines in Europe
  - Ground grain
  - Pumped water
  - Pressed oil
  - Sawed wood
- During the industrial revolution, wind mills were replaced by steam engines

Windmills in the U.S.

6 million windmills pumped water in the Great Plains and arid Western states.

Gas and electric engines replaced most windmills by the 1940s.

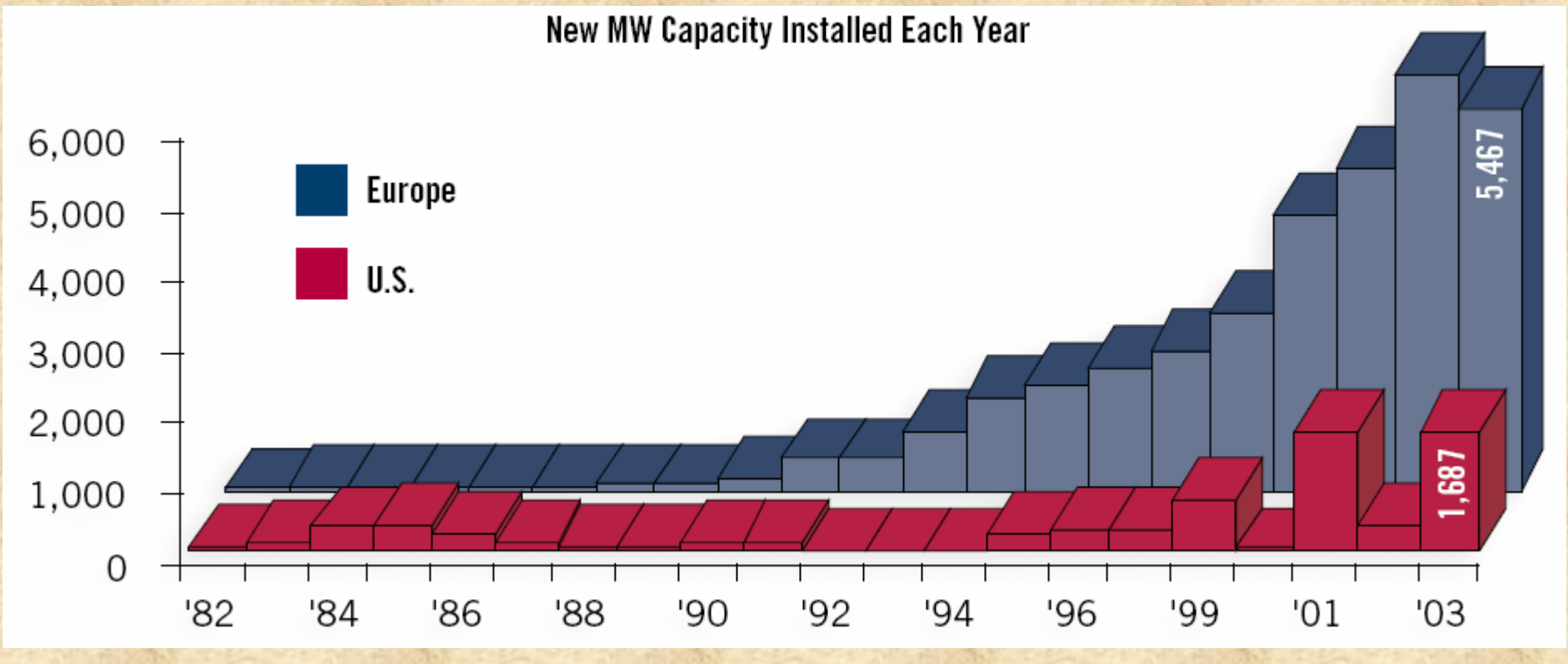


José Mascurel and his family pose proudly near the windmill on their ranch in Hollywood, California, in the 1880s. *Seaver Center for Western History Research, Los Angeles County Museum of Natural History*

Modern Wind Industry

- 1978 Public Utilities Regulatory Policy Act.
- Industry born in the hills of Tehachapi, CA
- Later spread to Texas, Minnesota, Iowa and Europe

European vs. U.S. Growth



Turbine Productivity

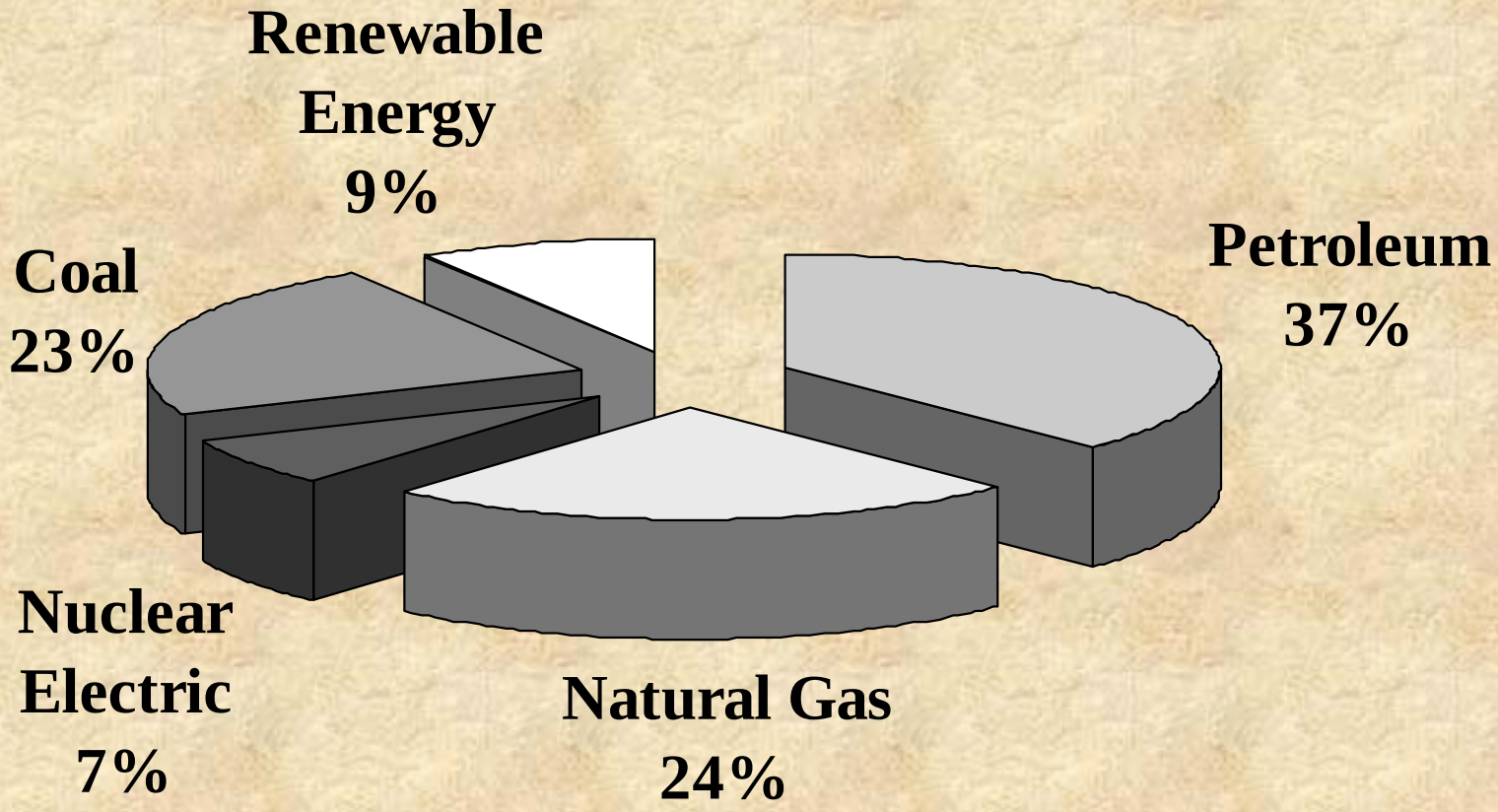
Rotor Diameter Drives Down Wind Cost

	1985	1990	1996	1999	2000	2005
Rotor (Meters)	17	27	40	50	71	93

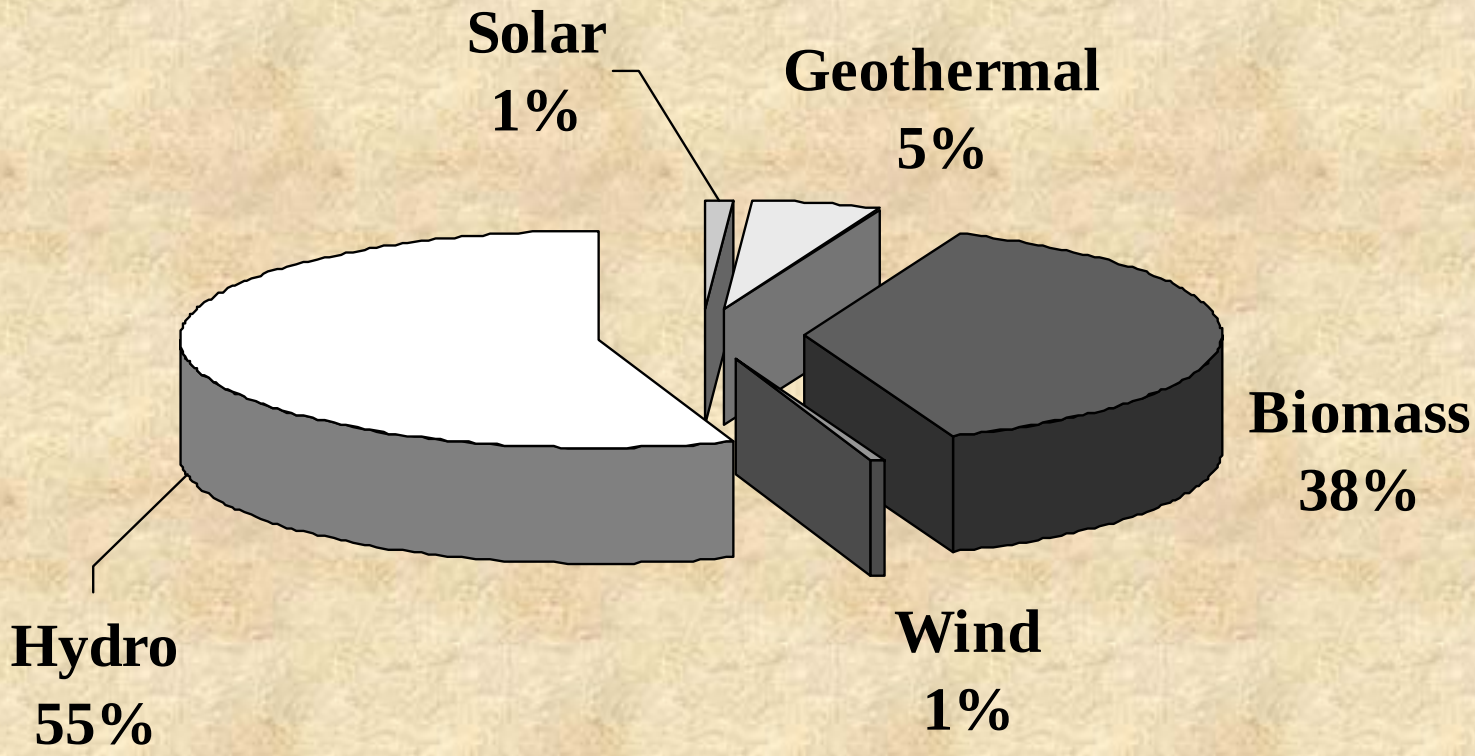
Cost/kW — 20x

Productivity — 125x

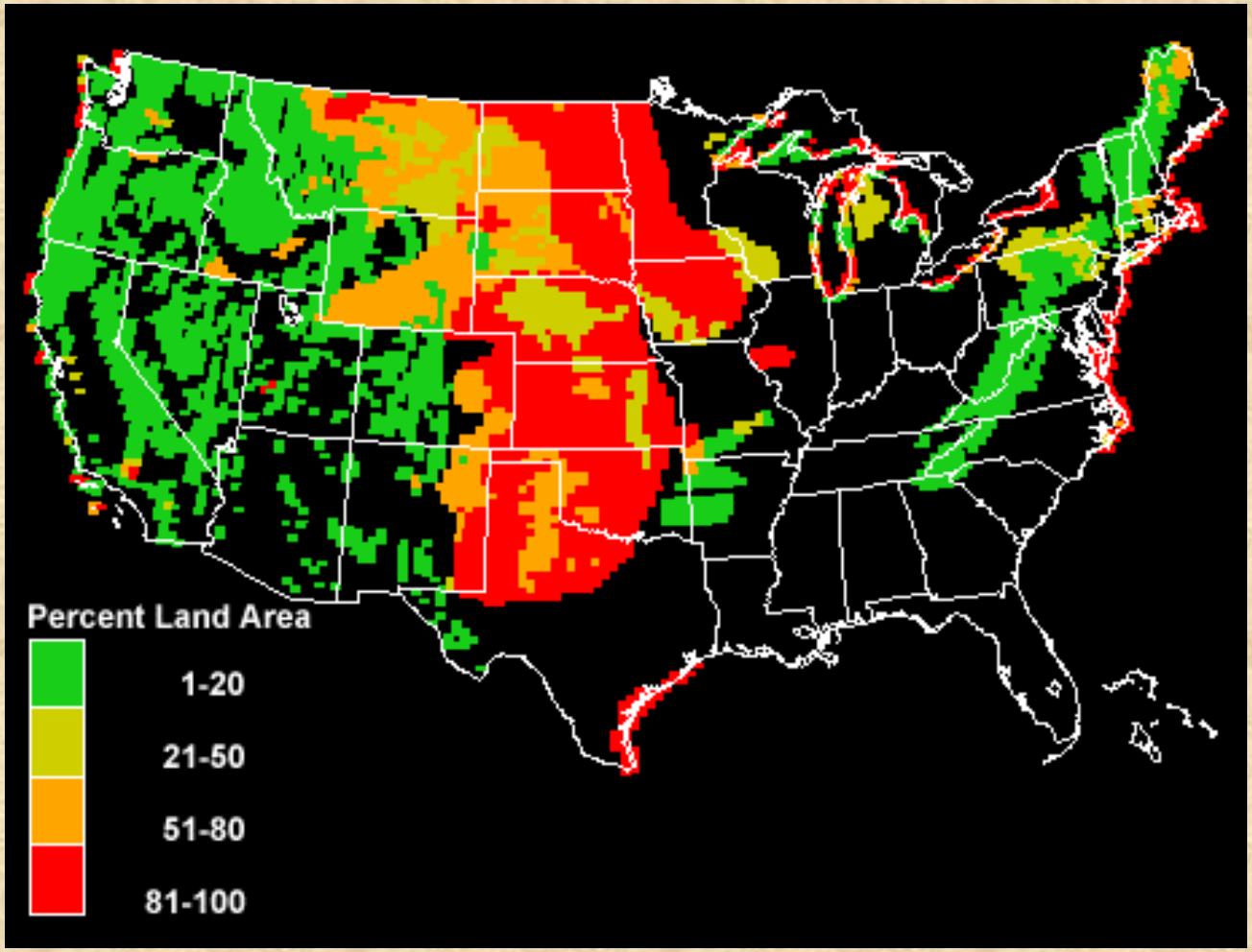
U.S. Energy Consumption, 2004



Renewable Electricity Generation, 2004

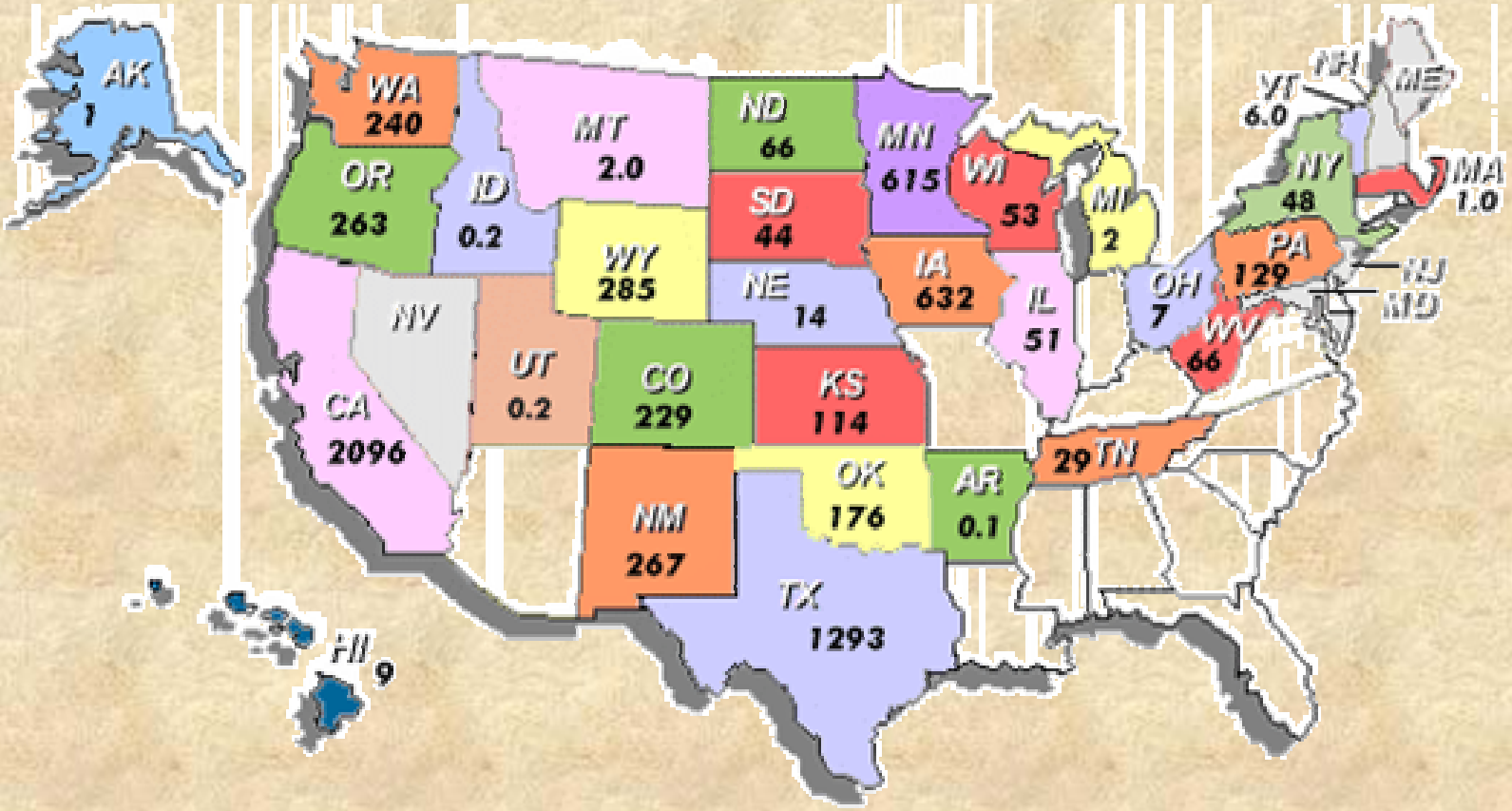


Percent U.S. Land Area with Wind Resource Class 3 or Above



What's Going On?

U.S. Wind Capacity, April 2005



Rolling Thunder

- Generate $6.6 million in revenues for landowners per year
- Generate $16.9 million in tax revenues for South Dakota per year
- Create 14,440 jobs including manufacturing, construction and operations

Buyers and Markets
4 Possible Scenarios

Build Out

- National energy and environmental policy produces large and sustained transmission investments to move wind power from Great Plains to southern States

WAPA Reform

- Changes in transmission operations and WAPA purchases creates favorable environment for wind development

Utility Coalition

- Utilities pursue changes to state policies that allow them to buy least cost renewables first

Incrementalism

- Slow, intermittent purchases by local utilities

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Description	Dakotas become the largest wind producers in the country	Congress reacts to drought and increasing power supply costs and restructures WAPA's role vis-à-vis power procurement	Coalition of Midwest utilities form to purchase wind energy at lowest possible unit cost	Small, individual projects in response to utility RFPs where existing transmission capacity can be used to deliver energy without costly transmission upgrades
Size	5,000 - 10,000 MW	250 - 500 MW	500 -1,000 MW	100 - 500 MW
Customer	Southern states with non-economic wind resources	WAPA/Coops	5 - 10 Midwest utilities	WAPA Coops, MISO members
Market Drivers	National RPS in response to environmental and/or security concerns	Increasing power supply costs as the result of expensive spot purchases to replace low hydro generation on the Missouri River Basin system	Aggressive efforts to contain power purchase costs	Utilities seek low cost wind supplies to average-down in-state wind generation

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Regulatory Drivers	National transmission reform accompanied by significant Congressional mandates and appropriations	Federal Energy Regulatory Commission mandates WAPA join MISO	License plate transmission tariffs replace postage stamp rates and allow WAPA to join MISO	MISO solves seams issues and is seen as an operational success. WAPA participates in MISO much more assertively and helps facilitate transmission service.
Legislative Drivers	Congress mandates significant transmission reform in response to reliability problems. Major Congressional appropriations.	Congressional enabling legislation to allow WAPA to enter into long-term power supply contracts	State RPS	State RPS
Transmission Provider	Super-regional and/or national "TAGG" high-voltage backbone	WAPA	WAPA, MISO, and new transmission construction	WAPA and MISO
Comment	Decade or more commitment. Would require coordinated efforts from state, regional, and federal government agencies.	This would require a failry significant and disciplined political campaign from the WAPA member coops	Utility cooperation difficult without some overriding environmental fear or legislative mandate. Parochialism for "in-state" wind projects continues to trump economics in siting decisions.	Would require changes in the way the Bureau of Reclamation manages water release for the competing objectives of habitat preservation, irrigation, flood control, recreation and electricity generation.

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Description	**Dakotas become the largest wind producers in the country**	Congress reacts to drought and increasing power supply costs and restructures WAPA's role vis-à-vis power procurement	Coalition of Midwest utilities form to purchase wind energy at lowest possible unit cost	Small, individual projects in response to utility RFPs where existing transmission capacity can be used to deliver energy without costly transmission upgrades
Size	**5,000 - 10,000 MW**	250 - 500 MW	500 -1,000 MW	100 - 500 MW
Customer	**Southern states with non-economic wind resources**	WAPA/Coops	5 - 10 Midwest utilities	WAPA Coops, MISO members
Market Drivers	**National RPS in response to environmental and/or security concerns**	Increasing power supply costs as the result of expensive spot purchases to replace low hydro generation on the Missouri River Basin system	Aggressive efforts to contain power purchase costs	Utilities seek low cost wind supplies to average-down in-state wind generation

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Regulatory Drivers	**National transmission reform accompanied by significant Congressional mandates and appropriations**	**Federal Energy Regulatory Commission mandates WAPA join MISO**	**License plate transmission tariffs replace postage stamp rates and allow WAPA to join MISO**	**MISO solves seams issues and is seen as an operational success. WAPA participates in MISO much more assertively and helps facilitate transmission service.**
Legislative Drivers	**Congress mandates significant transmission reform in response to reliability problems. Major Congressional appropriations.**	**Congressional enabling legislation to allow WAPA to enter into long-term power supply contracts**	**State RPS**	**State RPS**
Transmission Provider	**Super-regional and/or national "TAGG" high-voltage backbone**	**WAPA**	**WAPA, MISO, and new transmission construction**	**WAPA and MISO**
Comment	**Decade or more commitment. Would require coordinated efforts from state, regional, and federal government agencies.**	**This would require a failry significant and disciplined political campaign from the WAPA member coops**	**Utility cooperation difficult without some overriding environmental fear or legislative mandate. Parochialism for "in-state" wind projects continues to trump economics in siting decisions.**	**Would require changes in the way the Bureau of Reclamation manages water release for the competing objectives of habitat preservation, irrigation, flood control, recreation and electricity generation.**

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Description	Dakotas become the largest wind producers in the country	**Congress reacts to drought and increasing power supply costs and restructures WAPA's role vis-à-vis power procurement**	Coalition of Midwest utilities form to purchase wind energy at lowest possible unit cost	Small, individual projects in response to utility RFPs where existing transmission capacity can be used to deliver energy without costly transmission upgrades
Size	5,000 - 10,000 MW	**250 - 500 MW**	500 -1,000 MW	100 - 500 MW
Customer	Southern states with non-economic wind resources	**WAPA/Coops**	5 - 10 Midwest utilities	WAPA Coops, MISO members
Market Drivers	National RPS in response to environmental and/or security concerns	**Increasing power supply costs as the result of expensive spot purchases to replace low hydro generation on the Missouri River Basin system**	Aggressive efforts to contain power purchase costs	Utilities seek low cost wind supplies to average-down in-state wind generation

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Regulatory Drivers	National transmission reform accompanied by significant Congressional mandates and appropriations	**Federal Energy Regulatory Commission mandates WAPA join MISO**	License plate transmission tariffs replace postage stamp rates and allow WAPA to join MISO	MISO solves seams issues and is seen as an operational success. WAPA participates in MISO much more assertively and helps facilitate transmission service.
Legislative Drivers	Congress mandates significant transmission reform in response to reliability problems. Major Congressional appropriations.	**Congressional enabling legislation to allow WAPA to enter into long-term power supply contracts**	State RPS	State RPS
Transmission Provider	Super-regional and/or national "TAGG" high-voltage backbone	**WAPA**	WAPA, MISO, and new transmission construction	WAPA and MISO
Comment	Decade or more commitment. Would require coordinated efforts from state, regional, and federal government agencies.	**This would require a fairly significant and disciplined political campaign from the WAPA member coops**	Utility cooperation difficult without some overriding environmental fear or legislative mandate. Parochialism for "in-state" wind projects continues to trump economics in siting decisions.	Would require changes in the way the Bureau of Reclamation manages water release for the competing objectives of habitat preservation, irrigation, flood control, recreation and electricity generation.

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Description	Dakotas become the largest wind producers in the country	Congress reacts to drought and increasing power supply costs and restructures WAPA's role vis-à-vis power procurement	**Coalition of Midwest utilities form to purchase wind energy at lowest possible unit cost**	Small, individual projects in response to utility RFPs where existing transmission capacity can be used to deliver energy without costly transmission upgrades
Size	5,000 - 10,000 MW	250 - 500 MW	**500 -1,000 MW**	100 - 500 MW
Customer	Southern states with non-economic wind resources	WAPA/Coops	**5 - 10 Midwest utilities**	WAPA Coops, MISO members
Market Drivers	National RPS in response to environmental and/or security concerns	Increasing power supply costs as the result of expensive spot purchases to replace low hydro generation on the Missouri River Basin system	**Aggressive efforts to contain power purchase costs**	Utilities seek low cost wind supplies to average-down in-state wind generation

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Regulatory Drivers	National transmission reform accompanied by significant Congressional mandates and appropriations	Federal Energy Regulatory Commission mandates WAPA join MISO	**License plate transmission tariffs replace postage stamp rates and allow WAPA to join MISO**	MISO solves seams issues and is seen as an operational success. WAPA participates in MISO much more assertively and helps facilitate transmission service.
Legislative Drivers	Congress mandates significant transmission reform in response to reliability problems. Major Congressional appropriations.	Congressional enabling legislation to allow WAPA to enter into long-term power supply contracts	**State RPS**	State RPS
Transmission Provider	Super-regional and/or national "TAGG" high-voltage backbone	WAPA	**WAPA, MISO, and new transmission construction**	WAPA and MISO
Comment	Decade or more commitment. Would require coordinated efforts from state, regional, and federal government agencies.	This would require a failry significant and disciplined political campaign from the WAPA member coops	**Utility cooperation difficult without some overriding environmental fear or legislative mandate. Parochialism for "in-state" wind projects continues to trump economics in siting decisions.**	Would require changes in the way the Bureau of Reclamation manages water release for the competing objectives of habitat preservation, irrigation, flood control, recreation and electricity generation.

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Description	Dakotas become the largest wind producers in the country	Congress reacts to drought and increasing power supply costs and restructures WAPA's role vis-à-vis power procurement	Coalition of Midwest utilities form to purchase wind energy at lowest possible unit cost	**Small, individual projects in response to utility RFPs where existing transmission capacity can be used to deliver energy without costly transmission upgrades**
Size	5,000 - 10,000 MW	250 - 500 MW	500 -1,000 MW	**100 - 500 MW**
Customer	Southern states with non-economic wind resources	WAPA/Coops	5 - 10 Midwest utilities	**WAPA Coops, MISO members**
Market Drivers	National RPS in response to environmental and/or security concerns	Increasing power supply costs as the result of expensive spot purchases to replace low hydro generation on the Missouri River Basin system	Aggressive efforts to contain power purchase costs	**Utilities seek low cost wind supplies to average-down in-state wind generation**

Buyers & Markets

SCENARIO	BUILD-OUT	WAPA REFORM	UTILITY COALITION	INCREMENTALISM
Regulatory Drivers	National transmission reform accompanied by significant Congressional mandates and appropriations	Federal Energy Regulatory Commission mandates WAPA join MISO	License plate transmission tariffs replace postage stamp rates and allow WAPA to join MISO	**MISO solves seams issues and is seen as an operational success. WAPA participates in MISO much more assertively and helps facilitate transmission service.**
Legislative Drivers	Congress mandates significant transmission reform in response to reliability problems. Major Congressional appropriations.	Congressional enabling legislation to allow WAPA to enter into long-term power supply contracts	State RPS	**State RPS**
Transmission Provider	Super-regional and/or national "TAGG" high-voltage backbone	WAPA	WAPA, MISO, and new transmission construction	**WAPA and MISO**
Comment	Decade or more commitment. Would require coordinated efforts from state, regional, and federal government agencies.	This would require a failry significant and disciplined political campaign from the WAPA member coops	Utility cooperation difficult without some overriding environmental fear or legislative mandate. Parochialism for "in-state" wind projects continues to trump economics in siting decisions.	**Would require changes in the way the Bureau of Reclamation manages water release for the competing objectives of habitat preservation, irrigation, flood control, recreation and electricity generation.**

Questions?

Tom Feiler
(303) 295-7320
tfeiler@clipperwind.com

Manufacturing

Job creation at our Cedar Rapids plant:

- Number of employees: 141
- Payroll: $6 million
- Average annual wage: $41,850
- Average hourly wage: $20.12
- Total throughput at Capacity:
  $300 million

Regional Transmission Organizations