The Development of Worldwide Wind Energy

Horizon Wind Energy
An EDP Renewables Company

Andrew Young, CDO
Horizon Wind Energy
International Farm Management Congress (07.22.09)

Agenda

1. Introduction: Who We Are

2. Overview of the Global Wind Market

3. US Policy, Market Drivers and Challenges

4. Development Process and Land Use

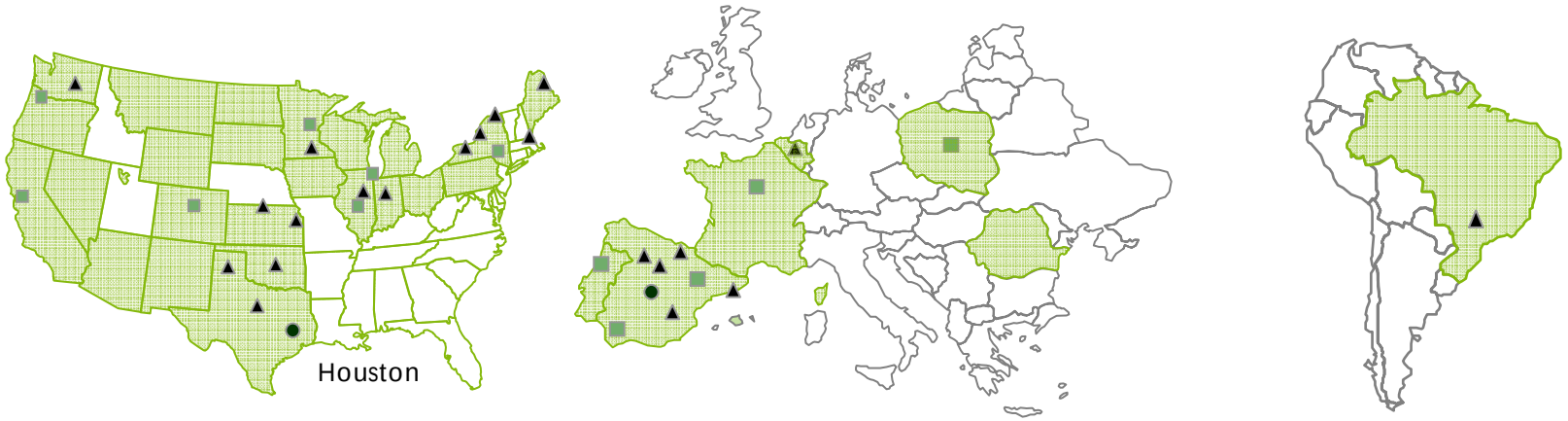
Horizon Wind Energy: Who we are

- Developed over 3,000 MW of projects
- Currently own and operate nearly 2,500 MW throughout the U.S.
- 4th largest in the US, and 3rd largest in the world in installed capacity (as of YE 2008)
- Owned by EDP Renováveis
- Approximately 300 employees in the US
- 22 offices across the country

EDP Renewables: Global Platforms

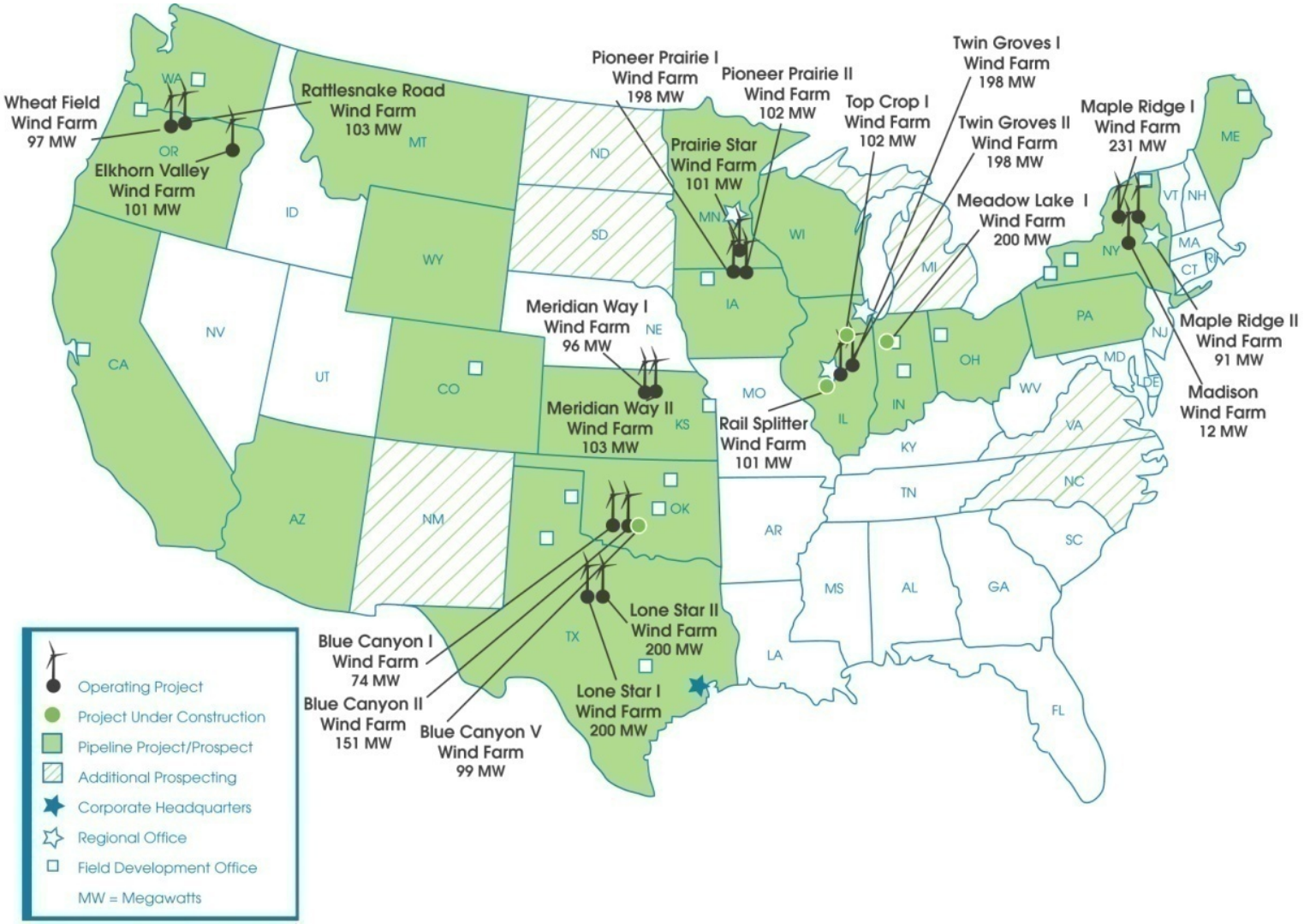
edp renewables

North America | Europe | South America



● Headquarters ■ Main Offices ▲ Regional Site Offices

Horizon is active in 19 US states, with nearly 2.5 GW of operating projects in 8 states…



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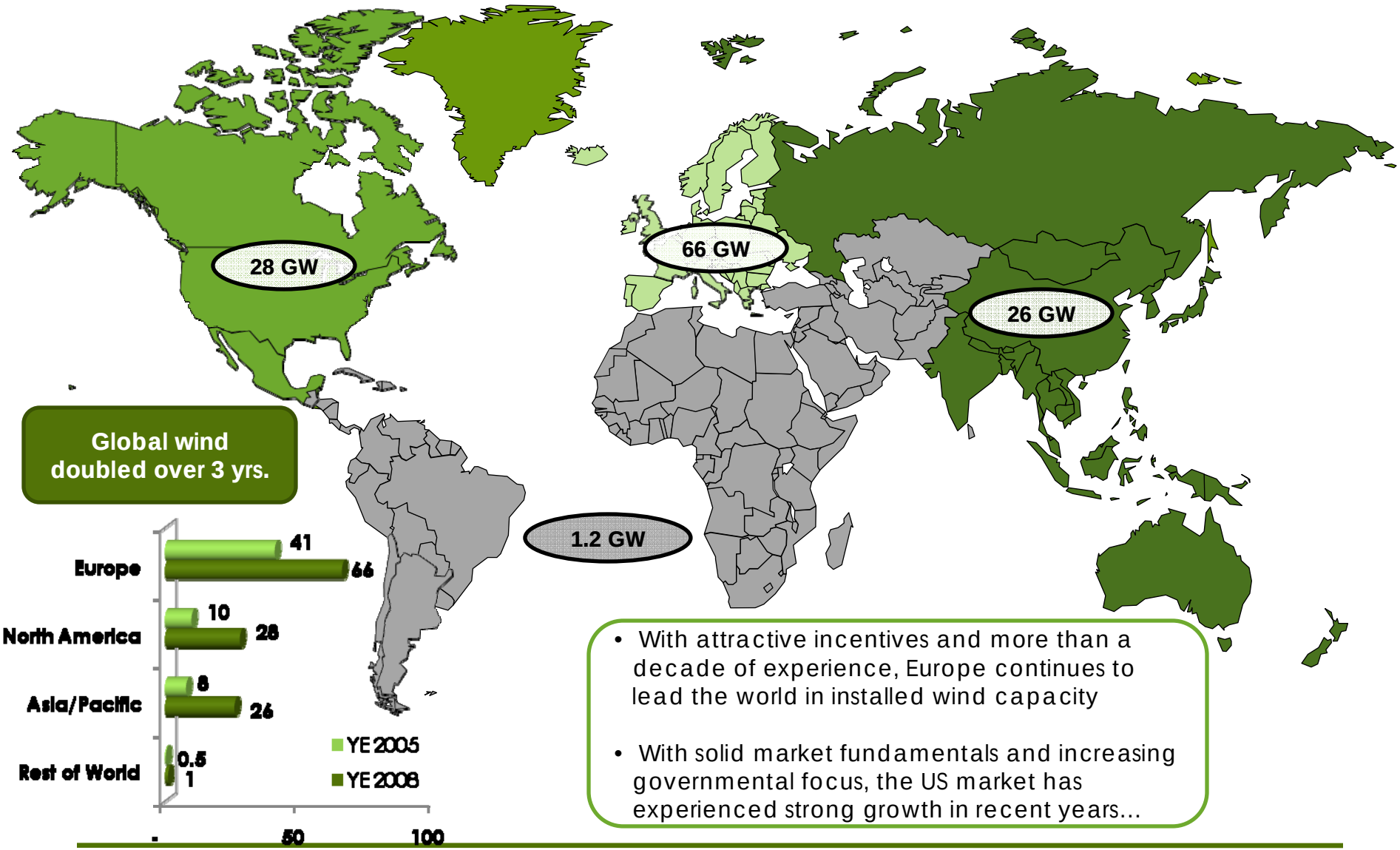
Why wind you may ask? In short…

Wind is good for the economy, landowners, environment, and the world at large…

- Fuel is free, abundant and inexhaustible
- Provides for greater energy security
- Provides full-time jobs
- Generates tax revenue for communities
- Promotes rural economic development
- Land friendly: compatible with land uses, including farming and ranching
- Can farm around turbines, roads and transmission lines
- Average installation uses less than 1% of project land
- Low cost of operation drives down overall electric rates

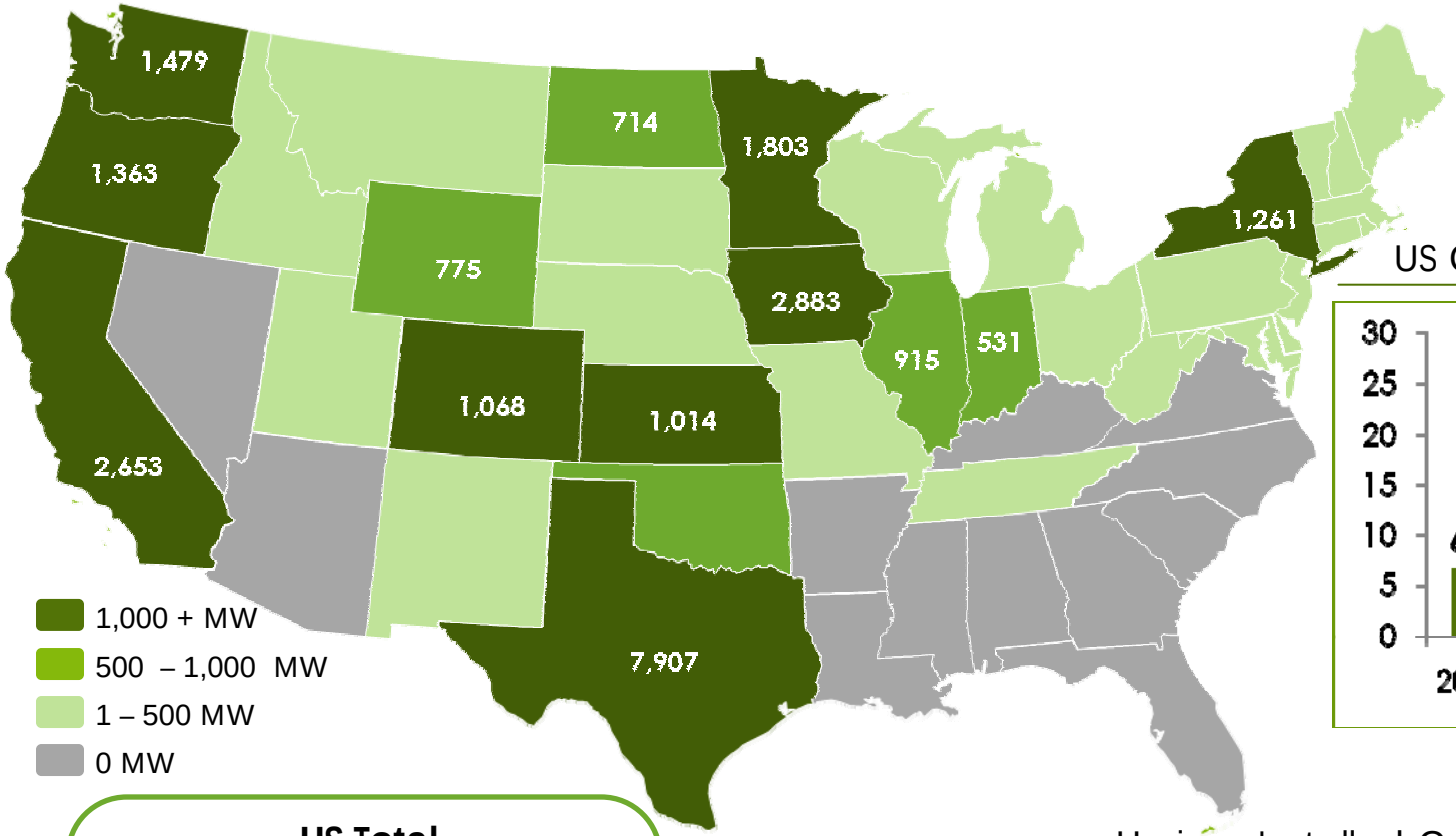
At the end of 2008, over 121 GW of wind had been installed worldwide….



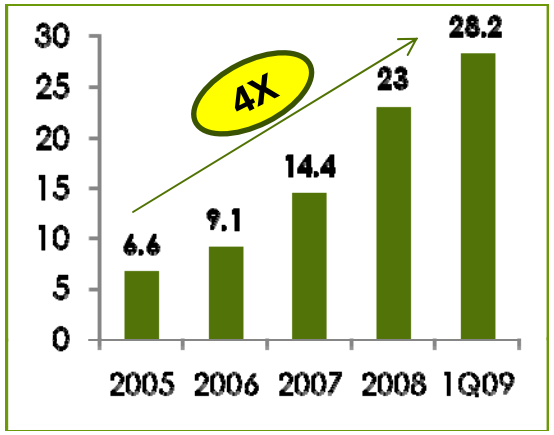
- With attractive incentives and more than a decade of experience, Europe continues to lead the world in installed wind capacity
- With solid market fundamentals and increasing governmental focus, the US market has experienced strong growth in recent years…

Source: EER (base case forecast), EDPR NA

As of the end of Q1 '09, the US alone had over 28 GW of installed wind capacity, a 4 fold increase over 3 yrs.



US Capacity ('05-1Q09)



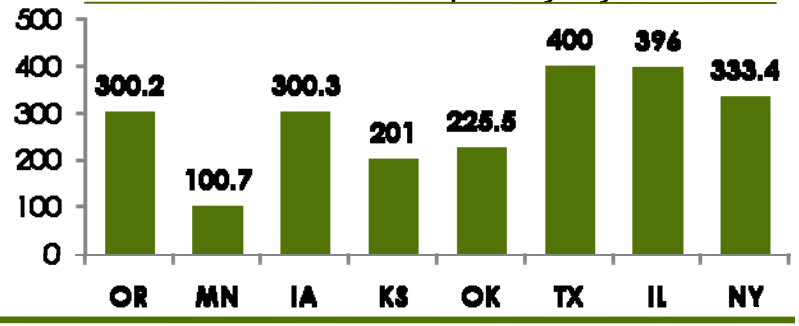
US Total

28,206 MW in 35 States

Horizon

2,257 MW in 8 states

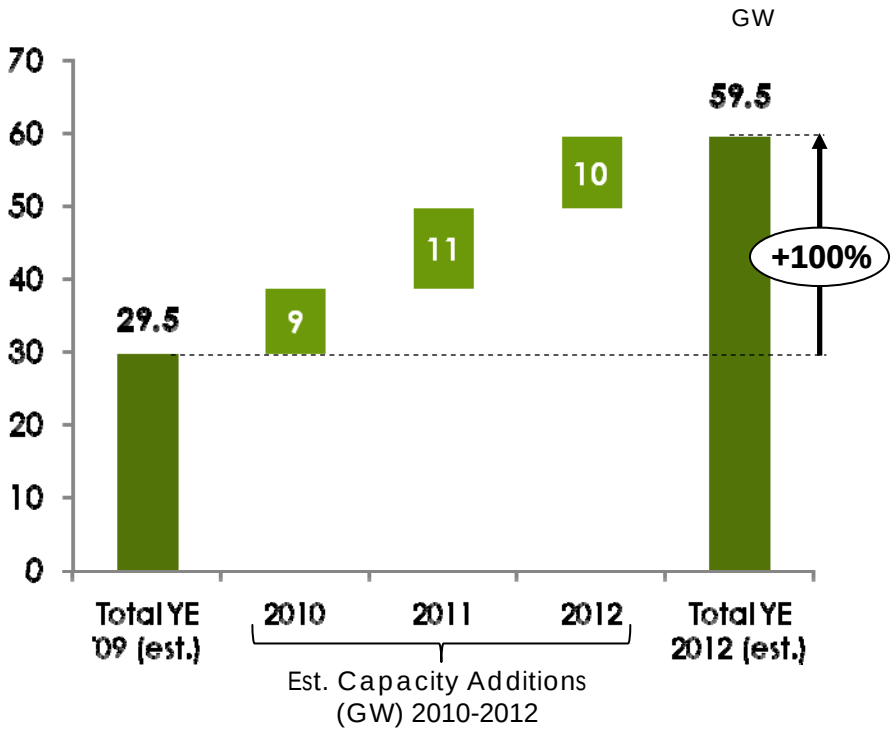
Horizon Installed Capacity by US State



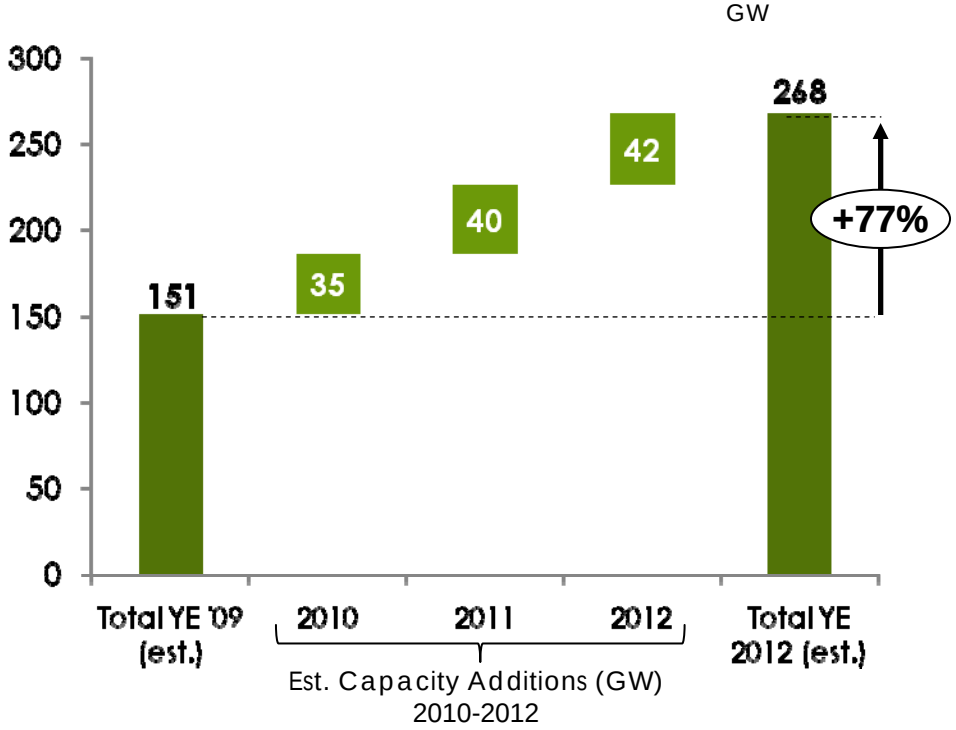
Source: EER (base case forecast), EDPR NA

The global wind industry is primed for continued growth…

Expected US Wind Capacity Additions 2010 – 2012



Expected Global Wind Capacity Additions 2010 – 2012



- The Global and US wind industries have experienced strong growth over the past years; a growth that is anticipated to continue with a strong increase in global installed capacity over the next 3 years.
- **The wind industry is not immune from the current financial crisis, and this growth will be contingent upon available financing, available transmission, and energy policy.**

Source: EER (base case forecast), EDPR NA

Despite strong growth, wind penetration of the overall global electricity market is relatively low…but growing….

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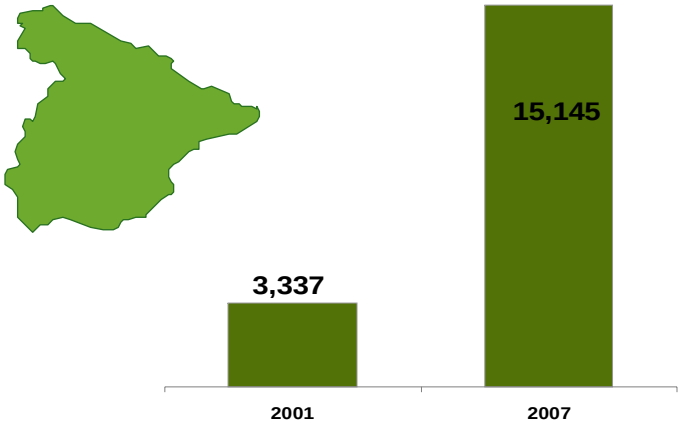
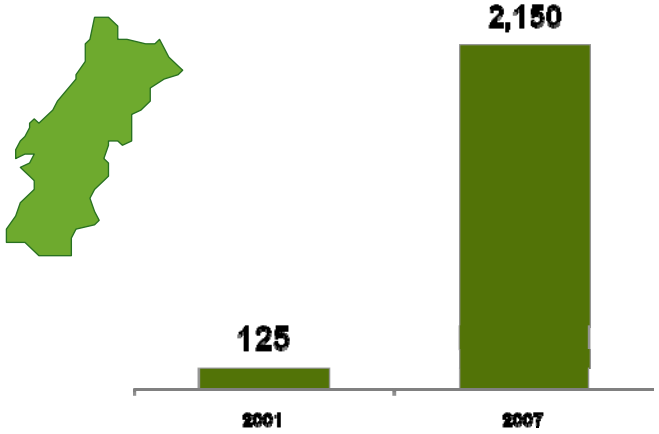
Spain

Wind penetration: ~10% **NCF: ~25%**



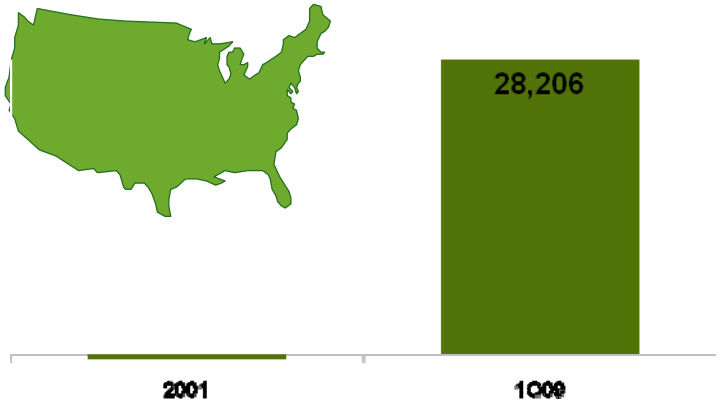
Portugal

Wind penetration: ~9% **NCF: ~25%**



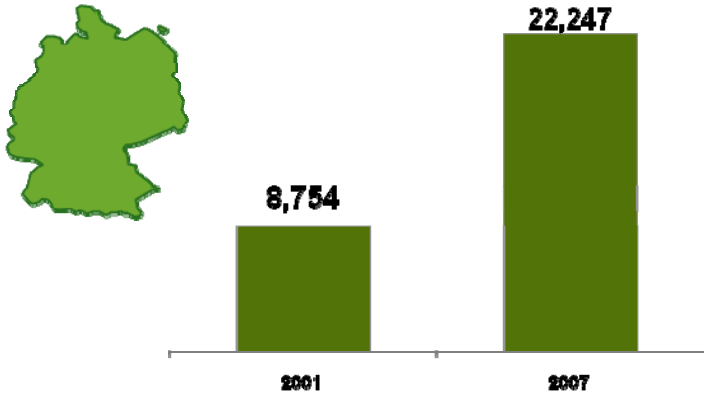
USA

Wind penetration: < 3% **NCF: ~33%**



Germany

Wind penetration: < 7% **NCF: ~21%**



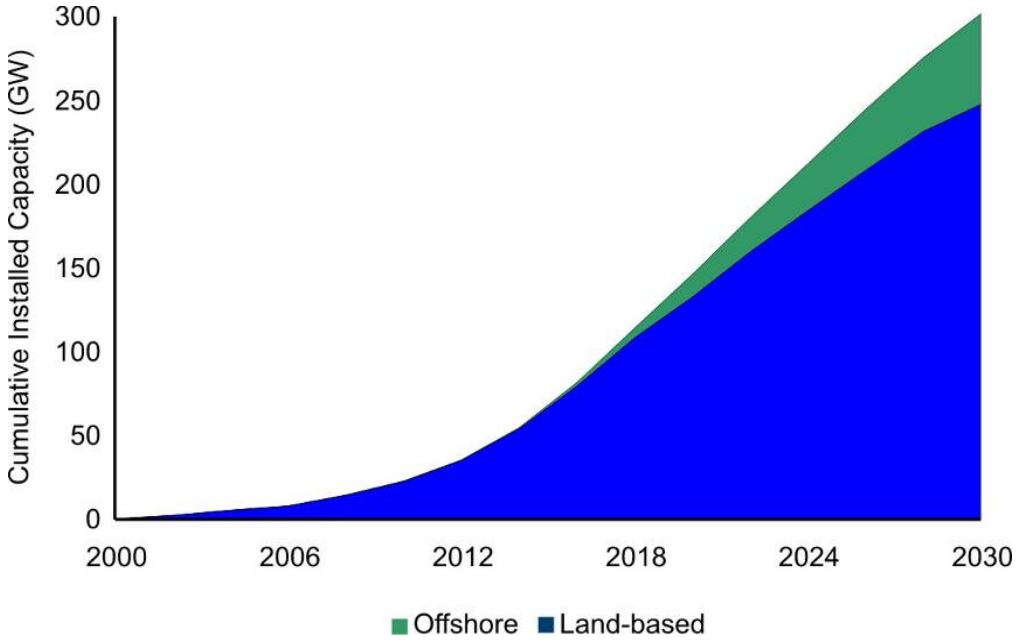
Source: EER, EDPR NA

The DOE forecasts that wind can account for 20% of US energy needs by 2030…

Wind has the potential to contribute 20% of US energy needs by 2030 (U.S. Dept. of Energy), but the right mix of drivers are needed to get us there…

Required installed capacity:

305 GW



Benefits of 20% Wind

1. 25% less CO2 output in electric sector
2. 11% less natural gas consumption
3. ~500,000 jobs, often in rural areas
4. >$500million/year to landowners
5. >1 billion/year in local property taxes

Source: AWEA

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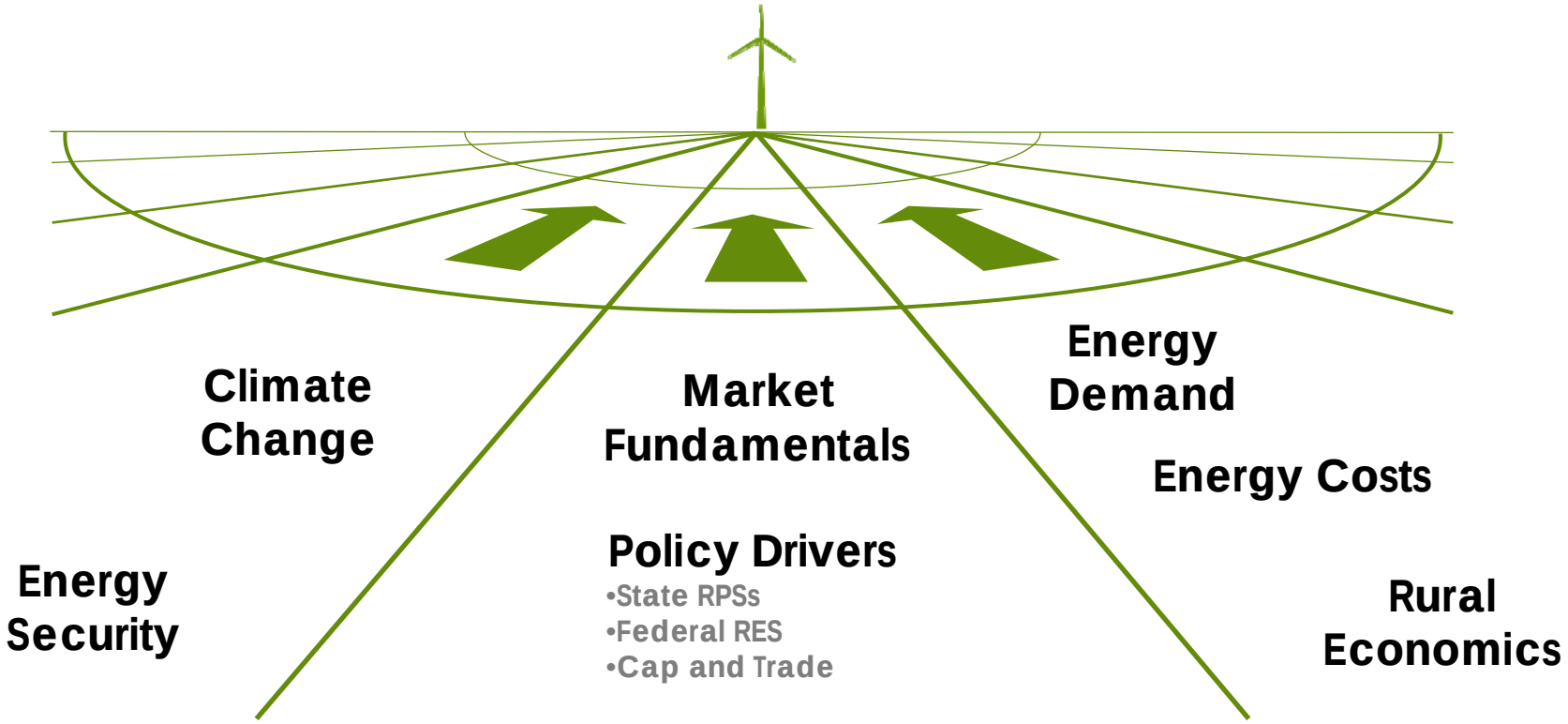
Drivers of wind energy



Incentives – the backbone of our regulatory structure

Tax Credits

<u>Production Tax Credit (PTC)</u>

On again, off again since the early 90s

- Worth$21/Mwh
- Currently extended until 2011

<u>Investment Tax Credit (ITC)</u>

- Per the Economic Stimulus package, can elect to go this route for 30% cash refund from the Department of Treasury
- Makes sense in all but the most windy of projects

Federal Renewable Portfolio Standard

Would require all states to purchase renewable energy

- Mainly incentivizes the Southeast
- Would help create a nation-wide market, with a base Renewable Energy Credit value

Passed in House; onto Senate

- While debated multiple times on the floor, this is the first bill to make it past either House
- If Senate passes, conference between the House & Senate, and then onto the President to become a law

Climate Change

Creates a marketplace for the selling or trading of climate credits

- Incentivizes clean energy by creating a carbon market
- Already some utilities are factoring in carbon prices into their models

Passed in House; onto Senate

- Sen. Majority leader Harry Reid pushed for RES & Climate change together
- If Senate passes, conference between the House & Senate, and then onto the President to become a law

The Economic Stimulus Bill has provided the industry with additional incentives…

3 year extension of PTC	Provides a 3 year extension of the Production Tax Credit, limiting extension risk and preventing the "boom and bust" cycle that has emerged due to yearly extensions.
30% ITC	Provides the optionality to select a 30% tax credit on a project's capital investment. The ITC may be beneficial as it is tied to investment rather than a projects production (for projects in service 2009-2012).
Treasury Cash Grant	The Cash Grant provides a means to monetize the ITC with the treasury to pay the grant within 60 days of application (for projects under construction by YE 2010).
Extension of Bonus Depreciation	Extends bonus depreciation for capital expenditures incurred in 2009, allowing for the faster recovery of costs of capital (immediate write off of 50% of the cost of depreciable property).

Source: AWEA

Short-Term: PTC or ITC

Production Tax Credit

Provides 10-years of production-based tax credits

- $21/Mwh in 2009, esclating with CPI
- Used through 3rd parties who can use the tax credits

But Markets are tight...

- Not much interest, and for those companies that are interested, very high rates

Vs.

Investment Tax Credit

Provides a 30% cash grant for the costs of a project

- Covers WTGs or projects that were started in 2009 or commissioned in 2009, all the way through 2012 provided that started construction in 2010.

Appliccations can be accepted August 1st

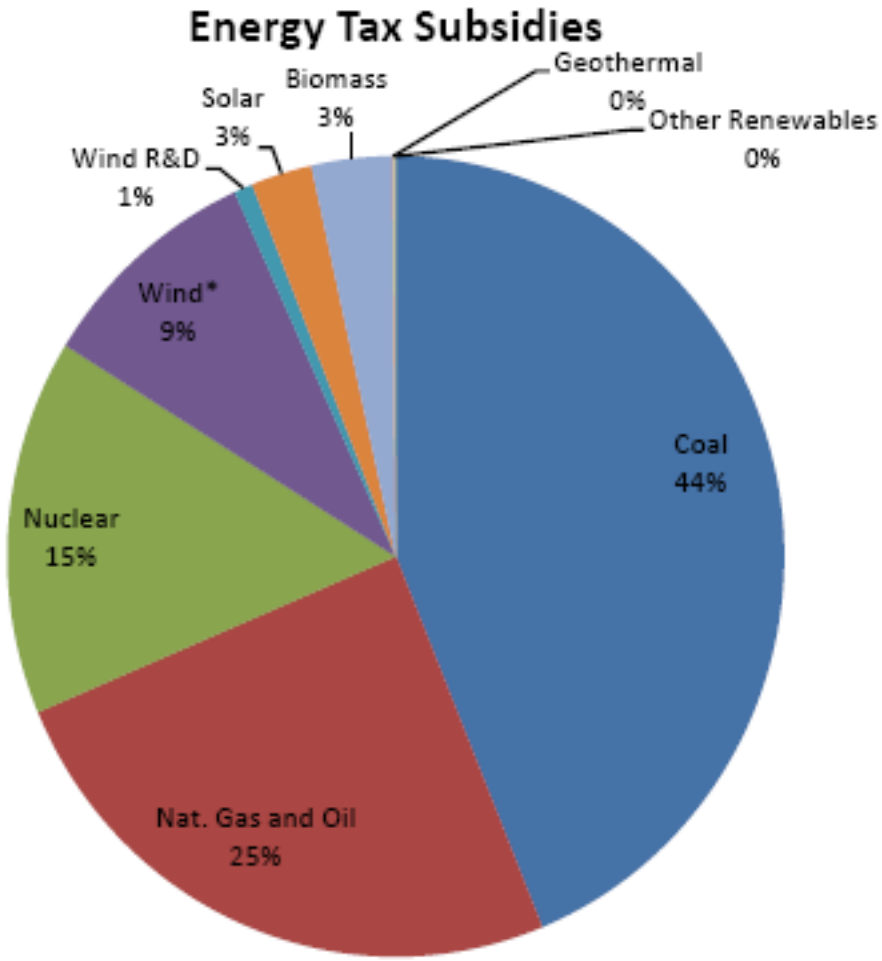
- Required 60 day turnaround from the Department of Treasury

US Tax Incentives for Energy in Perspective

Coal	**44%**
Oil+Gas	**25%**
Nuclear	**15%**
Wind	**10%**
Other Renewables	**6%**
TOTAL	**100%**

- All forms of energy in the US are subsidized

- $7.4B of tax incentives allotted in 2007:
  - 10% wind
  - 84% to conventional thermal



A Federal RES would spur demand for renewables in the US market…

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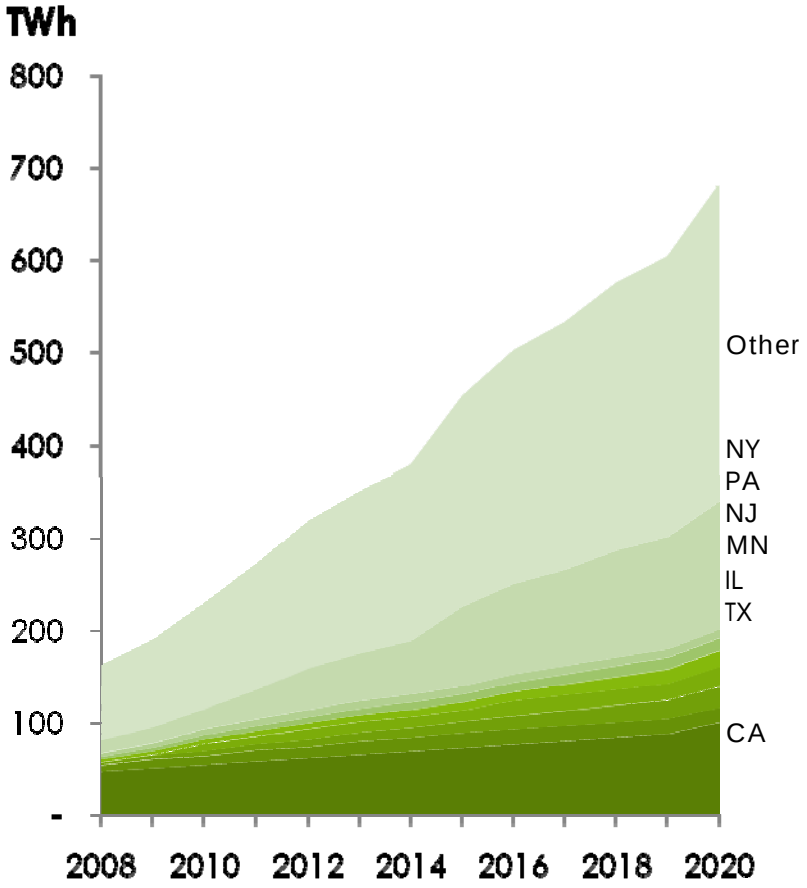
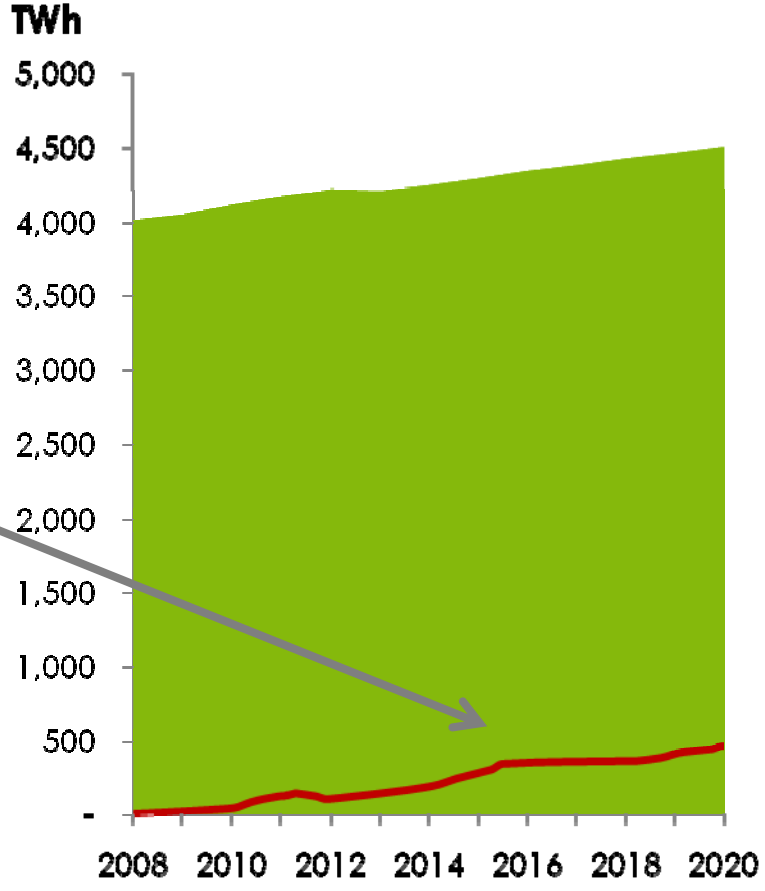
Cumulative State RPS Demand Outlook



US Energy Supply Outlook



Total RPS demand < 5% of U.S. supply in 2015

Source: EDPR NA

Current Proposed Federal Renewable Energy Standards weak...

Approved House Bill

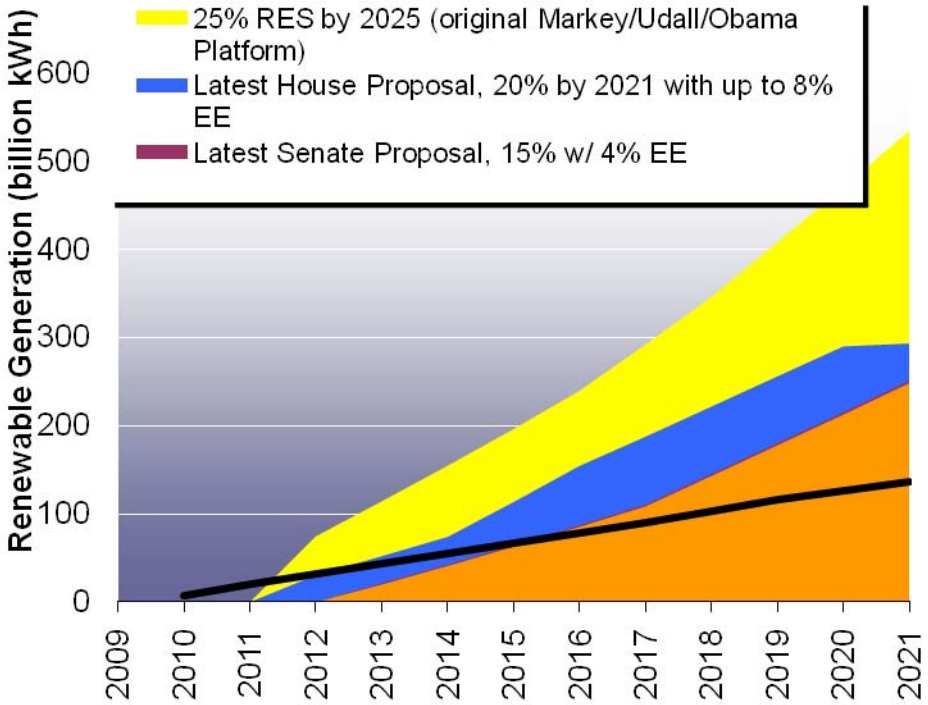
- House bill American Clean Energy & Security Act passed by a vote of 219 to 212. AWEA supported passage of the bill.
- Requires 20% by 2020 with 8% EE
- Existing generation counts towards totals (going back to 1988 in-service dates)
- Includes RES for federal government agencies
- Transmission: federal backstop authority approved for the west

Weak in the Short term

- Requires 0 extra GWs by 2012 (after 2009 construction)

Gains strength in the longer term

- Requires 66 extra GWs by 2012 (after 2009 construction)



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Current Proposed Climate Change portion....not ideal...

Approved House Bill

- House bill American Clean Energy & Security Act passed by a vote of 219 to 212. AWEA supported passage of the bill.
- Requires 17% emissions reduction by 2020; 83% by 2050
- Will help to create a carbon market, but will be based on a state level
- Allowances will drive the market, with 85% given away, and 15% auctioned off

Allowances are not the best for wind energy

- Allowances are split up three ways: 1/3rds equally to states, 1/3rd based on population; 1/3rd for energy consumption

Onto the Senate

- Expected to emerge from the Senate Environment & Public Works Committee in September

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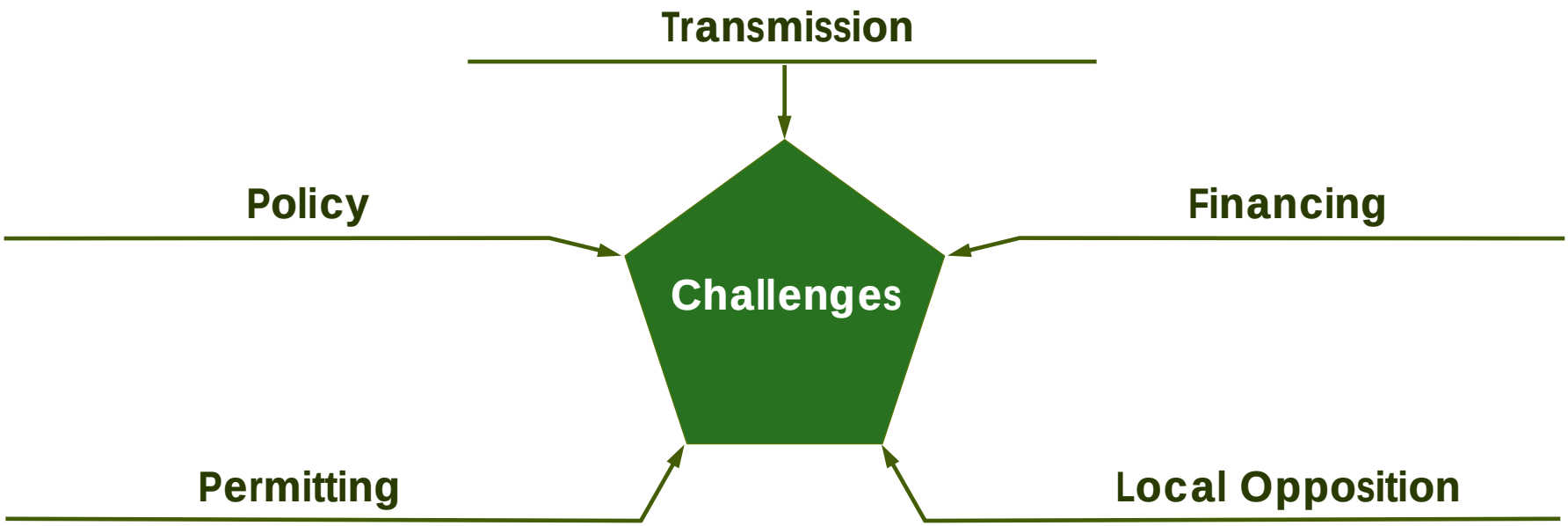
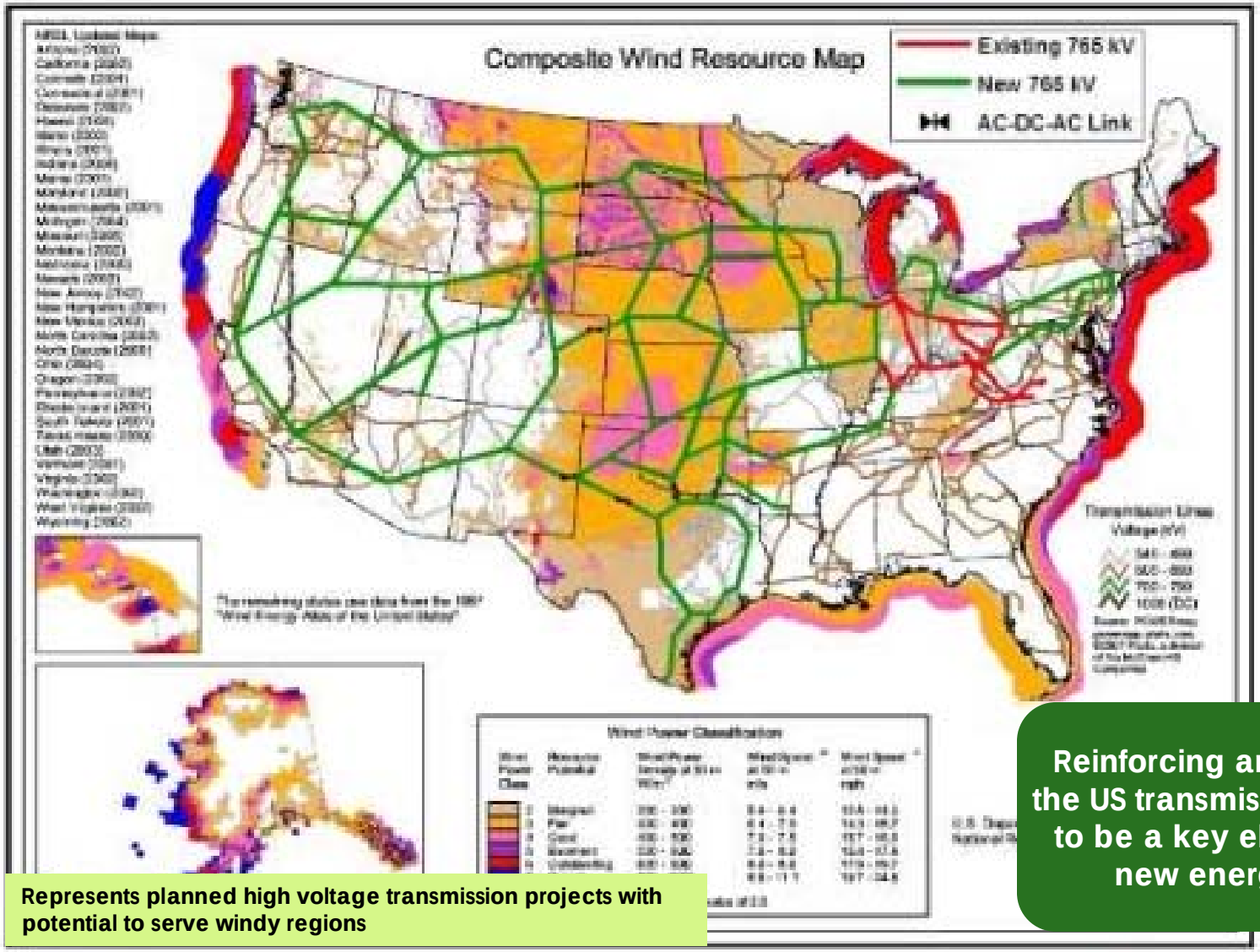
But challenges still remain for the industry…



New large transmission is needed to alleviate current constraints and to tap the US' windiest regions…

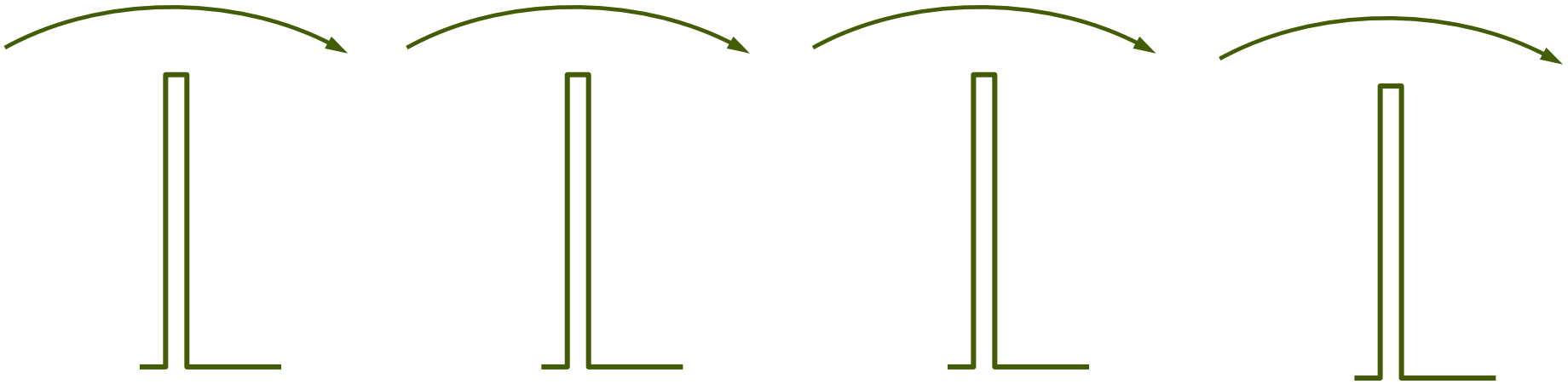


Represents planned high voltage transmission projects with potential to serve windy regions

Reinforcing and expanding the US transmission grid needs to be a key element of any new energy policy.

Source: NREL

But new transmission does not come without its hurdles…



- Older infrastructure
- Cost allocation for cross-ISO projects
- Focus on local economics
- Wind integration

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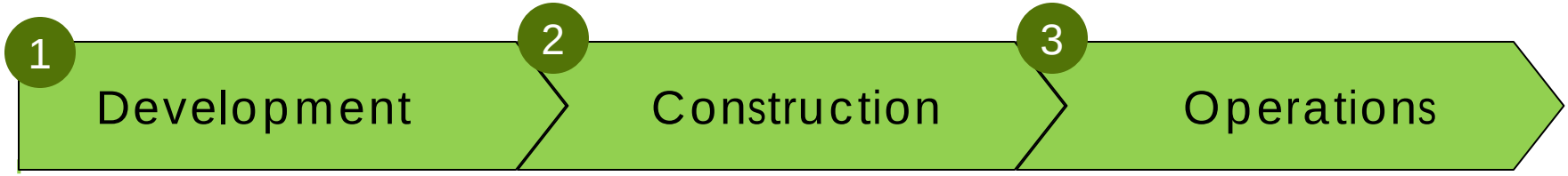
Horizon looks for a combination of…

1. Wind Resource
2. Transmission
3. Terrain
4. Existing Land Use
5. Community Acceptance
6. Market Attractiveness

Development Process Overview…

Once an attractive site has been selected, the project moves through three phases:



- 2-10 years
- Acquire land rights
- Conduct studies and secure permits
- Secure transmission
- Measure wind

- 1-2 years
- Dig foundations
- Build/improve access roads
- Erect turbines
- Dig underground collection cables
- Build substation
- Clean up

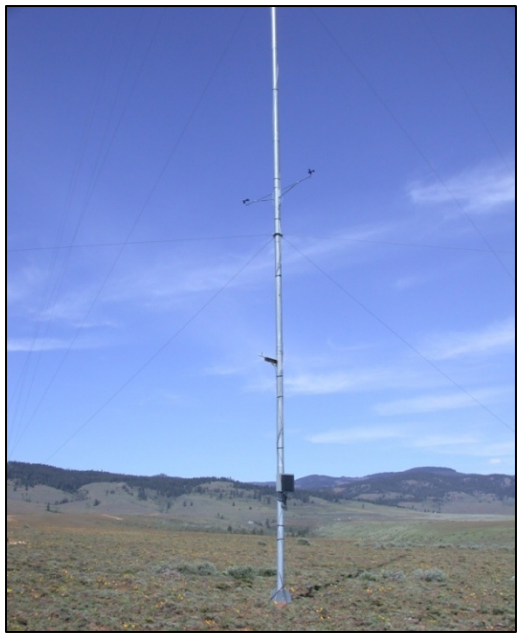
- 30+ years
- Monitor operation of turbines
- Sell power
- Conduct repairs and regular maintenance
- Pay landowners

Development Steps

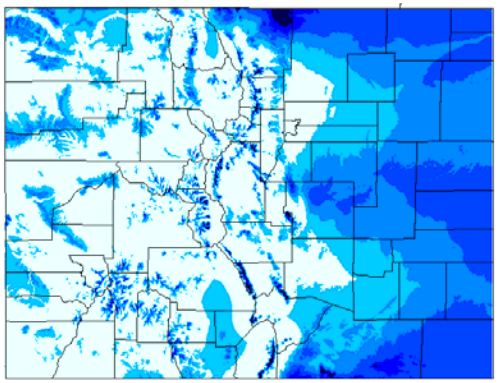
- Finding prospective sites close to a viable electricity market
- Execute land agreement(s)
- Implement wind monitoring program
- Perform fatal flaw environmental study
- Perform transmission studies (capacity, interconnection)
- Obtain all local, state and federal permits
- Work with Utility customers - power purchase agreement

Testing the Wind…

165ft tall steel pole 6-8” in diameter with instruments at multiple levels

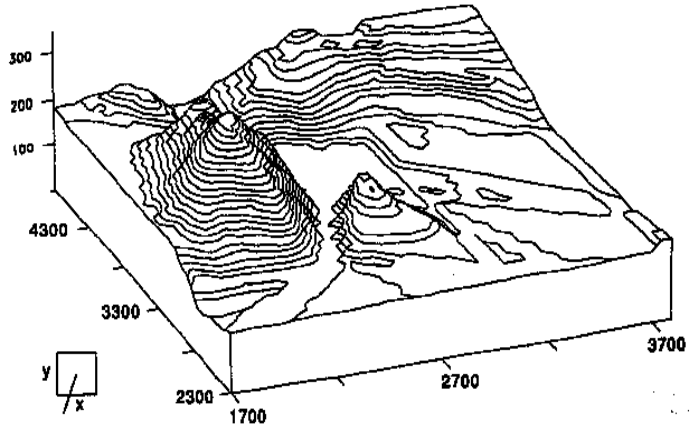


Meteorological Tower



Horizon spends 2+ years measuring the wind to identify the windiest locations and to predict generation

- Secure meteorological tower permits
- Erect towers
- Monitor the wind and quality control data
- Analyze data in-house and with outside meteorologists
- Verify the strength and characteristics of the wind resource



Typical Permit Studies

- **Ecological Baseline Study**:
  - Habitat mapping
  - Birds & Wildlife baseline study
  - Rare plant surveys
  - Raptor nest surveys
- **Visual Simulations**
- **Wind Testing**

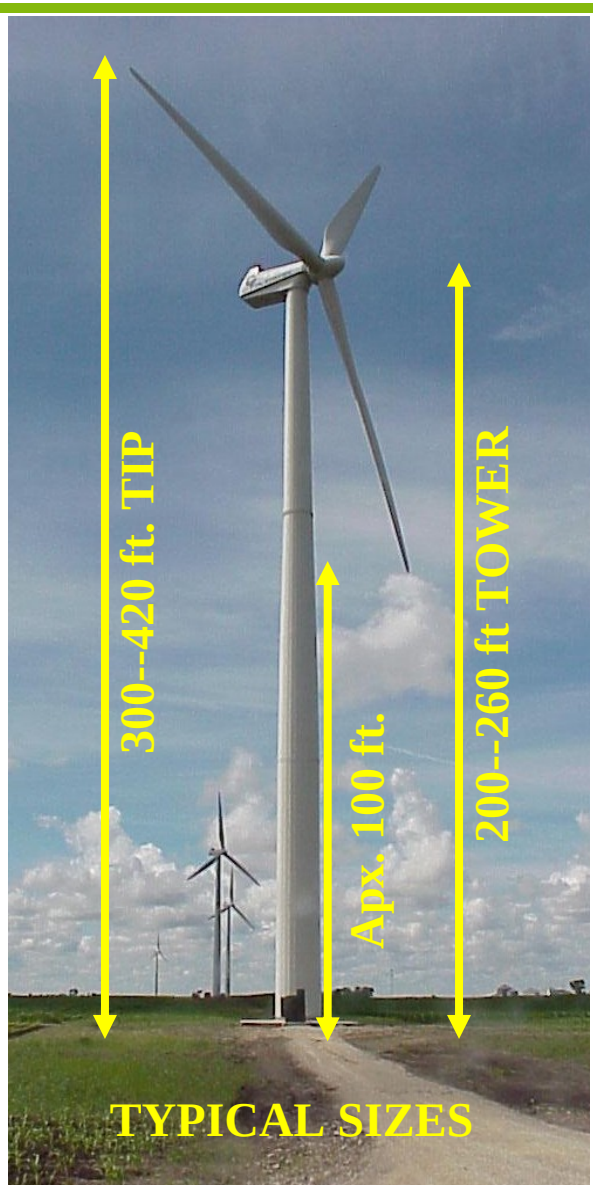
- **Economic Impact**
- **Construction Traffic Analysis**
- **Geotechnical Survey**
- **Noise Analysis**
- **Cultural Resources and Archaeology**

One of Horizon's core beliefs is respect for landowners and for the land itself…

- Depending on the project, tens of thousands of acres of land may be needed to make a project a reality.
- Land is one of the most critical components of project development.
- Access to land is needed for: wind analysis, turbines, collection systems, substations, setbacks, project buffers, transmission ROWs, etc.
- Land is typically leased from landowners (substation purchased)
- Site Plan Approval for landowners before Construction
- Respect and support traditional uses of the land
- Provisions in lease for restoration, construction impact, crop damage, field tile damage, fence damage, etc.
- Restoration fund of $25,000 per turbine – or more

Size of Turbines

- ✓ Turbine Footprint is small
- ✓ Rotors on larger machines bigger than Boeing 747
- ✓ Lowest ground clearance is about 100 ft.



Typical Land Space Required

- Roads ~ 20-35’ feet wide
- Underground Cables Trenched about 30-48” below surface beside roads

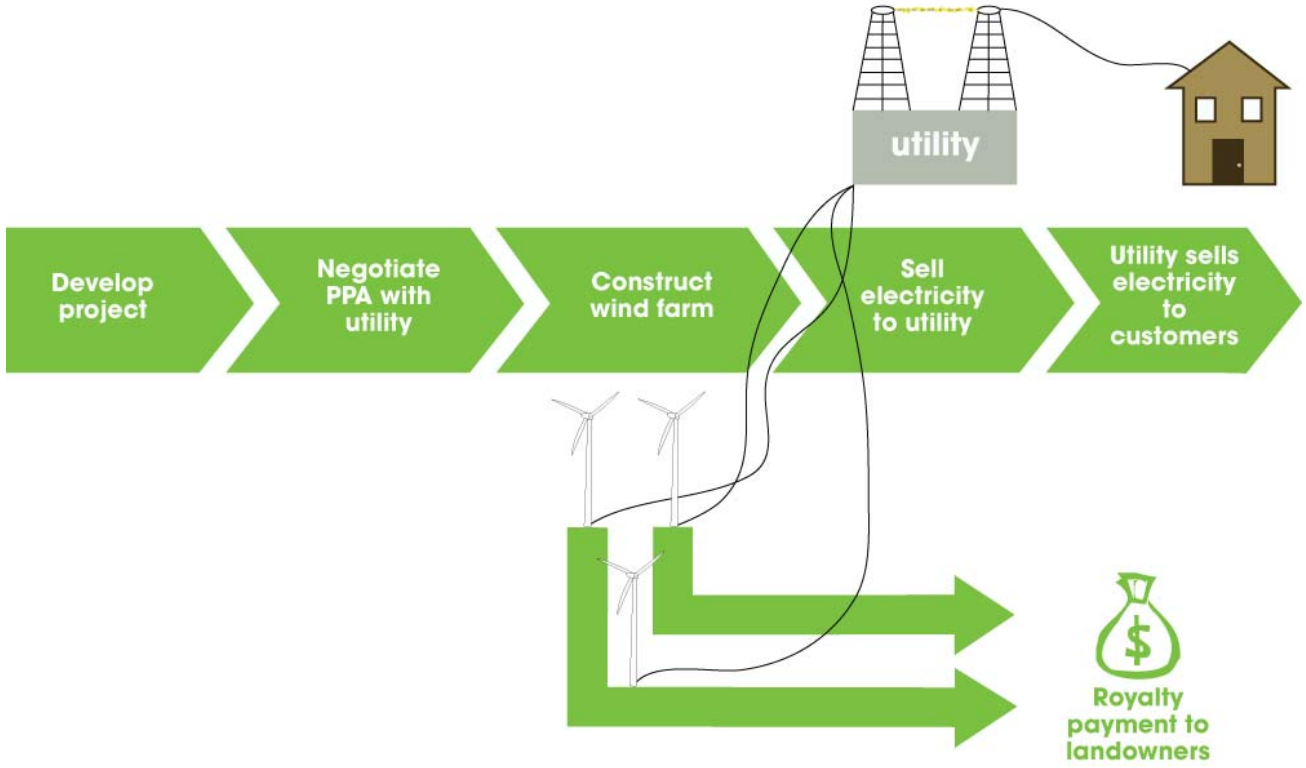
- Turbine Footprint is small (apx. 18 ft. diameter)
- Small pad for transformer – about 8x8 ft.

Delivering clean energy…

Horizon Wind Energy Business Model

We determine how to sell our power before we start construction

- Power purchase agreement vs. merchant market
- Renewable Energy Credits



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ANNEX

A note on other renewables…

- Declining costs and market incentives have increased the space for non-wind renewables .

- To date, wind has a predominant share in the renewables space—a position we expect it to maintain for the near future

- Though leading technologies such as solar provide attractive benefits such as production matching load and storage, a lack of operational history and high capital costs have prevented rapid expansion.

- Given the current economic recession, securing project financing for R&D type technologies may prove to be more difficult.

- Of the non-wind renewables, solar appears to be the most promising, a market which is forecasted to grow to between 13 and 26 GW by 2020

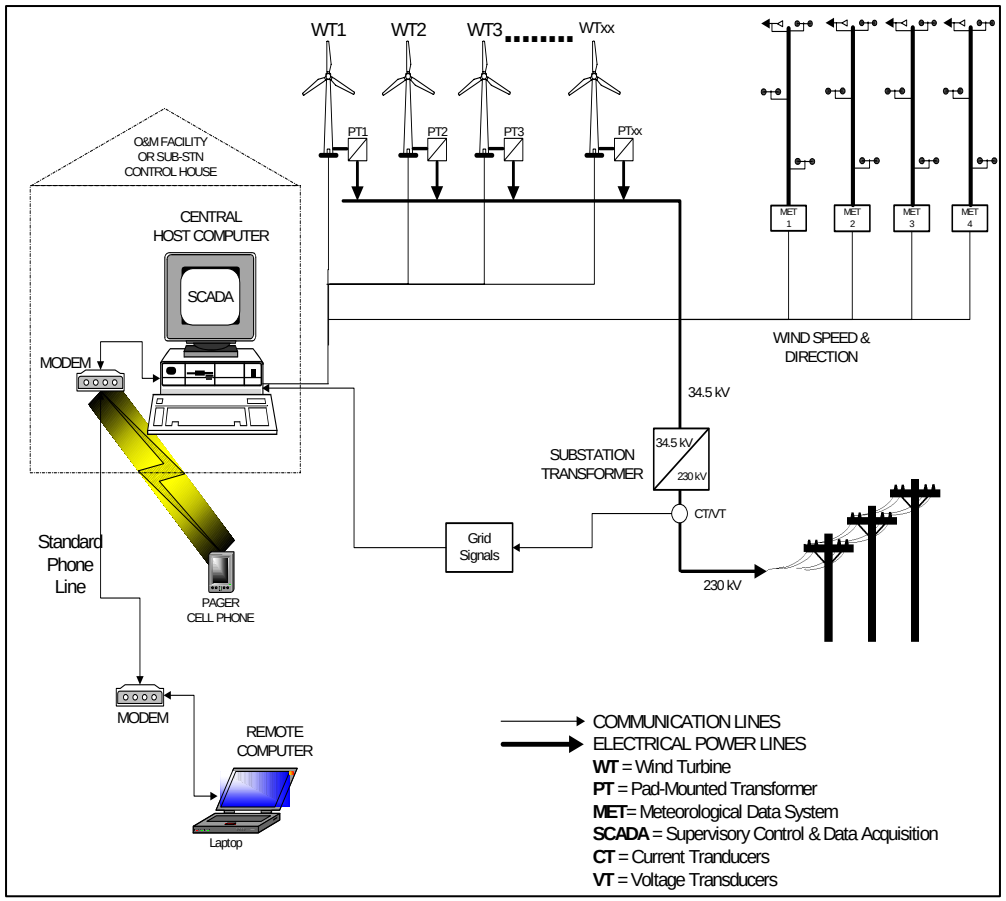
Power Tower

Parabolic Trough

PV

Source: EER, EDPR NA

How does it work?



- Wind turbines convert the kinetic energy of the wind into electrical energy
- Turbines ranging in size from 1.5MW to 3MW (powering between 450-900 American homes) are connected electrically by underground collection lines
- The collection lines meet at the Substation Transformer
- An overhead transmission line connects the wind farm to the electricity grid

Typical Footprint

Typical footprint – top view