

A large wind turbine is visible on the left side of the image, partially obscured by the dark grey overlay. The background shows a clear sky with some light clouds.

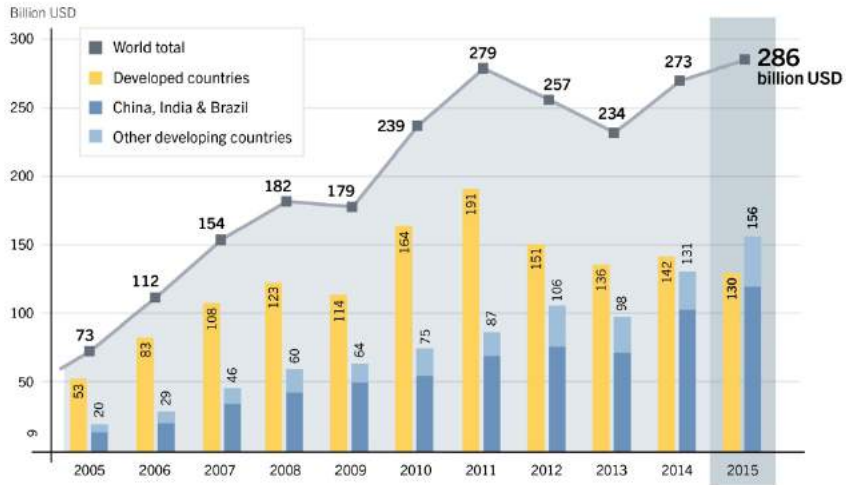
CLEAN ENERGY INVESTMENTS

HAL HARVEY

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ENERGY INVESTMENT TRENDS

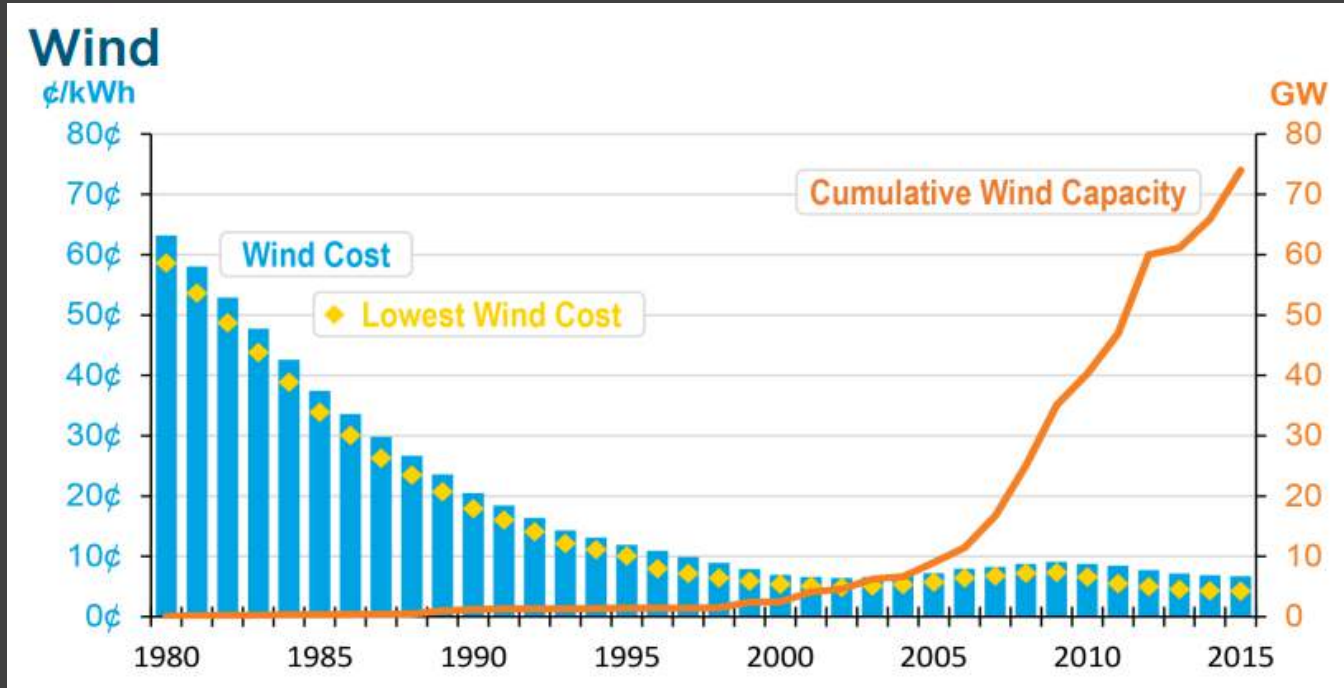
Global New Investment in Renewable Power and Fuels, Developed, Emerging and Developing Countries, 2005–2015



- Global renewables investment rose 5% in 2015 to \$286B (new record)
- More than double the investments in new coal and gas generation (\$130B)

ENERGY PRICE TRENDS: WIND

- Accounted for 2/5 of new generation in 2015
- Cost down 41% since 2008
- Avoided 132MMT of U.S. emissions, while adding 90,000 jobs, \$2B toward economy
- PPAs contracting below \$0.02/kWh



ENERGY PRICE TRENDS: SOLAR

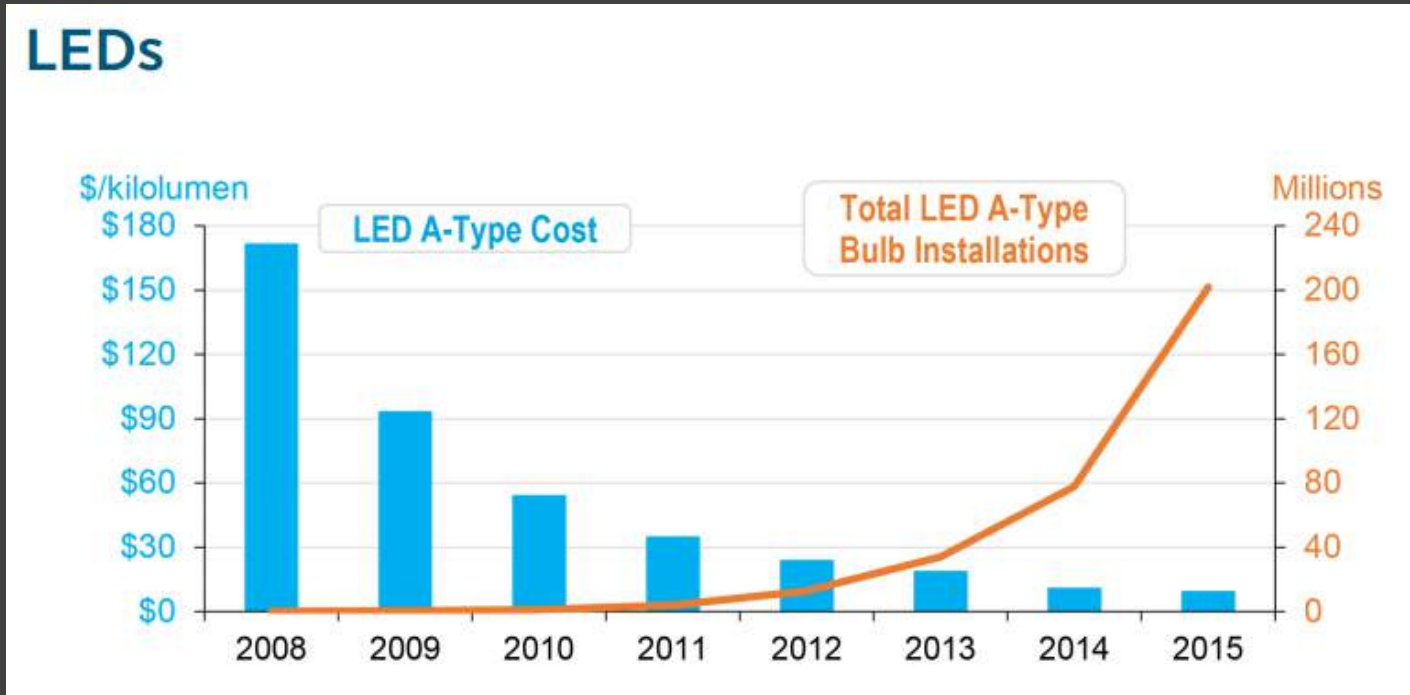
- Costs down 64% since 2008
- Installations increased 43% in 2015
- PPAs contracting below \$0.05/kWh
- Supported 220,000 jobs, contributed \$1B to U.S. economy

Solar PV: Utility-Scale



ENERGY PRICE TRENDS: LEDS

- Cost down 94% since 2008
- Installations more than doubled in 2015
- Consume 85% less energy than incandescent bulbs
- Projected to comprise 85% of U.S. lighting installations, save \$630B in energy costs by 2035



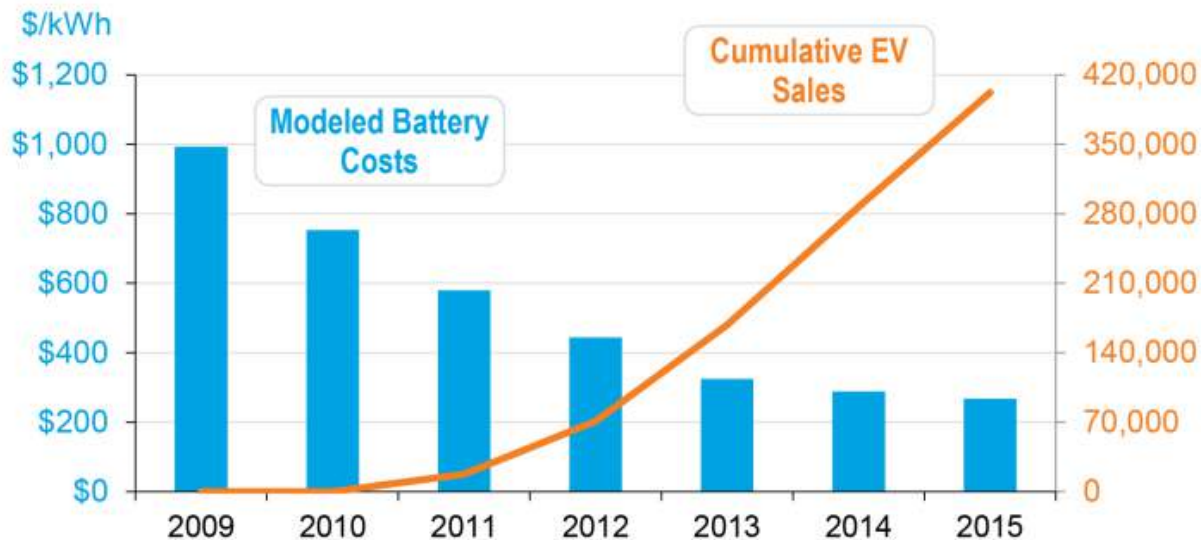
ENERGY PRICE TRENDS: EVS

EV battery cost down 73% since 2009

Nearly 500,000 EVs on the road, more than 35,000 charging stations in U.S.

- Emissions 58% lower compared to gas-fueled vehicle
- DOE's \$1B investment yielded \$3.5B in economic value

Electric Vehicles











GOLDMAN SACHS

\$150 BILLION TO CLEAN ENERGY INVESTMENT BY 2025

“We are at an inflection point when it comes to the deployment of clean technology and renewables. Goldman Sachs is targeting \$150 billion to finance and invest in companies that promote clean technology and renewable energy, and we are committed to helping to develop market-based solutions to environmental challenges.”

<http://www.goldmansachs.com/our-thinking/new-energy-landscape/future-of-clean-energy/>

 <p>3 Drivers of the Low Carbon Economy</p> <p>Kyung-Ah Park, head of the Environmental Markets Group at Goldman Sachs, discusses the key developments catalyzing the transition towards more sustainable global growth.</p> <p>WATCH VIDEO</p>	 <p>Clean Energy: The Future is Here</p> <p>By 2030, renewables will account for half of the world's energy mix. Learn about the new technologies and financial innovations that are driving this transformation.</p> <p>VIEW INFOGRAPHIC</p>	 <p>The Low Carbon Economy</p> <p>Clean energy sources need scale and growth to make an impact. Goldman Sachs Research identifies four technologies with a winning mix of policy support, market acceptance and technical and cost advances.</p> <p>READ REPORTS</p>	 <p>China's Path to a Low Carbon Economy</p> <p>Mark Schwartz, vice chairman of Goldman Sachs and chairman of Goldman Sachs Asia Pacific, discusses how China's green initiatives align with its broader economic transition.</p> <p>WATCH VIDEO</p>
 <p>Environmental Stewardship</p> <p>Lloyd C. Blankfein, chairman and chief executive officer of Goldman Sachs, discusses Goldman Sachs' updated Environmental Policy Framework, highlighting our expanded target to deploy \$150 billion to finance clean energy by 2025.</p> <p>LEARN MORE</p>	 <p>Harnessing the Markets to Address Climate Change</p> <p>Kyung-Ah Park, head of the Environmental Markets Group at Goldman Sachs, describes the role financial institutions can play in both mitigating and managing risks relating to climate change.</p> <p>WATCH VIDEO</p>	 <p>Clean Energy: A Tipping Point</p> <p>Stuart Barnett, an advisory director at Goldman Sachs, discusses how lower costs have led to the rapid adoption of renewable energy, creating a tipping point for energy producers and consumers.</p> <p>WATCH VIDEO</p>	 <p>Renewable Energy and the Capital Markets</p> <p>Chuck Park, managing director in the Equity Capital Markets Group in the Investment Banking Division at Goldman Sachs, discusses the evolution of capital raising for renewable energy businesses and growth opportunities in power generation.</p> <p>WATCH VIDEO</p>

NORWAY'S OPPORTUNITY HEDGE AGAINST THE END OF OIL



NORWAY'S OPPORTUNITY

POLICY LEADERSHIP

- Best building code in the world
- Highest penetration of Evs
- 95% decarbonized grid
- Urban planning

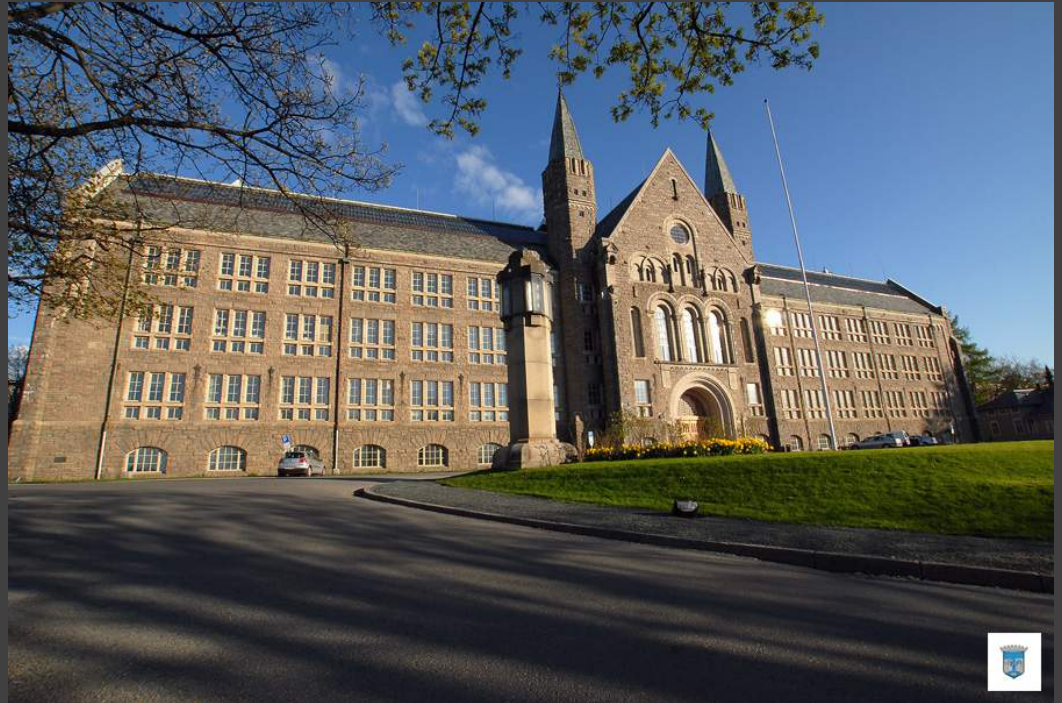
All give a strategic advantage



NORWAY'S OPPORTUNITY

HUMAN CAPITAL

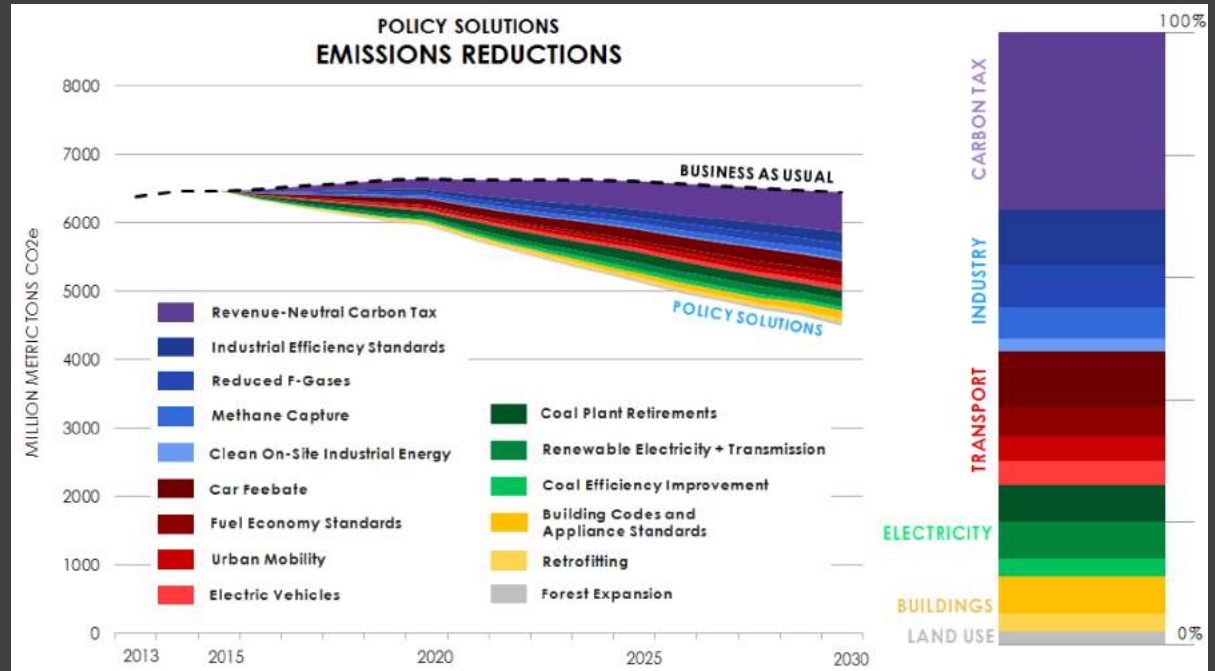
- Many well-trained engineers and technical workers—and some will be looking for work as oil sector declines
- Great technical university
- Good start-up and innovation culture



NORWAY'S OPPORTUNITY

INTERNATIONAL RELATIONS

- Pay-for-performance foreign aid (forests)
- Could, and should, be expanded to include energy policy assistance
- Unbelievably inexpensive method to make a huge difference



NORWAY'S OPPORTUNITY INVESTMENT STRATEGY

Build investment strategy across the spectrum

- Experiments via technical university and research institutes
- Venture with new venture fund
- Build a growth fund
- Commit a few percent of Pension Fund to clean energy. Requires direct investments

Creating
Options /
Ideation

- Venture Capital,
R&D

Demonstrating
Viability

- Commercial-scale
demonstration

Early Adoption

- First commercial
users

Mature Business

NORWAY'S OPPORTUNITY

CONCLUSION

- Own a significant portion of new energy economy
- Take advantage of core skills, policies, investment power, and ethos of Norway





THANK YOU

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INVESTMENT-GRADE POLICY

HOW TO DRIVE DOWN RISK

- Technology
- Siting
- Transmission access
- Power Purchase Agreements
- Permits

INVESTMENT-GRADE POLICY

HOW TO DRIVE DOWN RISK

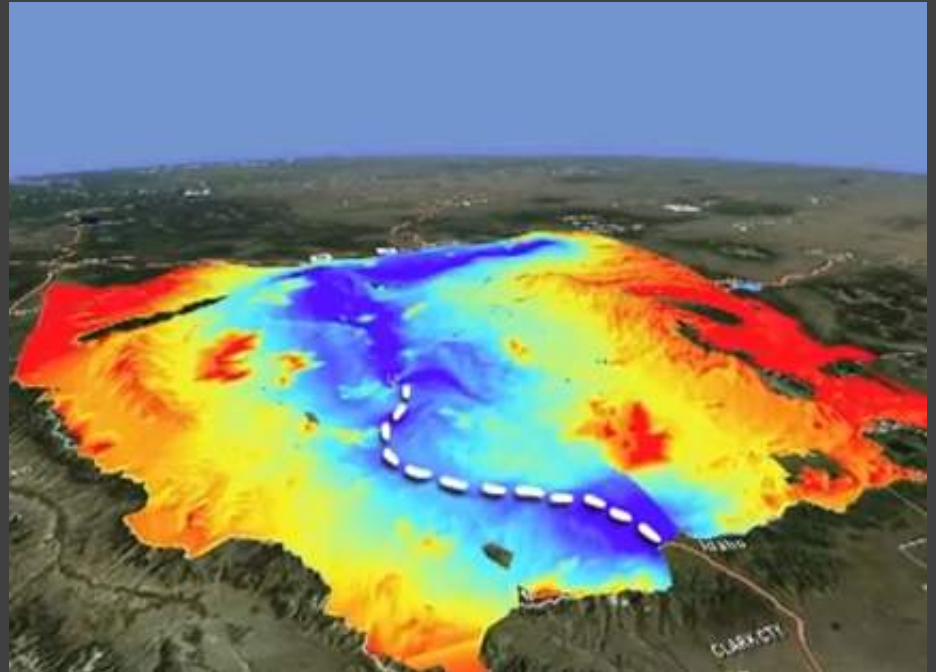
- Technology
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Four of these are susceptible to good policy

INVESTMENT-GRADE POLICY

HOW TO DRIVE DOWN RISK

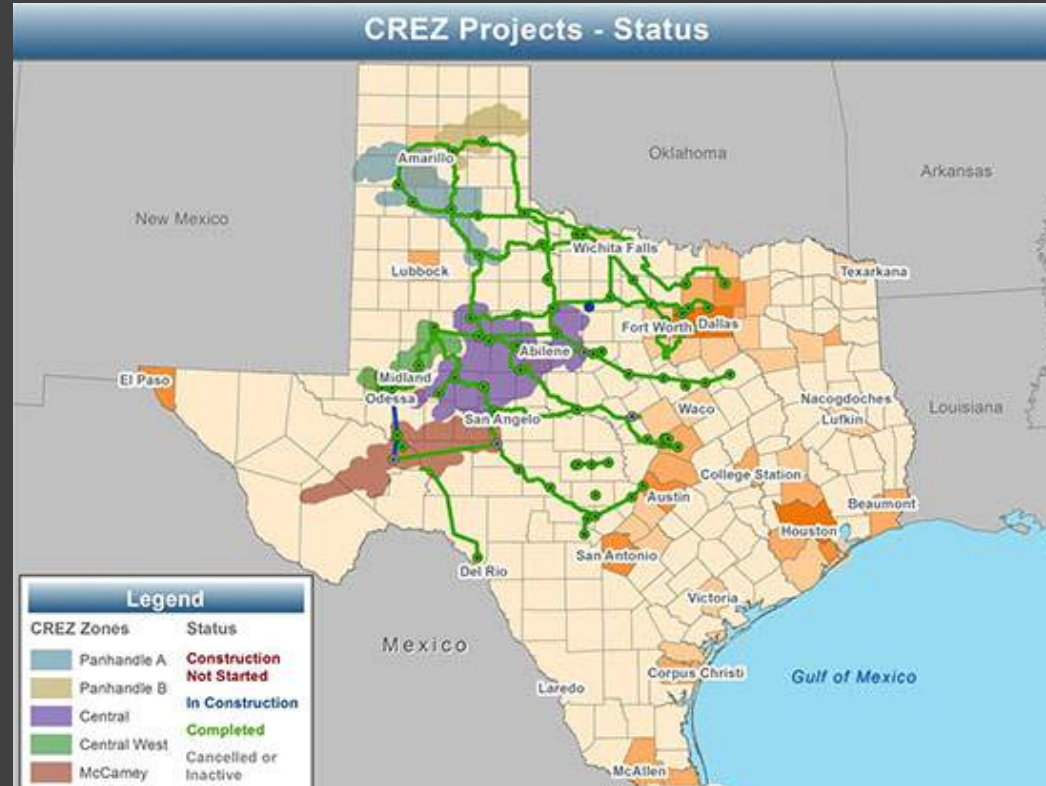
Siting



INVESTMENT-GRADE POLICY

HOW TO DRIVE DOWN RISK

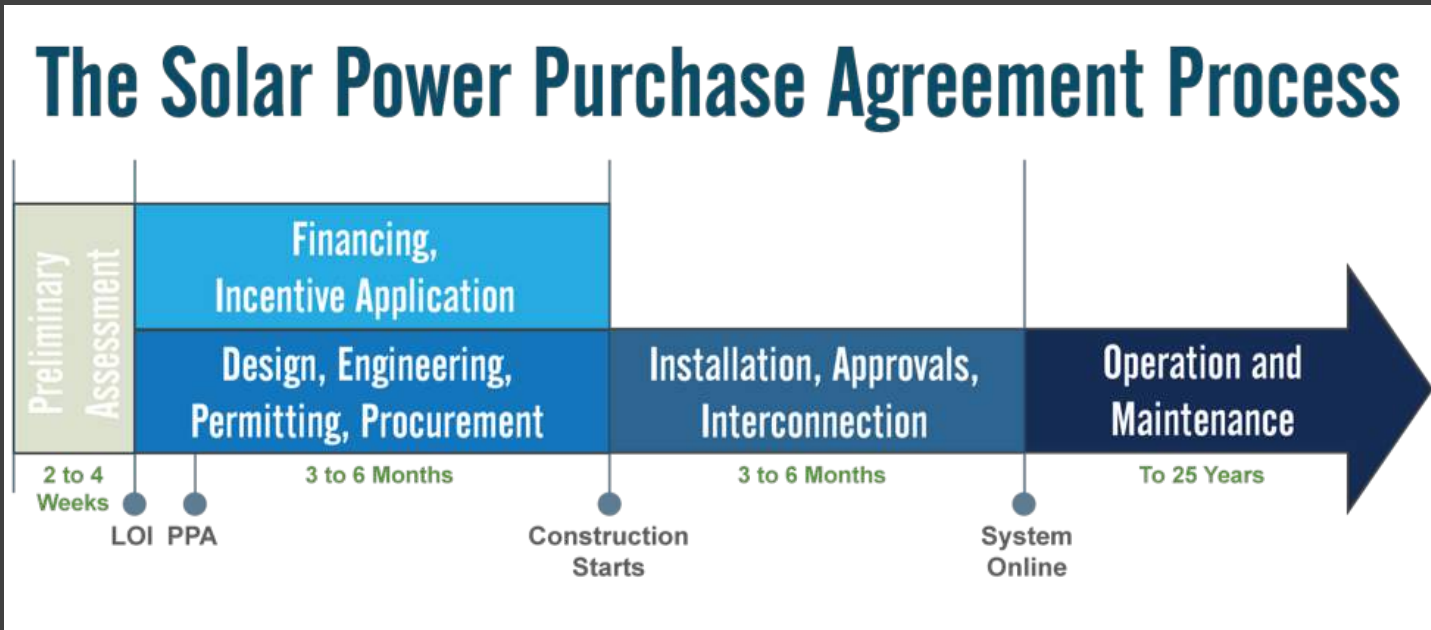
Transmission
Access



INVESTMENT-GRADE POLICY

HOW TO DRIVE DOWN RISK

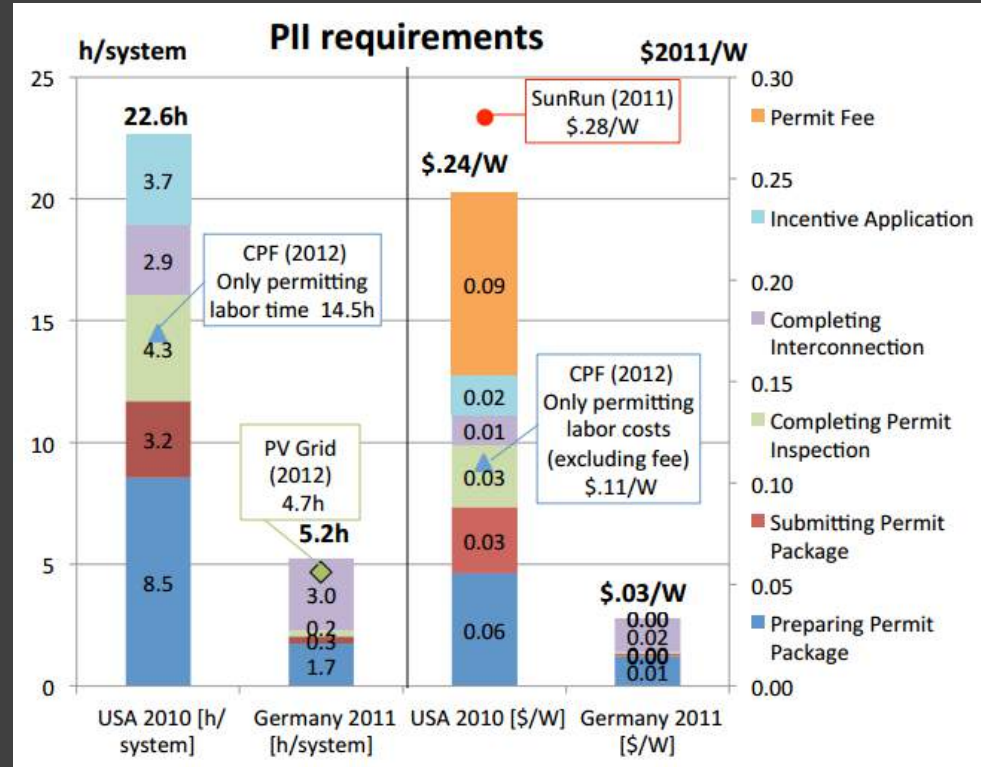
Power Purchase Agreements



INVESTMENT-GRADE POLICY

HOW TO DRIVE DOWN RISK

Permits



*Residential solar PV systems

POLICY IMPERATIVE FOR INVESTORS

- Clearly communicate that you are ready to invest, given good policy
- Enunciate the precepts of good policy
 - Long time horizons, continuous improvement, technology-finding, etc.
- Deliver that message to key venues
 - Governors, PUCs, Energy Ministers

