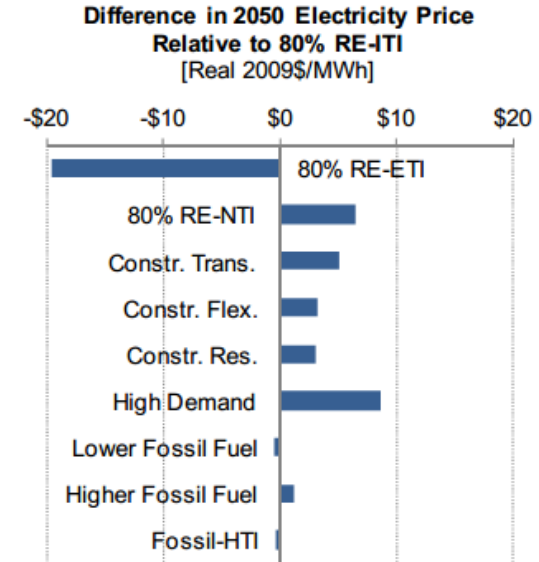
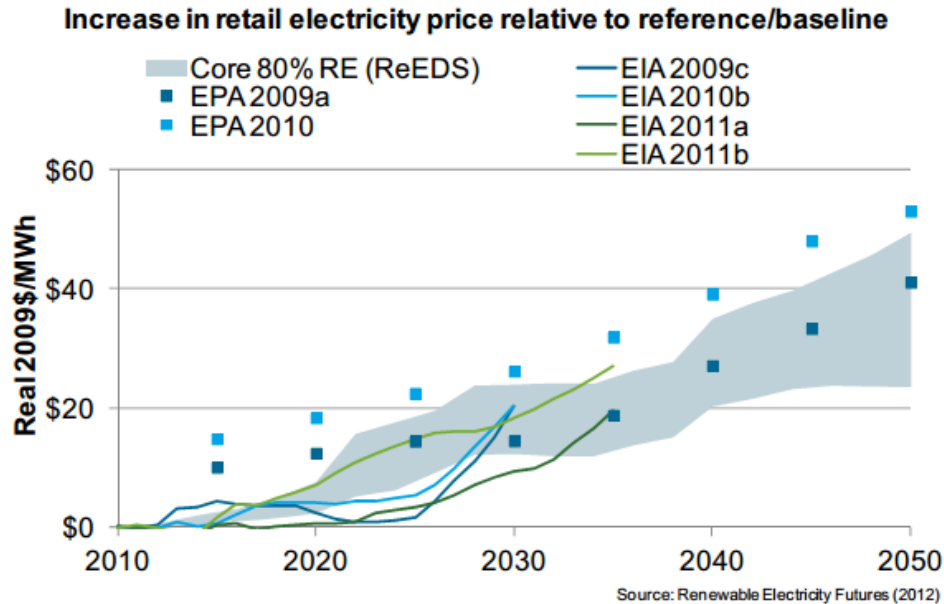
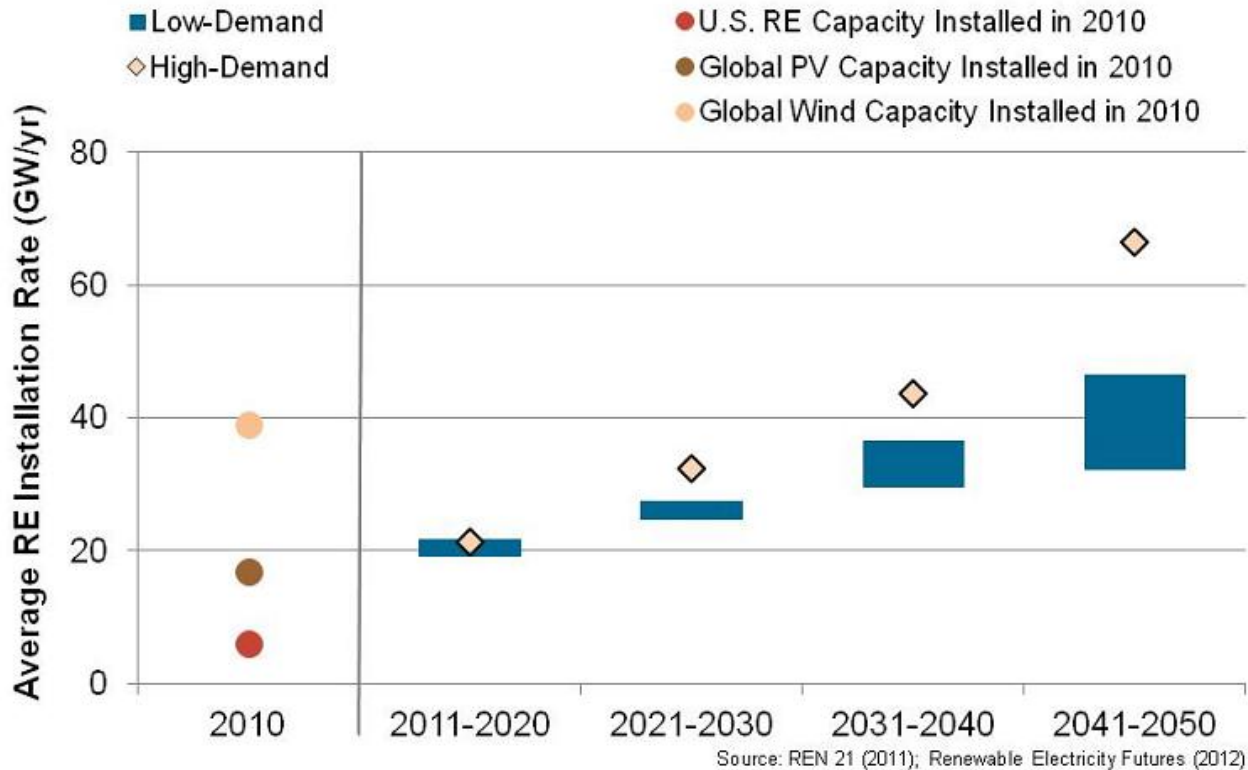


Incremental cost associated with high RE generation is comparable to published cost estimates of other clean energy scenarios



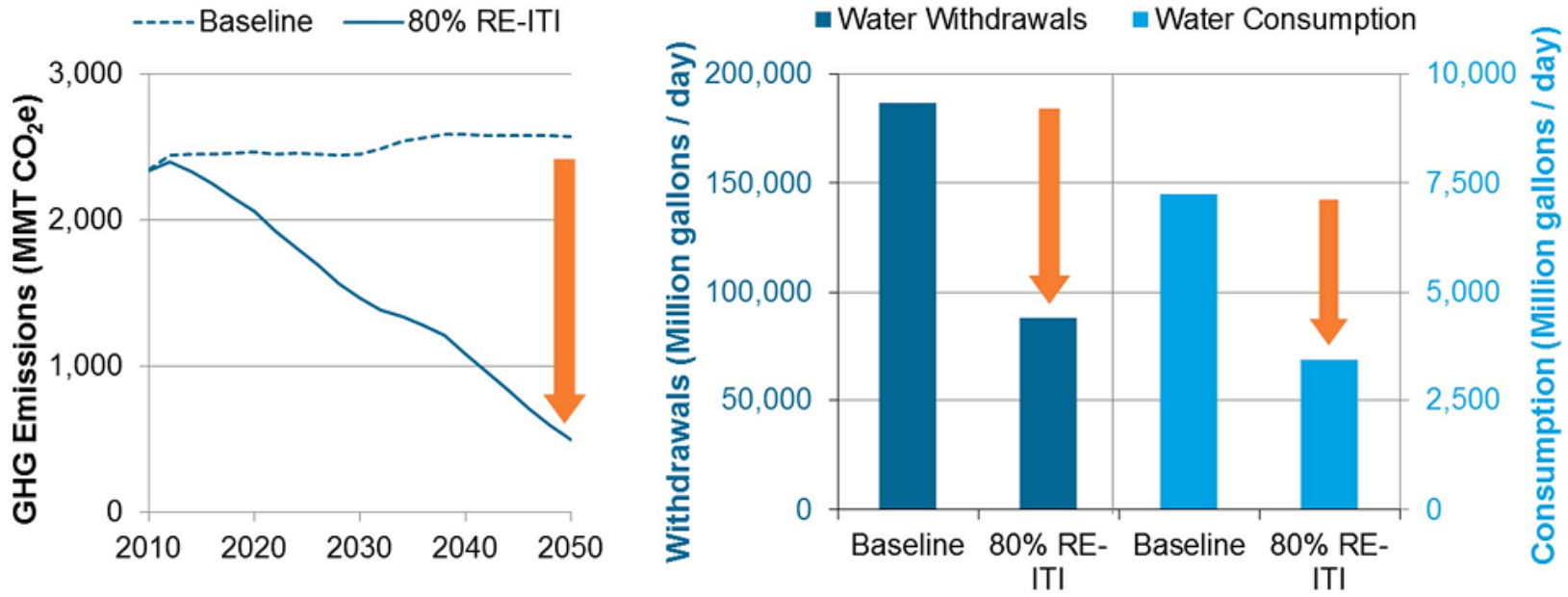
- Incremental cost reflects replacement of existing generation plants with new generators and additional balancing requirements (combustion turbines, storage, and transmission) compared to baseline scenario (continued evolution of today's conventional generation system)
- Improvement in cost and performance of RE technologies is the most impactful level in reducing the incremental cost
- Cost is less sensitive to the assumed electric system constraints (transmission, flexibility, RE resource access)

RE Industry Growth



No insurmountable long-term constraints to RE technology manufacturing capacity, materials supply, or labor availability were identified.

High RE Reduces Emissions and Water Use



Source: Renewable Electricity Futures (2012)

80% renewable electricity in 2050 could lead to:

- ~ 80% reduction in GHG emissions (combustion-only and full life-cycle)
- ~ 50% reduction in electric sector water use (withdrawals and consumption)

RE Land Use Implications

- **Area requirements:**
 - Gross estimate for RE Futures scenarios: < 3% of US land area
 - About half used for biopower
 - Majority of remainder for wind, but only about 5% is actually disturbed

80% RE scenarios

Gross Land Use Comparisons (000 km ²)	
Biomass	44-88
All Other RE	52-81
All Other RE, disrupted	4-10
Transmission & Storage	3-19
Total Contiguous U.S.	7,700
Major Roads**	50
Golf Courses **	10

* USDA 2010, 2012 ** Denholm & Margolis 2008

- **Siting issues:**
 - Permitting processes vary with technology and location
 - Wildlife and habitat disturbance concerns
 - Public engagement for generation and transmission—landscape, noise

Summary of Key Analysis Results

- **Renewable electricity generation from technologies that are commercially available today, in combination with a more flexible electric system, is more than adequate to supply 80% of total U.S. electricity generation in 2050, while meeting electricity demand on an hourly basis in every region of the country.**
- **Increased electric system flexibility is needed to enable electricity supply-demand balance with high levels of renewable generation, and can come from a portfolio of supply- and demand-side options, including flexible conventional generation, grid storage, new transmission, more responsive loads, and changes in power system operations.**
- **The abundance and diversity of U.S. renewable energy resources can support multiple combinations of renewable technologies to achieve high levels of renewable electricity use, and result in deep reductions in electric sector greenhouse gas emissions and water use.**
- **The direct incremental cost associated with high renewable generation is comparable to published cost estimates of other clean energy scenarios. Improvement in the cost and performance of renewable technologies is the most impactful lever for reducing this incremental cost.**
- **Future Work Needed: Comprehensive cost-benefit analysis; Power system reliability; Institutional challenges; Accelerating technology advancements**

Clean Energy to Secure America's Future

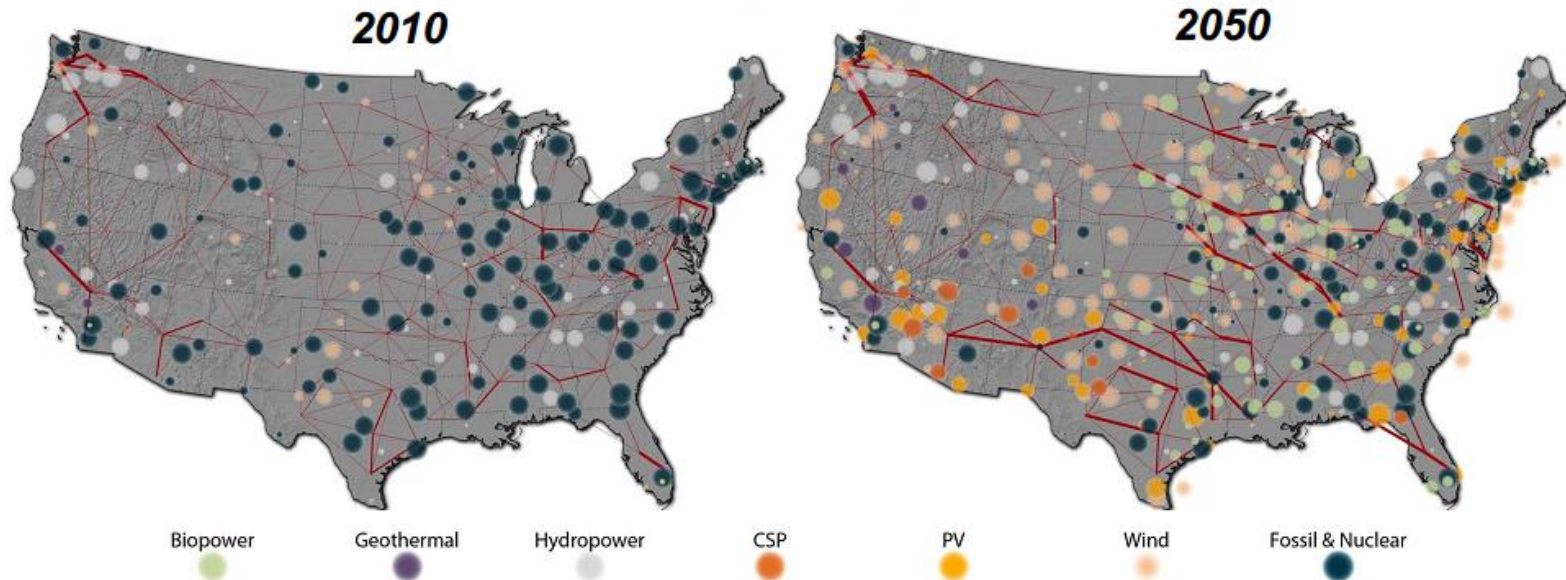


“We have a choice. We can remain the world's leading importer of oil, or we can become the world's leading exporter of clean energy. We can hand over the jobs of the future to our competitors, or we can confront what they have already recognized as the great opportunity of our time: the nation that leads the world in creating new sources of clean energy will be the nation that leads the 21st century global economy. That's the nation I want America to be.”

- **President Obama,**
Nellis Air Force Base,
Nevada, 5/27/09

A Transformation of the U.S. Electricity System

<http://rpm.nrel.gov/refhighre/dispatch/dispatch.html>



- RE generation from technologies that are commercially available today, in combination with a more flexible electric system, is more than adequate to supply 80% of total U.S. electricity generation in 2050—while meeting electricity demand on an hourly basis in every region of the country.
- The abundance and diversity of U.S. renewable energy resources can support multiple combinations of renewable technologies to achieve high levels of renewable electricity use, and result in deep reductions in electric sector greenhouse gas emissions and water use.

For more information

<http://www.eere.energy.gov>

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