

Duke Energy Florida: Energy Landscape and Renewable Energy

- Our Commitment to Renewables
- US and Florida Energy Landscape



Duke Energy Florida: Responsibly Pursuing Renewable Energy

- Duke Energy Florida is committed to providing safe, reliable, affordable and clean renewable energy to the 1.7 million homes and business that depend on us

- We are a leader among other Florida electric utilities
 - Served our customers with more than 1.1 million megawatt-hours from firm renewables in 2014
 - More interconnected biomass capacity than any other Florida electric utility
 - Long history with installing solar in our communities for education and awareness
 - ❑ Funded more than \$8 million of solar installations at over 50 schools and universities and partnered on sustainability and R&D

- In 2015, DEF is forecasted to serve about 4 percent of our customers' energy needs with renewable sources

- We believe in solar energy and recognize it will play a significant role in Florida's energy future
 - Duke Energy Florida plans to add up to 500 megawatts of new solar by 2024. This doubles the state's existing solar facilities and the first 5-MW facility will be under construction by the end of this year
 - Top Challenges for utility scale in Florida
 - ❑ Large parcels of land (6 acres =1 MW)
 - ❑ Grid cost / cost of solar vs. natural gas plant

US Electricity Generation Estimates

Figure 31. Electricity generation by fuel in the Reference case, 2000-2040 (trillion kilowatthours)

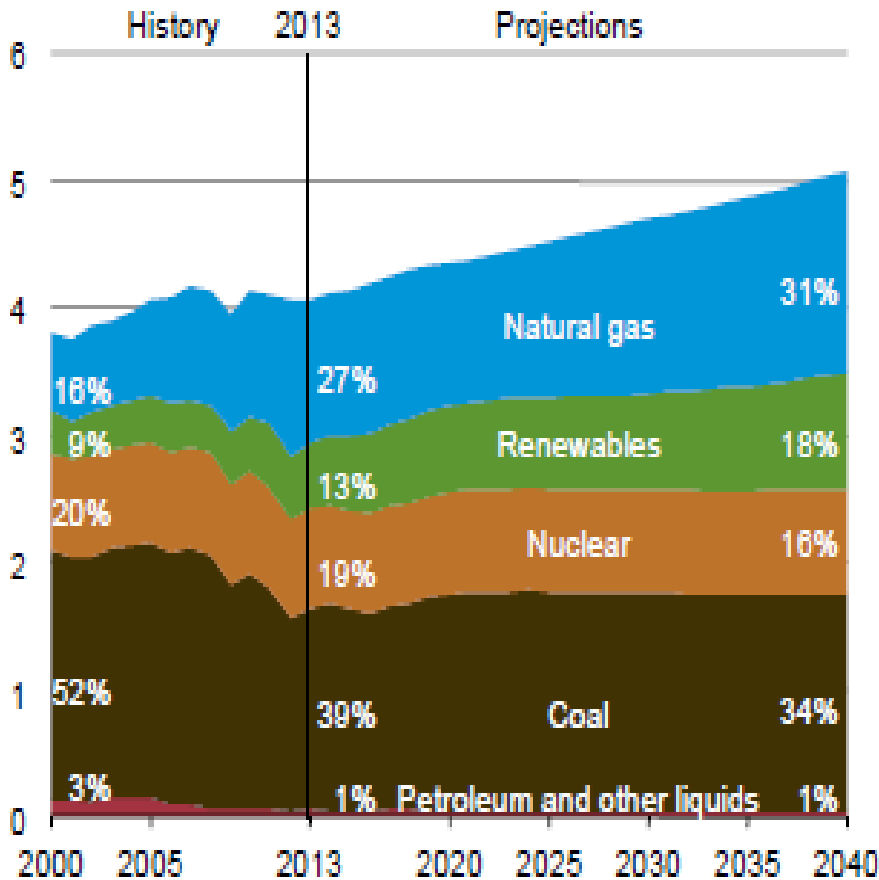
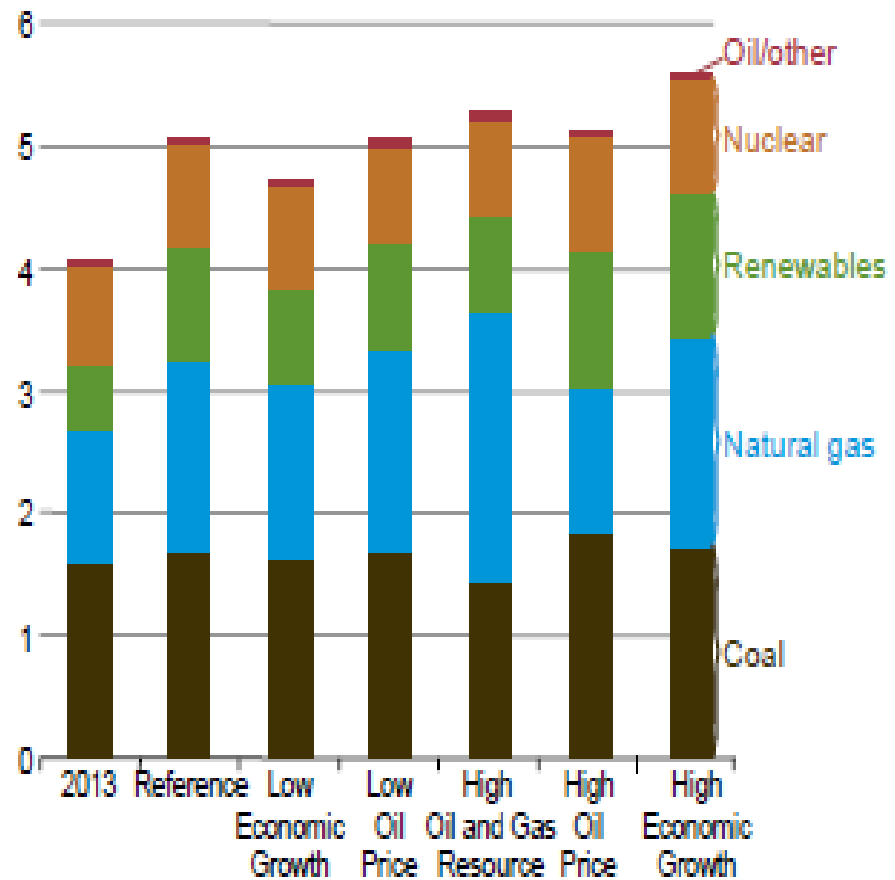
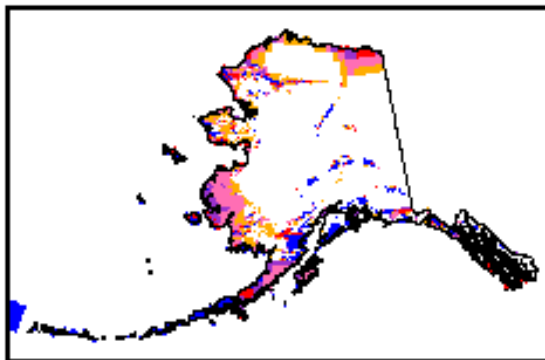
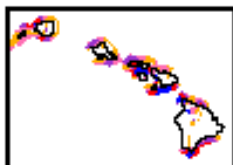
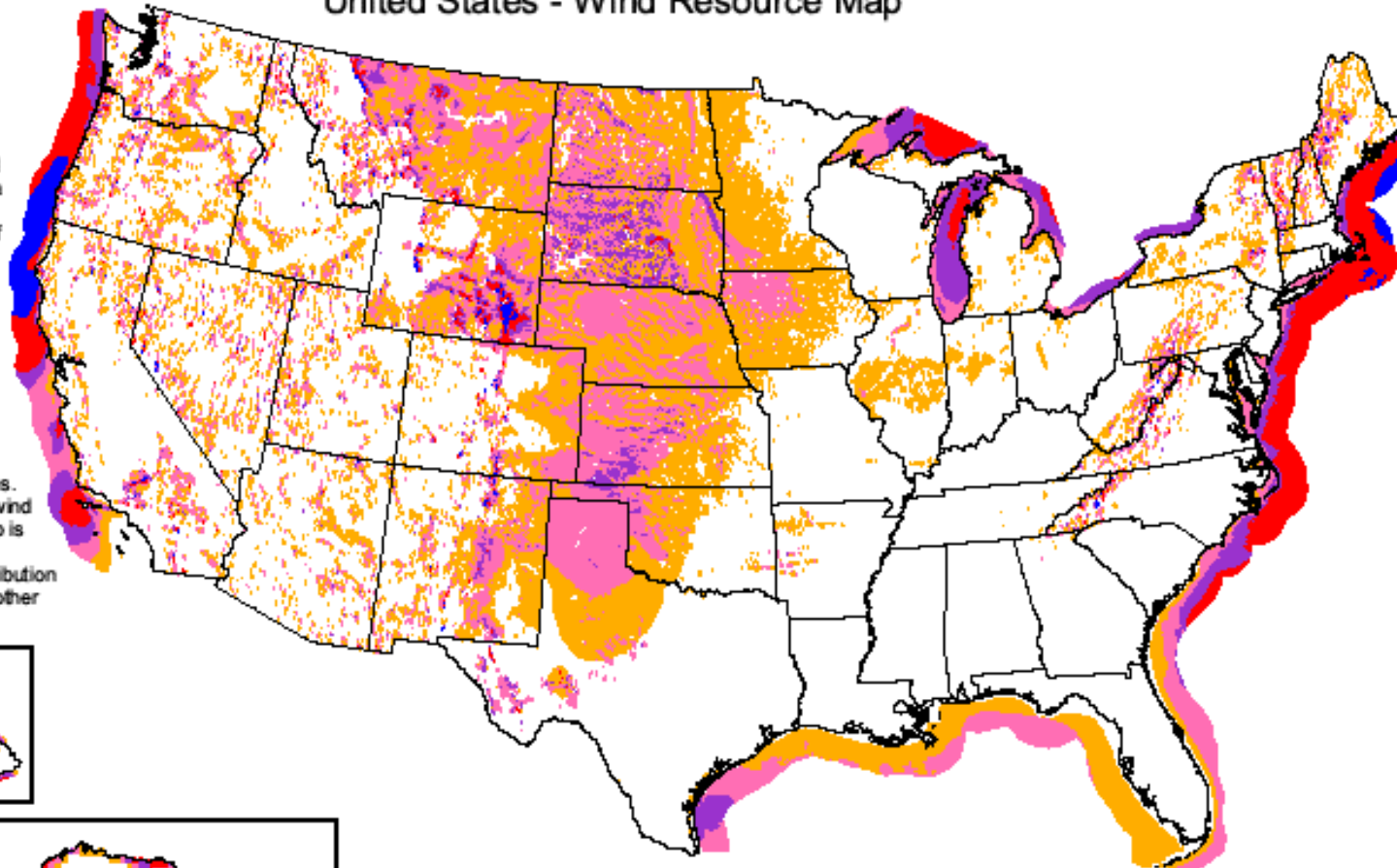


Figure 32. Electricity generation by fuel in six cases, 2013 and 2040 (trillion kilowatthours)



United States - Wind Resource Map

This map shows the annual average wind power estimates at a height of 50 meters. 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.



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
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 - 1600	8.8 - 11.1	19.7 - 24.8

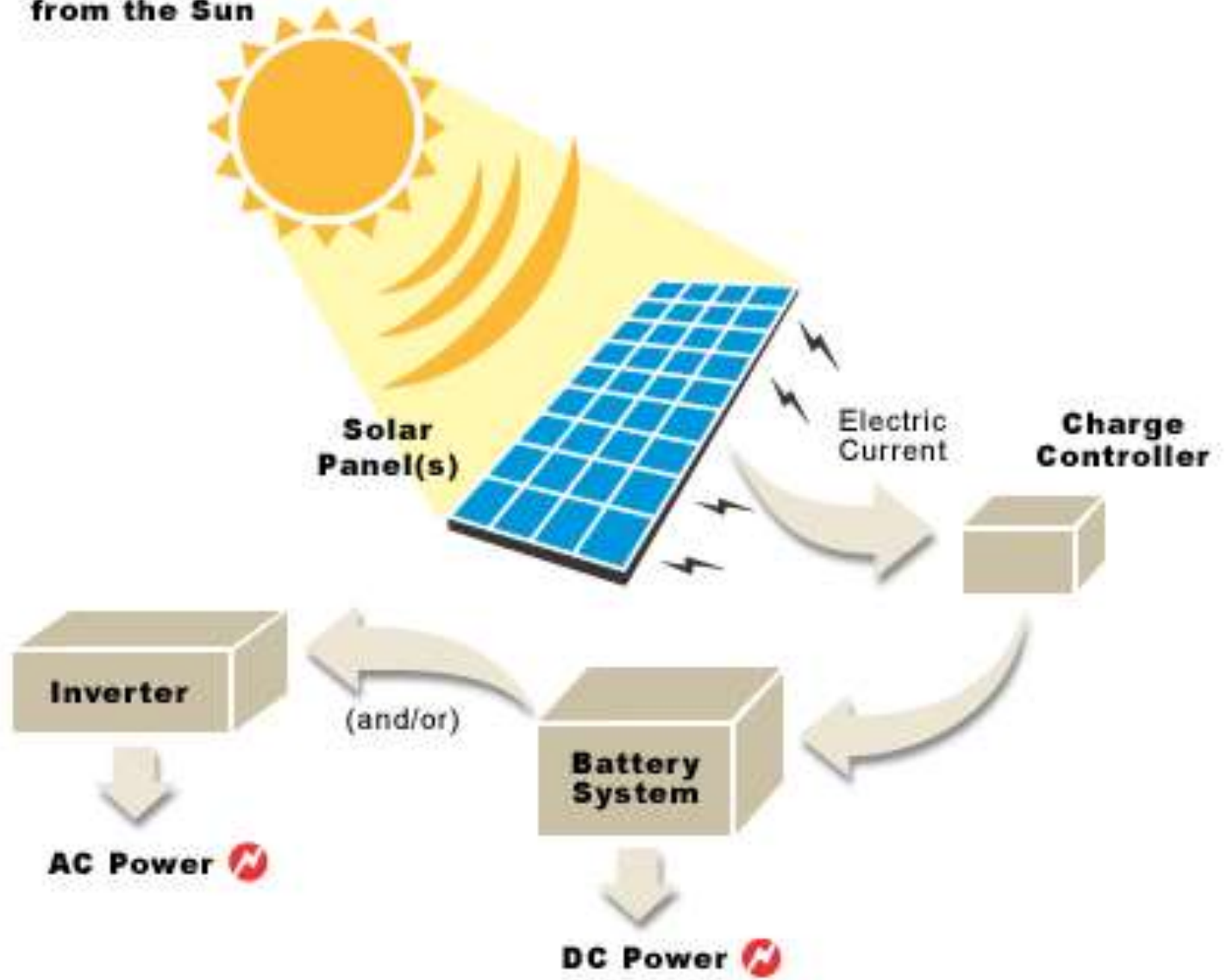
^aWind speeds are based on a Weibull k value of 2.0



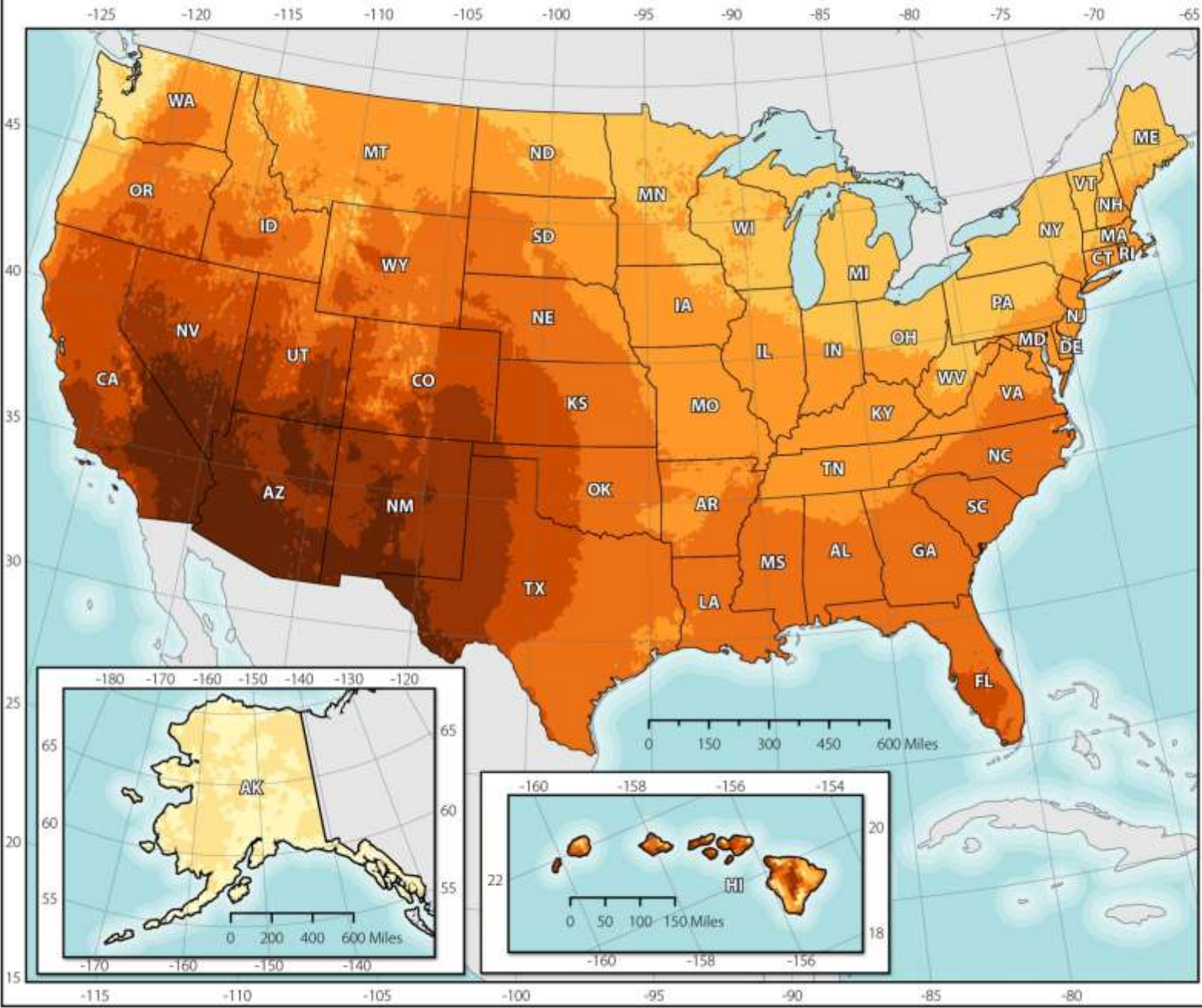
U.S. Department of Energy
National Renewable Energy Laboratory

REL-2005-11

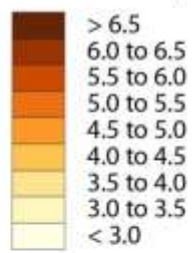
**Solar Irradiance
from the Sun**



Photovoltaic Solar Resource of the United States



kWh/m²/Day



Annual average solar resource data are shown for a tilt = latitude collector. The data for Hawaii and the 48 contiguous states are a 10km satellite modeled dataset (SUNY/NREL, 2007) representing data from 1998-2009.

The data for Alaska are a 40 km dataset produced by the Climatological Solar Radiation Model (NREL, 2003).

This map was produced by the National Renewable Energy Laboratory for the U.S. Department of Energy.
 Billy J. Roberts
 19 September 2012



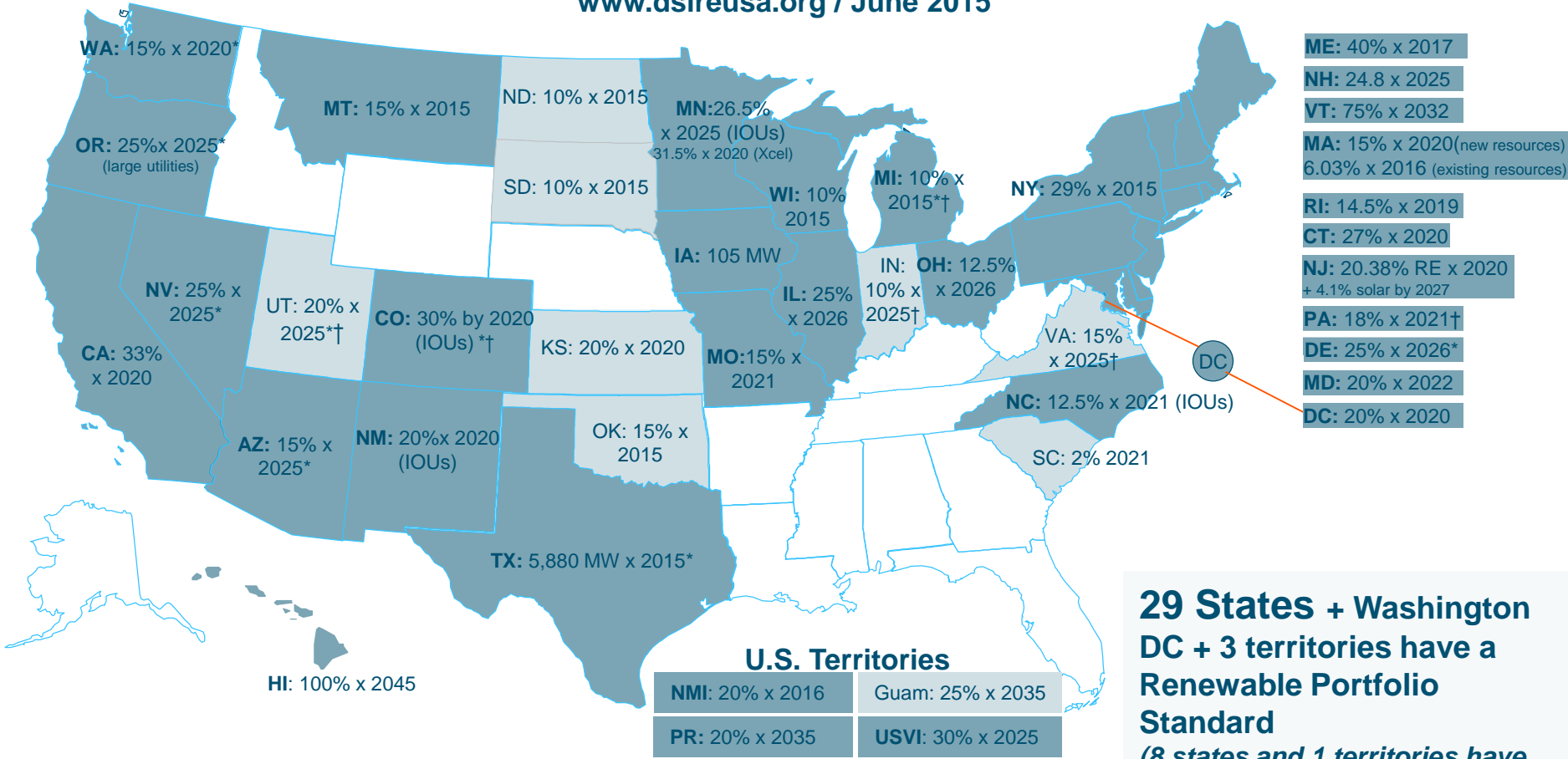
Florida Landscape

- Florida was second only to Texas in 2013 in net electricity generation from natural gas, which accounted for 62% of Florida's net generation; coal accounted for 21%, the state's nuclear power plants accounted for 12%, and other resources, including renewable energy, supplied the remainder.
- Renewable energy accounted for 2.2% of Florida's total net electricity generation in 2013 and the state ranked seventh in the nation in net generation from utility-scale solar energy.
- Due in part to high air-conditioning use during the hot summer months and the widespread use of electricity for home heating during the winter months, Florida's retail electricity sales to the residential sector were second in the nation after Texas in 2013.
- Electricity accounts for 90 percent of the site energy consumed by Florida households, and the annual electricity expenditures of \$1,900 are 40 percent higher than the U.S. average, according to EIA's Residential Energy Consumption Survey.
- Florida ranks first in the nation for the amount of installed solar generation when compared to states without Renewable Portfolio Standards. Thirty seven states lag behind Florida in the amount of installed solar

In the past 3 years, at least 17 states have taken action or actively considered bills to change policy

Renewable Portfolio Standard Policies

www.dsireusa.org / June 2015

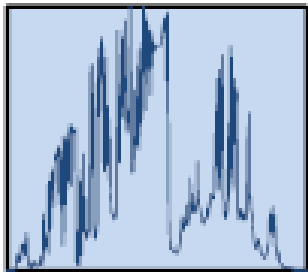


- ME: 40% x 2017
- NH: 24.8 x 2025
- VT: 75% x 2032
- MA: 15% x 2020 (new resources)
6.03% x 2016 (existing resources)
- RI: 14.5% x 2019
- CT: 27% x 2020
- NJ: 20.38% RE x 2020
+ 4.1% solar by 2027
- PA: 18% x 2021†
- DE: 25% x 2026*
- MD: 20% x 2022
- DC: 20% x 2020

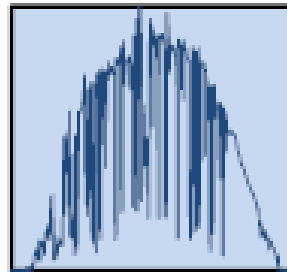
**29 States + Washington
DC + 3 territories have a
Renewable Portfolio
Standard
(8 states and 1 territories have
renewable portfolio goals)**

Renewable portfolio standard
 * Extra credit for solar or customer-sited renewables
 Renewable portfolio goal
 † Includes non-renewable alternative resources

Solar PV Generation



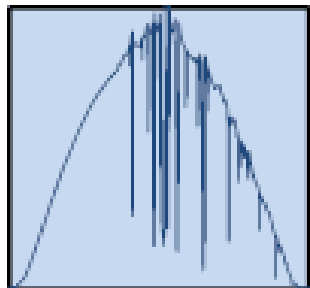
8/29/2012



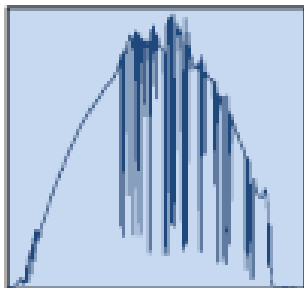
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Fuel Source Interruption

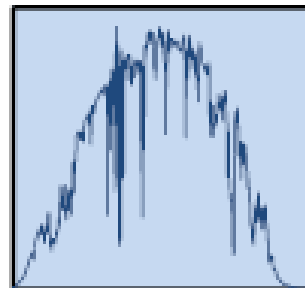
- Clouds
- Rain/storms
- Humidity
- Night



9/10/2012



9/12/2012



9/13/2012

Major Advantages

- No Fuel Costs
- Emission Free Energy

Grid Challenges

- Higher Cost – for now
- Not Continuous/Inconsistent (20%)
- Not available during times our customers need electricity the most

- **Customer side solar PV systems use the grid and grid services continuously**

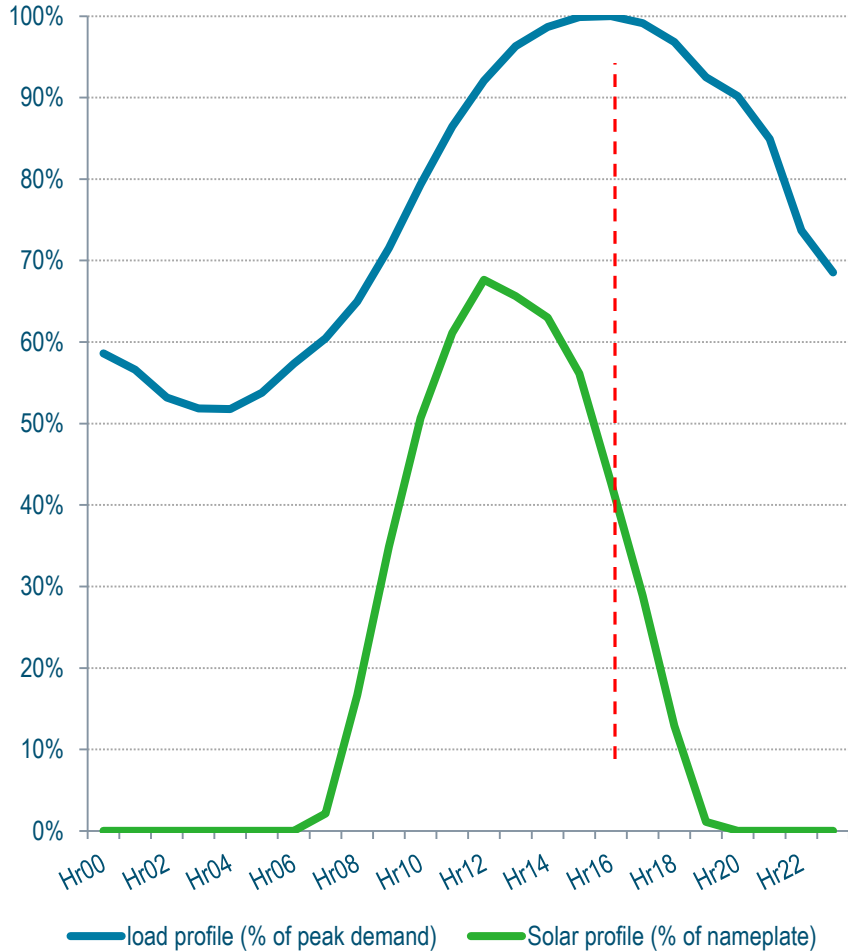
Other Considerations

- Life Cycle - materials/manufacturing, land impacts, decommissioning

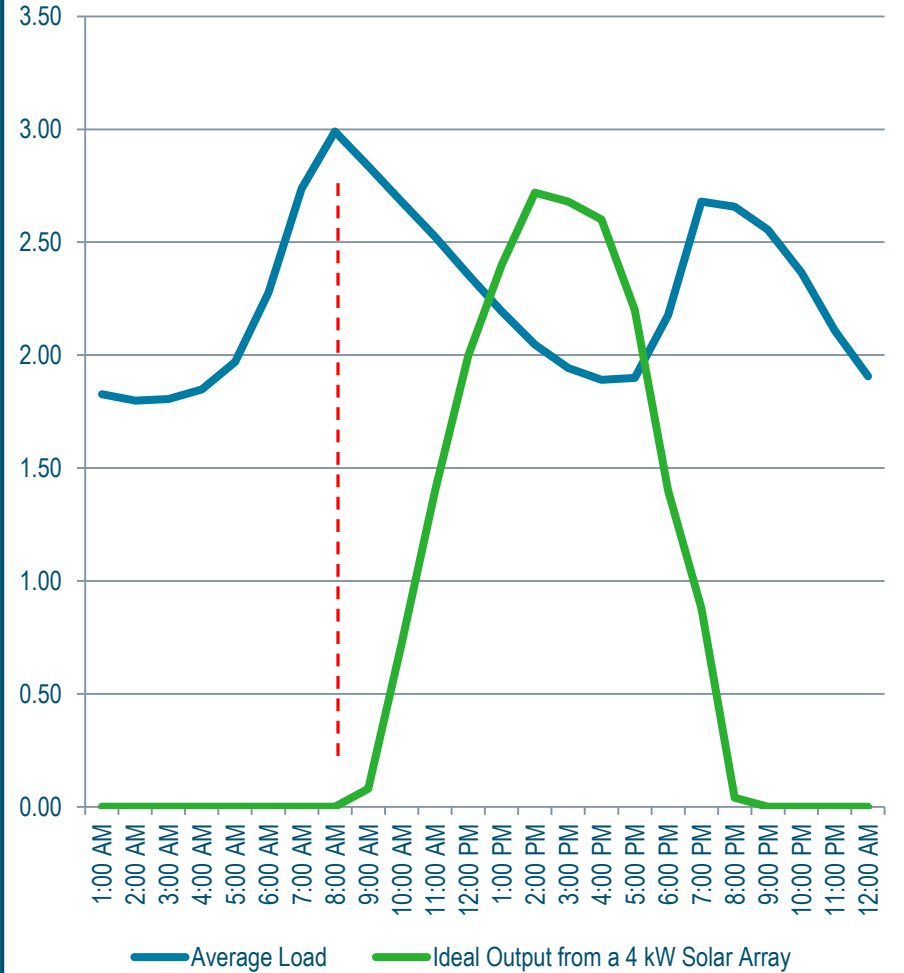
Florida Solar PV Generation is Non-Coincident to DEF's Peak Electricity Needs

Summer Peak Day

(August 19)



Winter Residential Load Profile



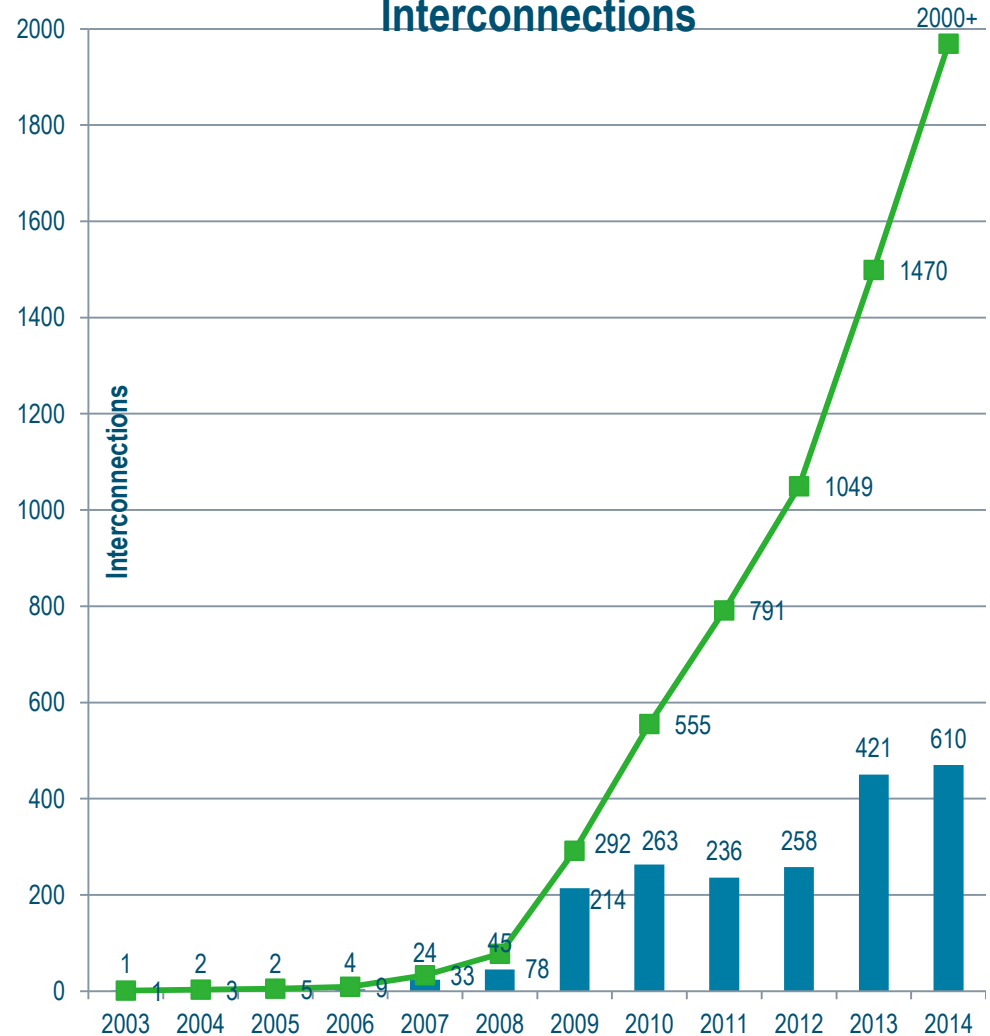
Options for Businesses and Communities

- **Locating Utility Owned solar near their town / business**
 - **Least cost option due to size if land is inexpensive**
 - **Need a large amount of land**
- **Microgrids also called community solar**
 - **Can fit closer to communities / businesses**
 - **Scale determines how it truly impacts renewable power contribution**
- **Rooftop solar**
 - **Fits on many but not most buildings**
 - **Tends to be more expensive than above options**

Renewable Energy Policy - Net Metering

- Net Metering of Customer-Owned Renewable Generation (2 MW or less)
 - Net metering is a paper transaction method that credits customers for their renewable energy production at retail rates
 - DEF has helped its customers expand their small solar generation from less than 1 MW of solar in 2008 to more than 22 MW today
 - Solar PV prices are declining
 - Customers that use the grid continuously should pay for what they use

DEF Annual Totals and Cumulative Grid Interconnections



Solar Policy Advancement

- Floridians can choose solar today
 - Floridians can install rooftop solar for their homes or businesses, use what they need, “bank” any excess for a later credit, all valued at the utility's full retail electric price
 - Solar companies or any person can build solar and impose a sale of all of their solar energy produced on to the utility
 - Solar companies (or third-parties) can build solar for any business or resident and the customer can own it, use any of the power at the premise, and then impose a sale of any excess amount of solar energy back to the utility
 - Two solar ballot initiatives are now available: Consumers for Smart Solar and Floridians for Solar Choice

- Next Steps
 - Supreme Court Review of amendment language and oral arguments
 - Review of comments provided to FPSC on Solar Advancement and Workshops
 - Continuing to advocate for transparent, comprehensive, and collaborative solar policies

Questions and Some Answers ?

