

Voluntary & Compliance Markets

Renewable Energy Markets 2010



- ***Renewable Energy Certificate***

A commodity that represents the environmental attributes of electricity generated from renewable resources like wind, solar, hydro, and biomass. One REC equals one megawatt hour of electricity generation.

- ***Compliance Markets***

Mandated markets created as a result of a Renewable Portfolio Standard (RPS) that requires utilities to supply a certain percentage of electricity from renewable resources. RECs are used to demonstrate compliance.

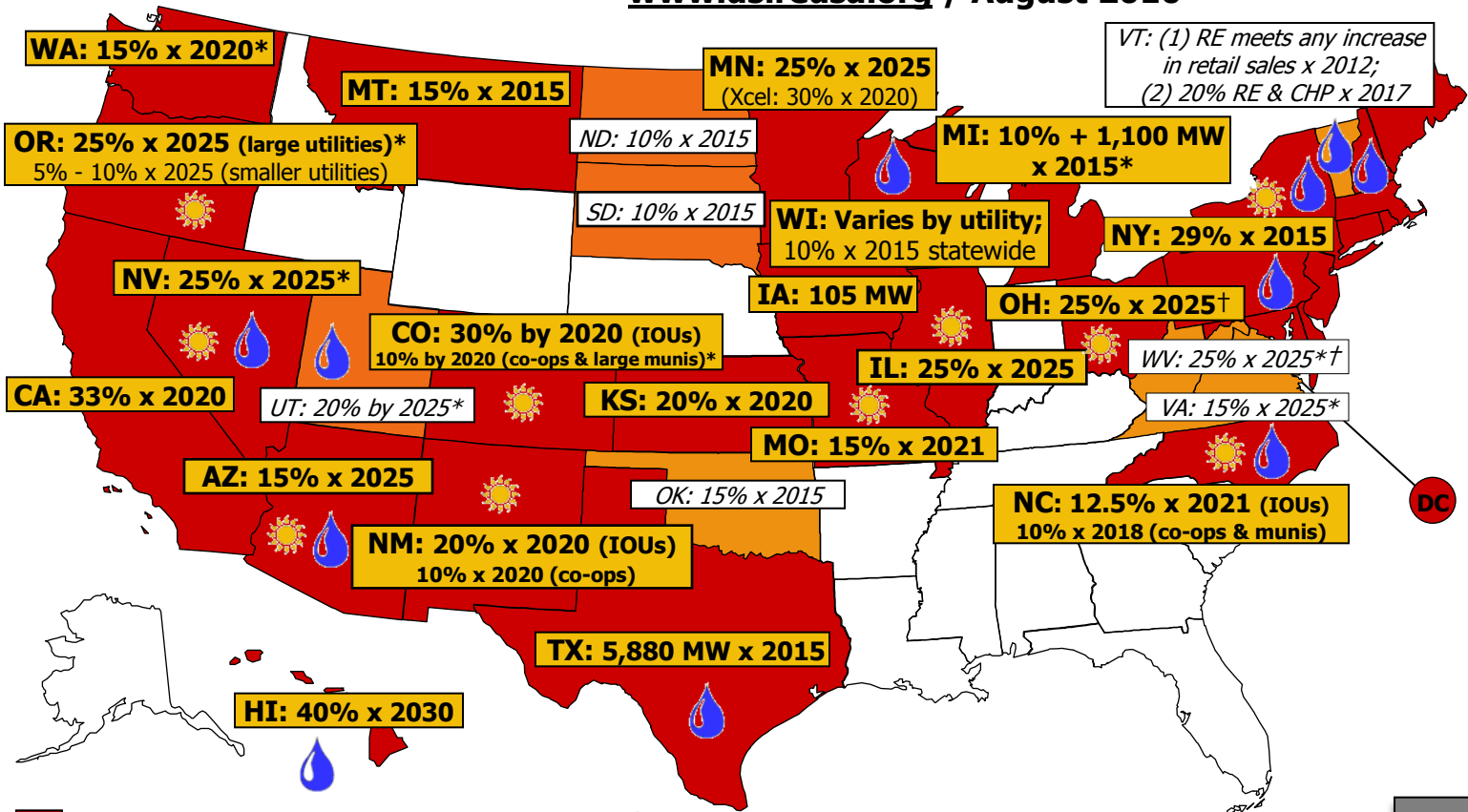
- ***Voluntary Markets***

Individuals and Businesses choosing to support renewable energy.



Renewable Portfolio Standards

www.dsireusa.org / August 2010



- ME: 30% x 2000**
New RE: 10% x 2017
- NH: 23.8% x 2025** ☀️
- MA: 22.1% x 2020**
New RE: 15% x 2020
(+1% annually thereafter) ☀️
- RI: 16% x 2020**
- CT: 23% x 2020**
- PA: ~18% x 2021†** ☀️
- NJ: 22.5% x 2021** ☀️
- MD: 20% x 2022** ☀️
- DE: 25% x 2026*** ☀️
- DC: 20% x 2020** 💧☀️

- State renewable portfolio standard
- State renewable portfolio goal
- Solar water heating eligible

- ☀️ Minimum solar or customer-sited requirement
- * Extra credit for solar or customer-sited renewables
- † Includes non-renewable alternative resources

29 states + DC have an RPS
(7 states have goals)

Market Fragmentation

	COD Date	Reporting Pd	Technologies	Geographic Constraints	Spot Price - Offer
Green-E	1/1/1997	Front Half/ Back Half	Wind, Solar, Geo, Biomass, LFG, Hydro	Nationwide	\$0.95
NJ I	NA	June- May	Wind, LFG	PJM	\$2.25
PA II	NA	3 Yrs	MSW, LG Hydro	PJM	\$0.20
NJ Solar	NA	June-May	Solar	PJM	\$665
Texas	9/1/1999	3 Yrs	Wind, Solar, Biomass, Geo, Hydro	ERCOT	\$0.95
Mass I	12/31/1997	3 Yrs	Solar, Wind, Wave, LFG, Biomass	ISO-NE	\$15.00

- Green-E:

“Green-E Energy only certifies renewable energy products that are fully aggregated to the extent possible under law. Green-E Energy certified MWhs (electricity of REC) must contain all the greenhouse gas (ghg) emission reduction benefits, including carbon dioxide (CO2) reduction benefits, associated with the MWh of renewable energy when it was generated.”

- NJRPS

“REC means a certificate representing the environmental benefits or attributes of one MWh of generation from the generating facility that meets the requirements”

- Tx RPS

“A REC is a tradable instrument that represents all of the renewable attributes associated with one MWh of production from a certified renewable generator”

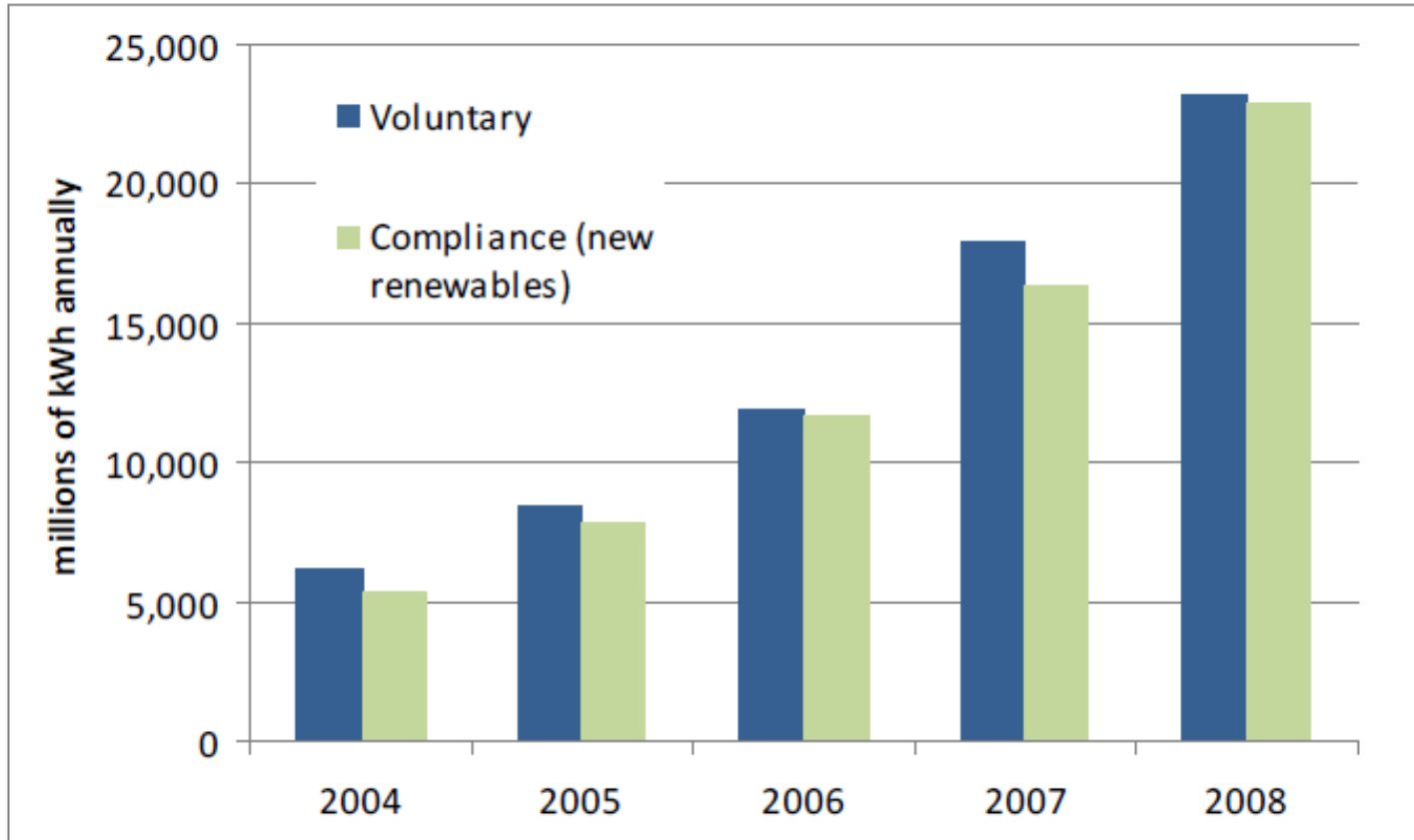


Contracting Differences

- Compliance Markets more Commoditized
- Contracting Hurdles in Voluntary Market
- VRE Set-Asides in RGGI States



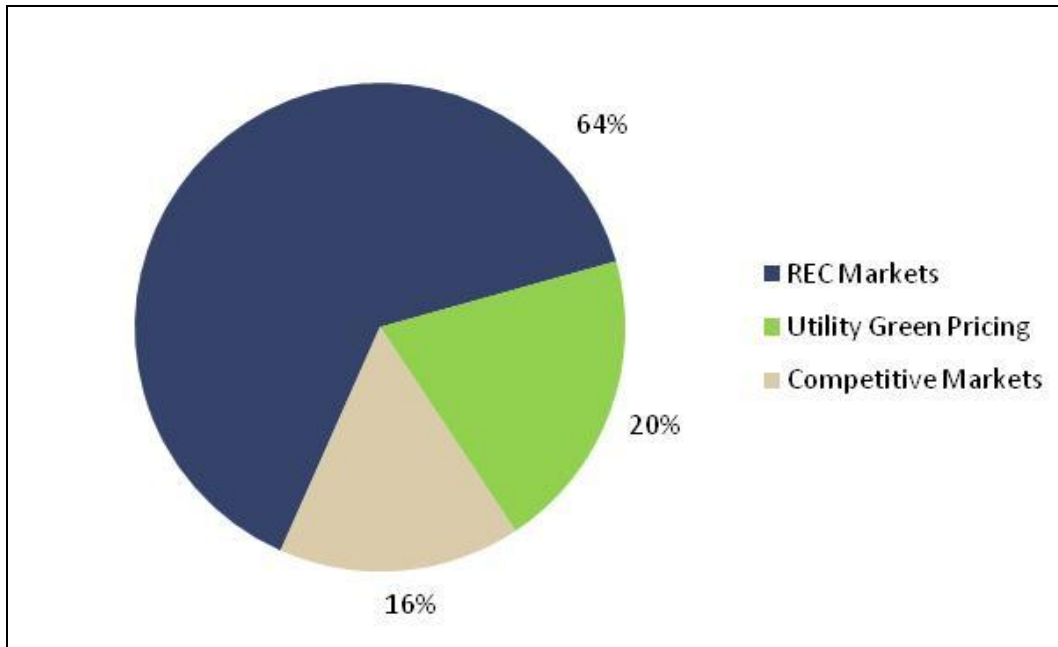
Market Snapshot: 2004-2008



Source: NREL 2009 Report, Green Power Marketing in the United States: A Status Report (2008 Data)

Unbundled REC market dominates voluntary renewable market with 15.6 M MWh

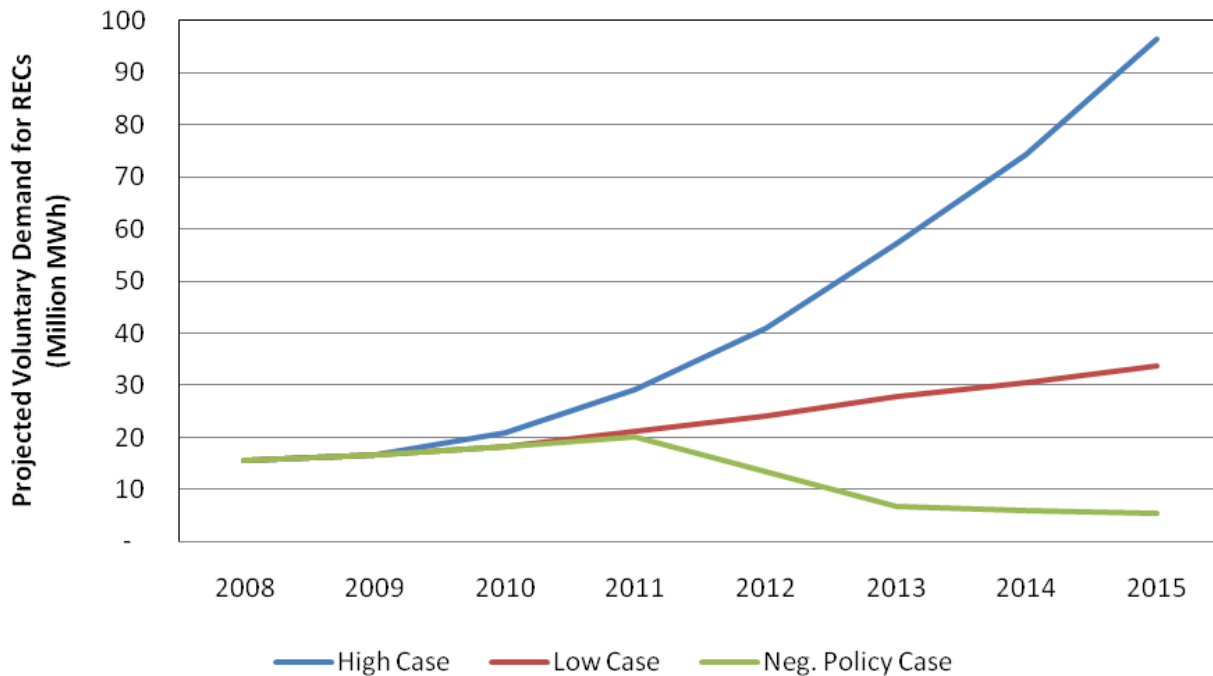
Total sales of voluntary renewable energy (2008) = 24 million MWh



- Unbundled REC market is almost entirely C&I driven
- In 2008, of the 15.6 M MWh of unbundled RECs sold:
 - 15.4 M MWh sold to non-residential customers (99%)
 - 0.2 M MWh sold to residential customers (1%)
- Voluntary renewable market exceeds size of mandatory market, which resulted in 23 M MWh in 2008

Source: NREL, 2010 report ("Voluntary Green Power Market Forecast Through 2015") based on 2008 data.

Continued growth of unbundled REC market will depend on GHG policy



High Case:

- Demand grows consistent with historical trends
- 40% growth in 2011-2013, ramping down to 30%

Low Case:

- Assume slower growth due to market maturity
- 15% growth in 2011-2013, declining to 10%

Negative Policy Case:

- Future policies reduce motivation for purchasing green power (non GHG claims allowed for voluntary market)
- Major reductions starting in 2012
- Steady 10% decrease per year after 2014

Source: NREL, 2010 report ("Voluntary Green Power Market Forecast Through 2015") based on 2008 data.

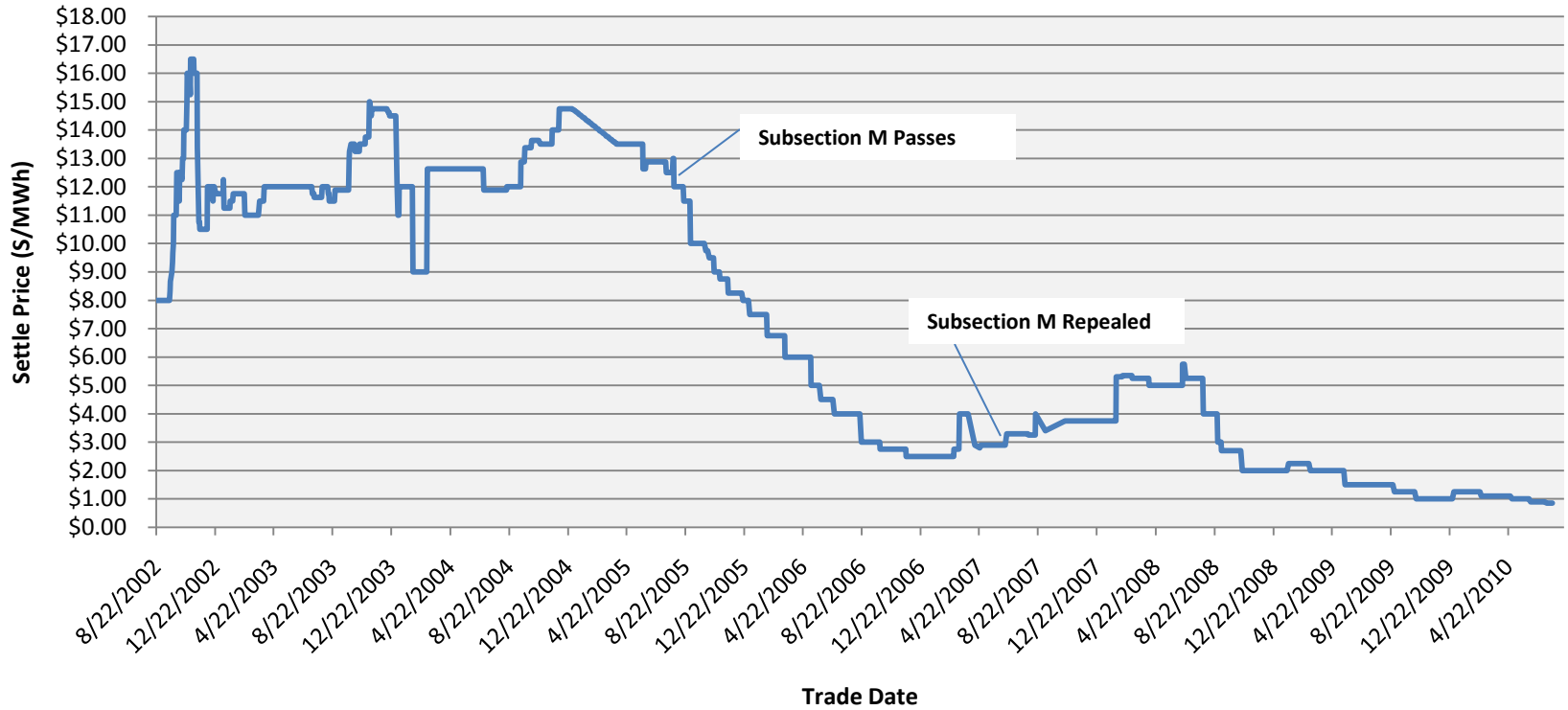


Voluntary Market Leading Texas

	Voluntary	Compliance	Total	Capacity (MW)
2007	1,672,306	3,388,063	5,065,291	4,919
2008	6,934,286	6,934,286	13,661,763	8,599
2009	8,942,836	6,800,249	15,748,427	10,367

Source: www.texasrenewables.com/reports.ap

Historical TX REC Spot Prices 8/2002 - 8/2010



Pricing Courtesy Evolution Markets



Future Uncertainties in Voluntary Market

- Voluntary Market Growth
- Increased Appetite for On-Site Solar/ Distributed Generation
- Federal RES
- Regional Carbon Markets & VRE Set-Asides





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