New Renewable Generation Capacity – Why Here and Not There?

Five Examples of Public Policies That Resulted in New Renewable Electricity Generation Here but Not There

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#TXQFRPSNEMPTC

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Who We Are

Synapse Energy Economics

- Research and consulting firm specializing in energy, economic, and environmental topics
- Services include economic and technical analyses, regulatory support, research and report writing, policy analysis and development, representation in stakeholder committees, facilitation, trainings, and expert witness services for public interest and government clients
- Experts in renewable policy analysis and economics, including resource planning, modeling, renewable portfolio standards, production and investment tax credits, PURPA QF avoided costs and fixed contract terms, ratemaking, and regional transmission organizations

Agenda

Transmission
Wind built where RTOs ensured adequate delivery from resource to load

PURPA Qualified Facility (QF) Contracts
QF PV built where contracts were both long and tall

Renewable Portfolio Standards
Wind and eventually PV will be built where RPS ratchets upward region-wide

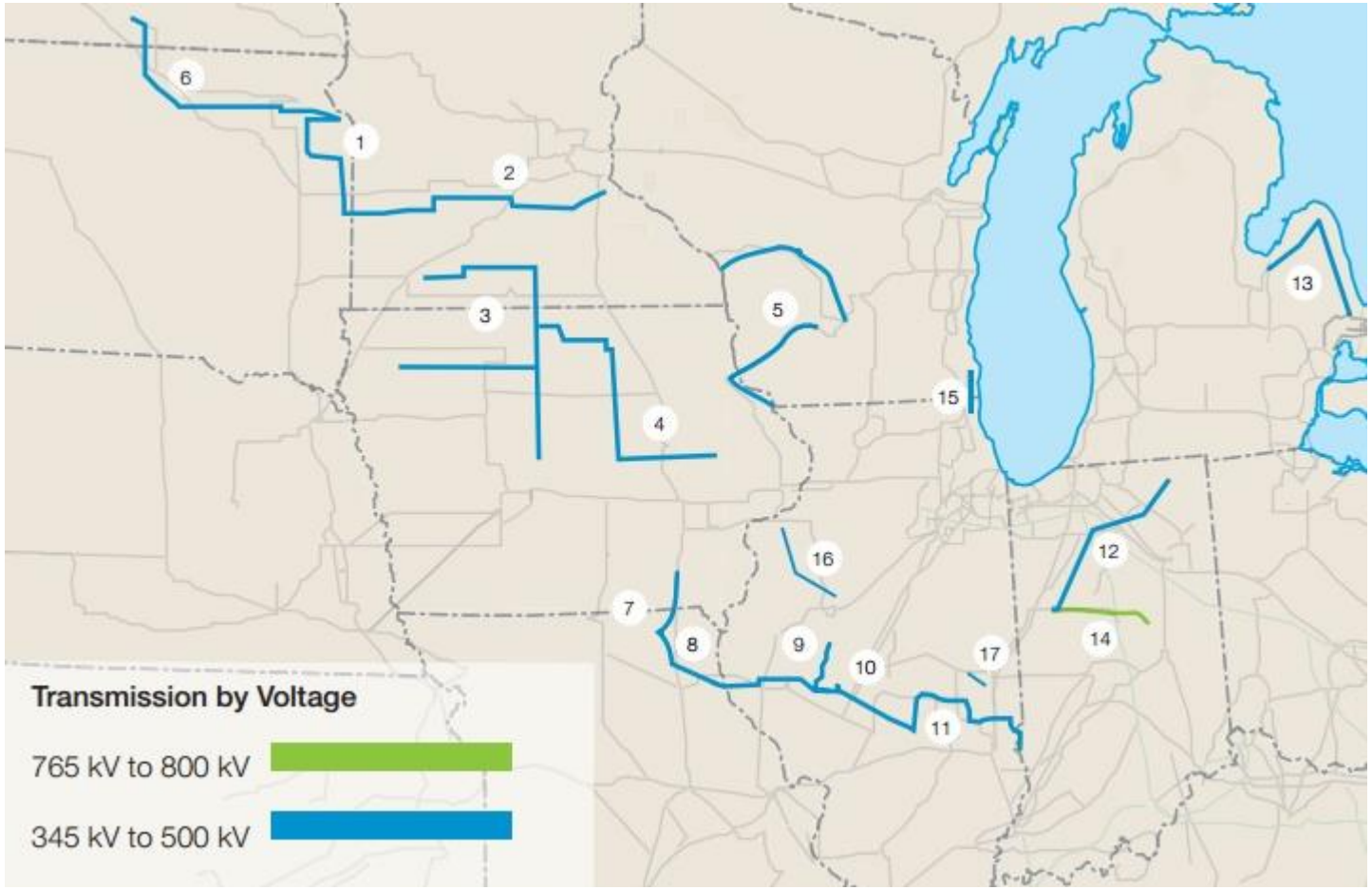
Ratemaking
DG PV built where retail rates allowed for sufficient payback

Production Tax Credit
Wind built where (when!) the PTC provided clarity

Transmission

Tx: MISO Multi-Value Projects (MVP)

Reliability	Policy	Economics



MISO. "MVPs Create Jobs, Benefits for States." 2012.

Tx: MISO MVP Incremental Wind Enabled

Voltage Stability Transfer Analyzed	Incremental Transfer Enabled by the MVPs	Incremental Transfer Enabled by the MVPs
MISO West – Twin Cities	1,841 MW	54%
MISO West – Madison	1,440 MW	84%
MISO West – Des Moines	1,100 MW	55%
MISO West – St. Louis	960 MW	26%

20-year present value of net benefits: 6.75 billion dollars

40-year present value of net benefits: 32.80 billion dollars

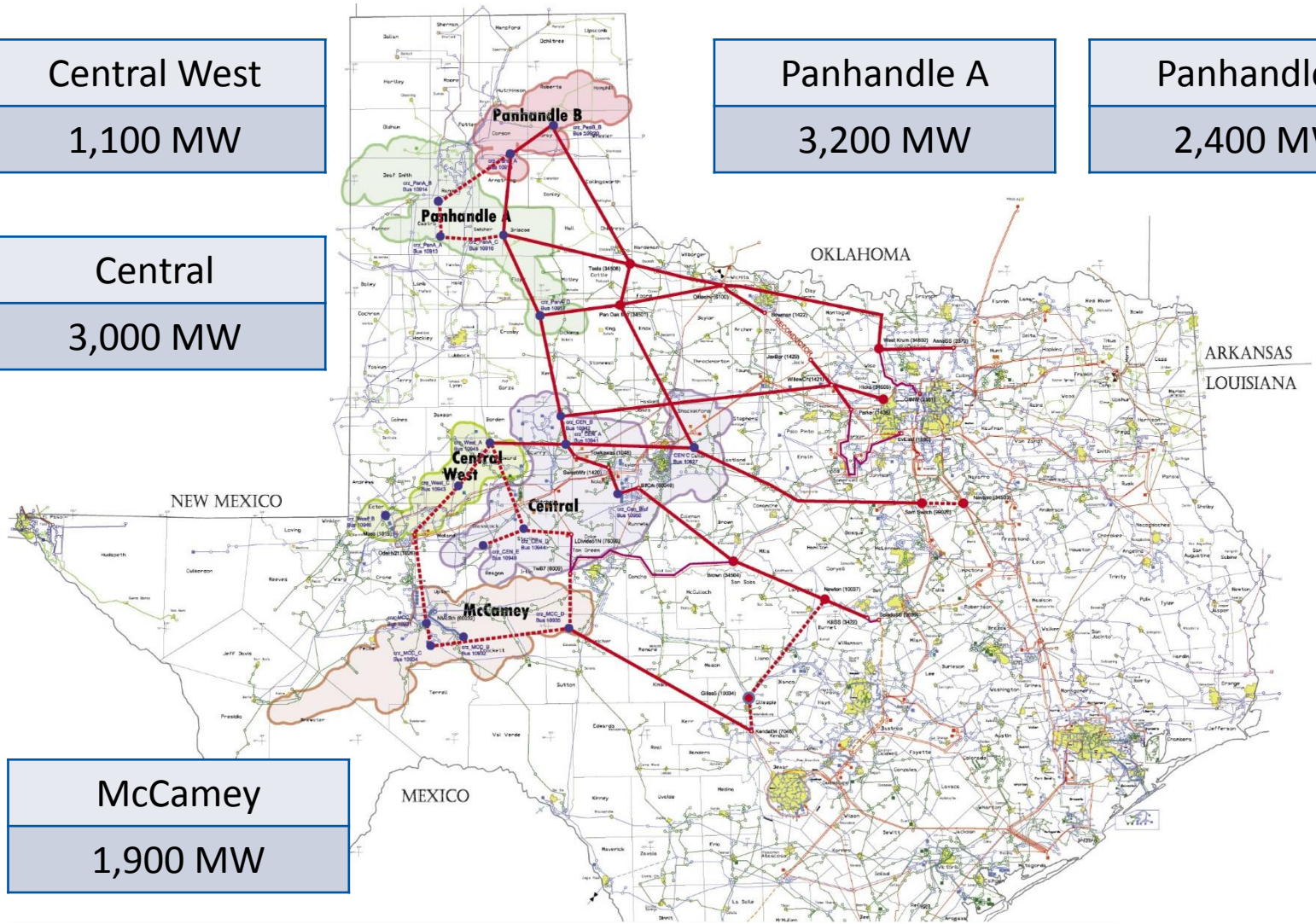
Tx: TX Competitive Renewable Energy Zones (CREZ)

Central West
1,100 MW

Panhandle A
3,200 MW

Panhandle B
2,400 MW

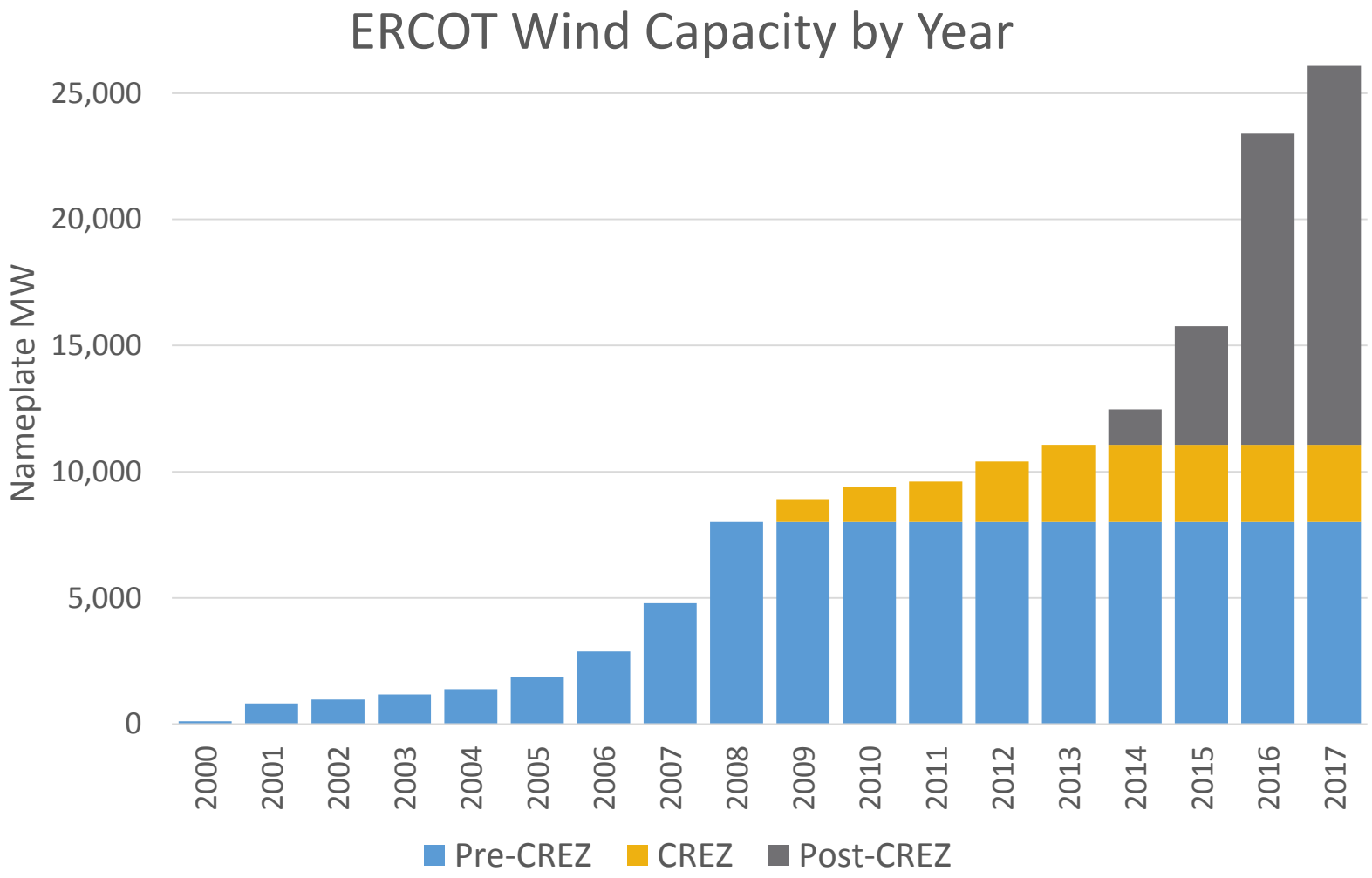
Central
3,000 MW



McCamey
1,900 MW

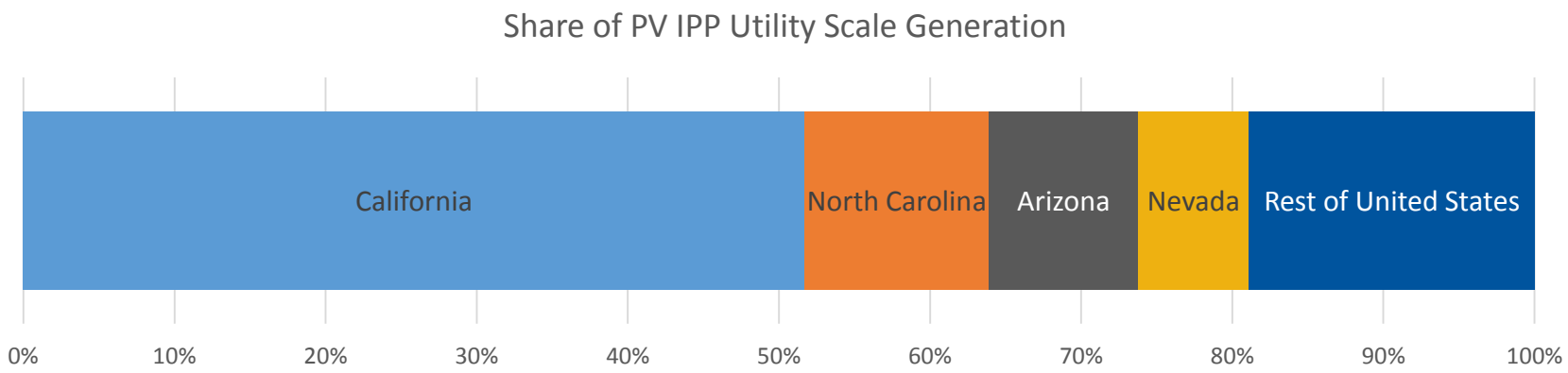
ERCOT. "Competitive Renewable Energy Zones (CREZ) Transmission Optimization Study Attachment A." 2008.

Tx: TX Wind Capacity Pre- and Post-CREZ



PURPA Qualified Facilities (QF) Contracts

PURPA PV QFs: SW? and NC!



Comments and caveats:

- EIA generation data, March 2016
- Most of CA and AZ IPP PV are *not* QFs; they are non-QF PPAs with PG&E, SCE, SDG&E, and APS.
- Missed the cut: MA, TX, NJ, GA, NM, and CO. None had more than 3 percent share.

PURPA PV QFs: Why NC?

Duke Energy Carolinas, LLC

Electricity No. 4
North Carolina Fifth Revised Leaf No. 90
Superseding North Carolina Twelfth Revised Leaves No. 91 and 92

SCHEDULE PP (NC)
PURCHASED POWER

AVAILABILITY (North Carolina only)

Upon Seller's completion and Company's acceptance of a Purchase Power Agreement, this Schedule is available for electrical energy and capacity supplied by Eligible Qualifying Facilities (as defined below) to Company, provided Seller is a Qualifying Facility as defined by the Federal Energy Regulatory Commission's (FERC) Order No. 70 under Docket No. RM79-54 and 18 C.F.R. §§ 292.203, 292.204, and 292.205. This Schedule is not available for electric service supplied by Company to Seller or to Seller who has negotiated rate credits or conditions with Company which are different from those below. This Schedule is not available to a Qualifying Facility owned by a Customer or affiliate or partner of a Customer, who sells power to the Company from another Qualifying Facility of the same energy resource located within one-half mile, as measured from the electrical generating equipment, unless the combined capacity is equal to or less than five (5) megawatts.

PURPA PV QFs: Why NC?

Option A
Administrative Charge — $19.91 per month

Interconnection Facilities Charge
The Interconnection Charge for each customer is set forth in the Agreement as outlined in the Terms and Conditions; however, the $25.00 minimum will not apply if the charge is for a meter only.

Interconnected to Distribution System:		Fixed Long-Term Rate (a)		
I. Capacity Credit	Variable Rate	5 Years	10 Years (a)	15 Years (a)
a. All On-Peak Energy per On-Peak Month per kWh:				
i. Hydroelectric facilities with no storage capability and no other type generation	3.34¢	3.45¢	3.64¢	3.82¢
ii. for all other hydroelectric and all non-hydroelectric facilities	2.00¢	2.07¢	2.19¢	2.29¢
b. All On-Peak Energy per Off-Peak Month per kWh:				
i. Hydroelectric facilities with no storage capability and no other type generation	1.67¢	1.73¢	1.82¢	1.91¢
ii. for all other hydroelectric and all non-hydroelectric facilities	1.00¢	1.04¢	1.09¢	1.15¢
II. Energy Credit				
a. All On-Peak Energy per Month per kWh:	4.05¢	4.31¢	4.87¢	5.28¢
b. All Off-Peak Energy per Month per kWh:	3.07¢	3.17¢	3.79¢	4.20¢

Interconnected to Transmission System:		Fixed Long-Term Rate (a)		
I. Capacity Credit	Variable Rate	5 Years	10 Years (a)	15 Years (a)
a. All On-Peak Energy per On-Peak Month per kWh:				
i. Hydroelectric facilities with no storage capability and no other type generation	3.26¢	3.37¢	3.56¢	3.73¢
ii. for all other hydroelectric and all non-hydroelectric facilities	1.96¢	2.02¢	2.14¢	2.24¢
b. All On-Peak Energy per Off-Peak Month per kWh:				
i. Hydroelectric facilities with no storage capability and no other type generation	1.63¢	1.69¢	1.78¢	1.87¢
ii. for all other hydroelectric and all non-hydroelectric facilities	0.98¢	1.01¢	1.07¢	1.12¢
II. Energy Credit				
a. All On-Peak Energy per Month per kWh:	3.95¢	4.21¢	4.76¢	5.16¢
b. All Off-Peak Energy per Month per kWh:	3.01¢	3.10¢	3.71¢	4.11¢

North Carolina Fifth Revised Leaf No. 90
Effective March 1, 2016
NCUC Docket No. E-100, Sub 140
Order dated December 17, 2015

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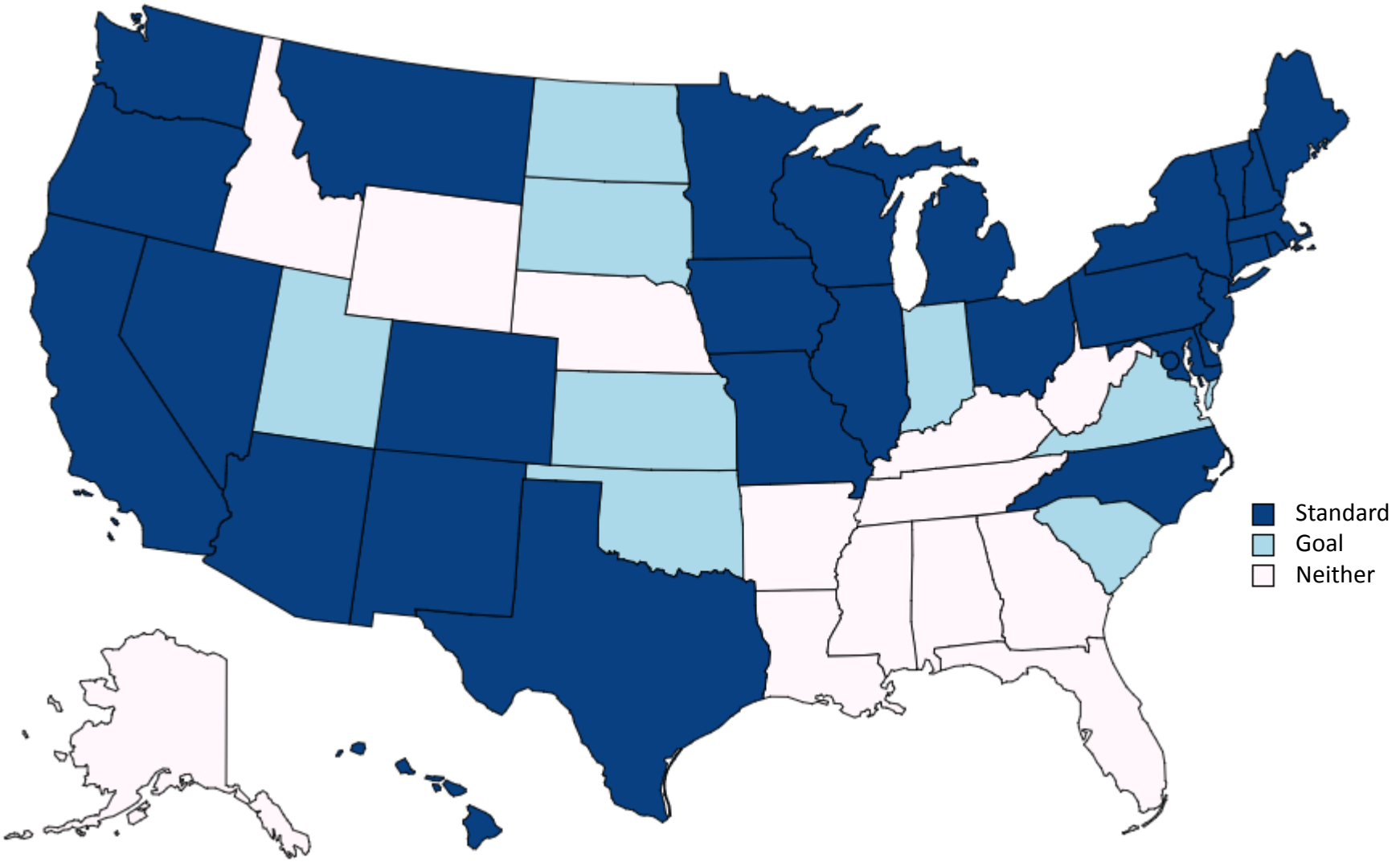
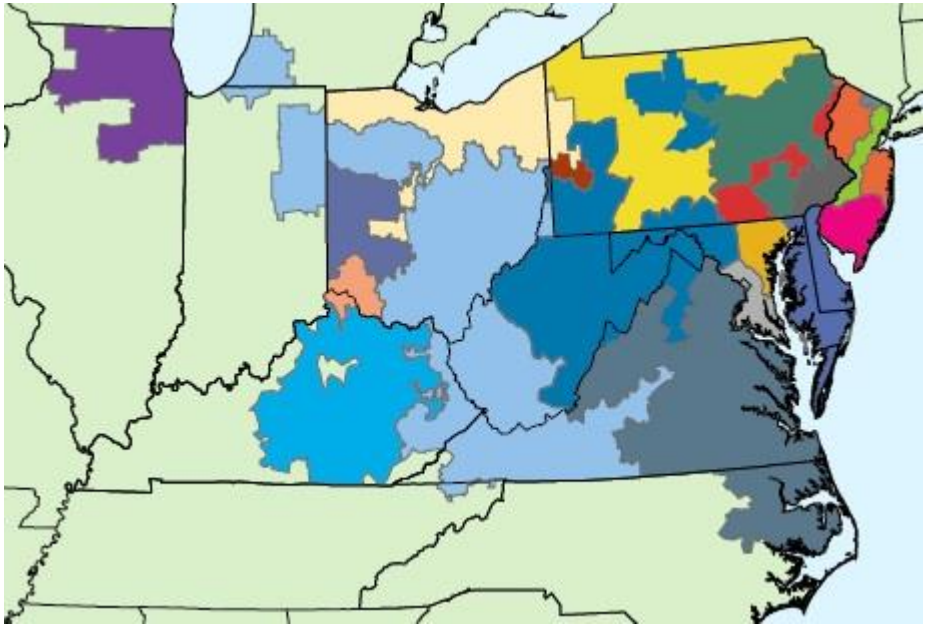
Renewable Portfolio Standards

Renewable Portfolio Standards (RPS)

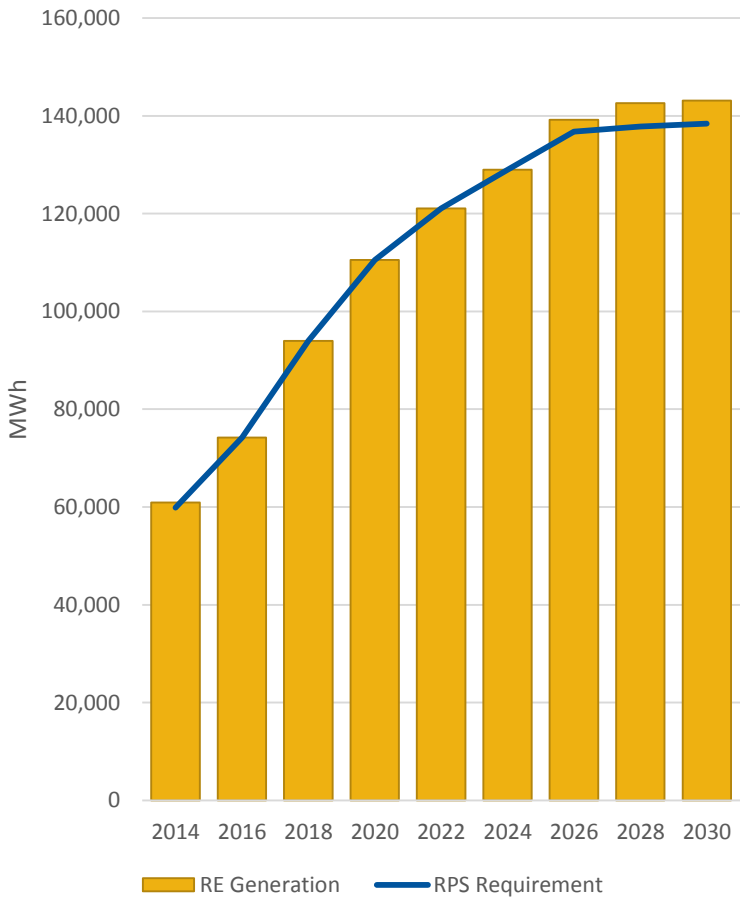


RPS & the PJM Regional Transmission Organization



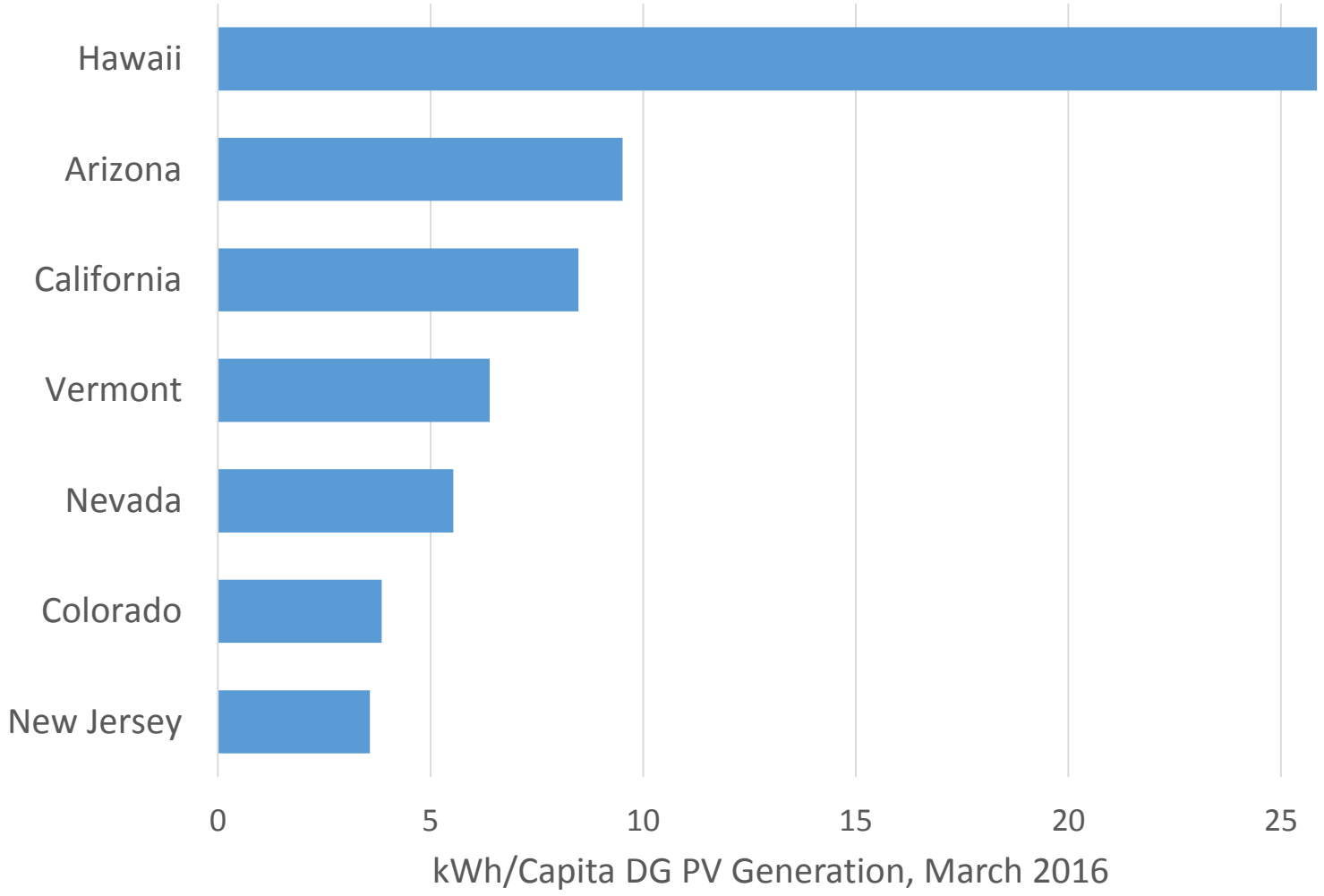
PJM 20160509

PJM's Aggregate RPS Requirement and Modeled Renewable Energy Generation



Ratemaking

Ratemaking: The Most DG PV per Capita by State



Ratemaking: HI High Variable Rate

Superseding Revised Sheet No. 51 — REVISED SHEET NO. 51
Effective March 1, 2011 — Effective September 1, 2012

SCHEDULE R

Residential Service

CUSTOMER CHARGE:

Single-Phase Service - per month	$ 9.00/month
Three-Phase Service - per month	$18.00/month

NON-FUEL ENERGY CHARGE (To be added to Customer Charge)

First 350 kWhr per month-per kWhr	8.1034 ¢/kWhr
Next 850 kWhr per month-per kWhr	9.2569 ¢/kWhr
All kWhr over 1,200 kWhr per month - per kWhr	11.1343 ¢/kWhr

BASE FUEL ENERGY CHARGE (To be added to Customer Charge and Non-Fuel Energy Charge)

All kWhr per month - per kWhr	13.6062 ¢/kWhr

Minimum Charge:

Single-Phase Service - per month	$17.00/month
Three-Phase Service - per month	$23.00/month

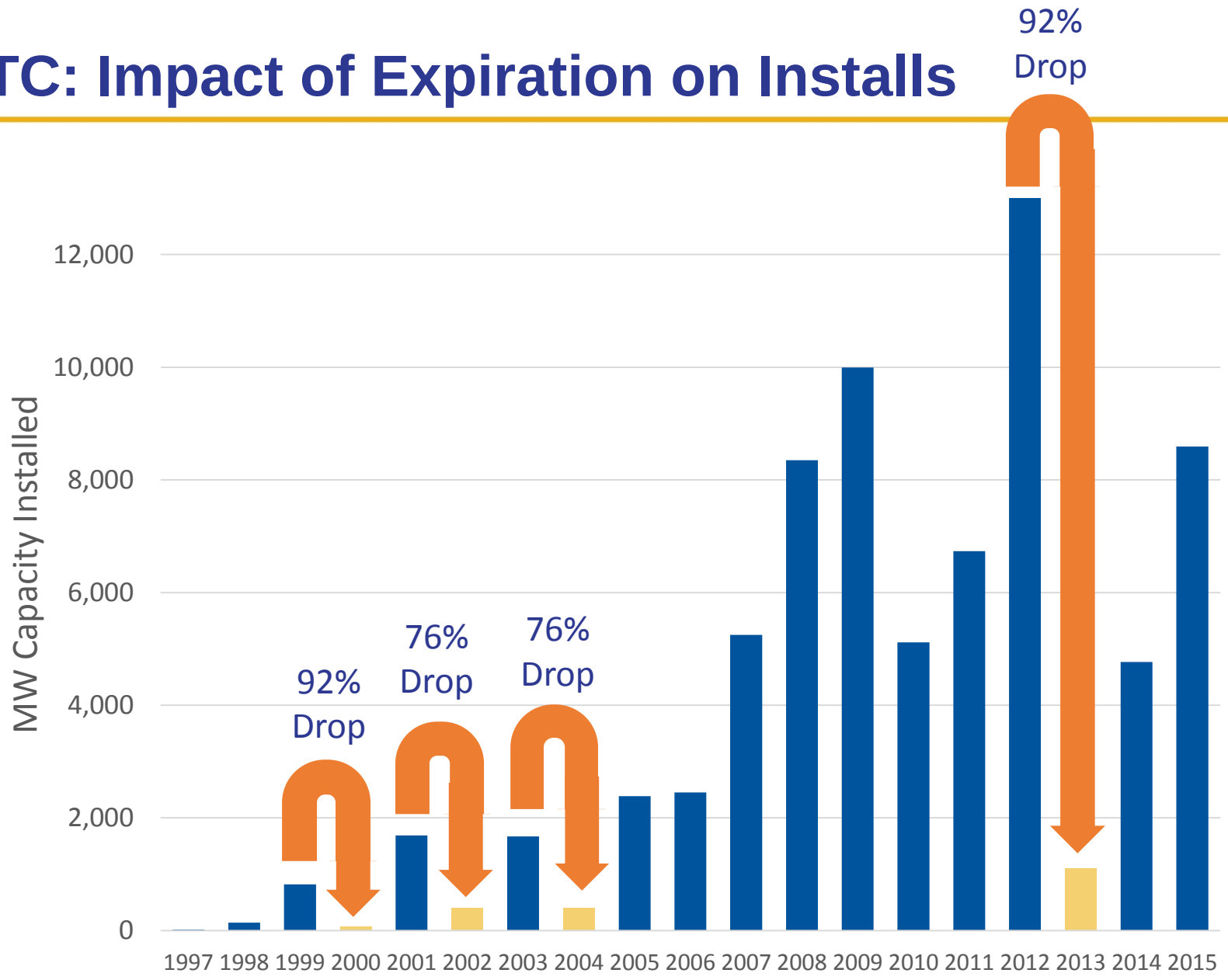
HECO Residential Variable Rate: $0.22/kWh – $0.25/kWh

Production Tax Credit

Wind Production Tax Credit (PTC): A Breezy History

- Enacted in the Energy Policy Act of 1992 (EPACT92) with a $15 per MWh tax credit, to be adjusted for inflation ($23 in 2016$)
- Credit duration is 10 years after facility placed into service.
- The American Taxpayer Relief Act of 2012 replaced “placed into service” deadlines with “commenced construction” deadlines.
- Allowed to expire four separate times: July 1, 1999; January 1, 2002; January 1, 2004; and January 1, 2014
- Current iteration (Consolidated Appropriations Act, 2016) phases the wind PTC out as follows: 20% reduction for 2017, 40% reduction for 2018, 60% reduction for 2019, elimination in 2020.

PTC: Impact of Expiration on Installs



Will New Renewable Energy Generation Capacity Appear Here and Not Just There?

Want to Team Up with Us?

Synapse provides:

- Economic and technical analysis
- Research and report writing
- Policy analysis and development
- Representation in voting and stakeholder committees
- Economic and power system modeling
- Expert witness services
- Regulatory support
- Facilitation and trainings
- Development of analytical tools

Related Resources

Synapse Spring 2016 National Carbon Dioxide Price Forecast: http://www.synapse-energy.com/sites/default/files/2016-Synapse-CO2-Price-Forecast-66-008_0.pdf

Consumer Costs of Low-Emissions Futures Factsheets and Reports: http://synapse-energy.com/project/consumer-costs-low-emissions-futures

Synapse Blog Posts on Renewable Energy:
http://synapse-energy.com/tags/renewable-energy

Testimony Detailing Value of Solar Calculation Methodology: http://www.synapse-energy.com/project/technical-analyses-south-carolina-solar-net-metering-docket

Synapse Clean Power Plan Toolkit: http://synapse-energy.com/CleanPowerPlan

Clean Power Plan Modeling Tools for States and Stakeholders: http://www.synapse-energy.com/project/clean-power-plan-modeling-tools-states-and-stakeholders

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Sources and Related Reading

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