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A summary of Iowa's Recent Inquiry into Distributed Generation

Anne Kimber, Director, EPRC

MARMET workshop March 30, 2015
University of Illinois Champaign Urbana

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Purpose:

- History and Context: States' approaches to recognizing and formulating policy on distributed generation
  - California:
  - New York "Reforming the Energy Vision"
  - Minnesota recent "Value of Solar" ruling
  - Iowa comprehensive inquiry …..

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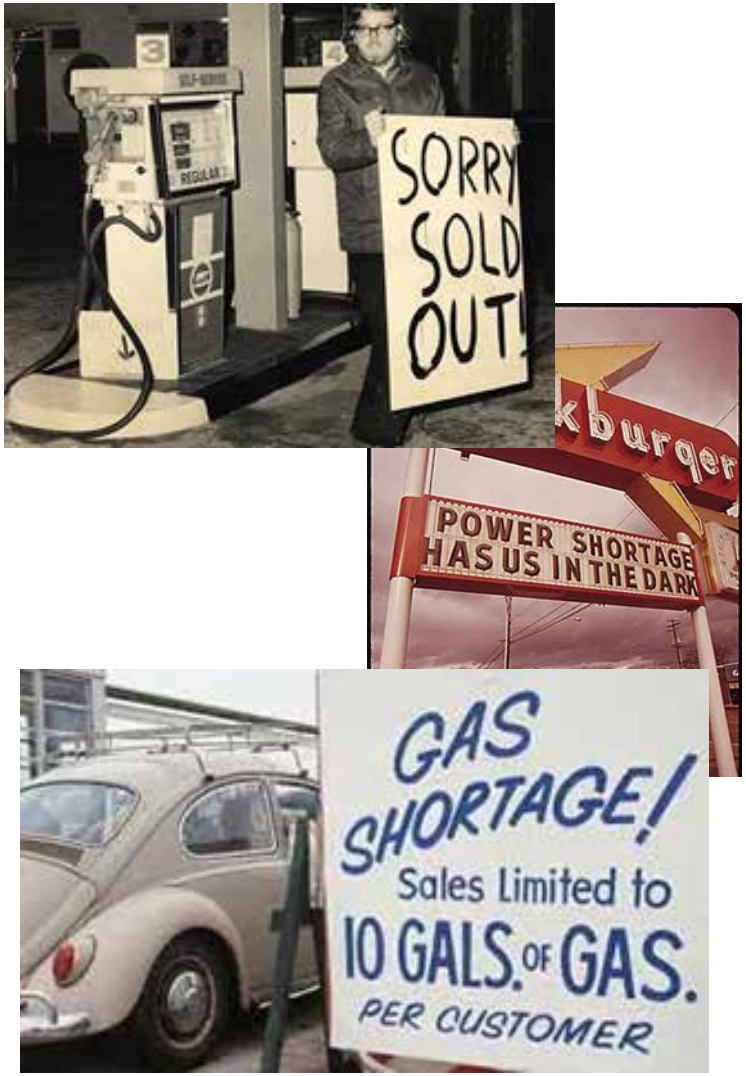
PURPA Overview

- Oil embargo of 1973-74 and shortage of natural gas in second half of decade, led to passage of the National Energy Act of 1978, including Public Utility Regulatory Policies Act (PURPA)



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PURPA - Basic Utility Requirements

- Interconnect with qualifying small power production facilities not exceeding 80 MW (QF) and qualifying co-generation facilities.
- Purchase energy and capacity from QFs at rates no lower than the utilities' avoided cost. (Some exceptions)
- Wheel to utility with higher avoided cost
- Sell power to QFs

[Note: some exceptions apply]

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DG – Background Factors

- Rising energy & capacity costs
- Lower costs for wind and solar PV
  - Technology **improvements**
  - Cost trends
- Cyber and physical security risks
- Markets
- Impact on the power world
  - Uncertain world for traditional utilities
  - State PUCs grappling with DR – Iowa example

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Rising energy & capacity costs

- Old plants, especially coal-fueled, are being retired – in part by EPA rules
  - MATS
  - Carbon (Proposed 111d)
- Cost of commodities for building new plants, e.g., steel, copper, Portland cement, rising due to world competition
- Although demand growth has slowed, a capacity shortfall is anticipated in MISO as early as 2016

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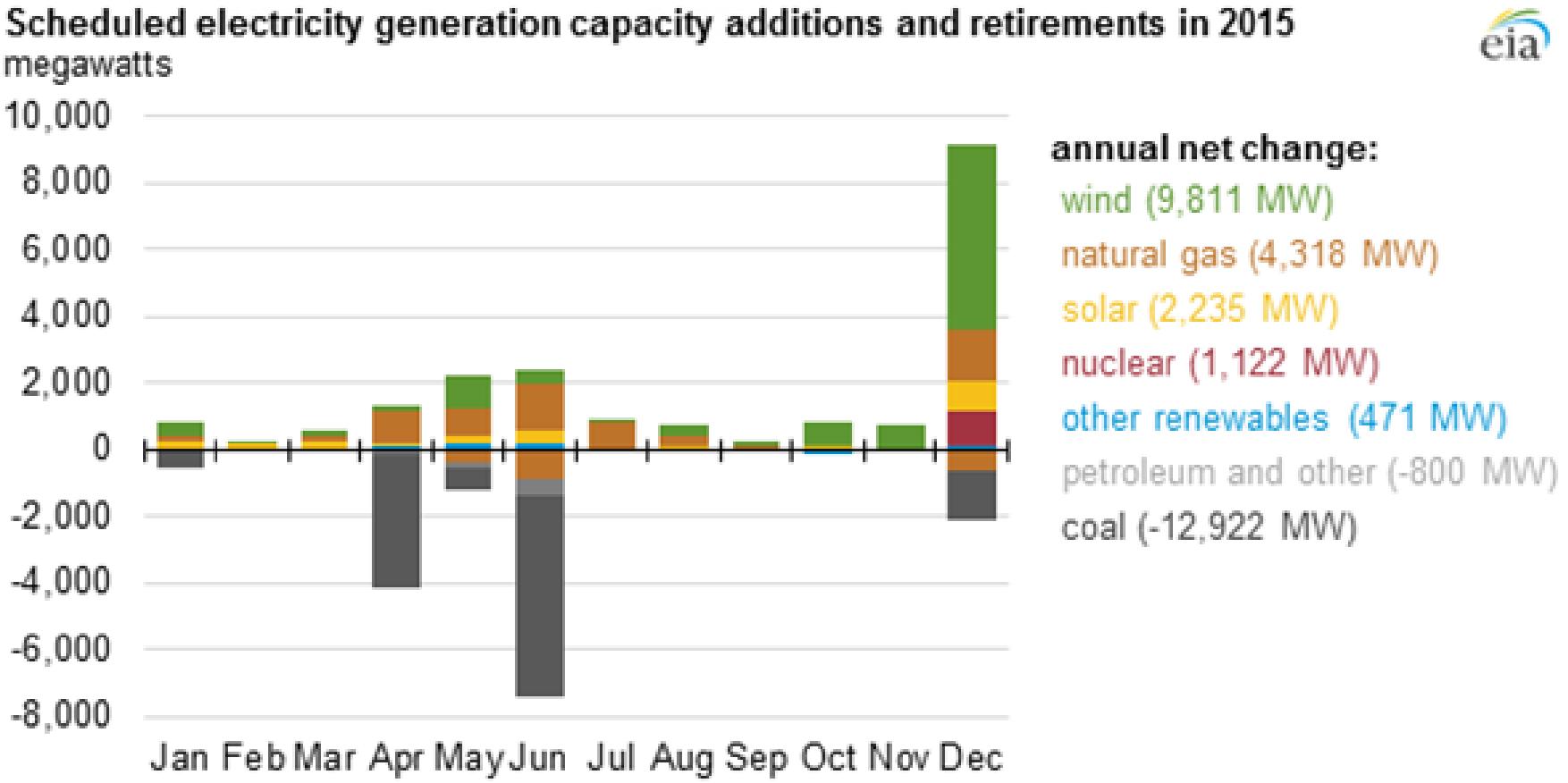

Drivers include: EPA MATS rule, declining cost of wind with subsidies, expected carbon price

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Cost of PV Panels

- 2006 = $3.80/Watt (1.4 GW installed)
- 2012 = $0.91/Watt (30.25 GW installed)

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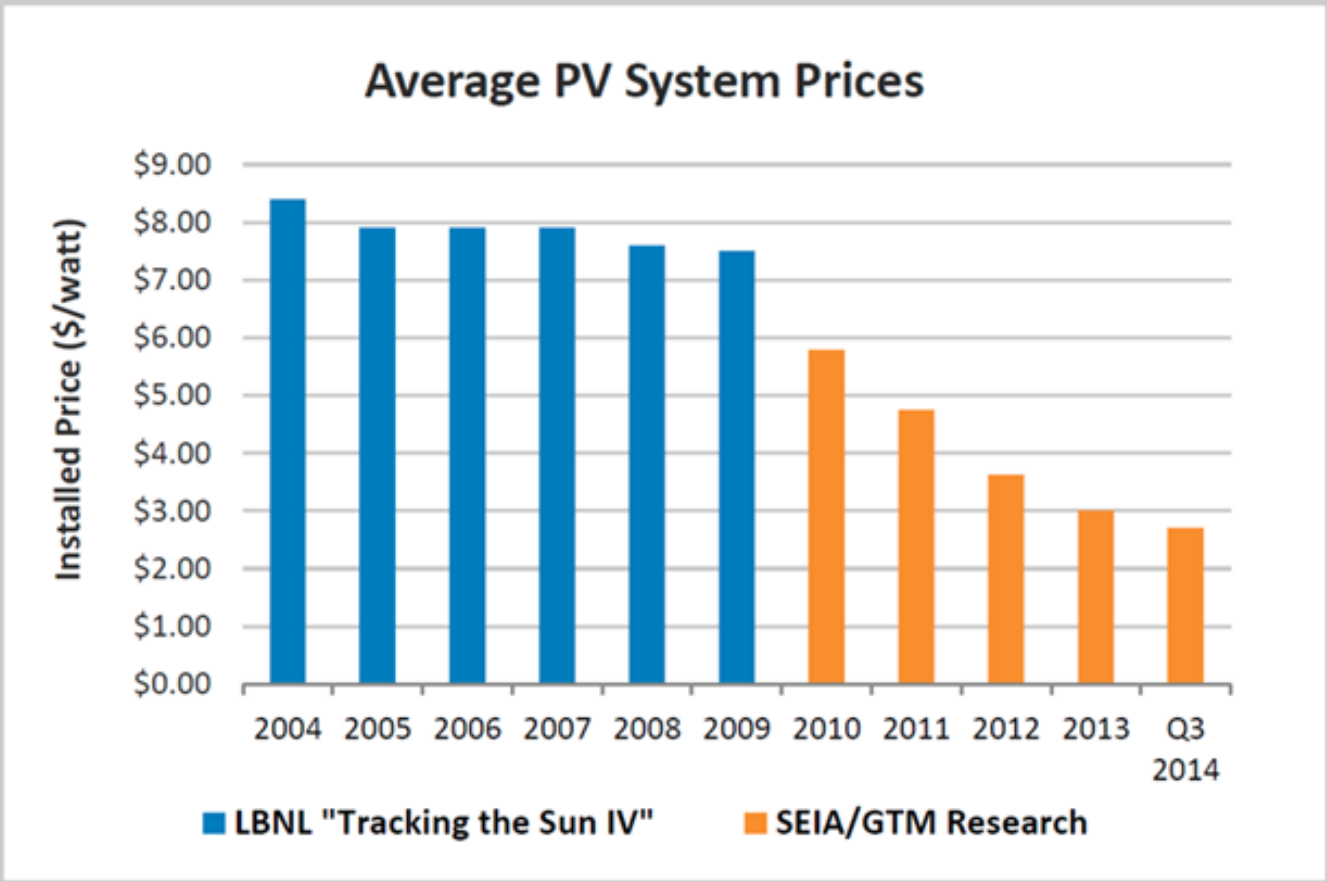

GTM RESEARCH

SEIA

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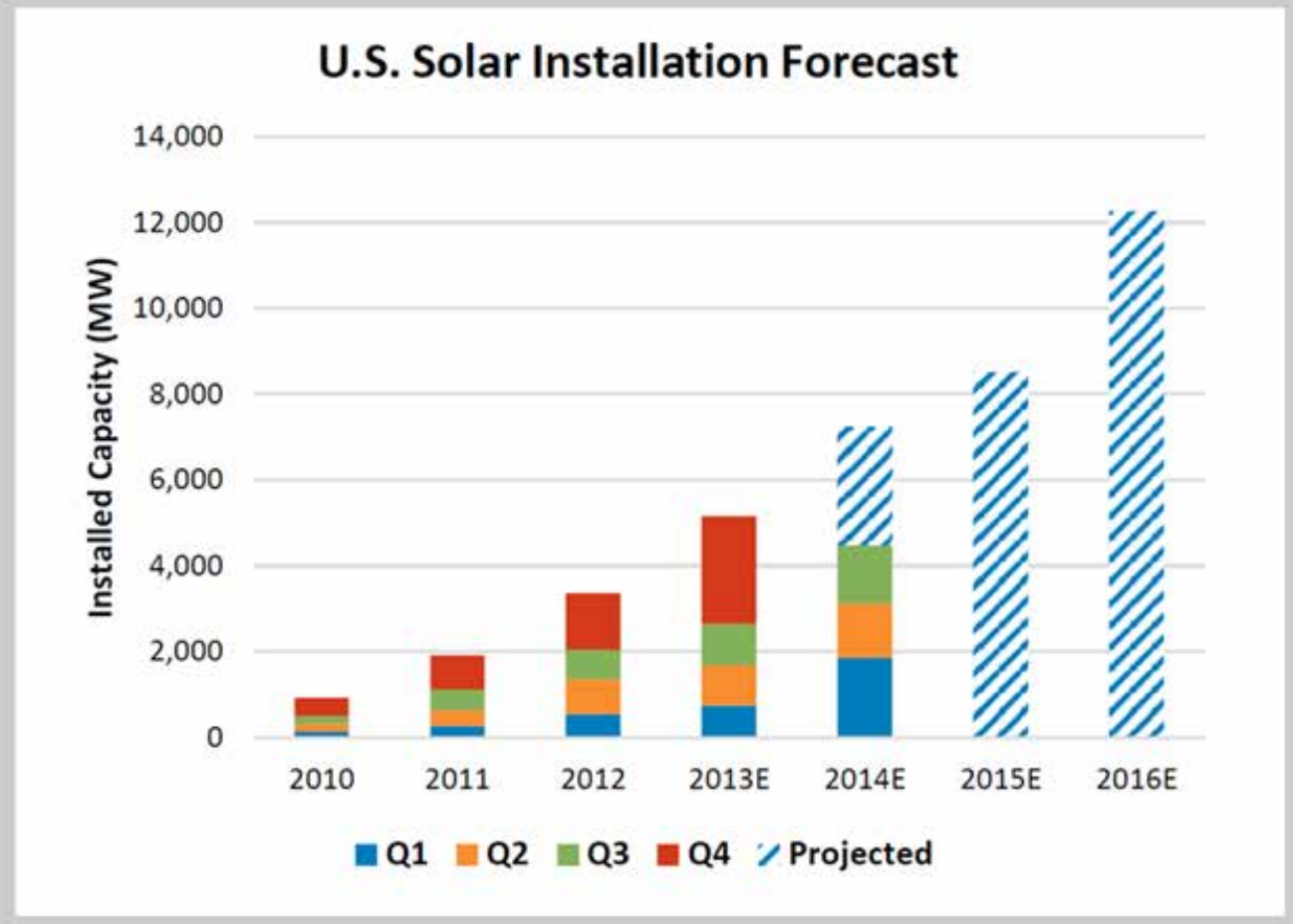

GTM RESEARCH

SEIA

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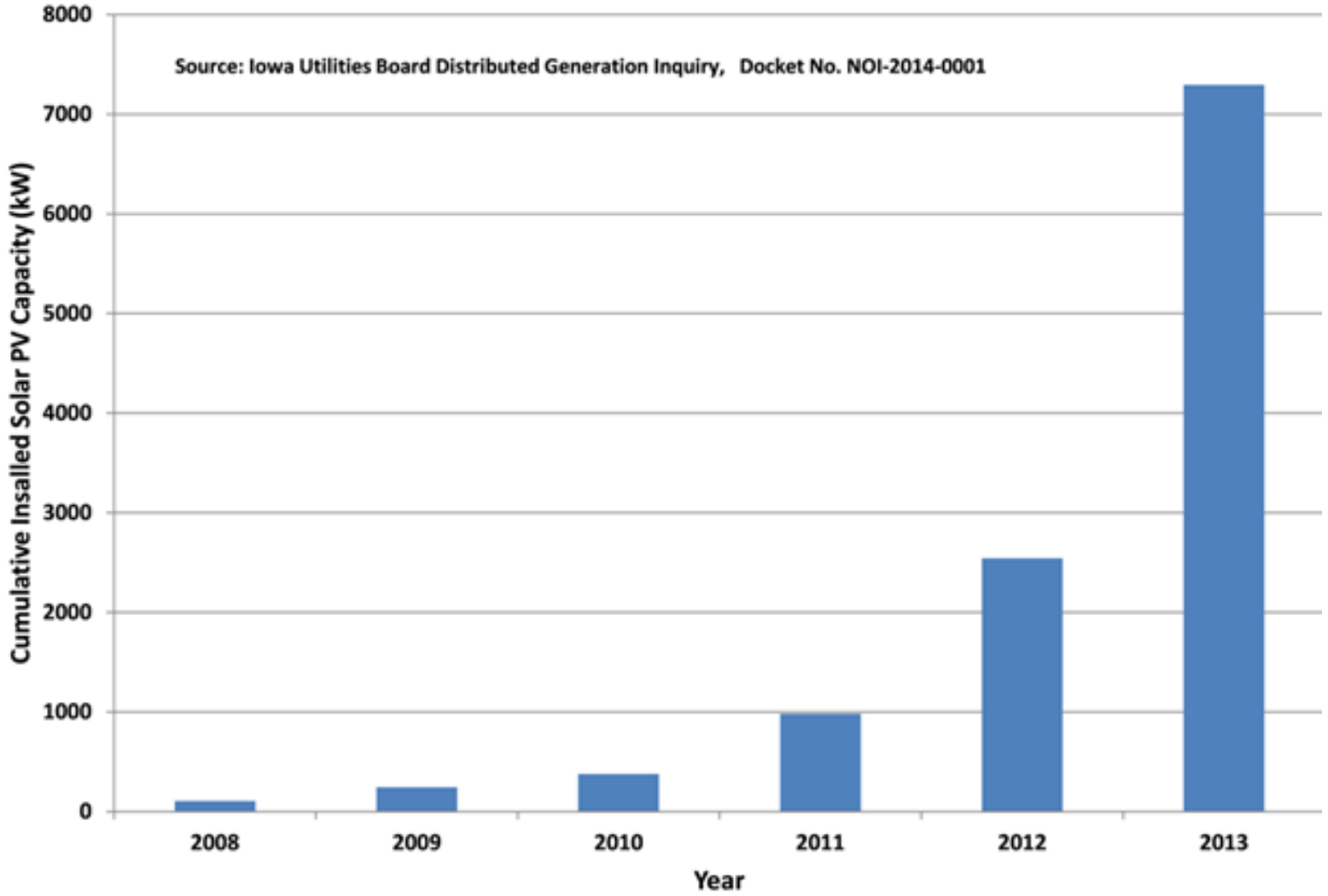
Installed PV - IOWA



Iowa solar: residential rooftop system reference: NREL PV WATTS http://pvwatts.nrel.gov/pvwatts.php

- Federal tax credit: 30%
- State tax credit: 60% of Federal tax credit= 18%
- Total tax credit= 48%
- Local utility offers $0.50/W dc rebate
- Local utility net meters (with excess carried as a credit on next month's bill)
- Assume installed cost= $3.3/W dc before rebate and tax credits
- Inverter efficiency 96%
- PV WATTS result: solar PV costs $0.08/kWh
- My summer electric rate: $0.11/kWh

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Advances in PV technology

- Some of the recent reductions in PV prices are due to market factors, but most are related to improvements in manufacturing
- New materials are also under development, e.g., tandem silicon (absorbs infrared) and perovskite (absorbs visible light) hold the promise of efficiencies in the 30-35% range compared to mass-market polycrystalline panels which have efficiencies of about 15-16%

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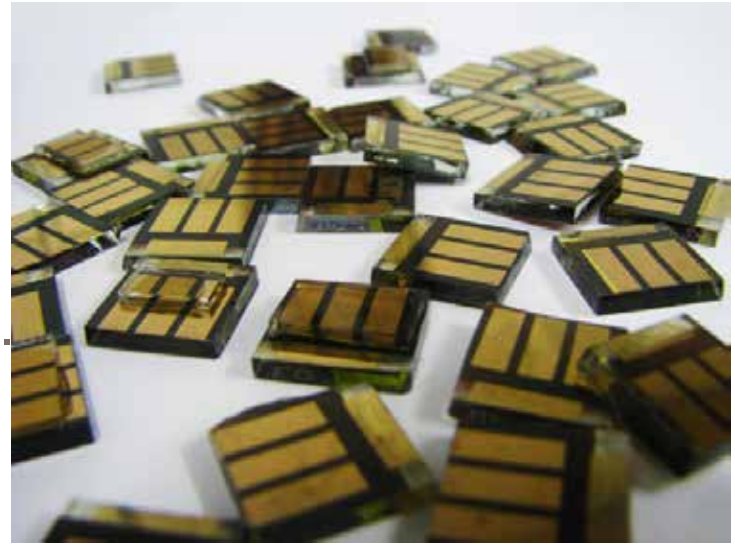
Technology game changers: "All the cool solar-cell scientists are working on perovskite photovoltaics"

- **"Perovskites for "Tandem" Solar Cells" posted March 24, 2015 on IEEE website**
- **http://spectrum.ieee.org/energywise/energy/renewables/perovskites-for-tandem-solar-cells-**

"By developing a way to coat silicon photovoltaics with crystals known as perovskites, researchers are creating tandem solar cells that may be substantially better at converting light to electricity than conventional solar cells while also being manufactured at low cost.



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Wind energy

- Wind is by far the lowest cost generation resource in the upper Midwest
- The technology continues to improve
  - Scale economies due to turbine size
  - More sophisticated remote monitoring has improved availability
  - Wind is now able to provide reactive power support

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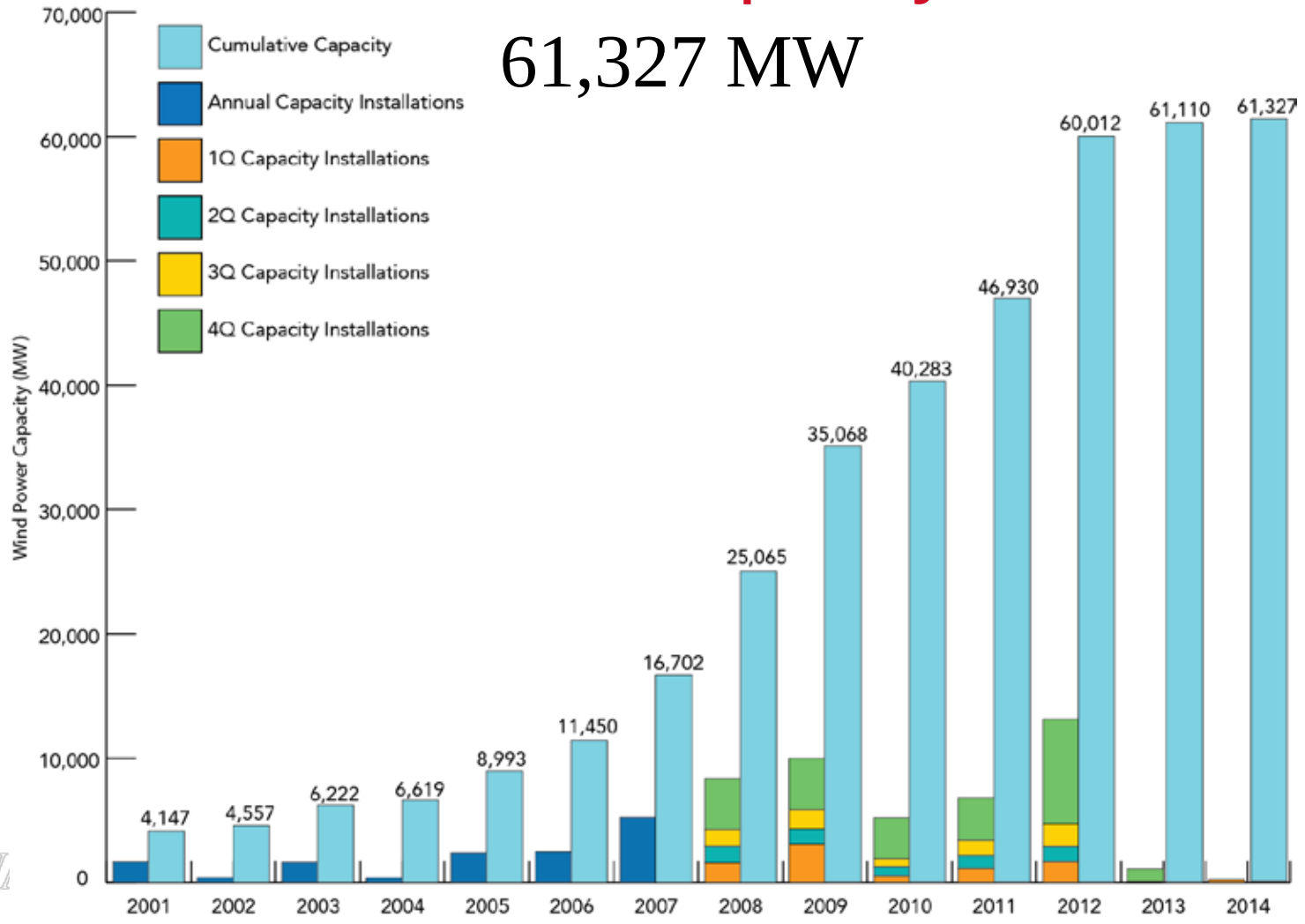
U.S. installed wind capacity 2014

61,327 MW



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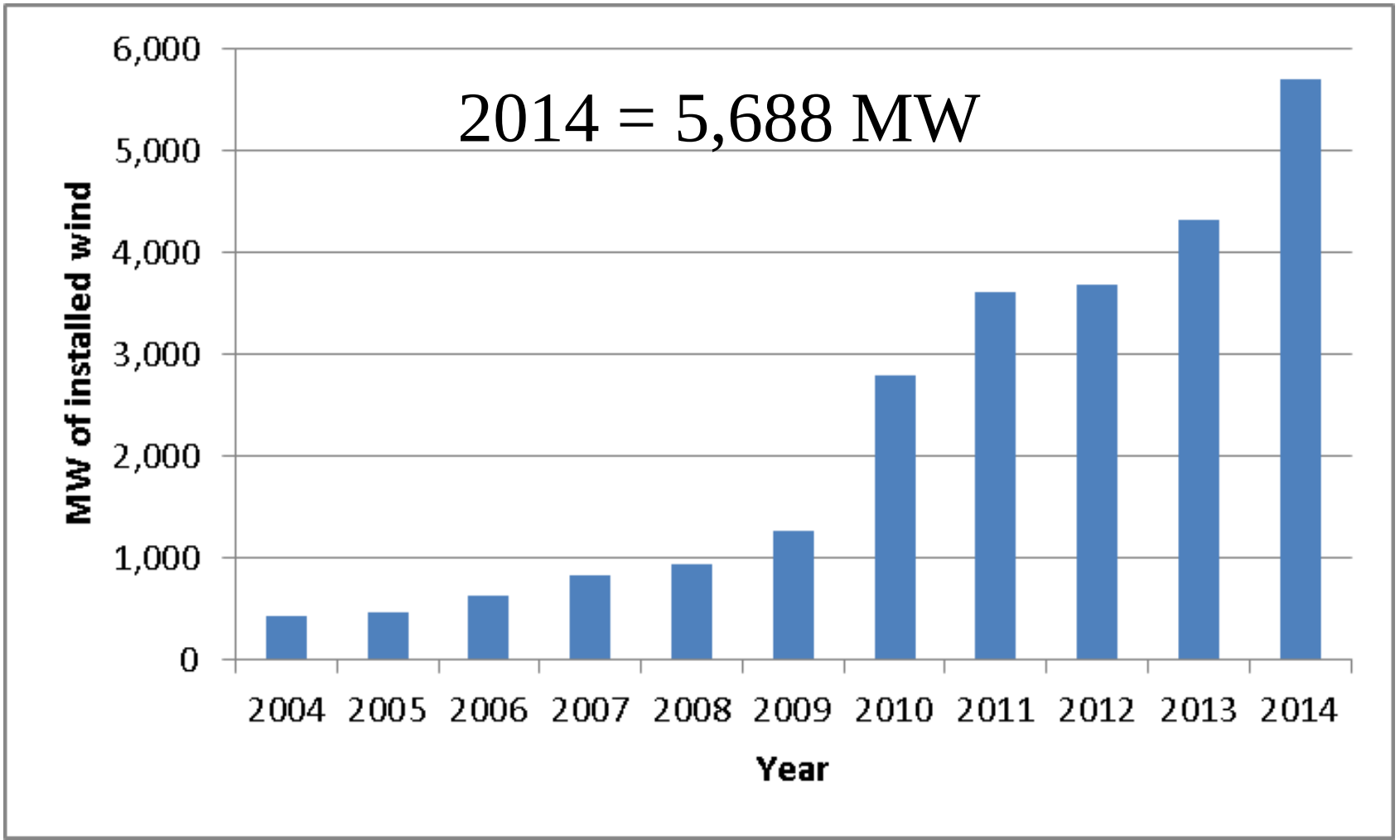
Installed Wind MW - IOWA



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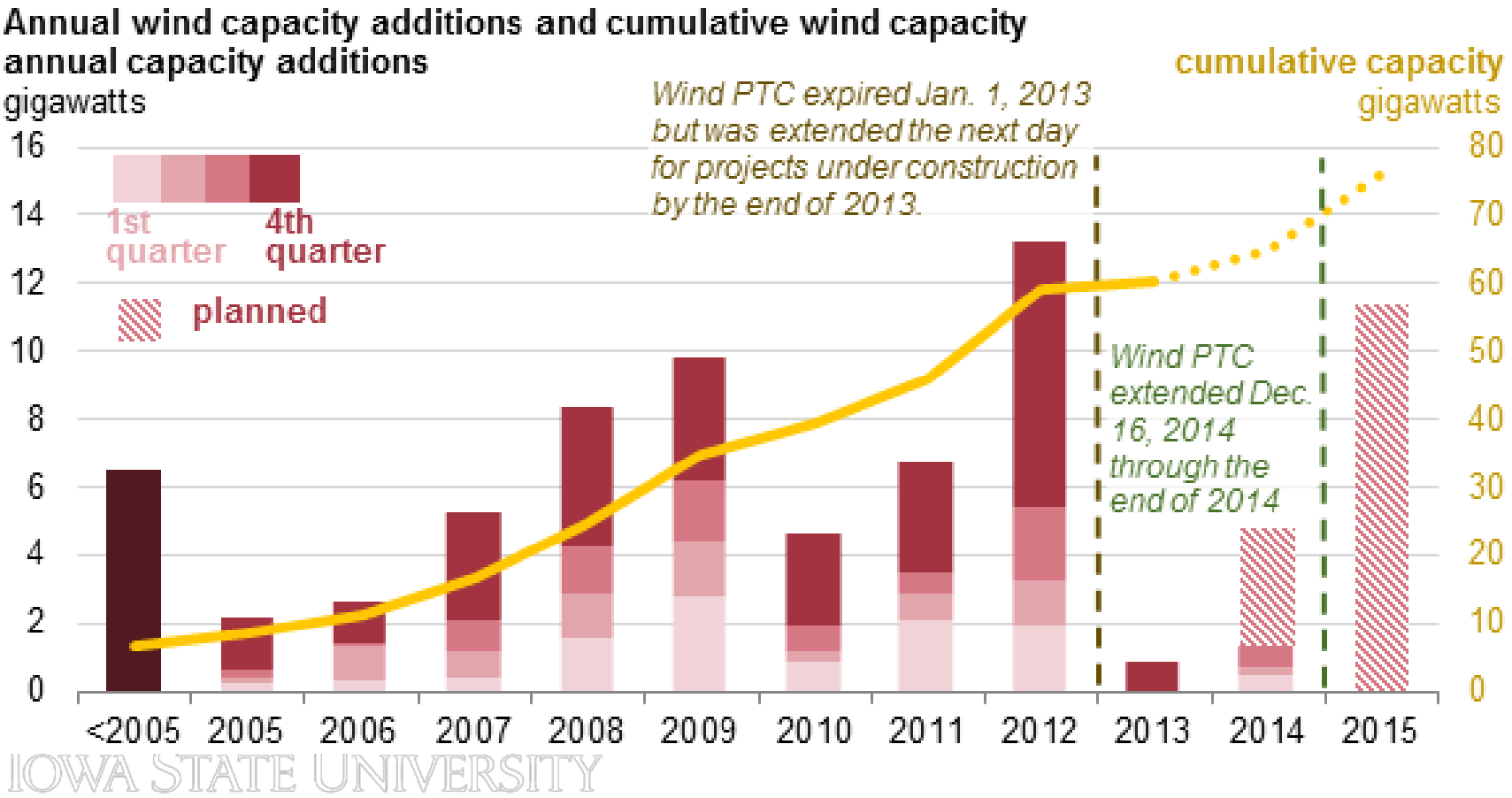
PTC drives wind capacity



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Storage

- Storage of all types will change the value of renewable energy systems
- October 2013: California Public UtilitCalifornia CPUC adopted an energy storage procurement framework and established an energy storage target of 1,325 megawatts for PG&E, Edison, and SDG&E by 2020, with installations required no later than the end of 2024.

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Cyber & physical security of grid

- Parts of the U.S. power grid are attacked online or in person every four days, according to an analysis of federal energy records

- The Department of Homeland Security was alerted to 151 energy-related “cyber incidents” in 2013, up from 111 in 2012 and 31 in 2011, USA Today reported.

Source: The Hill
3-25-15

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Similarities and Differences

- California and New York: Deregulated (retail rate competition, have CAISO, NYISO) and high retail rates compared with the Midwest:

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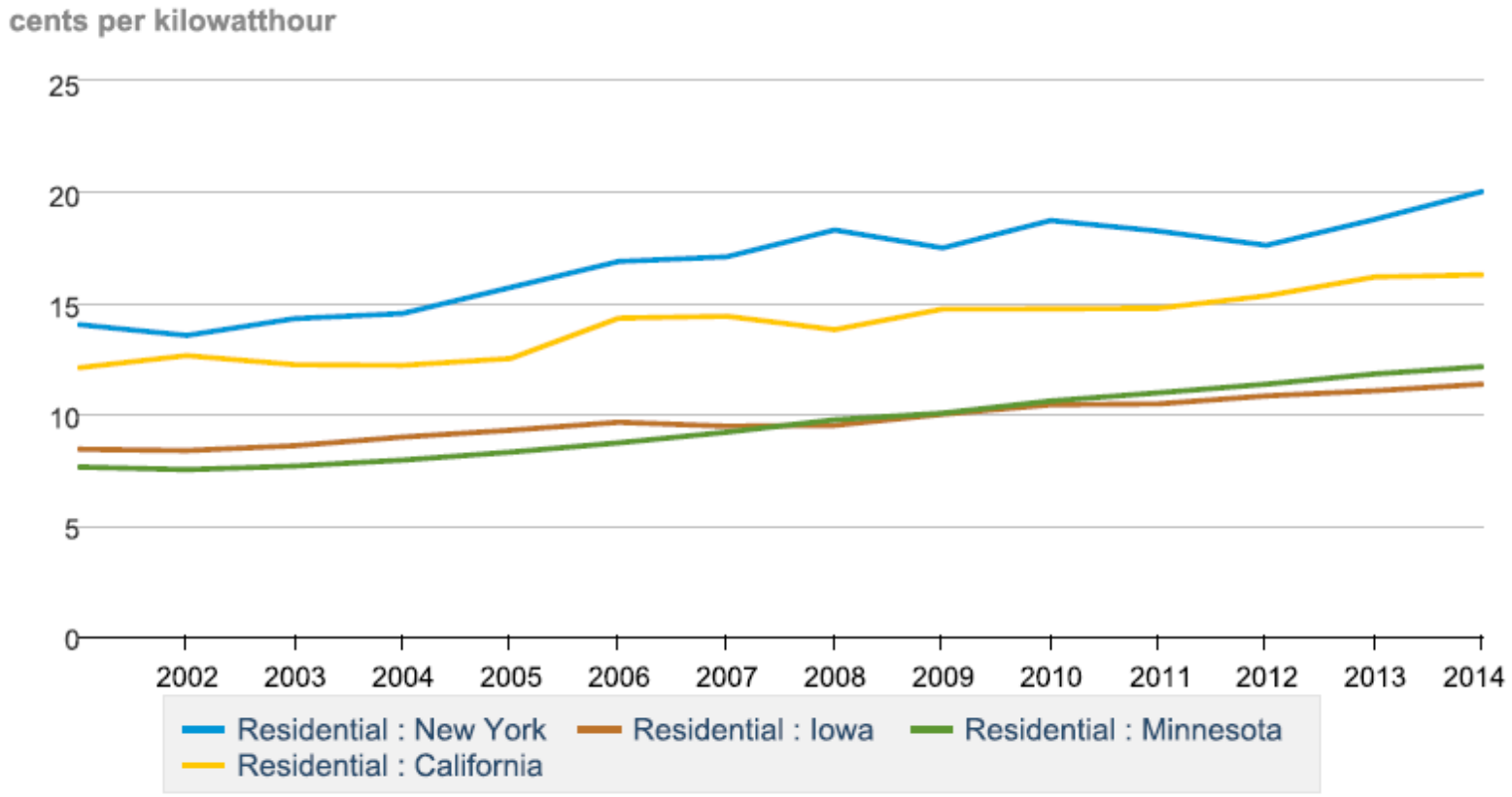
Average retail price of electricity, annual



Data source: U.S. Energy Information Administration

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California:

- Renewables to be 33% of total procurement by 2020 (as a percentage of total retail sales)
- http://www.cpuc.ca.gov/PUC/energy/Renewables/index.htm
- http://www.cpuc.ca.gov/PUC/energy/drp/index.htm by July 2015: “identify optimal locations for the deployment of distributed resources.” It defines “distributed energy resources” as “distributed renewable generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies.”

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NY REV: Case 14-M-0101

- Feb 26 2015 Order adopting: "REV will establish markets so that customers and third parties can be active participants, to achieve dynamic load management on a system-wide scale, resulting in a
- more efficient and secure electric system including better utilization of bulk generation and transmission resources. **As a result of this market animation, distributed energy resources will become integral tools in the planning, management and operation of the electric system. The system values of distributed resources will be monetized in a market, placing DER on a competitive par with centralized options.** Customers, by exercising choices within an improved electricity pricing structure and vibrant market, will create new value opportunities and at the same time drive system efficiencies and help to create a more cost-effective and secure integrated grid."

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NY REV:

- "The REV vision is strongly supported by parties. Of 81 comments received on the Straw Proposal, a large majority approved the Commission's general goals.
- The subjects addressed in REV are not unique to New York. It would be impossible to list all of the related developments in other jurisdictions, but prominent examples include integration of distributed resources in California and Hawaii,28
- consumer markets and emerging technologies in Texas,..grid modernization in Massachusetts,…and performance ratemaking in Minnesota and the United Kingdom."

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NY REV continued

- By December 15, 2015, each regulated utility must file a Distribution System Implementation Plan
- "DSIP will include: actual and forecast system loads and capital spending projections, at a level of specificity sufficient to inform market planning and participation by third parties; actual and forecast levels of DER including detailed analysis of system needs amenable to being met by DER; plans for encouraging market development of DER; plans for increasing DER deployment in underserved markets; specific plans including cost estimates for building DSP capabilities; and a description of internal organization of DSP and traditional utility functions."

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Snapshot of Iowa:

- Wholesale rate-regulated
- 2 Investor owned utilities
- 136 municipal electric utilities
- 36 distribution electric cooperatives
- 7 Generation and transmission cooperatives

Electric rates:

- Fixed and variable charges.
  - Common that some of the fixed costs of running the utility are included in the $/kWh charge…..
  - The monthly service charge assigned to customers (especially residential customers) does not include all fixed costs

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2014 “Eagle Point Solar” decision:

- Allows “third party” solar developer to contract with a customer to sell kWh to the customer, from generation owned by another party, via a purchased power agreement.

IOWA: NOI 2014-001 “Distributed Generation”

Began January 2014, ongoing

- 1. What are the potential benefits and challenges of distributed generation for utilities and ratepayers? Are these different for utility-owned distributed generation versus customer-owned distributed generation?
- 2. Are there policies the Board, other state agencies, or the General Assembly should examine related to distributed generation?
- 3. What other topics (i.e., technological, financial, regulatory, safety, or others) should be examined in this docket?

170 responders

- Utilities (MidAmerican, Interstate Power and Light (Alliant), municipals, RECs), Edison Electric Institute
- Midwest Cogeneration Association
- Solar developers
- Environmental groups
- Consumer advocacy groups
- Home owners, businesses, large industry (Microsoft, Facebook)
- Private colleges and community colleges
- Transmission company: ITC Midwest
- Religious groups
- Iowa Department of Revenue (loss of tax revenue from customer-owned generation)
- Iowa House of Representatives

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NOI May 12 2014 Order

Narrow the topics to:

- net metering;
- interconnection of DG (including safety and reliability)

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Net metering:

- Increase the size cap from 500 kW to 2,500 kW or 5,000 kW?
- Allow "virtual net metering“?
- Include combined heat and power (CHP) and waste heat and power (WHP) as net metering eligible facilities?
- Allow an annual cash-out of the net metering balance?
- Include aggregate metering for customers who may have more than one meter on their premises?

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Net metering:

- How does the utility account for energy "purchased" through net metering when reporting fuel type information to the Board, the United States Energy Information Administration, the Federal Energy Regulatory Commission, and others?
- (Brief answer: they do not account for it in filings)

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Costs, incentives questions:

- Currently Iowa does not offer feed-in tariffs. Explain why you think feed-in tariffs should or should not be implemented in Iowa. In your discussion, address the advantages and disadvantages of both net metering and feed-in tariffs.

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Costs, incentives questions continued:

"If you believe that net metering results in cross subsidization of DG customers by non-DG customers, how should the net metering rule be revised to reduce or eliminate such cross-subsidization?

If you believe that net metering does not take into account the benefits that DG provides to non-DG customers, how should the net metering rule be revised to account for such value? "

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Iowa's net metering questions in the context of Minnesota Value of Solar Tariff

- In March 2014, Minnesota became the first state to allow Investor Owned Utilities to pay customers a "value of solar" tariff rate instead of net metering.
- Example: Xcel community solar program will provide residential bill credits to subscribers of $0.14-$0.15/kWh

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Figure 1. Illustration of the VOS Calculation Table

Rectangular Snip

25 Year Levelized Value

	Gross Value ($/kWh)	×	Load Match Factor (%)	× (1 +	Loss Savings Factor (%)	) =	Distributed PV Value ($/kWh)
Avoided Fuel Cost	GV1				LSF-Energy		V1
Avoided Plant O&M - Fixed	GV2				LSF-Energy		V2
Avoided Plant O&M - Variable	GV3				LSF-Energy		V3
Avoided Gen Capacity Cost	GV4		ELCC		LSF-ELCC		V4
Avoided Reserve Capacity Cost	GV5		ELCC		LSF-ELCC		V5
Avoided Trans. Capacity Cost	GV6		ELCC		LSF-ELCC		V6
Avoided Dist. Capacity Cost	GV7		PLR		LSF-PLR		V7
Avoided Environmental Cost	GV8				LSF-Energy		V8
Avoided Voltage Control Cost							
Solar Integration Cost							

Value of Solar

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September 19 Order: asking for comments on the comments provided in the May 12 order:

- For non-utility participants:
- … legal issues associated with virtual net metering if retail energy from an off-site DG is wheeled over the utilities' systems.
- Is virtual net metering necessary if the utilities offer mechanisms for their customers to participate in renewable energy programs?
- ….if combined heat and power (CHP) or waste heat to power (WHP) facilities were considered eligible for net metering, the Board should retain the 500 kW size cap and the requirements that they be at one site and used primarily to serve the facility owner, as it is in its Rate NM.
- As with virtual net metering, there are legal issues discussed such as whether the delivery of excess power from a CHP facility would be considered a wholesale transaction subject to Federal Energy Regulatory Commission (FERC) jurisdiction ...

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September 19 Order continued:

- For utility participants:
- ….including CHP and WHP projects as eligible facilities in the net metering rules would encourage the development of small CHP and WHP projects. Assuming it is legally possible, would you object to including these types of projects as facilities eligible for net metering if they fall under the 500 kW size cap?

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September 19 order continued:

- Cash-out of net metering balance?
  - Is it a wholesale transaction
  - Would it lead to overbuild of DG?
  - Cash out…at retail rate? Or at utility avoided cost rate?
- Other pricing questions:
  - Should DG customers be required to participate in Time of Use rates, or demand rates, to remove cross-subsidies?
- Should there be a study of the costs versus the benefits of DG?

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September 19 Order continued

- Interconnection discussion:
  - Adopt? the updated FERC Small Generator Interconnection Procedures (less stringent than current Iowa law)
  - Adopt? the IREC Model Interconnection Procedures?

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September 19 Order continued: on interconnection screens

- 30. What, if any, specific Board rule changes are necessary to allow for the study of DG installations in new developments or neighborhood service areas?
- 31. Is there a need to revisit the 15 percent screen standard discussed in rules 199 IAC 45.8(1)"a" and 45.9(1)"a"?
- 32. What are the potential impacts of revising the 15 percent limit of the maximum load normally supplied by the distribution circuit to a higher limit?
- 33. What, if any, higher limit should be adopted? Explain the reasoning and data that support why such a higher limit is reasonable.

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Results so far of NOI-2014-0001

- Informational Guide for Onsite Generation
- https://iub.iowa.gov/sites/default/files/files/misc/IUB_Informational_Guide_Distributed_Generation.pdf

- Most recent order March 12 Ongoing comments on changes to the interconnection screens, essentially moving towards the FERC SGIP

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Order December 22, 2014

- Soliciting changes to interconnection rules IAC 199 Chapter 45)
- Current rules have 4 levels of screen:

- Most recent order March 12 Ongoing comments on changes to the interconnection screens, essentially moving towards the FERC SGIP

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IAC 199 Chapter 45 interconnection screens:

- **Level 1 Expedited Review** - For smaller lab-certified inverter-based facilities with a nameplate capacity of 10 kW or less, which require no upgrades of the utility's distribution system. This level involves limited insurance requirements, limited application fees ($50), and streamlined standard application forms and contracts.
- **Level 2 Expedited Review** - For larger lab-certified facilities with a nameplate capacity of 2 MW or less, which require no upgrades of the utility's distribution system. This level involves limited insurance requirements (for facilities 1 MW or less), higher application fees ($100 + $1 per kW), and standard application forms and contracts.

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IUB current interconnected screens:

- **Level 3 Expedited Review** - For non-exporting lab-certified facilities, which require no upgrades of the utility's distribution system. This level involves higher application fees ($500 + $2 per kW), and standard application forms and contracts.
- **Level 4 Review** - For all other interconnections. This level involves higher application fees ($1,000 + $2 per kW), standard application forms and contracts, and prescribed studies for determining any potential adverse system impacts and remedies (i.e., Feasibility Studies, System Impact Studies, and Facilities Studies). QFs and AEP facilities are required to pay all study costs and the costs of any required upgrades to the utility's distribution system.