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Smart. Focused. Done Right.

The ScottMadden Energy Industry Update

Highlights of Recent Significant Events and Emerging Trends

Early Fall 2013

Volume 13, Issue 2

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View from the Executive Suite

Executive Summary

The Times They Are a-Changin' (or Serenity Now!)

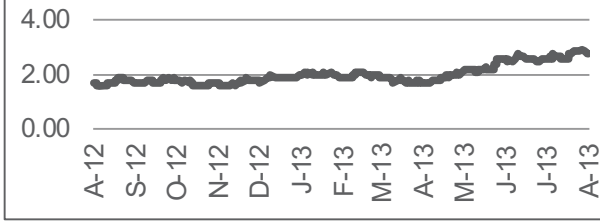
The confluence of relatively flat power demand, cheap natural gas, advancing technology (including learning curve effects on renewable technologies), public policies supporting renewables and efficiency, and perceived grid fragility after Superstorm Sandy has led customers to investigate other options such as self-delivery and self-supply. This is leading utilities to evaluate strategies, investment priorities, and even business models and regulatory paradigms.

Efficiency and Renewables	■ Demand-side management, and energy efficiency in particular, continues to make inroads ■ Declining solar photovoltaic (PV) costs have led to increasing numbers of distributed solar installations, although some utilities worry about socialization of significant costs with high levels of solar PV penetration
Evolving Utility Business Models	■ As policies and resources in some jurisdictions favor renewable energy, and smart grid technologies become more prevalent, end-users have more options, including distributed generation and microgrids ■ Some are saying that this customer empowerment is a "mortal threat" to the traditional volumetric-based utility business; we believe there are opportunities as well, but utilities should begin planning now
Wholesale Market Debates	■ There remains ongoing debate over the role, compensation, and rules for demand response, especially in capacity markets ■ Meanwhile, with capacity prices lower than expected in some markets, discouraging suppliers, FERC is teeing up discussion of capacity market designs and regional transmission organizations are tweaking market rules ■ These discussions coincide with continuing concern about coal-fired power plant retirements and the ability and economic incentives to fill any possible supply shortfalls
Grid Resilience Efforts	■ In the wake of Superstorm Sandy and other recent notable lengthy power interruptions, the utility industry, in collaboration with regulators and policymakers, is pursuing system hardening and resilience ■ Further, energy executives, security professionals, and policymakers are giving cybersecurity more attention, but prevention efforts remain uneven across the energy industry ■ Finally, work is ongoing in dealing with the interdependence of gas and power infrastructure, focused now on information and process, but many contractual and financial issues and incentives remain unaddressed

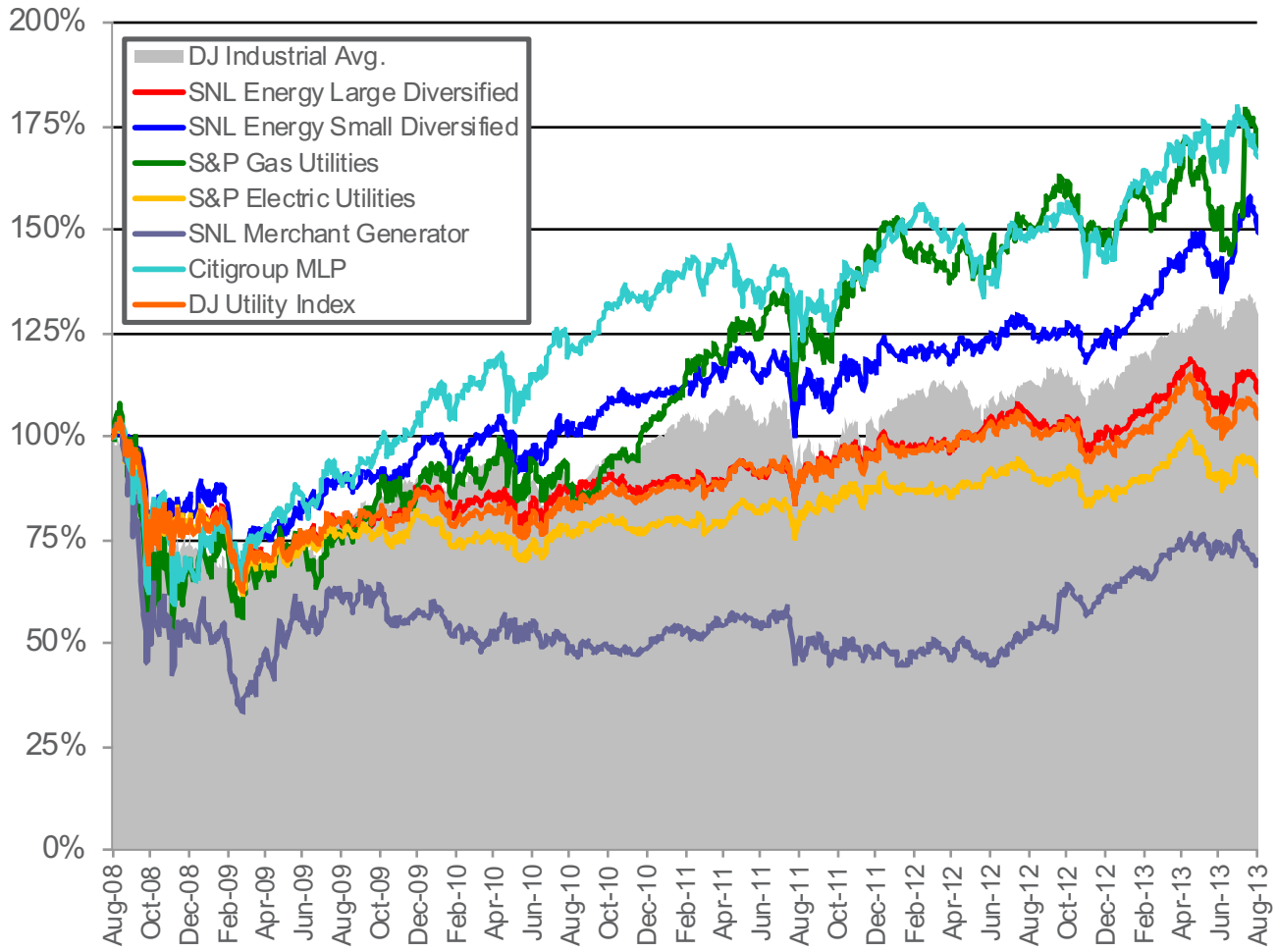
Stock Price Growth:
Utilities Still Lag, Haunted by an Uncertain Rate Environment

- As interest rates began to rise somewhat in early summer 2013 on instruments like 10-year T-bills, investors who sought high-yielding stocks in sectors like utilities began to move out
- Time will tell, however, whether talk of Federal Reserve tightening will turn into action and significant interest rate increases, or continued moderate rates will encourage a return of yield-hungry investors to energy utilities
- Energy MLPs* continue to experience positive investor sentiment due to partnership-like tax treatment coupled with equity-like liquidity

Yield on 10-Year Treasury Note (Aug. 2012–Aug. 2013)



Five-Year Growth in Selected Energy and Utility Stock Prices Indexes vs. the Dow Jones Industrial Average (Index: 100%=Value at Mid-Aug. 2008)



Note: *Master limited partnerships
Sources: SNL Financial; The Wall Street Journal; ScottMadden analysis; industry and financial news

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Mergers & Acquisitions:
Regulated Utilities Are Primary Targets of Whole Company Deals

Selected North American Target Energy Whole Company Acquisitions (Jan. 2012–Mid-Aug. 2013)

Buyer	Target	Asset Type	Announced	Status	Closed	Deal Value ($MMs)
Berkshire Hathaway	NV Energy	Electric utility	5/29/2013	Pending	-	$10,494.3
NRG Energy	GenOn Energy	Merchant generator	7/20/2012	Completed	12/14/2012	3,909.2
Dynegy	Ameren Energy Resources Company	Merchant generator	3/14/2013	Pending	-	3,176.0*
Fortis Inc.**	CH Energy Group	Combination utility	2/20/2012	Completed	6/27/2013	1,609.7
AltaGas Ltd.**	SEMCO Holding Corporation	Gas utility, storage	2/1/2012	Completed	8/30/2012	1,135.0
Laclede Group	Missouri Gas Energy	Gas utility	12/14/2012	Pending	-	1,056.9*
TECO Energy	New Mexico Gas Intermediate	Gas utility	5/25/2013	Pending	-	950.0
Centrica PLC.	Hess Energy Marketing, LLC	Energy marketing	7/29/2013	Pending	-	731.0
Algonquin Power & Utilities Corp.**	Natural gas distribution operations	Gas utility	8/8/2012	Completed	4/1/2013	140.7
Algonquin Power & Utilities Corp.**	New England Gas Company	Gas utility	2/11/2013	Pending	-	74.0
Sempra Energy	Willmut Gas & Oil Company	Gas utility	1/3/2012	Completed	5/31/2012	29.0

*Announced transaction value not available; target total asset value shown
**Canada-based purchaser

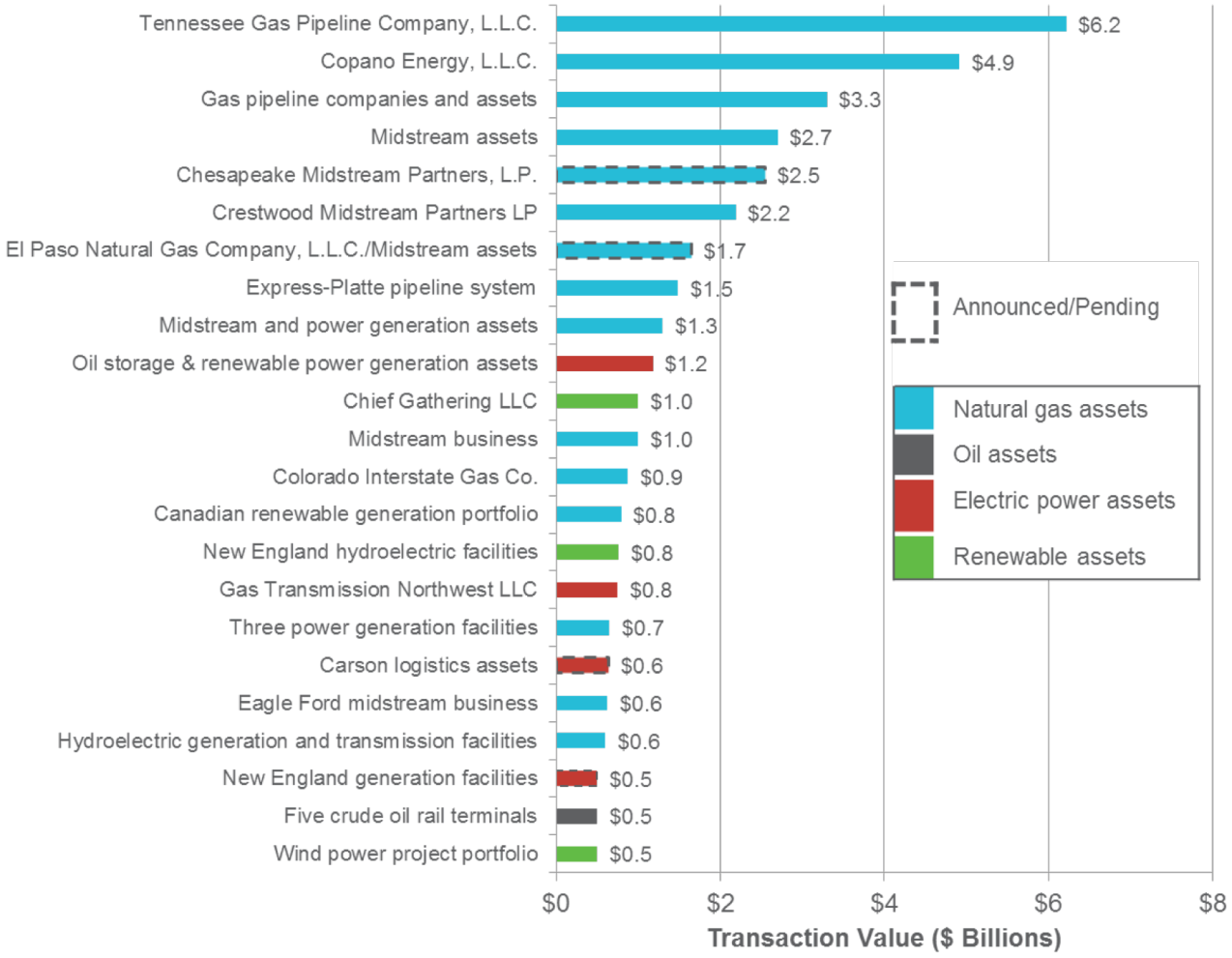
- While a couple of large deals (NRG-GenOn, Dynegy-Ameren Energy Resources) were driven by continued distress and therefore consolidation opportunities in merchant generation, most “headline” acquisitions have been focused on regulated properties
- Some Canadian purchasers have been active in the U.S. market, in whole company and asset transactions, e.g., Fortis-CH Energy and Emera’s purchase of New England gas generation
- A strong stock market (and concomitant higher valuations) may cool interest in acquisitions, although at least one analyst points to attractive returns in regulated utilities: “[I]n an environment where yield is low, utilities remain an attractive investment for those seeking reasonable cash returns,” at least in the current relatively low interest rate environment
- Some acquirors seek scale economies given tight capital budgets, as companies have a wave of capital spending ahead (later rounds of environmental upgrades and system hardening)
- Low organic growth is leading some to use M&A as a financial lever and a tool to gain geographic and revenue diversification and expansion

Sources: SNL Financial, “Berkshire Deal for NV Energy Highlights Broader Appetite for Regulated Assets in Q2'13” (July 10, 2013); industry news; ScottMadden analysis

Mergers & Acquisitions:
Large Asset Transactions Dominated by Midstream Gas Assets

- During the past 18 months, gathering and midstream gas assets have comprised the bulk of large asset acquisitions
- Strategic investors and investor groups (including private equity and infrastructure funds) are increasingly more prevalent in the market on the purchaser side
- Of the 23 transactions totaling $36.7 billion shown at right, two large players seeking to enhance scale account for half of asset acquisitions by valuation
  - Kinder Morgan ($12.8 billion)
  - Global Infrastructure Partners ($5.2 billion)

Selected Large Energy Asset/Plant Acquisitions of $500 Million+ by Target Name (Jan. 2012–Mid-Aug. 2013)



Sources: SNL Financial; ScottMadden analysis; industry news

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Utility Investment Outlook: Analyst Views

	Headwinds	Tailwinds	Uncertainties
Investor-Owned Electric Utilities ▪ Stable credit ratings ▪ Market perform	■ Lack of organic growth ■ Concerns about rate structure innovation due to advances in renewable and distributed generation (DG) ■ Potential loss of bonus depreciation, causing a decline in cash from operations ■ Pending/anticipated environmental regulations ■ Weak macroeconomic signals ■ Flat weather-adjusted power demand ■ Transmission businesses providing above-average EPS growth	■ Supportive regulatory relationships ■ Special recovery mechanisms for aging infrastructure, renewable portfolio standards, and other environmental concerns ■ Changing capital plans from costly environmental updates to less-costly hardening system infrastructure, freeing some cash flow ■ Stability of financial metrics	■ Carbon emissions rules ■ DG growth
Public Power, Municipal, and Cooperative Utilities ▪ Stable credit ratings	■ Natural gas supply/demand challenges ■ Lack of legislative solutions for environmental protection ■ "Best available" control technology/new source performance standards	■ Low natural gas prices ■ Financially manageable environmental regulation ■ Economic recovery (budgets now adjusted to new operating environment)	■ Natural gas price volatility ■ Weak economic growth ■ Future regulations ■ Existing source carbon regulation

Sources: Morgan Stanley; Fitch Ratings; S&P Ratings; Macquarie; Moody's

Utility Investment Outlook: Analyst Views (Cont'd)

	Headwinds	Tailwinds	Uncertainties
Natural Gas Distributors ▪ Stable credit ratings ▪ Market perform?	■ Costs of distribution infrastructure maintenance and expansion ■ Increased public scrutiny of safety issues around gas delivery ■ Timely cost recovery and regulatory support ■ Sustained period of low natural gas prices	■ Potential greenhouse gas regulations ■ Regulated growth opportunities (driven by cost advantages over competing fuels) ■ Lower business risk	■ Load growth ■ Renewable generation growth ■ Liquefied natural gas exports ■ Weather variability
Competitive (Merchant) Generators ▪ Negative ratings outlook ▪ Market underperform	■ Sustained period of low natural gas prices that depress power prices ■ Weak demand growth and surplus capacity in most regions ■ Large fixed operating costs ■ RPS ■ Pressure on the regional wholesale electricity market from demand response, energy efficiency, and distributed generation (DG)	■ "De-integration" – acquisitions of spun-off merchant businesses stand to benefit pure-play independent power producers ■ Certain market conditions remain favorable ■ Environmental legislation would likely raise power prices, making merchant power more competitive	■ Shortage of flexible capacity can result in reliability concerns ■ Weather variability ■ Carbon emissions rules ■ DG growth

Sources: Morgan Stanley; Fitch Ratings; S&P ratings; Macquarie; Moody's

From the CEO to Shareholders: Some Quotes and Themes

Themes	Electric and Combination Utilities	Electric Distribution	IPPs and Merchants	Gas Distribution Companies (LDCs)	Gas Pipelines
Mergers, Acquisitions, Divestments, and Retirements	■ Exit the merchant generation business ■ Build a major new natural gas-fired power plant ■ Acquired $273 million of gathering and processing assets ■ Grow solar portfolio ■ Invest in regulated energy infrastructure	■ Invested $1.2 billion in T&D improvements ■ Spend about $2.2 billion in 2013 to grow infrastructure	■ Identify high-return growth project ■ Combined to form the largest competitive power generation company ■ Expand into the Northeast deregulated retail markets	■ Completed 10 major acquisitions…of regulated assets ■ Completed the sale of natural gas distribution assets; more geographically efficient ■ Invest in core business, with better returns than acquisitions	■ Pursue both acquisitions and organic growth ■ Grow crude oil production in a number of shale plays…to provide growth opportunities ■ Take long view in assessing opportunities ■ Expand reach into complementary growth sectors
Operations and Financial Issues and Initiatives	■ Ensuring timely cost recovery ■ Use innovative rate structures ■ Reduce debt; restructure balance sheet ■ Aggressively managing costs ■ Pursue efficiency initiatives to keep O&M costs in line with sales growth	■ Secure accelerated recovery with new distribution system improvement charge ■ Gain cost savings by implementing a shared services operating model ■ Balance infrastructure needs with customer costs	■ Seeing nuclear, coal-fired power plants challenged in sustained, low natural gas price environment ■ Focus on reliable, safe, and profitable plant operations	■ Pursue accelerated infrastructure replacement program ■ Develop employees and partner with other companies for talent ■ Replace aging high-pressure feeder lines	■ Have significant pipeline rehabilitation and replacement programs ■ Enhance pipeline system integrity ■ Move revenue mix to fee-based business; diminish exposure to commodity price volatility

From the CEO to Shareholders: Some Quotes and Themes (Cont'd)

Themes	Electric and Combination Utilities	Electric Distribution	IPPs and Merchants	Gas Distribution Companies (LDCs)	Gas Pipelines
Growth Initiatives and Capital Projects	■ Invest in system modernization and safety-related infrastructure ■ Acknowledge cyber attack threat to critical energy infrastructure ■ Pursue "no-regrets" activities in T&D ■ Modernized fleet of power plants ■ Invest $3.5 billion for new generation, emission reduction projects, plant efficiency upgrades	■ Pursue large construction program and accelerated recovery of investment	■ Made additional investments in our growing clean energy businesses ■ Make a play in the demand response market, particularly in the Northeast and Mid-Atlantic regions, and "look for sustainable, competitive products that go beyond pure commodities"	■ Replace aging plastic pipe ■ Fortify, repair, replace, and replenish portions of intrastate natural gas transmission and storage system	■ Executed a $1.2 billion organic growth capital program…new well connections, truck stations, and gathering and long-haul pipelines ■ Identified approximately $12 billion in expansion and joint venture investment
Customer-Side Initiatives	■ Invest about $750 million to install high-tech meters	■ Increased local focus that has helped improve, in particular, our performance and responsiveness when interacting with our customers and regulators	■ Acquire customer-driven demand response companies	■ Replaced or restored nearly 1,500 meters system wide ■ Used asset management tools to offset lower customer usage ■ Install wireless radio transmitters on conventional meters	

Utility Business Model: Chronicle of a Death Foretold? Or Hype?

While phrases like "death spiral" and "mortal threat" are in the news, our view is that although profound changes in self-supply and self-delivery of electricity are possible, there is also opportunity, and time to plan.

Four main forces can enable self-supply and self-delivery…

Technology Advances
- Smart Grid
- Distributed generation (DG)
- Microgrids

Electricity Prices
- Higher utility prices
- DG closing on grid parity in some cases

Policy Support
- Net metering
- Incentives

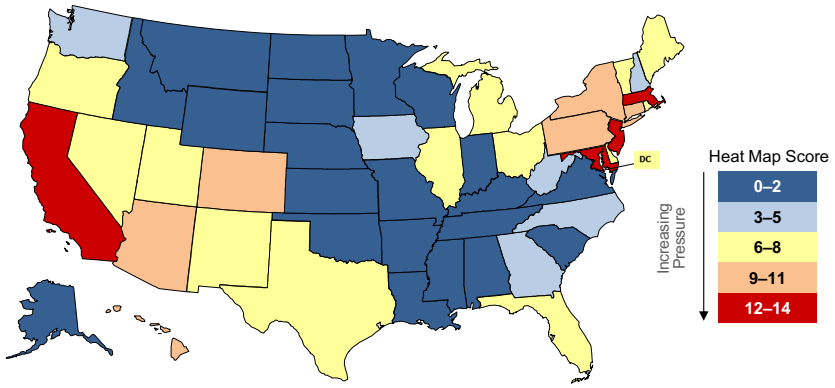
Customer Preferences
- Green solutions
- Grid independence

…Leading to a new landscape and evolving business models

Increasing change and complexity

Traditional	Potential
	
■ Central station generation ■ Long-haul transmission ■ Utility centered – a single system ■ Cohesive and centrally controlled	■ DG ■ Microgrids ■ Fragmented and localized ■ Dispersed control; independent actions

ScottMadden analysis suggests pressures on business models will be greater in some areas than others



However, all should develop a plan that is cohesive across a number of elements

Plan Elements	Discussion
■ Strategy ■ Regulatory ■ Ratemaking ■ Market rules ■ Public policy ■ Operations ■ Financial ■ Customer outreach	■ Time, weather, and locational predictive analytics ■ Protocols for distributed resource callability, availability ■ Real-time ops methods: feeder overloads, VARs, etc. ■ System control and integration

Click here to view the ScottMadden white paper

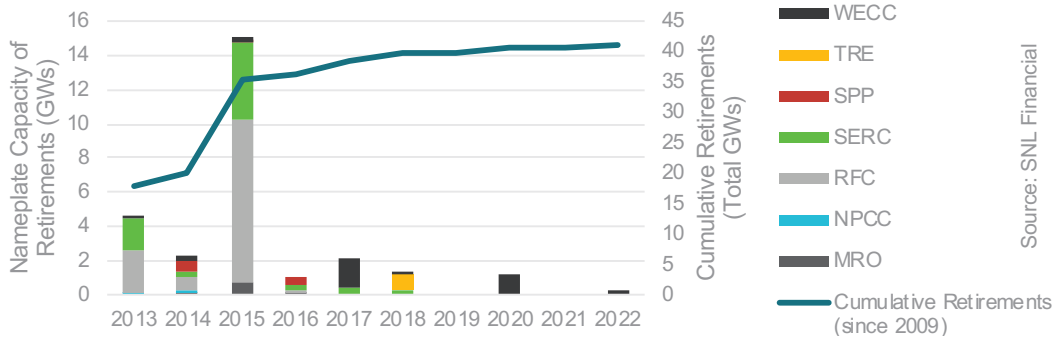
Sources: ScottMadden white paper, "Distributed Resources and Utility Business Models – The Chronicle of a Death Foretold?"; ScottMadden analysis; inputs from DSIRE, IREC, American Council for an Energy-Efficient Economy, U.S. Energy Information Administration, and other sources

Energy Supply, Demand, and Markets

Coal Retirements: Beyond Macro Forecasts to Regional Impacts and Economic Incentives

U.S. coal plant retirement estimates range from 24 GW to 100 GW, depending on assumptions and time frame. But now, focus is turning to incentives for new generation and what happens regionally during 2015–2018 and beyond when retrofits will continue and the retirement pace picks up.

Announced Coal-Fired Generation Retirements by Year and Reliability Region (GWs)



With Widespread Generation Retirements, Will New Capacity Be Encouraged?

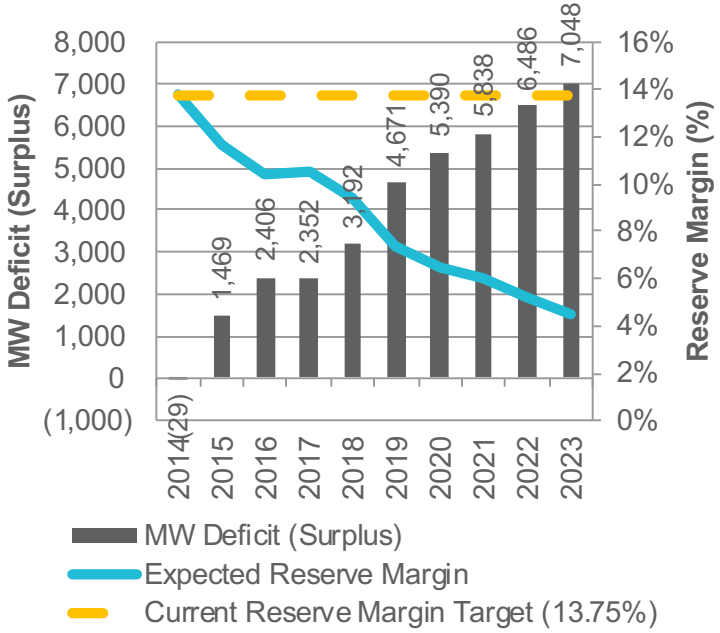
PJM	■ In its most recent capacity auction, 2016–17 clearing prices averaged $59/MW-day vs. forecasts of $120 ■ There is emerging concern among generators that demand response and energy efficiency will suppress capacity prices and dis-incent needed new generation, especially baseload. AEP's president said, "The current market structure does not fully value existing generation or provide incentives for new generation, and we have concerns about the longer-term impacts of that structure" ■ Some analysts are more circumspect, saying [RTO-wide] capacity prices will likely trend over time toward "an aggressive new build level" near $100/MW-day, sufficient to incent new generation*
Midwest ISO	■ More than 39 GW will require controls, and more than 6 GW are uneconomic and will need to be replaced ■ With 75% affected, MISO's fleet is evolving rapidly—a "paradigm shift" to gas in composition and utilization ■ MISO forecasts capacity should be sufficient for 2013–16, but reserve margins will be tight. High demand could render MISO 9 GW to 16 GW short in that time frame ■ Market monitor says low pricing signals block private investment; this will persist due to capacity market design
ERCOT	■ ERCOT faces impending capacity shortfalls (per NERC, one of the regions with the lowest reserve margins) ■ Stakeholders in Texas are now debating different structures to encourage generation and demand response — Interim Solution B+ is a formulaic operating reserve demand curve that sets the value of reserves — Many stakeholders oppose this, seeking planning criteria, and possibly a more formal capacity market — The clock is running, and reserve margins are expected to tighten soon

Notes: *Per Morgan Stanley
Sources: SNL Financial; ERCOT; PJM; Midwest ISO; industry news

Capacity Markets:
Things Are Different in the Lone Star State...for Now

The Public Utility Commission of Texas is engaging in spirited debate over the current tight reserve margins, an impending shortfall, and policy options to address a resource adequacy vs. economic efficiency dilemma.

ERCOT Reserve Margins and Capacity Deficits Below a 13.75% Target Margin



"In the low gas price environment that exists, it's nearly impossible to justify the construction of new capacity on a merchant basis." —*David Crane, NRG CEO*

Note: *In mid-September, the PUCT adopted Solution B+ as an interim (next several years) approach

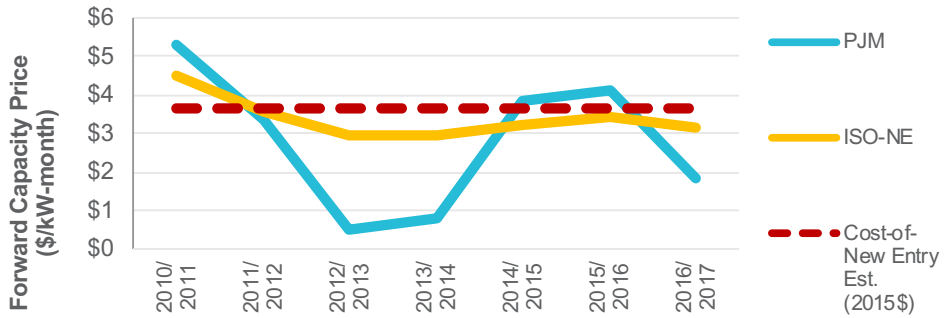
Sources: ERCOT; PUCT; NERC; EIA; Memo from PUCT Chmn. Nelson (Aug. 9, 2013); Supplemental Comments of NRG Energy (filed Aug. 27, 2013); Austin American-Statesman; SNL Financial; industry news

The Problem	■ Capacity margins are expected to plummet over the next several years, and NERC has identified Texas as one of a few regions vulnerable to near-term reliability issues ■ ERCOT generation is gas-dominated, and with low prices and low heat rates, returns in an energy-only market are low ■ Per PUCT's chairman, ERCOT needs quick-start, flexible generation, but revenue does not support it presently. For example, a gas CT garnered 2012 revenue of $25/kW-year vs. an estimated requirement of $80–$105/kW-year
Proposed Solution A: New Forward Capacity Market	■ A key debate is whether to augment the current energy-only market with a centralized forward capacity market ■ Opponents believe that this would create a windfall to generators without encouraging new build ■ ISOs have such markets—NYISO, PJM, and ISO-NE—but are still (with FERC) trying to balance interests to ensure "just and reasonable" rates and make those markets work
Proposed Solution B: Maintain/ Enhance Scarcity Pricing	■ Energy-only markets depend upon scarcity pricing (high prices during shortages) to encourage new generation ■ ERCOT has offer caps in place, but has planned to raise those in steps to $9,000/MWh by June 2015 (it was $3,000 in June 2012 and has been raised since to $5,000) ■ ERCOT's consultants have said that even at a $9,000 cap, reserve margins will only be 8%–10% vs. target of 13.75%, depending upon increased demand response
Proposed Solution B+: Demand Curve*	■ Texas regulators have pointedly debated a proposed administratively (vs. market) set, downward-sloping operating reserve demand curve (indicating that as prices rise, demand falls) ■ Proponents say that this values reliability more appropriately than at present ■ Opponents say that the curve would be economically inefficient, set the price too high, over-procure capacity, distort market outcomes, and increase volatility

FERC Revisits Capacity Market Design: Adaptation or Overhaul Ahead?

- **On the docket:** In Fall 2013, FERC considers how "current ISO centralized capacity market rules and structures are supporting the procurement and retention of resources necessary to meet future reliability and operational needs." Focus will be on New England, New York, and PJM
- **Evolving mix, evolving rules:** FERC observes a changing resource mix since market rules were established, in part due to "low natural gas prices, state and federal policies encouraging the entry of renewable resources and other specific technologies, and the retirement of aging generation resources." Also, states are setting policies that are counter to centralized capacity market structure theory

All Over the Map: Capacity Clearing Prices in Selected Regions for Commitment Periods 2010–2017 Can Be Lower Than Cost of New Entrant



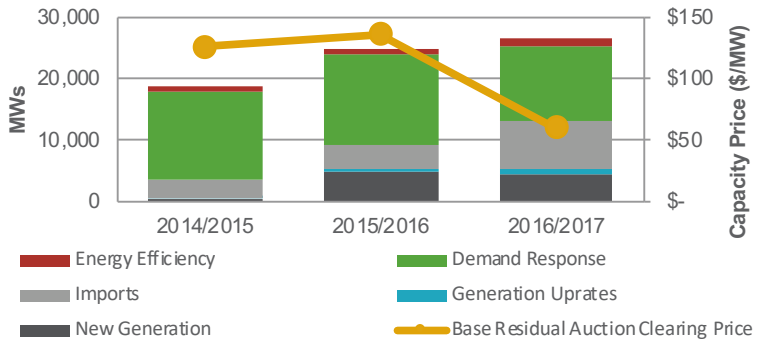
FERC Staff Outlines Capacity Market Design Elements: Effectiveness and Efficiency to Be Debated	
Demand Curves	■ Administrative mechanism approximating customer demand, matching capacity value with reserve margin ■ Downward-sloping demand curve ensures price floor at cost of new entrant, but debate on how value should be determined and technology selection of marginal unit. Descending clock auction effectively sets a vertical demand curve, making prices volatile (as approach planning reserve margin, capacity clears at one price or gets nothing) ■ Unclear how self-supply should be reflected in demand and supply curves
Forward & Commitment Periods	■ Periods establish how far in advance and for what duration capacity commitments should be made ■ Timelines vary from shorter term (e.g., 30 days forward/6-month commitment) to longer term (multiple years), but no market has a commitment duration that is more than a fraction of the investment life, often 20 years ■ Different resources may need different periods (demand response less in advance; generation needs lead time)
Capacity Product	■ Currently, little value differentiation between products on operational capabilities, demand vs. supply resources, except for location in some markets ■ Additional differentiation—fuel diversity, quick start, etc.—may be needed, but could impinge on policy goals
Performance Requirements	■ "Must-offer" requirements and penalties for non-performance of a capacity resource ■ Possibly more stringent standards, penalties, but may deter participation if revenue potential doesn't match risk
Market Power Mitigation	■ Supply-side (limited competition in demand area) and demand-side (bidders able to suppress prices below market) ■ Tension with other goals (e.g., RPS) and possibly penalize where intent to artificially impact prices is absent

Sources: FERC Docket No. AD13-7-000, Centralized Capacity Markets in Regional Transmission Organizations and Independent System Operators, and related documents

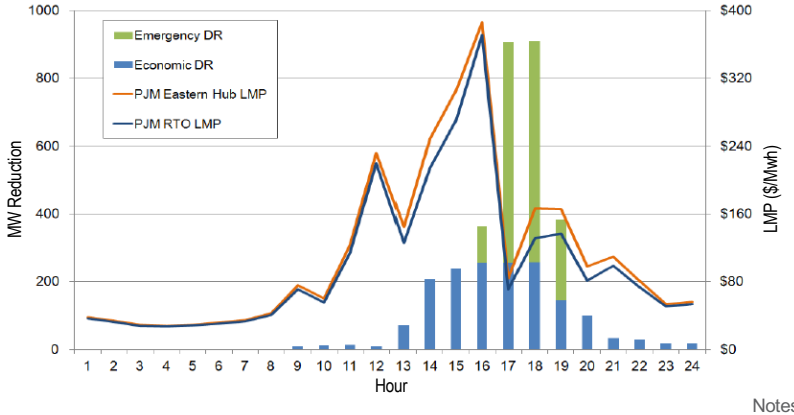
Demand Response in Power Markets: Policy and Reliability – Striking a Balance?

2013 saw a hot spell requiring emergency demand response (DR) to be called plus a capacity auction that yielded low prices. Generators and DR proponents are jousting over the dependability of DR and whether it is discouraging long-term investment in generation.

PJM Capacity Auction – Unforced Capacity Bid and Base Residual Capacity Price by Year



Estimated Demand Response in PJM: July 15, 2013



Generators Say	DR Proponents Say
■ "Recent media reports and blog postings vastly overstate the role played by demand response programs....Demand response has a role to play, provided it is comparably regulated and properly compensated. Demand response should also result in actual reductions in net demand, as advertised, not merely shifts of demand from cleaner on-grid power to much dirtier back-up diesel generators."[a]	■ "Ultimately, we'll be able to bid [demand response] into organized markets everywhere....We could reduce our peak loads in this country 20% by using demand response."[c]
■ "This version of socialism that equates [demand-side management] and non-firm transmission with reliable, capital-intensive, steel in the ground is really just capitalism in a sandbox, where the rules seem to penalize long-term investors. This has to change."[b]	■ "If they get [the Texas market structure through an operating reserve demand curve] approximately right, this will stimulate demand response participation and provide a very strong economic signal to then develop and mature."[d]
	■ "With record temperatures and demand for electricity increasing as the heat wave persisted, our DemandSMART [demand response software] enabled us to efficiently manage a multitude of simultaneous dispatches and deliver the capacity that our grid operator and utility customers rely on."[e]

Attempting to split the difference: With large amounts of DR being bid into capacity auctions, PJM has proposed rules to require DR providers to submit information on type of DR, location, timelines, and type of equipment, and customer information to establish reliability of DR resources. DR providers have pushed back, noting that such information is commercially sensitive and, being three years hence, is "a guess." FERC will take this up in Fall 2013.

Notes: [a]Electric Power Supply Ass'n; [b]Nick Akins, CEO of American Electric Power; [c]Jon Wellinghoff, FERC Chmn.; [d]William Hogan, Harvard Univ.; [e]Tim Healy, CEO of EnerNOC

Sources: PJM; SNL Financial; FERC industry news

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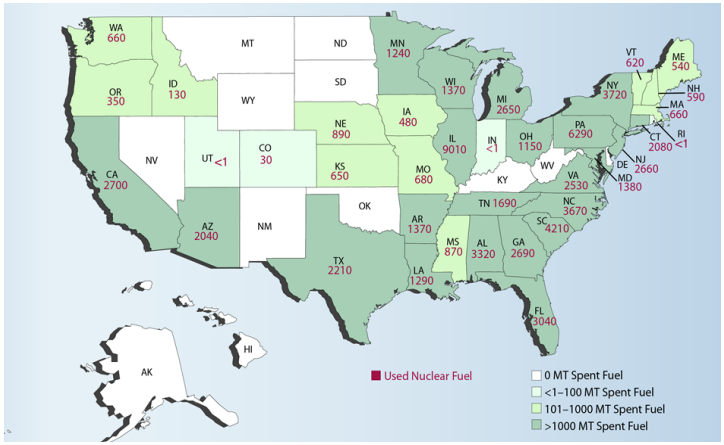
The Nuclear Power Sector in Flux

- **Yucca Returns:** After terminating the Yucca Mountain waste storage proceeding in a politically charged move, the NRC was ordered by a federal appeals court to resume review of the licensing application. However, we expect that politics, local opposition, budget, and proposals for a "consent-based approach" to nuclear waste will be challenging
- **Small Nuclear Reactors (SMRs) Get Some Help:** DOE announced a second round of funding, $452 million, to encourage SMRs. The first round went to Babcock & Wilcox's mPower, which is working with DOE and TVA. DOE seeks to establish an industry with annual capacity of 20 SMRs by 2030
- **Overall Fukushima Impacts Looking Less Harmful, except Recent Reports of Leaks:** In May 2013, a U.N. committee reported two years after the incident that, "additional exposures received by most Japanese people in the first year and subsequent years…are less than the doses received from natural background radiation" and that no "acute effects" have been felt by workers who were at the accident site. But the "dread-to-risk" ratio remains high, and radioactive water leaks continue
- **Natural Gas, Lack of Scale, Wind, and Repair Costs Force Early Retirements:** Persistent low natural gas prices and subsidized wind units continue to challenge margins for nuclear units, especially small, single-unit plants
  - Dominion Resources announced in October 2012 that it would retire single-unit Kewaunee station due to unfavorable economics
  - Duke Energy said in February 2013 that it would shutter Crystal River 3 after an extended outage and damaged containment structure. It also cancelled its planned Levy County nuclear plant
  - In June 2013, Southern California Edison decided to retire San Onofre Nuclear Generation Station after persistent steam generator issues. Decommissioning cost is pegged at more than $4 billion. Debates began over who bears that cost and stranded investment
  - Entergy recently announced it would close its single-unit Vermont Yankee plant by the end of 2014

Implications for the Electric Industry

- Increasing need to examine and plan for "backfill" capacity for retiring nuclear units
- Strategies for decommissioning and fuel disposal
- Migration to new nuclear opportunities like SMRs
- Implications of non-fossil alternatives and less diverse fuel mix – reinforcing the grid
- Planning scenarios that include factors impacting fuel prices and examining cash operating cost "valley of death" at "razor thin" margins
- Engaging dialogue with stakeholders on value of nuclear power, fuel diversity, and its costs

Used Nuclear Fuel in On-Site Storage (Metric Tons) (as of Year-End 2012)



Sources: World Nuclear News; NuclearStreet.com; E&E News; SNL Financial; Bloomberg; Wall Street Journal; American Nuclear Society; Energy Information Administration *Today in Energy*

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Utility Demand-Side Management, Especially Efficiency Efforts, Continue to Advance

Growth of electric utility demand-side management (DSM) programs has accelerated in recent years

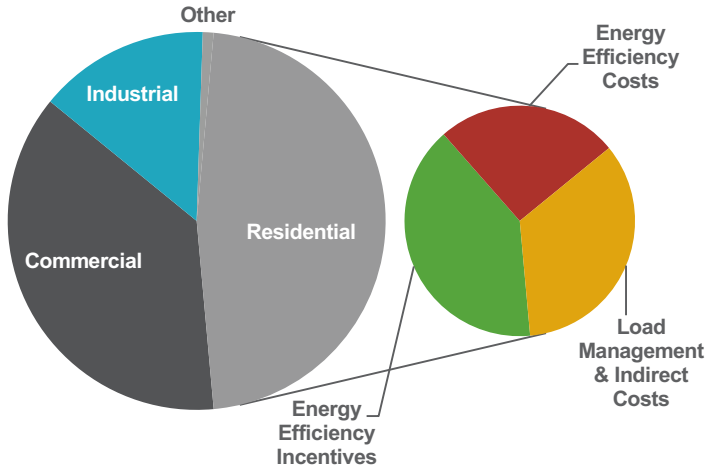
- DSM includes energy efficiency, load management (interrupting or reducing consumption especially during peak periods), and, according to some, grid independence at selected times through self-generation*
- Energy efficiency has led the way. Energy efficiency measures accounted for 99% of the energy savings and 67% of the peak load reduction. Energy efficiency programs costs and incentives account for 72% of utility expenditures across all customer classes
- Over the last decade, annual energy savings have grown rapidly while the rate of growth in retail sales has slowed considerably. In 2011, electric utility DSM programs resulted in 109 million MWh in energy savings and a peak load reduction of 36,700 MW
- Electric utilities spent more than $5.1 billion on DSM programs in 2011; 47% of this was spent in the residential sector

Additional expansion of electric utility DSM programs is expected in coming years

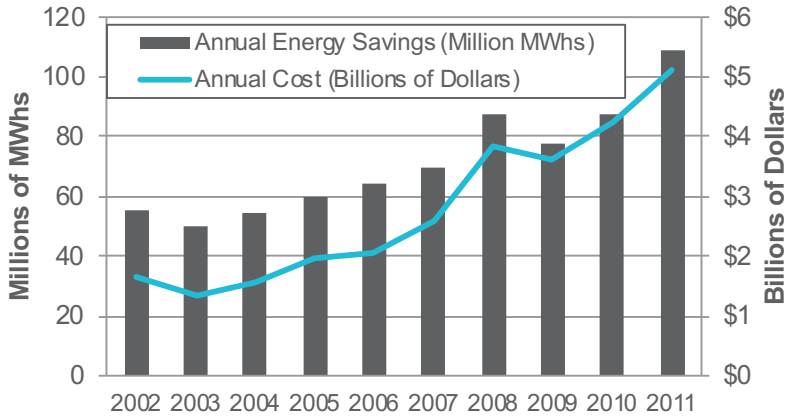
- Energy savings have accelerated in recent years, increasing at an annually compounded growth rate of 11% since 2006
- Continued growth will be supported by public policies, such as energy resource standards and grid modernization efforts
- Additional savings will continue through third-party DSM administrators and non-utility measures, such as improving building codes and appliance standards

Where DSM Spending Is Going and What It Is Saving

Breakdown of U.S. Utility DSM Expenditures by Customer Class and Type (2011)



U.S. Utility DSM Energy Savings and Costs (2002–2011)



Notes: *Based on EIA data structure and definitions, the charts on the right look only at energy efficiency and load management. Data above are electric utility-only and do not include natural gas DSM.

Sources: EIA Form 861 data (latest release as of 2013 of 2011 data); ScottMadden analysis

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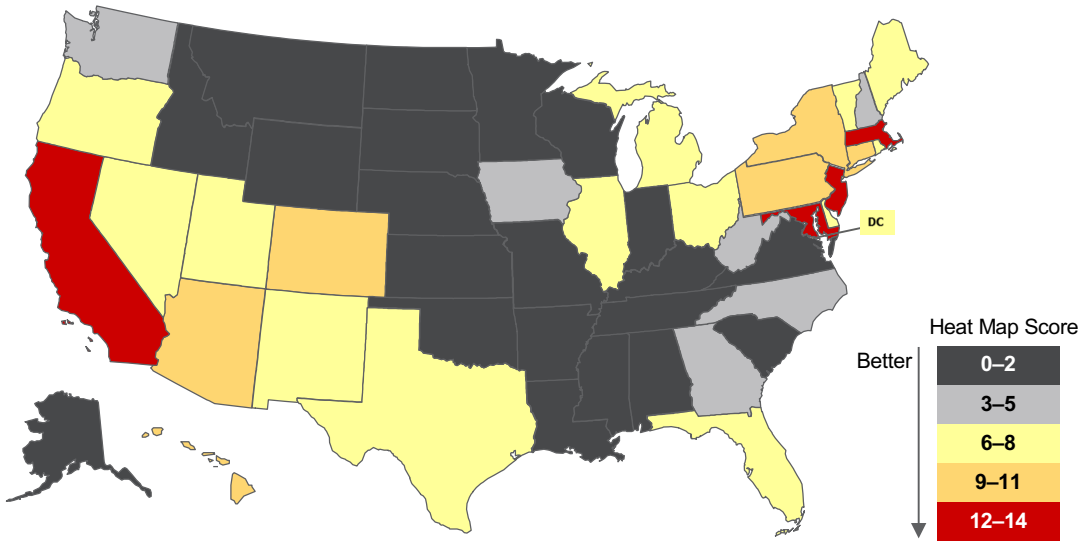
Distributed Solar Resource Heat Map: One Approach

Distributed Solar Market Attractiveness: The Heat Map



- Distributed resources have different odds of success, or at least competitiveness, based upon a number of factors. ScottMadden examined the distributed solar market and regulatory environment to develop a multi-factor approach to identify attractive distributed solar markets
- Where jurisdictions are "better" on more factors (e.g., easier interconnection; third-party solar power purchase agreements (PPAs) permitted; net metering; lower differential between utility-supplied power and installed solar PV), they scored higher on the heat map. Solar cost comparisons vs. grid power includes subsidies and incentives
- This scoring system is subjective, so stakeholders should understand the criteria and adjust weights and factors according to their own point of view on the market opportunities

Key Takeaways

- **Solar Today, Microgrids Tomorrow:** The heat map looks primarily at solar, but other DG has similar implications
- **The Coasts Are the Most:** As one might expect, California, the Southwest, and some of the Mid-Atlantic states appear to be the most favorable for DG, including "hotspots" on both coasts that are high-cost and renewable-friendly, such as California, Massachusetts, and New Jersey
- **More DG Means More Infrastructure Needs:** This means that those jurisdictions are more conducive to new DG, especially solar, and may also be candidate regions for enhanced distribution infrastructure and upgrades; they will also likely face increasing rate pressures
- **Infrastructure Costs Could Slow Development:** Arizona appears high on the scale, but recent moves to recoup the costs of grid infrastructure through demand charges associated with solar installations may limit further development
- **Customer Adoption Wildcard:** It is still unclear which and how many customers will embrace DG
- **Utility Business Models Are Implicated:** The greatest opportunity for disruption of the traditional utility business model are in "hotter," higher-scoring jurisdictions

Sources: ScottMadden analysis; inputs from DSIRE, IREC, American Council for An Energy-Efficient Economy; U.S. Energy information Administration; and other sources

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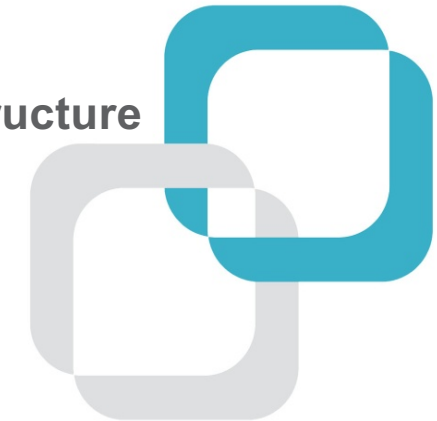
Infrastructure

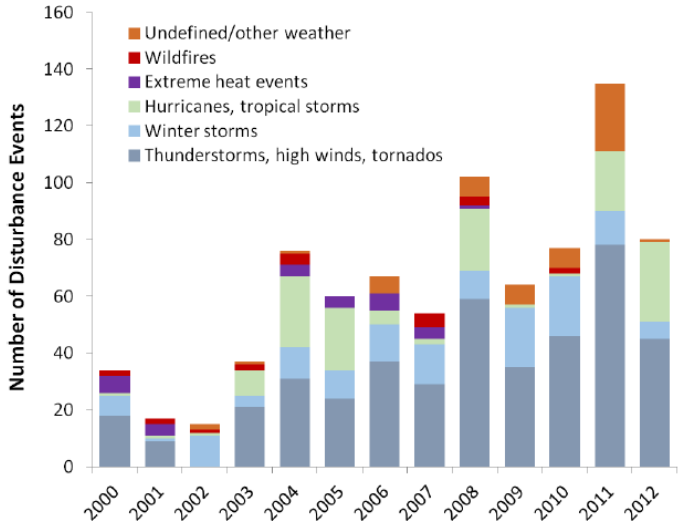


Grid Resilience...Weathering the Storm?

- Superstorms, derechos, blizzards, and other weather phenomena have focused regulators and the energy industry on grid resilience
- The Obama Administration released a report in August 2013 estimating the average annual cost of power outages caused by severe weather to be between $18 and $33 billion per year and outlining the need for government-private sector partnerships and incentives for innovation. Some examples* include:
  - *Manage risk:* readiness exercises; improved restoration crew prep; enhanced communication and planning; vegetation management
  - *Consider cost-effective strengthening:* undergrounding; T&D structure upgrades (poles, towers); elevating substations
  - *Increase system flexibility and robustness:* microgrids; additional transmission; power electronic-based controllers
  - *Increase visualization and situational awareness:* outage awareness through smart meters and synchrophasor technology
  - *Deploy advanced control capabilities:* automated feeder switching; automated fault isolation and service restoration technology
  - *Ensure availability of critical components and software systems:* standby equipment (trucks, mobile transformers, mobile substations, large generators); restoration materials (poles, wires, transformers)
- Deployment of microgrids is emerging as an area of interest. For example, in the wake of Superstorm Sandy, Connecticut has allocated about $18 million in funding to pilot nine small microgrids for critical buildings across the state
- Key issues to be addressed by utilities and regulators include:
  - How extreme an event (e.g., hurricane category) should infrastructure be hardened for?
  - What level of investment or increased cost of service is the "sweet spot" versus the reliability and resilience gained?
  - How and how much costs will regulators permit energy companies to recover from ratepayers?
  - What solutions or upgrades should be prioritized?

Whether or not one attributes recent headline-grabbing extreme weather events to human-induced climate change, given our almost existential dependence on reliable electric power, utilities cannot avoid heightened expectations of customers and regulators regarding system reliability and resilience (no outages or at least shorter ones).

U.S. Weather-Related Grid Disruptions (2000–2012)



Note: *Examples are from the White House and Edison Electric Institute (EEI)

Sources: EEI, Before and After the Storm (Jan. 2013); Executive Office of the President, Grid Resilience Report (Aug. 2013); DOE, U.S. Energy Sector Vulnerabilities to Climate Change and Extreme Weather (July 2013); DOE, Comparing the Impacts of Northeast Hurricanes on Energy Infrastructure (April 2013); industry news

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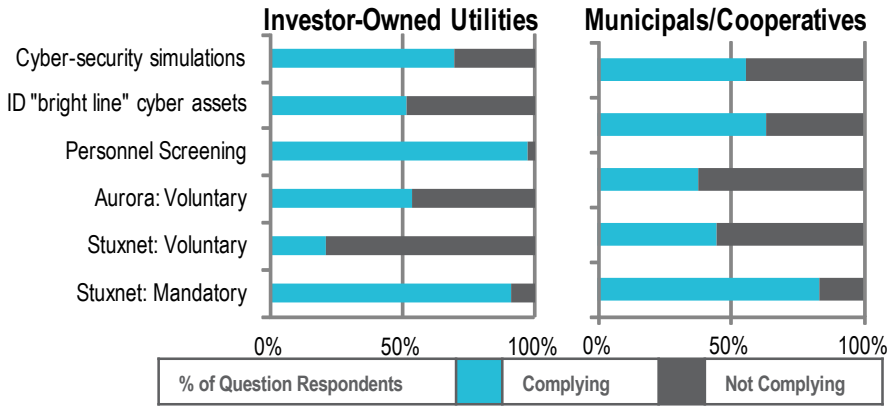
Cybersecurity: Increasingly Urgent Concerns

Per a Recent Congressional Survey, Industry Results on Compliance with Cybersecurity Standards Have Been Mixed



U.S. Government Accountability Office Assessment of Shortcomings of Electric Utility Cybersecurity

- Lack of coordinated approach to monitor industry compliance with voluntary standards
- Current regulatory environment makes it difficult to ensure the cybersecurity of smart grid systems
- Focus on compliance vs. comprehensive security
- Security features not consistently built into smart grid systems
- Lack of effective mechanisms for cyber info sharing
- Lack of metrics for evaluating cybersecurity

Notes: *National Institute of Standards and Technology; **U.S. Dept. of Homeland Security
Sources: U.S. Dept. of Defense; American Bar Association Section of Public Utilities, Communications, and Transportation; Environmental Defense Fund; E. Markey & H. Waxman, Electric Grid Vulnerability (May 21, 2013); "Electric Utilities and the Cybersecurity Executive Order," *The Electricity Journal* (April 2013); Sutherland; Government Accountability Office, Cybersecurity: Challenges in Securing the Electricity Grid (July 17, 2012)

- **A Top National Concern:** In its latest threat assessment in April 2013, U.S. intelligence characterized cybersecurity as the top global threat and determined that cyber attacks, as a soft war, are already under way
- **Administration Increased Focus on Utility Cybersecurity:** In February 2013, President Obama issued an executive order in part due to a Congressional impasse on cybersecurity legislation and reports of cyber attacks of varying severity
  - NIST* to identify critical infrastructure (CI) subject to cyber risks and use a consultative process to develop a flexible, performance-based "Cyber Security Framework" of standards (draft by Oct. 2013; final by Feb. 2014)
  - DHS** will establish a voluntary program to adopt the framework and incentivize owners and operators of critical infrastructure to participate in the program
- **Key Issues**: Incentives and scope are key concerns critical infrastructure owners have regarding cyber requirements, especially if they are mandated (vs. voluntary)
  - *Incentives:* In August 2013, the White House indicated it was looking at a number of incentives for adoption of the framework, including cybersecurity insurance, grants, liability limitation, and rate recovery, among others
  - *Scope and consistency:* The order could expand scope of facilities (beyond the bulk system), technology, and inconsistent regulation

ScottMadden's View

- Potential impacts from cyber events pose huge risks
- Increasing consequences = increasing executive attention
- Many times, cybersecurity is a "check the box" exercise, not thoughtful risk management
- Emerging debate on voluntary vs. mandatory standards and adequacy of current requirements

Rates, Regulation, and Policy

New Energy Secretary Ernest Moniz: Where Does He Stand on the Key Issues?

In May, President Obama's nominee for Secretary of Energy, Ernest Moniz, was sworn in after receiving bipartisan support. Both industry and environmental groups generally support the choice of Secretary Moniz. Time will tell how Moniz will navigate some of the stark differences of opinion on U.S. energy policy.

Education	B.S. *summa cum laude* in physics, Boston College Ph.D. in theoretical physics, Stanford University
Prior Experience	Professor of physics and engineering systems at MIT and founder of MIT's Energy Initiative Under Secretary of Energy (1997–2001), focused on nuclear issues Assoc. Dir., President's Office of Science and Technology Policy (1997)
Areas of Expertise	■ Nuclear energy and weapons ■ Intersection of energy technology and policy regarding nuclear power, coal, nuclear fuel cycles, natural gas, and solar energy

What the New DOE Secretary Has Said About the Issues

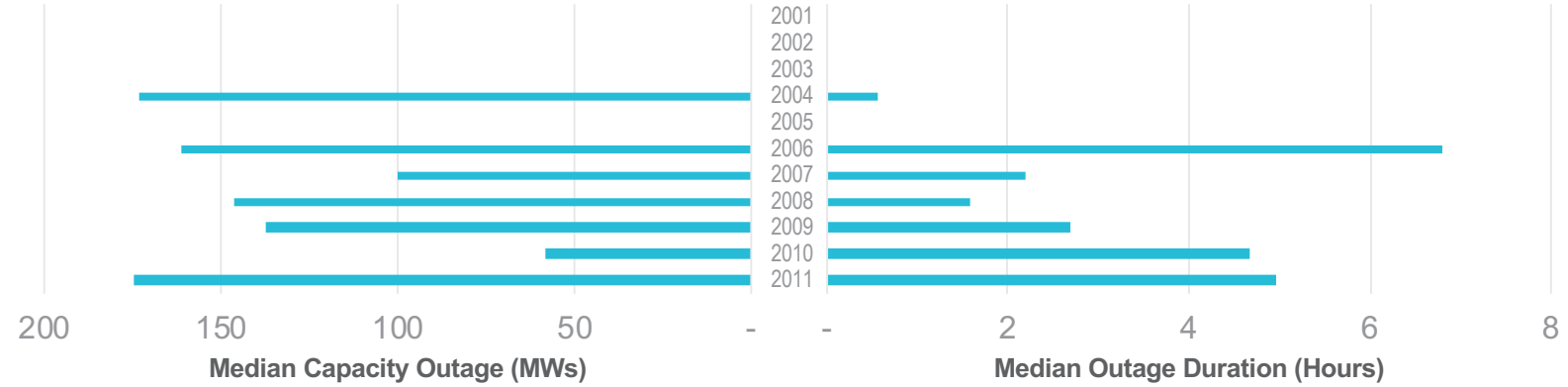
Coal-Fired Generation	■ Coal power is likely to remain a part of the American energy portfolio, ultimately displaced by natural gas as a bridge fuel, although clean coal technologies are an essential part of that equation
Nuclear Generation	■ "It would be a mistake...to let Fukushima cause governments to abandon nuclear power and its benefits.... Nuclear power's track record of providing clean and reliable electricity compares favorably with other energy sources"
Renewable Power	■ "The scale and timeframe of the impact of solar technology is underestimated....There are many situations today in which solar is, in fact, competitive due to incredibly reduced costs"
Power Transmission	■ Implementing recently issued Presidential Order to "identify and improve the use of energy corridors on federal lands that are most suitable for siting electric transmission projects, to help expedite permitting while improving environmental and community outcomes"
Shale Gas	■ "All of the issues that have arisen [with respect to hydraulic fracturing], I believe are manageable"
LNG Exports	■ Offers no firm timeline for decision on natural gas export applications and initially delayed final approval of 20 applications to export LNG until he reviews studies on the impact exports would have on domestic natural gas prices; has since authorized three applications
Climate Change	■ "Scientists are all but unanimous in agreement on the reality of human-induced global warming" ■ "In my scientific view, what we are seeing is consistent with being driven by manmade activities"

Sources: Industry news; Secretary Moniz Senate confirmation hearing testimony; DOE website

Gas-Power Interdependence: NERC's Latest Policy and Technical Prescriptions

Planning	■ Reliability assessment and resource adequacy ■ Gas supply and fuel security ■ Transportation expectations ■ Generator availability ■ Back-up fuel and switching capabilities	■ Pipeline construction takes at least three or four years. Industry must conduct probabilistic analysis and trend gas-fired generator outages related to fuel issues to identify transportation "fixes" ■ Rare but possible single-point-of-failure risk within gas fuel supply chain can impact downstream generators. Industry should incorporate natural gas fuel and generator availability into risk assessments ■ Supply shortages can be mitigated through geographical diversity of shale plays ■ Regional solutions will likely include a mix of mitigating strategies, increased gas and/or electric infrastructure, and dual or back-up fuel capability ■ Power, gas industries should develop and analyze statistical data on gas system outages ■ Power system operators (PSOs) must identify "critical generators" (gas-fired) and ensure their ability to mitigate risks associated with fuel disruptions and curtailments
Operations	■ Seasonal, day-ahead observability ■ Coordinated operational procedures and outage schedules ■ Increasing flexibility ■ Information sharing and situational awareness ■ Emergency operating procedures	■ Sharing information for operational planning purposes is essential to fully understanding generator availability risks in the season ahead ■ PSOs need increased gas delivery situational awareness and, during extreme conditions, need observability of pipeline conditions, capacity availability, supply concerns, and potential issues and formalized communication with pipelines and gas suppliers ■ PSOs need training and awareness of vulnerable (gas fuel risk) capacity and available flexible resources and operating procedures in the event of fuel disruption

Example: Texas Reliability Entity Gas-Fired Median Capacity Outages and Median Outage Duration Due to Lack of Fuel (2001–2011)



Source: NERC, Accommodating an Increased Dependence on Natural Gas for Electric Power, Phase II: A Vulnerability and Scenario Assessment for the North American Bulk Power System (May 2013)

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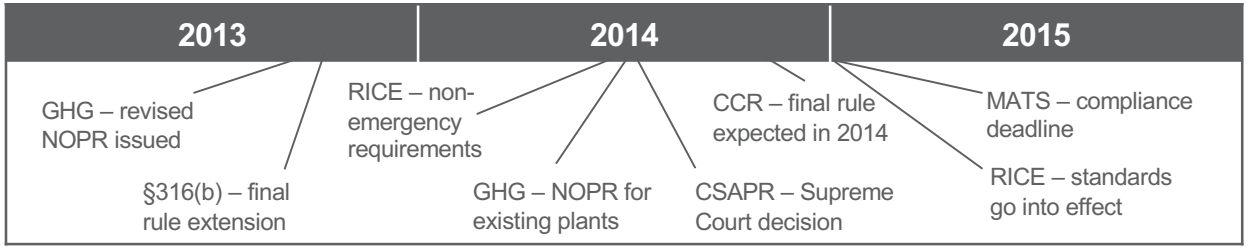
The Ticking Clock of EPA Power Sector Regulations

Despite some legal uncertainty, EPA continues to advance its regulatory agenda affecting the energy industry, as new proposals emerge on carbon emissions, back-up generators, and plant start-up and shut-down.



Area	Timing	Status	How It Is Playing Out
Greenhouse Gas (GHG) Regulation	Revised NOPR (for new plants) re-proposed on Sept. 20, 2013	■ New source performance standards (NSPS) for GHG emissions for new fossil fuel-fired electric generating units proposed in April 2012 were revised and re-proposed with a limit for small gas and coal-burning plants of 1,100 pounds of CO_2/MWh (up from 1,000 pounds in prior draft) ■ Per Presidential directive, in EPA's regulatory plan is a NOPR scheduled for June 2014 covering existing fossil power plants GHGs	■ The new proposal will likely strike a legal battle, with a major question around the EPA's ability to show that carbon capture and storage technology is a viable option for the power industry. The Clean Air Act requires the EPA to show that the proposed standards are "achievable" and that required technology has been "adequately demonstrated"
Coal Combustion Residuals (CCR)	Final rule expected in 2014	■ House passed bill that would allow state regulation as solid waste, pre-empting EPA, but it is unlikely to get Senate approval ■ EPA is considering regulation of coal ash as hazardous waste under RCRA* but is also conducting a risk assessment of less onerous regulation solid waste ■ In early August, EPA reopened comment solely on feasible timing of surface impoundments	■ An April 2013 Congressional Research Service report stated that a state-based approach could work, but that EPA's ability to establish requirements, identify deficiencies, and enforce compliance could provide it a role. The report has generated debate over CCR regulation, but EPA is not expected to alter its pragmatic approach on this matter
Cross-State Air Pollution Rule (CSAPR)	Pending Supreme Court appeal; decision by mid-2014	■ Vacated by D.C. Court of Appeals, but this decision was subsequently accepted for review by the Supreme Court during its next term beginning in October. DOJ** had viewed the D.C. Court's requirement that reductions under CSAPR be "proportional" to contribution as "unrealistic"	■ States are having difficulty determining the compliance scheme, e.g., whether state implementation plans should be submitted under the predecessor Clean Air Interstate Rule or CSAPR

Notes: *Resource Conservation and Recovery Act; **U.S. Dept. of Justice
Sources: SNL Financial; Inside EPA; Van Ness Feldman; Reginfo.gov (accessed Aug. 19, 2013); http://www.epa.gov/ttn/atw/utility/utilitypg.html (accessed Aug. 19, 2013); TheHill.com; WSJ

The Ticking Clock of EPA Power Sector Regulations (Cont'd)

Area	Timing	Status	How It Is Playing Out
Mercury and Air Toxics (MATS)	Compliance by early 2015, but EPA expects most to have until early 2016	■ In March 2013, EPA updated emissions limits for new power plants but maintained final emissions limits for existing plants ■ In June 2013, EPA reopened the public comment period on the start-up, shut-down, and malfunctioning provisions included in the November 2012 proposed limits for new power plants under MATS. EPA contends data indicates fewer emissions are attainable in these situations, but industry disagrees. Comment period ended in late August	■ EPA has observed that mercury compliance thus far has been a "so far, so good situation" and that to ensure system reliability, many units will have an extra year (to 2016) for compliance ■ Coordination between EPA, RTOs, and FERC is expected ■ As of June 2013, more than 45 GW of capacity had FGD* controls under development; 34 GW of that capacity comprises projects at plants without scrubbers ■ Industry opposes eliminating the start-up/shut-down exemption
Reciprocating Internal Combustion Engines (RICE)	Standards go into effect in 2015	■ EPA has established emissions standards for various stationary internal combustion engines ■ Peak shaving units are required to meet non-emergency engine requirements by May 2014 ■ "Emergency engines" used for emergency demand response or local reliability have relaxed requirements but will also have mandated: • Use of ultra low sulfur diesel fuel • Annual reporting requirements	■ EPA is moving forward with the rules, but in June 2013 re-opened the rule for public comment on some specific areas: • Timing of fuel and annual reporting requirements, as well as content • Conditions for operation of "emergency engines" for certain hours (financial arrangement, non-emergency—e.g., demand response resource)
Cooling Water Intake [Clean Water Act §316(b)]	Final rule expected in July 2013, extended to November 2013	■ EPA and environmentalists agreed to five-month extension for final rule to consult with federal wildlife and fisheries services about potential harmful impacts on protected species ■ EPA has used a controversial survey asking individuals about the value they gave to fish and fish populations that could be effected by the rule	■ Industry groups have largely praised the entrainment portion of the rule but have urged the agency to develop a similarly flexible standard for impingement of adult fish on structures ■ EPA indicated that it will include significant flexibilities in the final version of the rule, steering away from a closed-system standard

Note: *"FGD" means flue gas desulfurization
Sources: SNL Financial; Inside EPA; Van Ness Feldman; Reginfo.gov (accessed Aug. 19, 2013); http://www.epa.gov/ttn/atw/utility/utilitypg.html (accessed Aug. 19, 2013); TheHill.com

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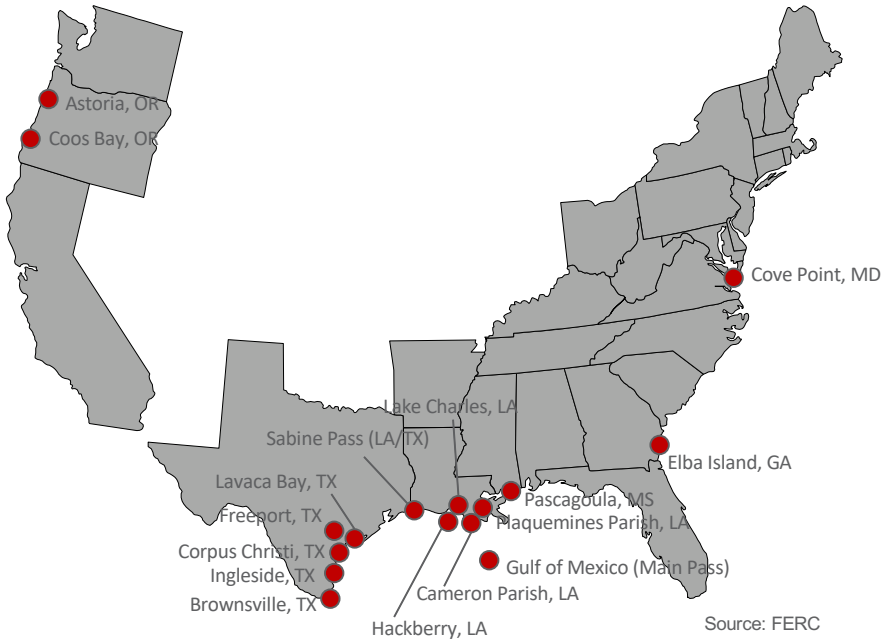
LNG Exports: Developments

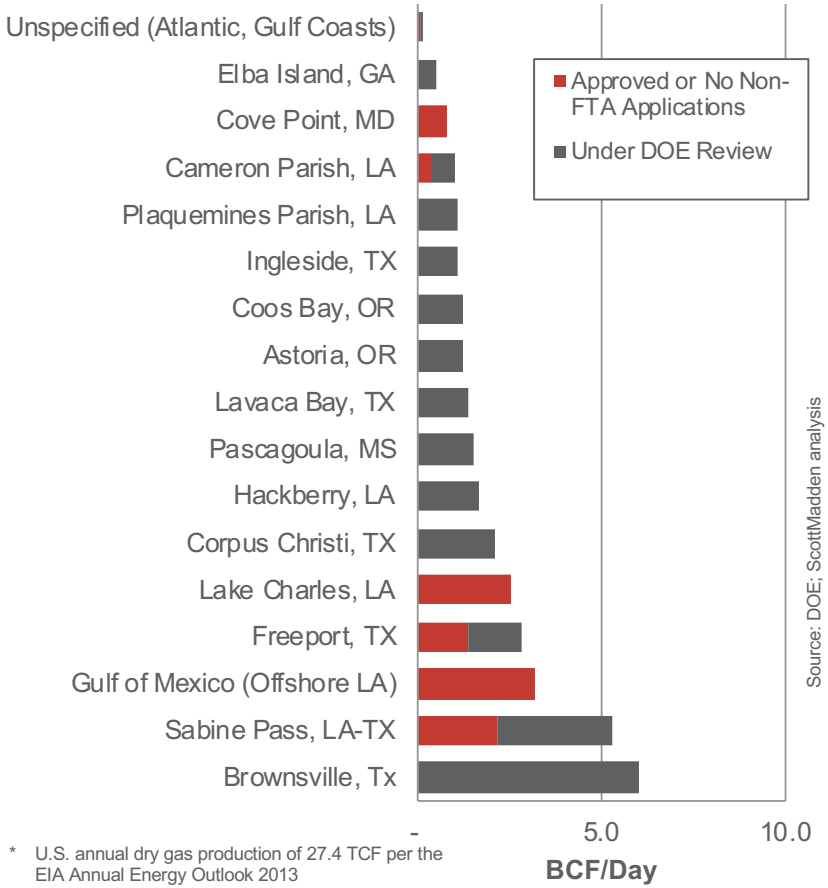
Selected Existing, Approved, and Proposed LNG Export Facilities



- Amidst much debate, increased availability of natural gas via hydraulic fracturing and low domestic prices have sparked interest in selling into global LNG markets. However, there are strong opinions favoring and opposing LNG exports and related terminal development
- In the United States, as of early June, 20 new LNG export terminals (or expansions) have been proposed to FERC or identified as potential sites by project sponsors in addition to one that has been approved and is under construction

About 33 BCF/Day of Export Capacity Is Sought (Compare ~75 BCF/Day* Current U.S. Production)

Applications** to Export Domestically Produced LNG by Location (BCF/Day)



* U.S. annual dry gas production of 27.4 TCF per the EIA Annual Energy Outlook 2013

** Includes approved applications; non-FTA means non-Free Trade Agreement countries

Sources: FERC; DOE; EIA, Effect of Increased Natural Gas Exports on Domestic Energy Markets (Jan. 2012); Van Ness Feldman; World Resources Institute; America's Energy Advantage; Peterson Institute; industry news; ScottMadden analysis

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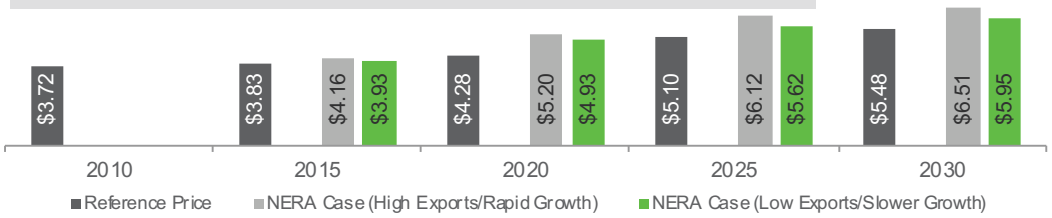
LNG Exports: The Debate and Outlook

DOE Studies Indicate Minimal Effects on Price	■ Two studies indicated that liquefied natural gas (LNG) exports should have minimal impact on price and, in all cases, have positive macroeconomic benefits ■ However, the scenarios assumed increased exports to a maximum limit of 12 BCF/day, more than 50% less than the requested export capacity, almost 20% of current U.S. demand
Environmental Position "Shift"	■ After indicating initial support, environmental groups are increasingly uncomfortable with LNG exports which will spur further shale development; some claim the alternative is worse—for China to burn more coal ■ Concerns to date have focused on fracking, but increasingly these organizations cite potential fugitive methane emissions as an unwelcome byproduct of production and transportation and liquefaction processes
Industrials' Concern: Exporting U.S. Advantage	■ Energy-intensive industries, which currently or potentially could use cheap natural gas, generally oppose LNG exports as driving up prices. Indeed, DOE's December 2012 study acknowledged: "Higher natural gas prices in 2015 can also be expected to have negative effects on output and employment, particularly in sectors that make intensive use of natural gas"
Obama Administration Caution	■ The Obama Administration has voiced cautious support as well as due consideration of environmental issues. Energy Secretary Moniz says, "We want to go forward on a case-by-case basis...in terms of evaluating licenses in as expeditious a way [possible], consistent with that review [of DOE economic reports] process" ■ The Administration likely cannot openly oppose (to avoid provoking trade protectionism) but could "slow walk" the review process. However, the initial DOE approvals of LNG exports from Freeport and Sabine Pass have established a template for export approval and adhere to known and familiar standards

DOE-NERA Natural Gas Price Estimates in Selected LNG Export Scenarios

Note: Compare EIA estimates, which ranged from less than 10% difference from over 50% increase by 2018, depending upon scenario



Our take: the Administration under Moniz is likely to take a favorable but measured approach to export applications. Volumes will take a while to ramp up, and in the next five years, we would not expect dramatic increases in exports, absent some dislocation in global LNG markets.

Sources: FERC; DOE; EIA, Effect of Increased Natural Gas Exports on Domestic Energy Markets (Jan. 2012); Van Ness Feldman; World Resources Institute; America's Energy Advantage; Peterson Institute; industry news; ScottMadden analysis

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Clean Tech

Greater Adoption of Distributed Solar Photovoltaics Is Challenging Utilities' Traditional Business Model

Solar photovoltaics (PV) is leading the growth of distributed generation (DG) in the United States

- Net metered systems can be used to examine DG trends; solar represented 97% of net metered customers and 93% of net metered capacity at the end of 2011
- Solar PV has grown as decreases in module prices have lowered installed costs dramatically for distributed solar PV

But some utilities worry about who bears the cost

- Net metering and other policies, including third-party power purchase agreements and leases and third-party ownership (TPO), are creating favorable conditions for distributed solar generation in some key markets (e.g., CA, NJ, AZ, HI, MA). In particular, states that authorize TPO of solar PV have experienced strong growth in capacity and declines in installed price
- However, a growing concern exists that fixed costs of distributed PV are being disproportionately paid by non-solar customers as PV penetration increases in certain favorable markets

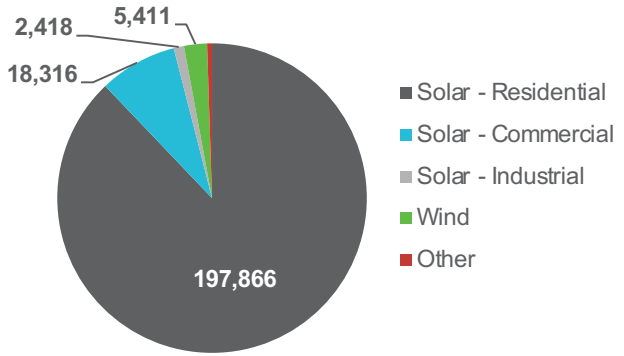
Utilities are unsure about long-term regulatory framework and investment opportunities associated with distributed solar generation

- One study noted that distributed solar and other disruptive technologies create financial risks for utilities including: "declining utility revenues, increasing costs, and lower profitability potential, particularly over the long term"
- In response, some utilities have begun investing in DG through joint financing ventures or directly in utility owned resources

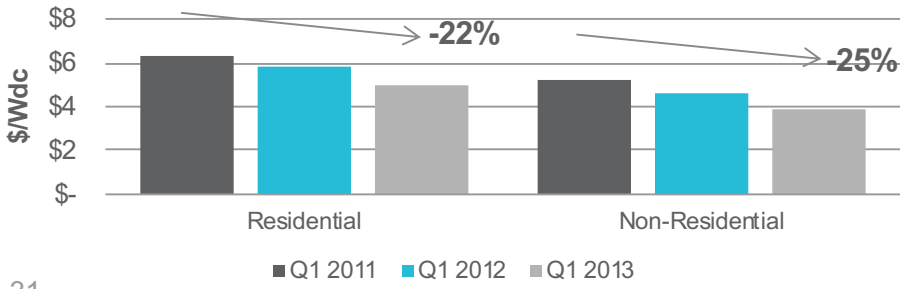
CEOs React to the Growth of DG

- "If we don't price the cost of connection and back-up generation, we have subsidization of low- to high-income people."
  —T. Fanning, Southern Co.
- "We just want to be sure people understand what the true cost is. Avoided cost is important. What are you avoiding by putting PV on rooftops? I would suggest it is not a lot."
  —M. Yackira, NV Energy
- "The regulatory process doesn't move quickly enough in many respects to be able to respond as quickly as customers change."
  —N. Akins, AEP

U.S. Net Metered Customers (as of Year-End 2011)



Installed Price of Distributed Solar PV



Sources: EIA (latest data as of Aug. 2013); SEPA; Greentech Media; SNL; Sustainable Business News; *NY Times*; ScottMadden analysis

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Residential Solar Photovoltaics: Looking at the Margins for Retail Rate Grid Parity

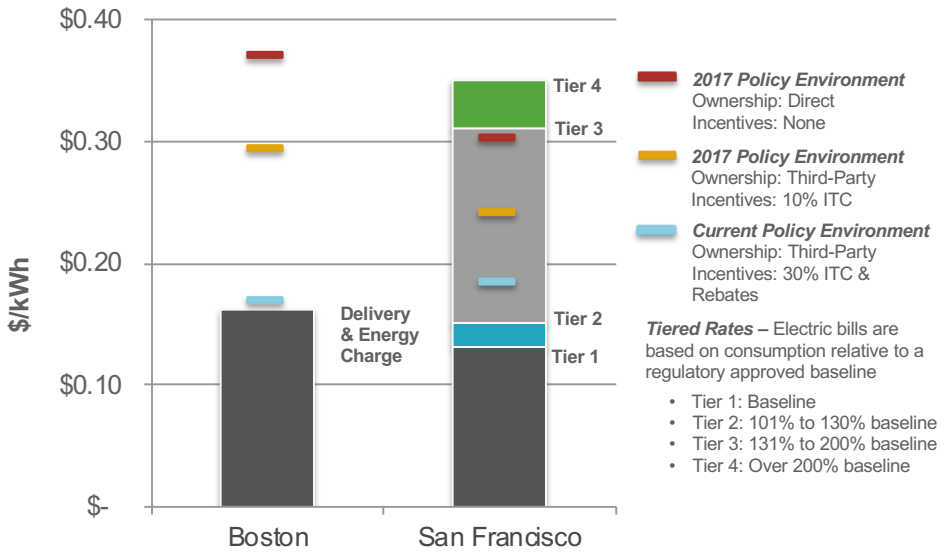
Solar photovoltaics (PV) becomes competitive when parity is reached with high time-of-use rates or upper tiers of inclining block rates, which charge higher marginal rates as consumption increases

- The levelized of cost of energy (LCOE) can be used to compare the lifetime cost of solar PV to the retail cost of grid-supplied electricity
- Grid parity with retail rates is heavily influenced by a number of variables—some dynamic—including solar irradiance, installed price, and utility rates
- In 2017, the ITC reverts to 10% for commercial and third-party-owned systems and drops to zero for direct ownership of residential systems. However, LCOE of distributed solar PV still remains cost competitive against retail rates in several markets even with the loss of the ITC

Deployment of distributed solar PV will continue to accelerate and become more cost competitive with higher retail rates

- Market forecasts estimate the installation of 17,514 MW of distributed PV from 2013 through 2017. Expansion of that scale will require an investment of $48.5 billion
- Significant opportunities exist for future reduction in "soft costs" including overhead, customer acquisition, permitting, and supply chain
- Further declines in the installed price of solar PV or an increase in electric rates will increase attractiveness of residential solar PV in many U.S. markets

LCOE of Residential Solar PV and Retail Rate Grid Parity in Select Locations



The analysis above considers the following:

- LCOE of residential solar PV under three scenarios reflecting current and future policy conditions
- LCOE of residential PV as it relates to volumetric rates in Boston and inclining block rates in San Francisco
- Potential revenue from the sale of renewable energy certificates is not considered
- Incentives in Boston include $0.80/watt rebate through the Commonwealth Solar II Rebate program; California incentives are assumed to be zero with the phasing out of the California Solar Incentive

Notes: LCOE assumptions include: 25-year analysis period; 5kW system; 80% debt financing at 5% interest for 25 years; discount rate is 7%; federal tax rate is 13% (effective corporate tax rate in 2010); modified accelerated cost recovery system (MACRS) applied to TPO systems; $0.80/watt Commonwealth Solar II Rebate in Boston; no rebates in San Francisco; figures do not consider SRECs; analysis does not consider separate demand changes; results may differ from similar analysis because of differences in model assumptions

Sources: Greentech Media; Nstar; PG&E; ScottMadden analysis

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Renewable Policies Withstand Increased Scrutiny

Renewable portfolio standards (RPS) and net metering policies are under increasing scrutiny across the United States

- In 2013, well-organized campaigns attempting to repeal or weaken RPS requirements failed in several states
- Efforts to repeal or weaken RPS policies are expected to be renewed during the 2014 legislative year, but observers do not expect significant changes during an election year, and changes, if any, will be piecemeal
- Policy debate and attention is shifting to net metering as state RPS requirements become oversubscribed with existing and contracted projects
- "Value of solar" studies are emerging as an effort to understand the costs, benefits, and net impacts of distributed generation (DG). However, estimates and expert opinions vary widely, and there is no agreed upon analytical method
- Minnesota passed legislation allowing a value of solar tariff (VOST) to be offered instead of net metering. The trend toward VOST as a policy option will accelerate as adoption of DG resources increases

RPS – Recent Legislative Actions	■ Kansas, Missouri, and North Carolina considered bills to weaken or repeal standards; legislation did not pass in any state after considerable debate ■ Colorado doubled its renewable requirement from 10% to 20% by 2020 for cooperative utilities that provide service to 100,000 meters or more. Preference for in-state generation was also eliminated, which may mitigate impact of federal lawsuit arguing the RPS violates the U.S. Constitution's Commerce Clause ■ Minnesota revised standard to require 1.5% of sales from solar PV by 2020; 10% of requirement must be met from systems of 20 kW or less ■ Connecticut revised standard to allow large hydro for compliance if the state determines there is a shortage of Class I renewable energy certificates
Net Metering – Recent Regulatory Actions	■ Regulators in Idaho and Louisiana rejected proposals that would have decreased the value of net metering to DG systems ■ Some regulators are considering net metering expansions, including the authorization of leased systems in Ohio and meter aggregation in Arkansas ■ In Arizona and Colorado, utilities have proposed alternatives and/or significant changes to net metering

Sources: DSIRE; AEE; ScottMadden analysis

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Wind Operating & Maintenance Costs: Industry Maturation Will Include Adoption of Fleet Management Strategies

Data* indicate project-level operating & maintenance (O&M) costs increase with the age of a project

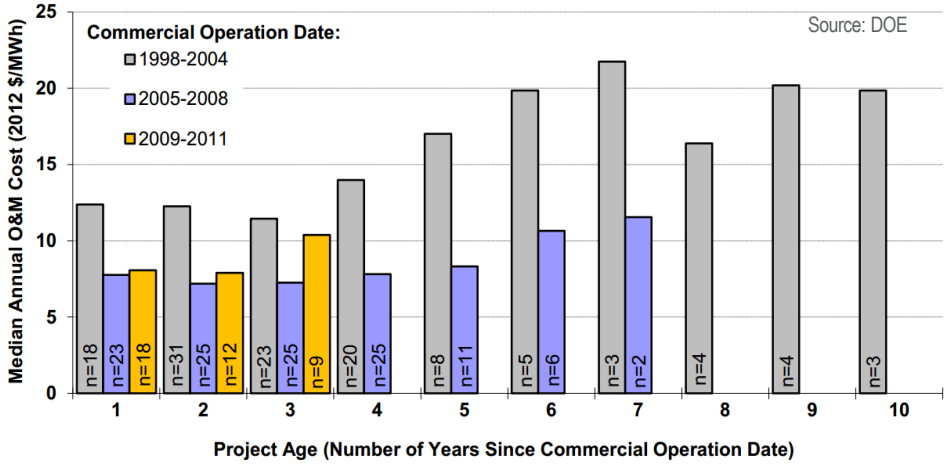
- Wind projects installed in recent years have experienced lower O&M costs compared to those installed in prior years
- Project-level O&M costs increase over time as unscheduled maintenance and premature component failures challenge wind facility owners

The wind industry's continued maturation will include adoption of best practices from conventional generation fleet management

- Fleet operations will become a critical focus as original equipment manufacturer warranties expire and project-level O&M costs increase
- Transfer of best practices from other generation technologies will ensure optimal reliability and performance for wind turbine fleet
- Practices will include condition-based monitoring, fleet management strategies, and peer benchmarking
- Early evidence of this shift can be seen in diversity of O&M services provided by independent service providers and growing interest in peer benchmarking of performance metrics
- A key challenge is the limited availability of public data, but peer consortia can provide opportunities for benchmarking and sharing of best practices

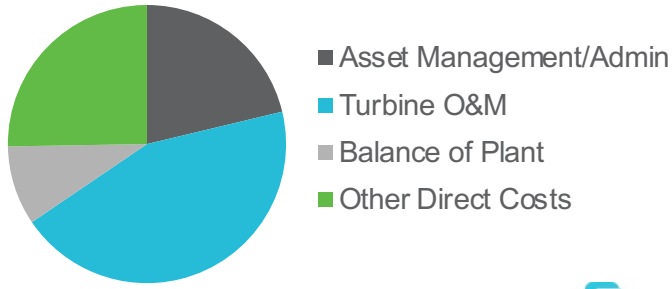
Growth of Wind O&M Costs Over Time

Median Annual O&M Costs by Project Age and Commercial Operation Date*



O&M Is Major Source of Total Operating Expenditures

Wind Turbine Operating Expenditures Example: Infigen Energy**



Notes: *n indicates sample size. Note that older projects have smaller samples; **based upon a small sample of publicly available information. Infigen operates 1,089 MW of wind capacity in the United States

Sources: DOE, 2012 Wind Technologies Market Report (Aug. 2013); NREL, Infigen; *Wind Systems* magazine; ScottMadden analysis

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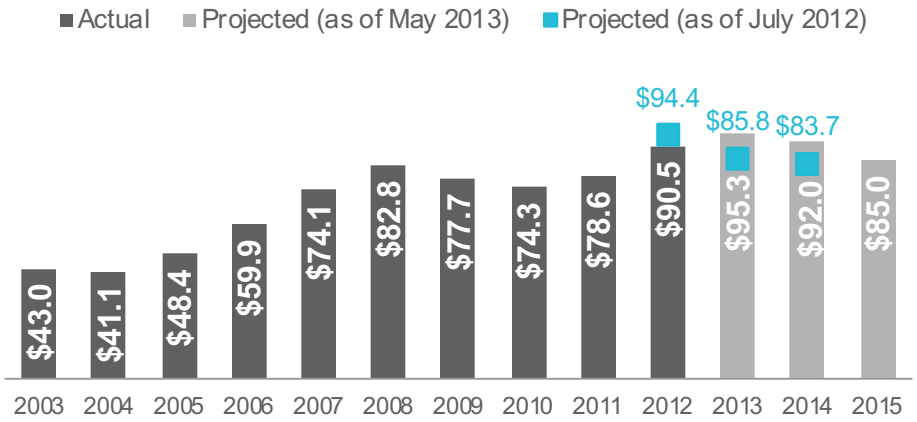
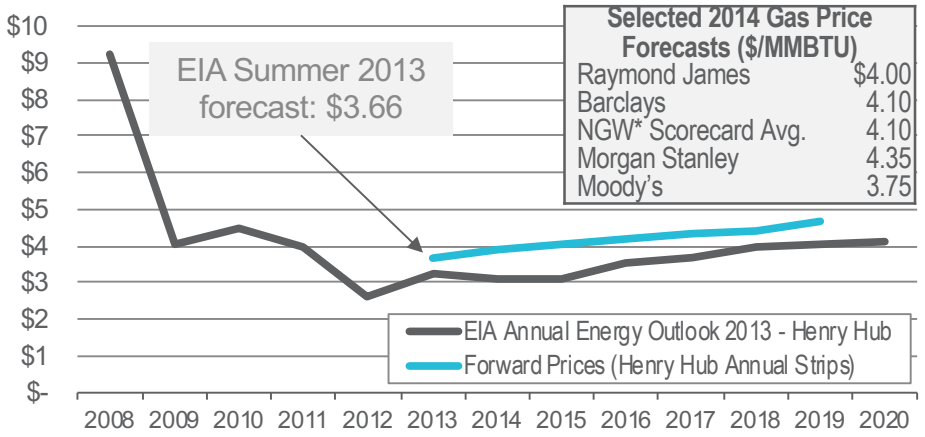
The Energy Industry by the Numbers

The Energy Industry by the Numbers

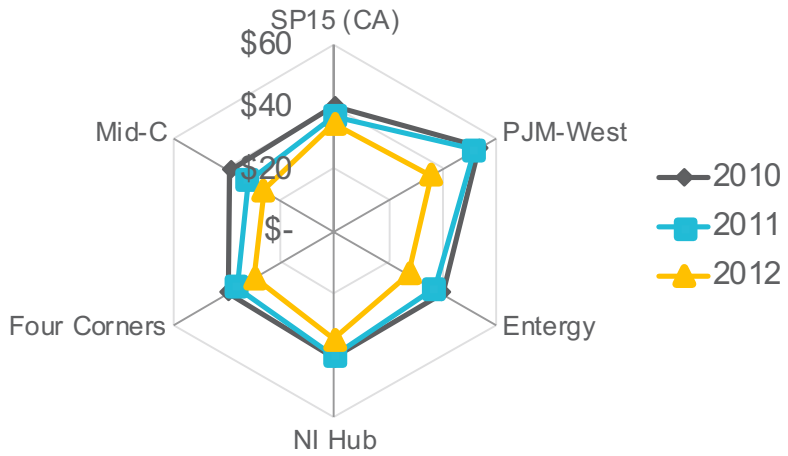
Actual and Projected Investor-Owned Utility Capital Expenditures (in $Billions)



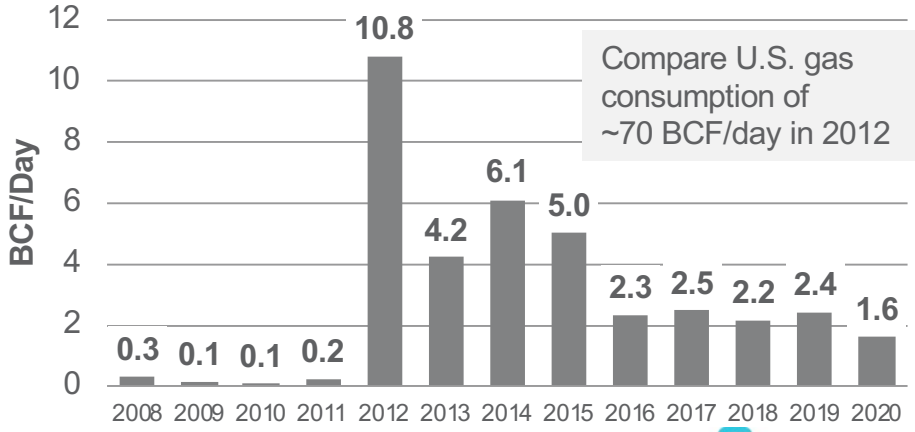
Actual and Projected Henry Hub Natural Gas Prices ($/MMBTU)



Average Spot Power Prices (On-Peak) at Selected Hubs ($/MWh)



U.S. Firm Natural Gas Transportation Contract Capacity Expiration (by Year)



Sources: EEI; EIA; *Energy Intelligence's *Natural Gas Week*; SNL Financial; FERC

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Part of knowing where to go is understanding where you are. Before we begin any project, we listen to our client, understand their situation, and then personalize our work to help them succeed.

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The energy industry is our industry. We are personally invested in every project we take on.

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