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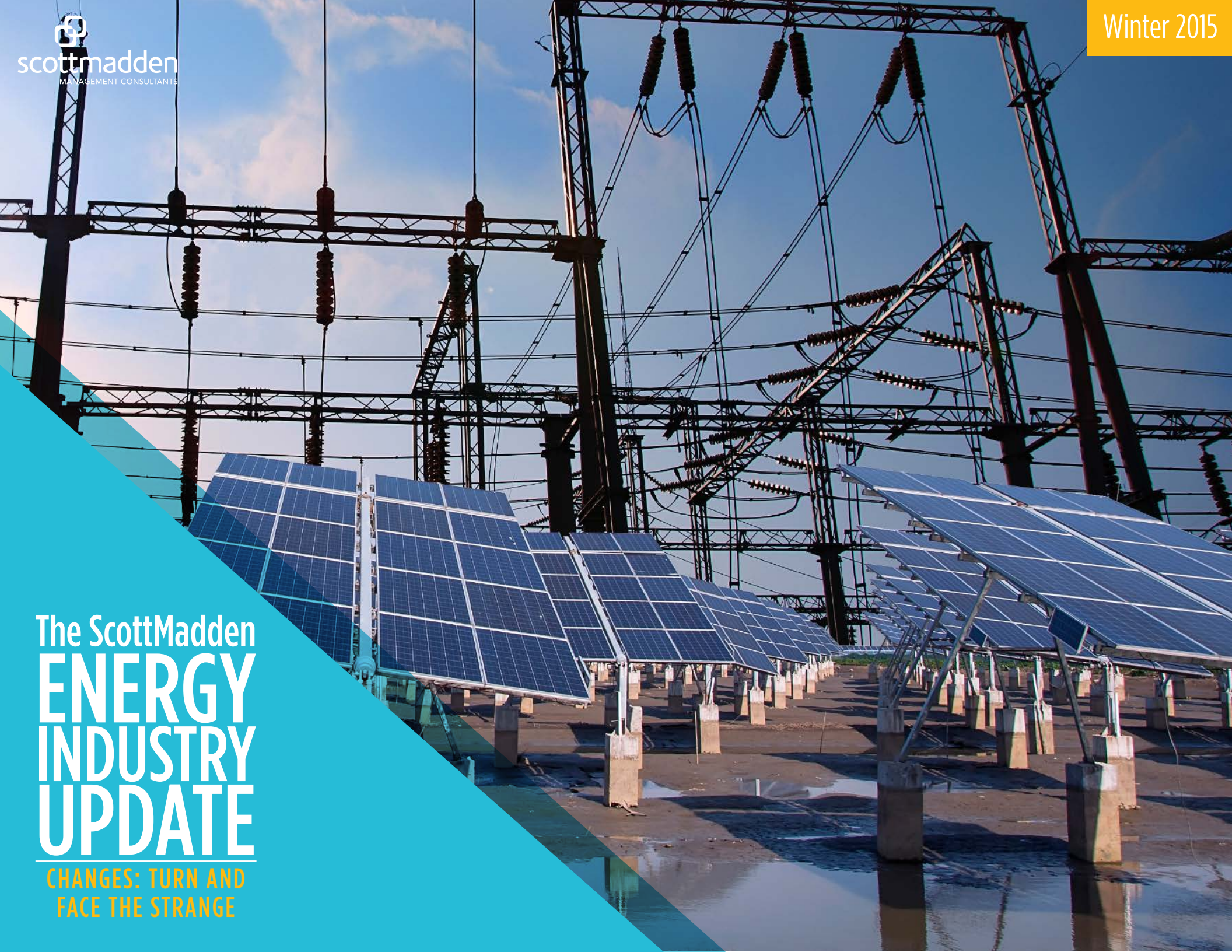
MANAGEMENT CONSULTANTS

Winter 2015



The ScottMadden ENERGY INDUSTRY UPDATE

CHANGES: TURN AND FACE THE STRANGE

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The ScottMadden Energy Industry Update

VIEW FROM THE EXECUTIVE SUITE

EXECUTIVE SUMMARY

CHANGES: TURN AND FACE THE STRANGE

AS MARKET CHANGES, REGULATORY PROCESSES, AND TECHNOLOGY EVOLUTION HAVE UNFOLDED, ENERGY AND UTILITY COMPANIES HAVE TO FACE THEM AND ADAPT

With apologies to David Bowie, we enter 2015 to turn and face the strange and the opportunity of changes—changing market dynamics, regulatory models, and options for the future. Hydrocarbon prices and renewables costs are the lowest they have been in about a decade. New regulatory models are being proposed and tested. New options for the future are moving from design to test—and will be proven one way or the other. Energy utilities are confronting change and creating it, challenging it, and embracing it. There is a saying, "May you live in interesting times." We do.

Some themes that are explored in this edition include:

Some Industry Themes	What's Inside This Edition
Adapting to Changing Market Dynamics	• Low petroleum prices are having ripple effects through the energy sector, including natural gas, where they are manifesting themselves in low natural gas liquids prices and reduced oil-associated gas production—but for how long? • Utilities are adapting to customer and policymaker interest in green energy by instituting renewable energy tariffs in some jurisdictions • Also driving interest in renewables is continued progress down the experience curve due to economies of learning and scale
Facing the "Strange" of Regulation	• State approaches to utility regulation are changing, as regulators factor in a mix of policy considerations (renewables, energy efficiency, and microgrids, among others) to traditional cost-plus regulatory constructs. Different jurisdictions are using differing approaches, along a spectrum from commission-orchestrated to market-based, and utilities are navigating and testing these approaches • Environmental regulations are being implemented, and utilities are putting implementation plans into motion as a long-awaited rule on coal combustion residuals is finalized and contours of proposed rules governing greenhouse gas emissions from new and existing sources are finalized by the U.S. Environmental Protection Agency • But uncertainty is high as court challenges loom on several fronts
Embracing Options for the Future	• Electric vehicles continue to make inroads, and utility and other companies in this sector seek the right charging infrastructure and business models • In Germany, which has undertaken a historic energy transition from fossil-fired and nuclear energy, reliability has been maintained, although significant capital investment is required for the grid and renewable energy, and incumbents have had to adapt to a rapidly changing business environment. The jury is still out on the long-term effects of the German effort; the situation is more complex than the sound bites and headlines indicate

MERGERS, ACQUISITIONS, AND CORPORATE RESTRUCTURINGS: CHANGING OWNERS AND FORM

DESPITE LOW INTEREST RATES, NO MERGER AND ACQUISITION BOOM HAS EMERGED—BUT SOME THEMES ARE EMERGING

Deal Type
- Renewable
- Gas
- Electric

Selected Major Energy and Utility Transaction Announcements (Q3 and Q4 2014)

SEPT

Announced: Sept. 28
Deal: NiSource spin-off of Columbia Pipeline Group
Deal value: TBD (est $800M for 14.6%)

Planned IPO in mid-2015 of MLP of 15,000 miles of interstate and gathering pipeline and 300 Bcf storage

OCT

Announced: Oct. 20
Acquirer: Macquarie-led investor group
Target: Cleco
Deal value: $4.7B

Utility holding company serving 0.3M retail and wholesale electric customers in LA (mostly) and MS; 3 GW of generation capacity

NOV

Announced: Nov. 17
Acquirer: SunEdison
Target: First Wind Holdings
Deal value: $2.4B

1.6 GW of pipeline and backlog wind energy projects; 6.4 GW of wind energy project development opportunities

Announced: Nov. 30
Deal: E.ON (German utility) proposes split into two

German electric utility proposes split into two public companies, one company focused on renewables, the other with conventional generation, energy trading, and E&P*

DEC

Announced: Dec. 3
Acquirer: NextEra Energy
Target: Hawaiian Electric
Deal value: ~$4B**

Regulated electric utility serving 0.45M electric customers in HI; 1.6 GW of generation capacity

Spinning Off Gas Assets and Improving Project Funding

- NiSource, which owns both regulated gas and electric utilities and gas midstream assets, filed to spin off its midstream business, which is poised to invest $12 to $15 billion over the next 10 years
- Dominion Resources also offered midstream assets—principally its Cove Point LNG export project—to the public through an IPO, largely to help fund its construction

Small and Midsize Utility Acquisitions: Cash Flows and Test Beds

- Proposed acquisitions of Cleco Corp., a Louisiana utility holding company, and Hawaiian Electric Industries
- Purchasers are financial investors and non-contiguous utilities, respectively, so analysts perceive limited traditional utility deal cost-savings synergies
- Both purchasers will benefit from steady cash flows, and with NextEra's renewables bent, the "smart deployment of capital in ways that improve the customer value proposition over time," including testing new technologies like energy storage and studying impacts of rapid solar deployment

Adjusting to Industry Sea Changes

- As Germany's power generation portfolio is restructured with much higher levels of renewable resources, E.ON, a major investor-owned utility, is splitting its business into renewable and conventional generation to reflect differences in risk, business outlook, and policy support

NOTES:
*Oil and gas exploration and production. **Includes debt assumption; rounded to the nearest $100M.
SOURCES:
SNL Financial; industry news; *The Wall Street Journal*; Streetwise Reports; company reports; Hunton & Williams; analyst reports

REVERSE MLPs ARE BEING CONSIDERED BY SOME ENTITIES AS SOME MLPs "MATURE."

UNWINDING KMI—THE MASTER LIMITED PARTNERSHIP (MLP)

- In August 2014, Kinder Morgan Inc. (KMI) announced its plans to acquire all the outstanding equity securities of Kinder Morgan Management LLC and MLPs Kinder Morgan Energy Partners and El Paso Pipeline Partners
- The deal, valued at $75.6 billion, was finalized on November 26, 2014, reorganizing as a C-corporation

TOO BIG AND OLD TO MLP?

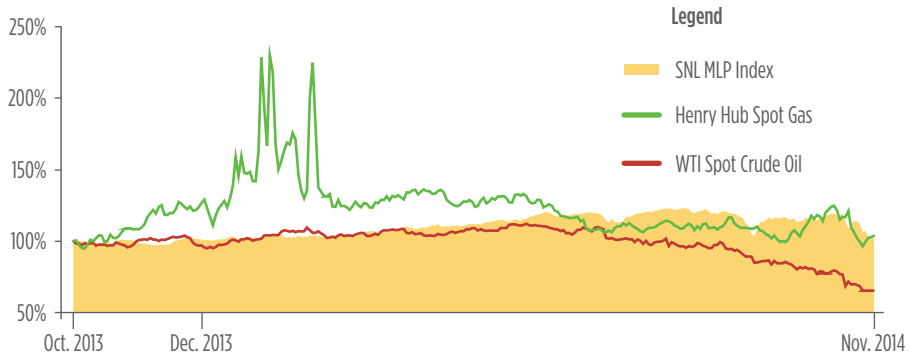
- The rationale for the "reverse MLP" was that traditional tax, cash flow, and dividend benefits were overshadowed by high incentive distribution rights payments and organizational unwieldiness
- According to one analyst: KMI "breaks the link to the MLP model, where quarterly distribution increases are the norm, providing eventual headroom to walk dividend growth down as the business matures and growth opportunities slow next decade"
- Interestingly, as a C-corporation, KMI's borrowing costs were lower than as an MLP
- Others potentially in a similar position as KMI include ONEOK and Williams

DOWN, BUT NOT OUT

- MLPs and yieldcos are still being considered by some, including EQT (midstream gas) and Sempra Energy
- Sempra is debating the two structures for its gas, renewables, and other businesses
- Sempra says the choice of vehicle will be driven by:
  - › Strategy and growth initiatives
  - › Value creation for shareholders
  - › Asset mix flexibility
  - › Liquidity and size of investor base
  - › Volatility and trading history of existing entities

FALLING TO EARTH: MLP VALUATIONS HAVE FALLEN, AT LEAST TEMPORARILY, AS OIL AND GAS PRICES HAVE FALLEN.

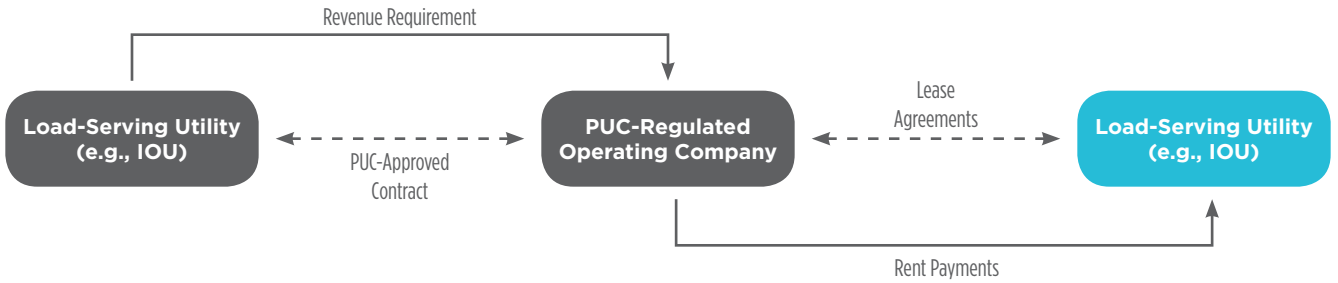
SNL MLP Index Performance vs. Oil and Gas Spot Prices (Oct. 31, 2013 through Mid-Dec. 2014



SOURCES:
Industry news; SNL Financial; company reports; ScottMadden analysis

"WIRES" COMPANIES ARE INCREASINGLY INTERESTED IN REITs AS FINANCING VEHICLES.

"Wires" Real Estate Investment Trust (REIT) Structure



ARE REITS THE NEW YIELDCOS?

- Some growth investments (renewables, gas generation) have used yieldcos for tax-efficient financing
- REITs are gaining increasing attention as attractive vehicles for projects with more stable, steady, and passive cash flow, especially in transmission
- Like MLPs, qualifying REITs are not subject to corporate income tax (although one must also check state tax laws to ensure equivalent state tax treatment)
- With IRS approval to use REITs for properties like electric transmission, transmission REITs could become a popular investment vehicle in 2015

PERHAPS, BUT THERE ARE LIMITATIONS TO WHAT REITS CAN DO

- Despite IRS approval of a wires REIT, its role must be passive
  - › The REIT cannot operate the T&D system—the REIT must lease the T&D system to a lessee/operator
  - › Lessee/operator of the T&D system can own only a limited economic interest in the REIT
  - › The REIT's income from the T&D system must be passive rental income; no portion of the rent can be based on the net income or profits of the lessee/operator
  - › Substantially all of the property owned by the REIT and leased to the lessee/operator must be "real property"

> **An electric transmission and distribution system—from the busbar through and including the meters—qualifies as real property since it is "an inherently permanent structure that is not an accessory to the operation of a business" and "the system is a passive conduit that allows electricity created by a generation source to flow through the system to end-users."**
>
> –Sharyland Utilities IRS Private Letter Ruling (2007)

SOURCES:
Industry news; Moody's Investors Service; Sullivan & Worcester presentation to California PUC; Chadbourne & Parke; McDermott Will & Emery (law firm); Law360.com; Hunton & Williams

The ScottMadden Energy Industry Update

ENERGY SUPPLY, DEMAND, AND MARKETS

ENERGY STORAGE: INSTALLATIONS ON THE RISE

> Wind and solar power's mismatch with system peaks, together with declining solar costs, have created interest in storage in tandem with renewables.

CALIFORNIA SETS THE STAGE

- In October 2013, the California Public Utilities Commission (CPUC) ordered state investor-owned utilities to procure 1,325 MW of storage capacity by 2020
- The CPUC decision mandates specific, biennial storage procurement targets beginning in 2014 and increasing over time
- Energy storage systems can be deployed in three "grid domains"—transmission interconnected, distribution interconnected, and behind the meter

LARGEST BATTERY STORAGE FACILITY GOES INTO SERVICE

- In September 2014, Southern California Edison unveiled the Tehachapi Energy Storage Project, the largest battery energy storage system (BESS) in North America
- The 32-MWh (8 MW x 4 hours) demonstration project uses lithium-ion batteries to evaluate the ability of BESSs to improve grid performance and assist in integrating large-scale variable renewable energy resources like wind and solar power

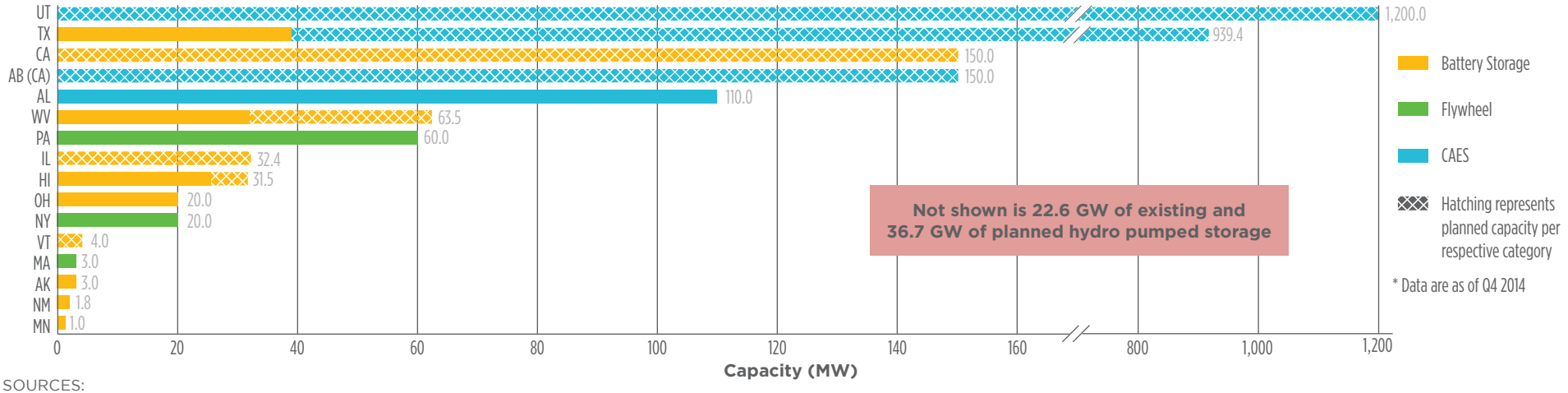
PJM GETS SOME GRID-SCALE UNITS

- In July 2014, Beacon Power brought online 20 MW of fast-response flywheel energy storage in PJM's footprint
- AES has had a 32-MW battery storage facility in West Virginia since 2011, related to a 98-MW wind farm
- Storage opportunities are more attractive in the wake of FERC Order 755 (2011), which mandated higher rates for fast-responding frequency regulation sources

TEXAS GETTING INTO THE ACT

- Texas is home to the largest operating battery storage power plant facility in the United States, the 36-MW battery at Notrees Windpower
- Companies Apex and Chamisa are planning 904 MW of compressed air energy storage (CAES) in Texas

Operating and Planned U.S. and Canadian Energy Storage Capacity by State or Province



SOURCES:
SNL Financial; California Energy Storage Alliance; SmartGrid.gov; *Electric Light & Power*; industry news; ScottMadden analysis

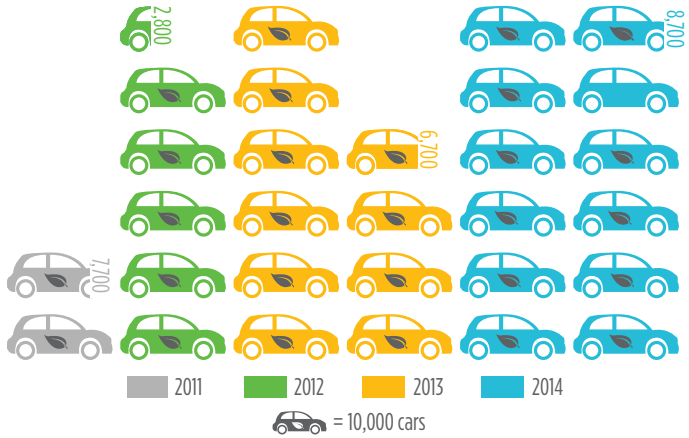
ELECTRIC VEHICLES:
SALES TRENDS AND BUSINESS MODELS

MARKET PENETRATION STILL GROWING, BUT LOW GASOLINE PRICES MAY IMPACT 2015 OUTLOOK

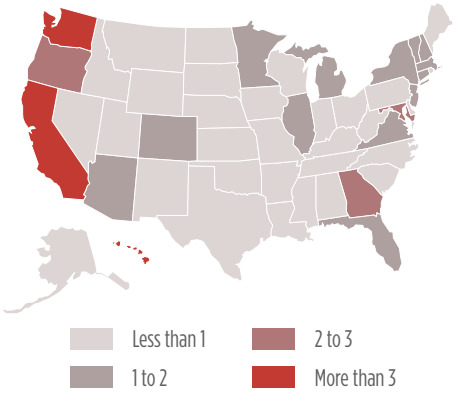
ELECTRIC VEHICLE SALES ARE GROWING

- U.S. electric vehicle (EV) sales continued to increase in 2014 but not as rapidly as in the prior two years
- 2014 sales growth at a glance:
  - › Overall auto sales up 5.8%
  - › Battery electrics up 33%
  - › Plug-in hybrids up 13%

U.S. Plug-in Electric Vehicle Sales*



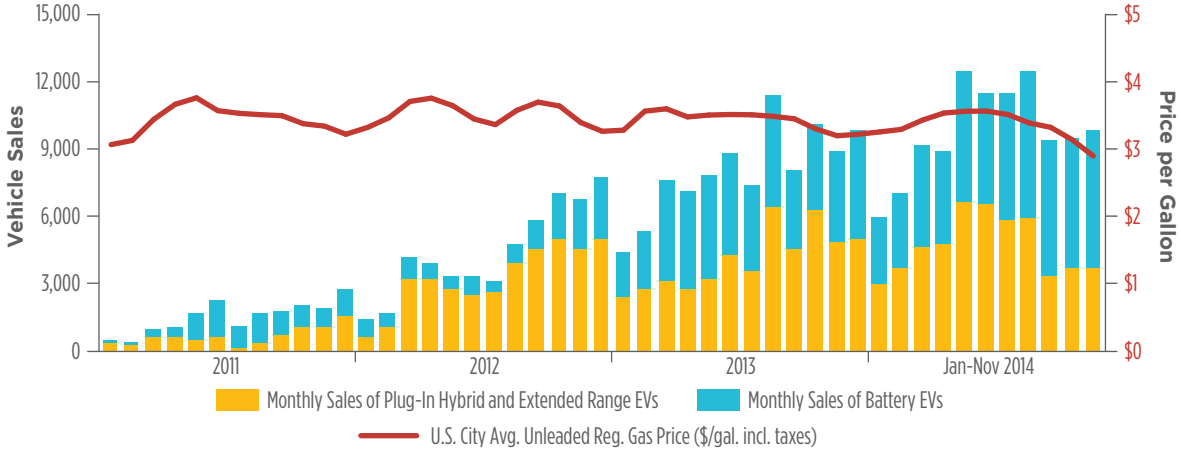
Electric Vehicles per 1,000 Registered Vehicles**



INCENTIVES MATTER

- A number of states with high EV penetration (e.g., California and Georgia) have attractive state tax incentives to reduce upfront costs of EVs
- However, it is unclear how U.S. plug-in electric vehicle sales will respond to recent significant reductions in gasoline prices. Softness in winter EV sales is not unusual, so the industry will have to see whether low gasoline prices hold and whether spring 2015 EV sales are negatively affected

Monthly Sales of Plug-In Electric Vehicles* vs. Unleaded Gasoline Prices



NOTES:
*Includes plug-in hybrid, battery, and extended range electric vehicles from 2011-2014. **As of year-end 2013.
SOURCES:
EIA; Electric Drive Transportation Association; HybridCars.com; Argonne National Laboratory; Transportation Technology R&D Center; ScottMadden analysis

SEEKING A PROFITABLE PUBLIC CHARGING MODEL

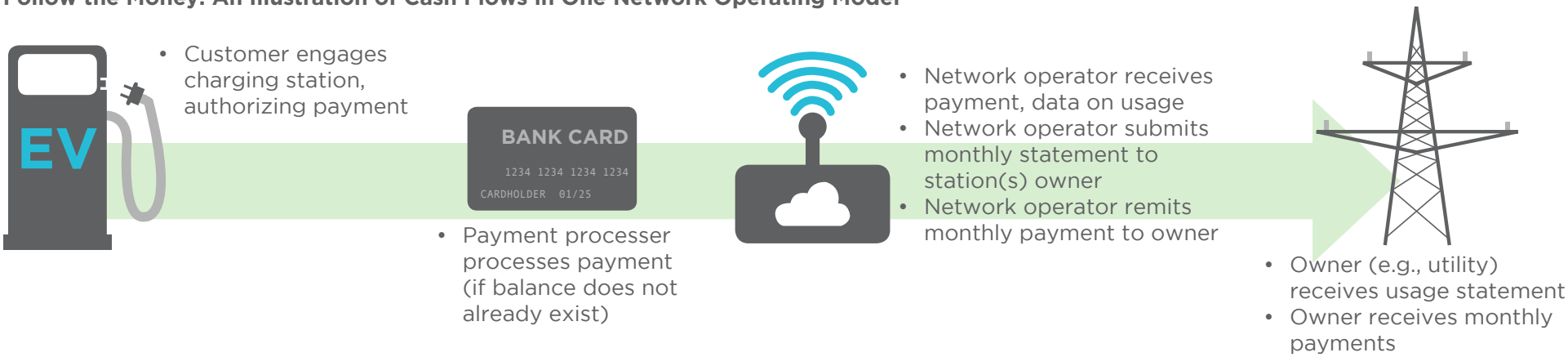
Utilities are increasingly looking at public charging as a way to:

- Promote transportation electrification (and concomitant power sales)
- Reduce range anxiety*
- Support EV ownership by residents of multi-unit dwellings that don't have residential charging infrastructure (particularly in metropolitan areas with high concentrations of early adopters and multi-unit developments)

Public Charging Models Are Varied and the Industry Is Seeking a Profitable Model

Type	Model	Description
Network Operator Models**	*Prepaid*	Allows access to in-network charging stations with a prepaid fee
	Club Membership	Users pay a small monthly fee for access and discounted electricity costs
	Cell Phone	Bundles residential plans with high monthly fees and electricity costs
Site Owner* Revenue Models**	*Green*	Free; used by retailers and others to attract clientele
	Gas Station	Fee for service; per session fee
Specialty Pricing	*Specialty*	Charging station owner sets up unique pricing constructs

Follow the Money: An Illustration of Cash Flows in One Network Operating Model



NOTES:
*Concern that all electric vehicles may become stranded due to inadequate battery performance/capacity and inability to charge. **Network operator is often a software firm that manages the network the stations are hosted on, typically managing customer interface and billing. ***A site owner buys and installs the stations and collects revenue from the network operator.
SOURCES:
EPRI; EEI; DOE; UCLA; utility websites; ScottMadden analysis

CHARGING INFRASTRUCTURE MUST BE MATCHED TO SEGMENT NEEDS.

What Different Charging Levels Mean

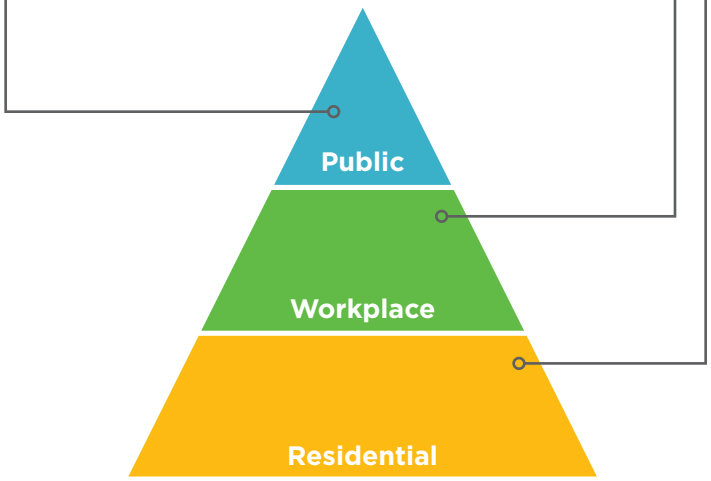
Level	Time to Charge*	Typical Volts/Amps	Description
1	*8 to 14 hours*	*110 volts (AC)/12-16 amps*	• Special cord • Residential and workplace
2	*3 to 5 hours*	*240 volts (AC)/40 amps*	• Standalone box that can be wall-mounted, wired to electrical panel • Residential, workplace, and public charging
3	*80% in 30 mins*	*480 volts (DC)/60 amps*	• Dedicated breaker with special grounding equipment • Public charging

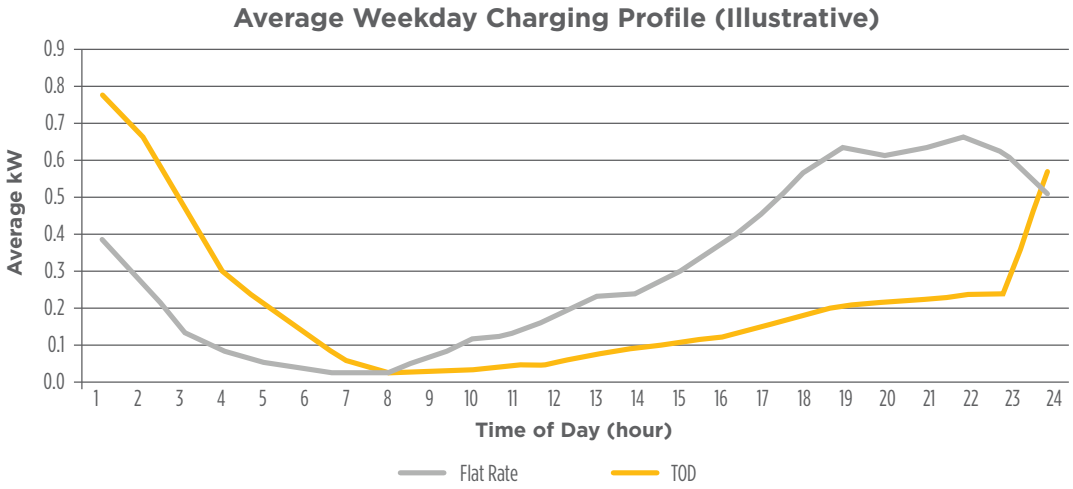
TIMING IS EVERYTHING: TIME OF DAY (TOD) PRICING FOR EVs SHIFTS CHARGING TO OFF-PEAK HOURS.

Max % of Vehicles Charging:** <15%
Optimal Charging Levels: Levels 2 and 3
Possible Utility Approach to Market Segment:
- Deploy public (non-household) charging to develop EV ecosystem, relieve range anxiety
- Establish a pricing construct that fits utility needs, based on time, event, or kWh pricing

Max % of Vehicles Charging:** <28%
Optimal Charging Levels: Levels 1 and 2 (mostly)
Possible Utility Approach to Market Segment:
- Determine need for workplace EV time of use (TOU) rate
- Establish/deploy workplace rebate program

Max % of Vehicles Charging:** Balance
Optimal Charging Levels: Levels 1 and 2
Possible Utility Approach to Market Segment:
- Establish need for residential EV TOU rate
- Establish/deploy residential rebate program





NOTES:
*Time to charge a Nissan Leaf (24 kWh battery); **Maximum percent of vehicles charging at any given time.
SOURCES:
EPRI; EEI; DOE; UCLA; Edmunds; utility websites; ScottMadden analysis

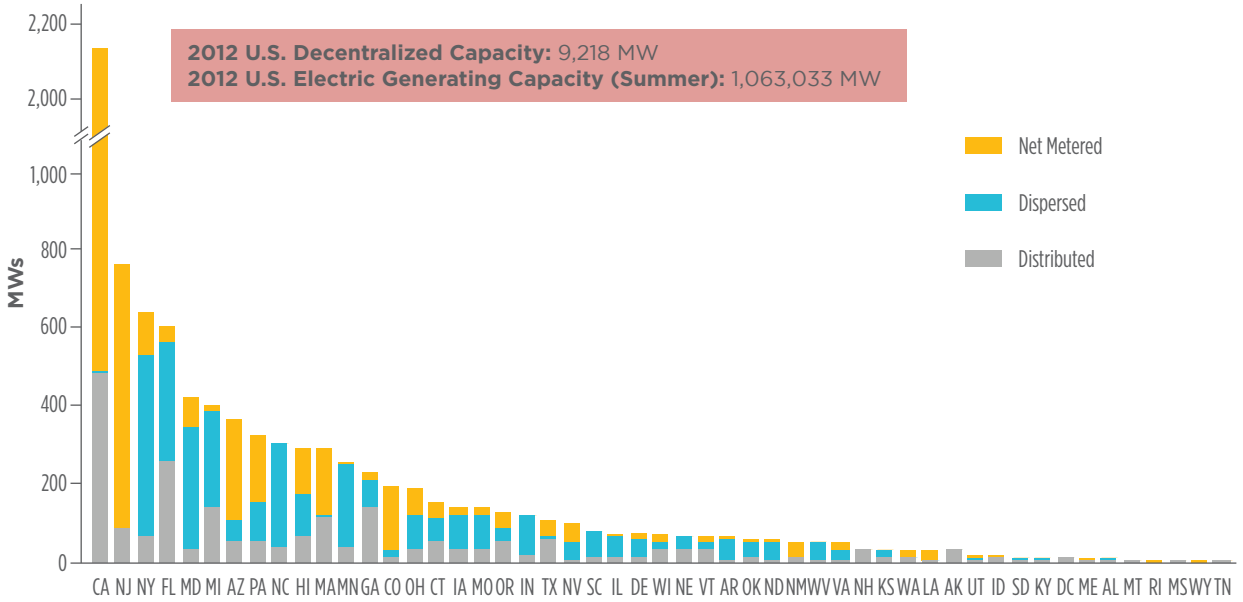
DECENTRALIZED GENERATION:
SOLAR IN A NARROW LEAD

DISTRIBUTED SOLAR CONTINUES TO GROW, AND NEW GOVERNMENT ESTIMATES OF DECENTRALIZED RESOURCES ARE EXPECTED IN EARLY 2015

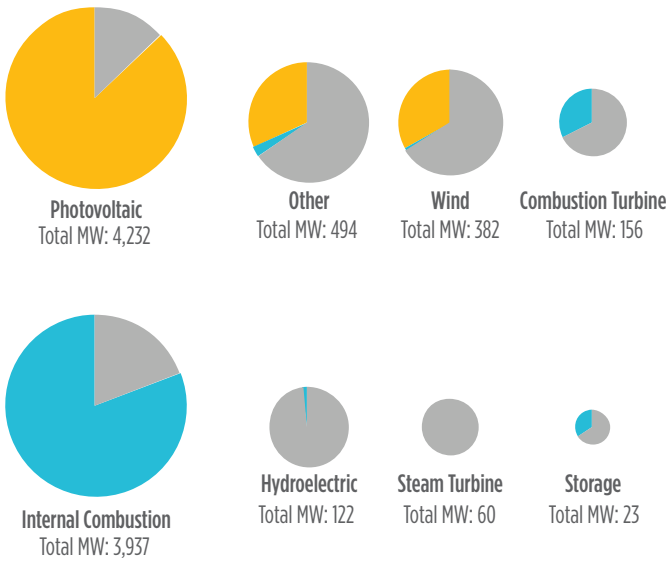
DECENTRALIZED RESOURCES* ARE DOMINATED BY A FEW STATES

- Decentralized generation continues to make inroads into the U.S. power supply mix, but still remains a small fraction compared with installed central station power generation—around one percent
- Based upon EIA's most recent data, photovoltaic solar installations lead the decentralized generation mix, followed by traditional internal combustion generation
- Soon-to-be-released EIA 2015 longitudinal data (for 2013) will be telling as this is a rapidly evolving sector
- One question: how much dispersed generation exists but is not seen by utilities?

U.S. Distributed, Dispersed, and Net-Metered Generation by State in MWs**



U.S. Distributed, Dispersed, and Net-Metered Generation by Technology**



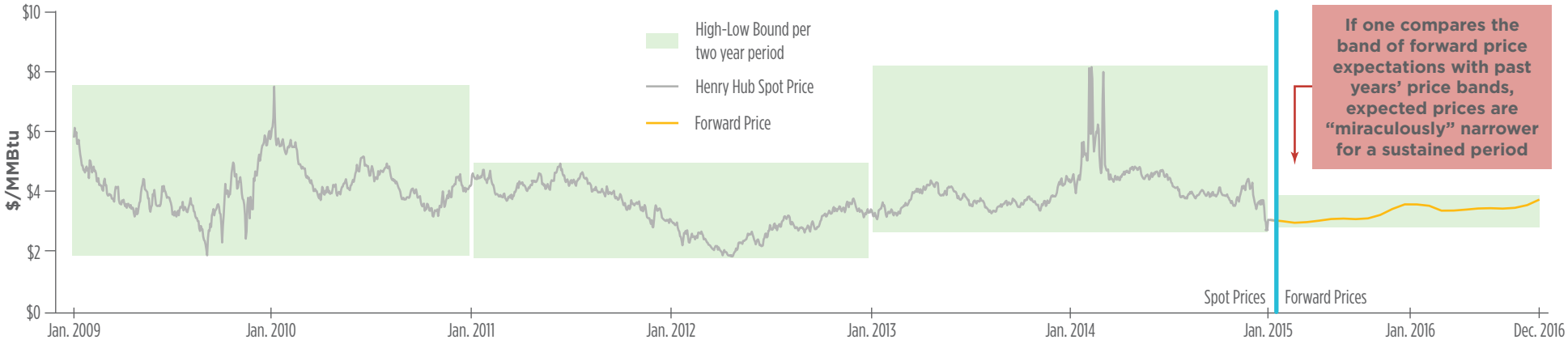
NOTES:
*Decentralized resources are the aggregate of distributed, dispersed, and net-metered generation. **Distributed and dispersed includes commercial and industrial generators < 1 MW; net metered refers to residential, commercial, and industrial generators < 2 MW. Distributed and net metered are grid-connected and grid-synchronized; dispersed generators are neither connected nor synchronized to the grid. Figures include both actual and estimated and include both utility and customer-owned generation. Due to nature of data, it is possible some systems may be double-counted. Data are as of year-end 2012.
SOURCES:
EIA Form 860 and 861 data; ScottMadden analysis

NATURAL GAS MARKETS:
LATEST DEVELOPMENTS

HOW LOW CAN YOU GO...OR STAY?

NATURAL GAS PRICES REMAIN LOW

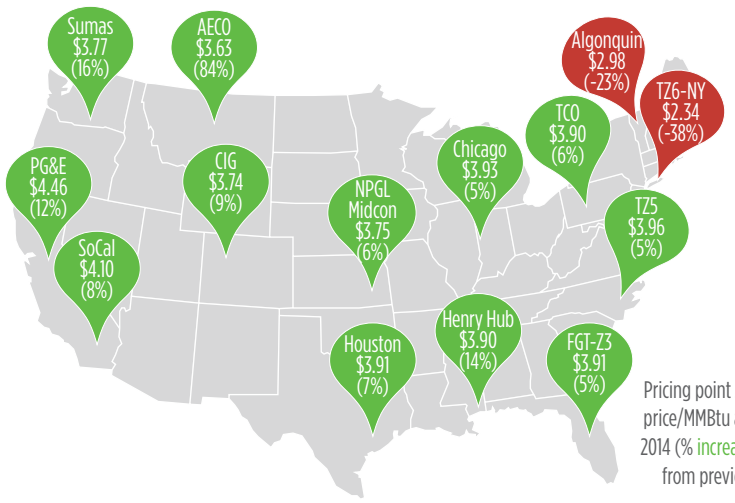
Henry Hub Spot (Jan. 2009-Dec. 2014) and Forward (Feb. 2015-Dec. 2016) Natural Gas Prices



LOCATION MATTERS: SOME PRICES ARE UP WITH 2014 STORAGE DRAWDOWNS

- Low natural gas prices continue in North America, and industry observers peg it anywhere from $3.55 to $4.50 per MMBtu in 2015
- Price basis in Marcellus, Utica, and nearby market areas remains negative, pending additional takeaway capacity
- Some regions see flat to negative basis versus Henry Hub

Natural Gas Prices (at End of Q3 2014) at Selected Trading Hubs vs. Prior Year

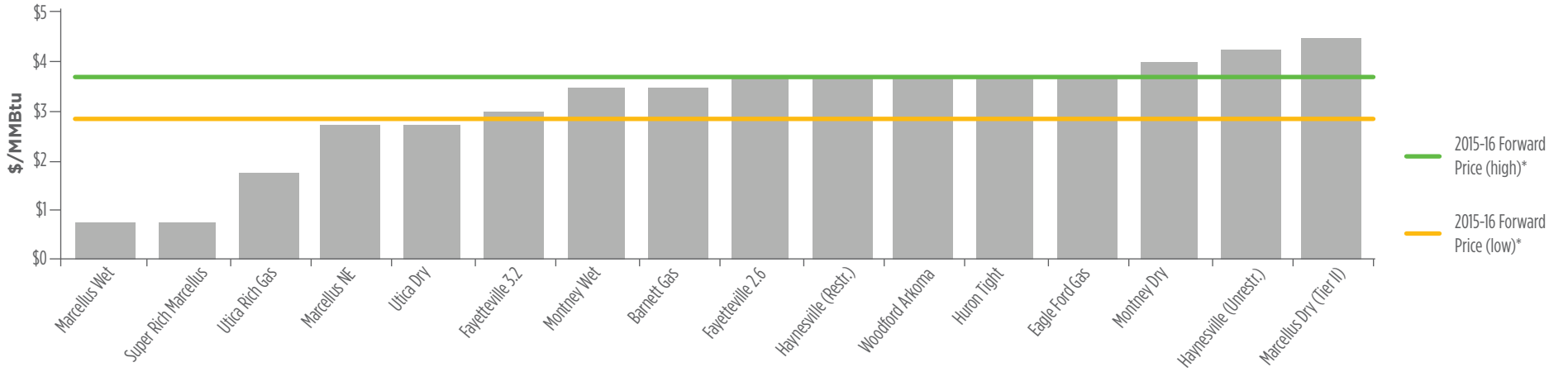


SOURCES:
EIA; FERC; SNL Financial; *Natural Gas Week*; Morgan Stanley; industry news

WHAT ABOUT CHEAP OIL?

- Generally, natural gas is relatively price inelastic in the short run, both on supply and demand sides. But unusually low petroleum prices could have an impact on natural gas markets in two ways:
  - › Affecting the economics of natural gas liquids (NGLs). NGL prices are correlated with oil prices, which could reduce the attraction of liquids-rich shale gas plays like Marcellus and Utica, which have been moneymakers because of NGLs
  - › Possibly reducing associated gas from "oily" shale plays as producers ramp down production

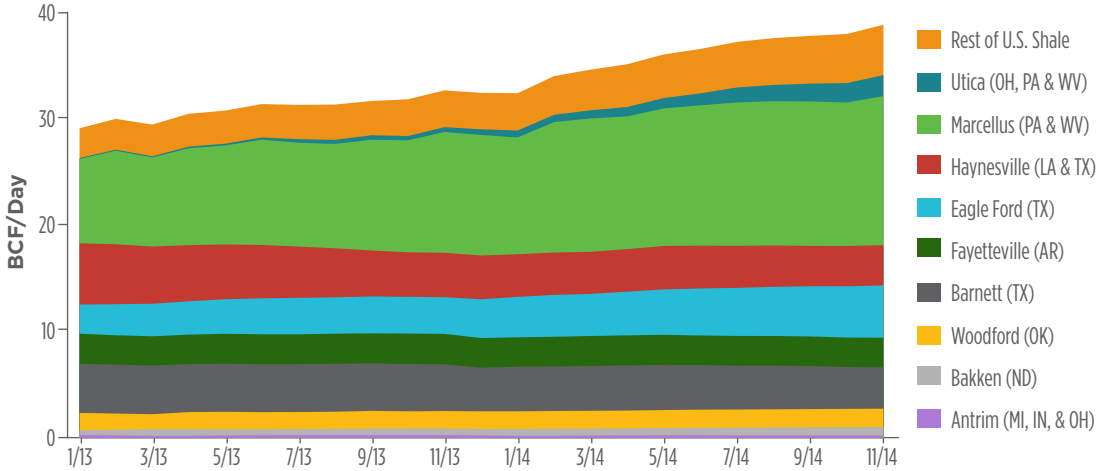
Natural Gas Breakeven Price (10% IRR) by Basin vs. Henry Hub Forward Gas Prices (Deutsche Bank Estimates)



HOW IT'S PLAYING OUT

- Despite these dynamics, production has continued to be strong in key shale gas plays
- One bright spot: New gas power generation benefits from lower gas prices as would increased coal-to-gas switching, which is called for in EPA's proposed Clean Power Plan
- The key question: How low can natural gas prices go and still support continued production? It depends upon the play

Monthly Dry Shale Gas Production by Play (Jan. 2013-Nov. 2014)



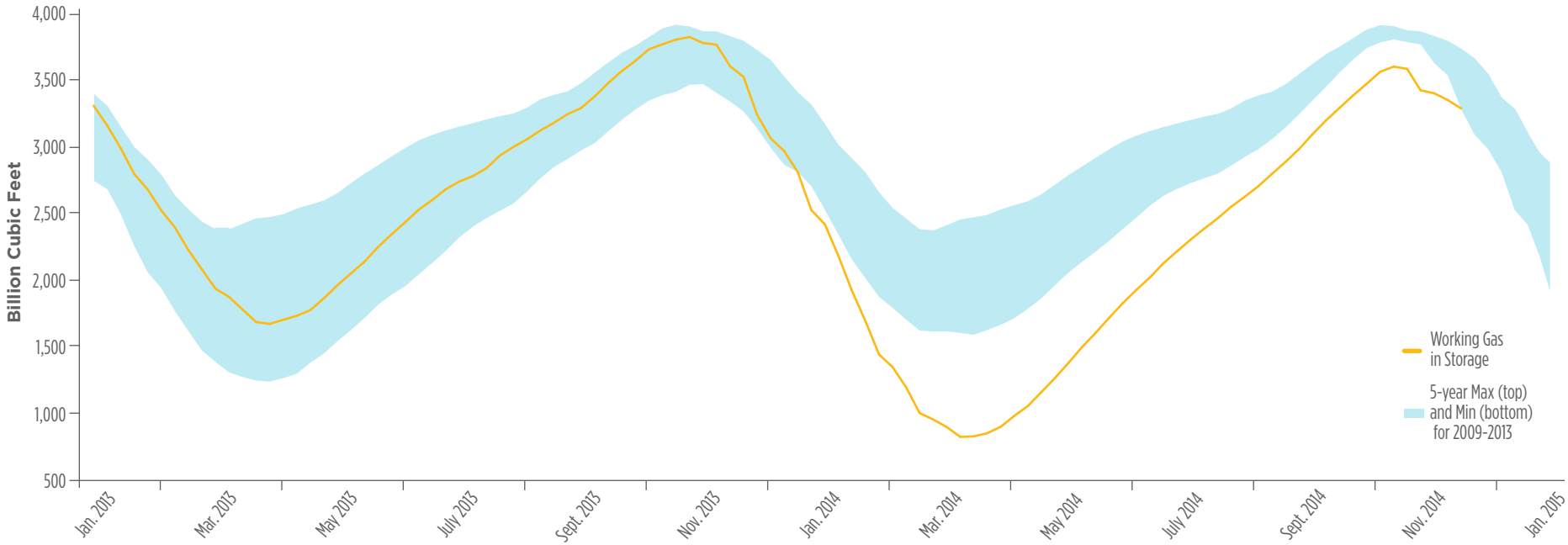
NOTES:
*Forward prices are monthly high/low as of early Jan. 2015 for Henry Hub gas in months Feb. 2015 to Dec. 2016. IRR based upon half-cycle return not including leasehold acquisition expense or allocated costs. Assumes NGL prices at 40% of West Texas Intermediate crude, regional gas price differential and company disclosed D&C costs and recoveries
SOURCES:
EIA; FERC; Deutsche Bank; SNL Financial; *Natural Gas Week*; Wood Mackenzie; Charles River Associates; industry news

POSSIBLE LONG-TERM IMPACTS OF LOW GAS PRICES

- Longer term, investment in LNG export capability may be impacted as lower oil prices may dampen oil-linked global LNG prices
- So far, however, Asian prices remain in the $12/MMBtu range as of late 2014 and only one facility (Excelerate Energy's Port Lavaca) has been tabled for now due to LNG market dynamics. But one analyst notes that at $10/MMBtu, there is no market for gas export. Liquefaction, transportation, landing, and regasification alone costs $6/MMBtu
- Capital expenditures, or at least the pace of cash burn, is being re-evaluated by producers
  - › Capital expenditures are forecast to increase in many plays, but some companies are trimming those values (e.g., Linn Energy cutting oil and gas capex by 53% in 2015)
  - › One question: whether the industry will see consolidation of smaller, less capitalized players

AFTER SOME LOW GAS INVENTORIES IN 2014 BUOYED PRODUCER HOPES FOR PRICING, THOSE INVENTORIES HAVE SINCE RECOVERED.

Working Gas in Underground Storage (2013-2014 vs 2009-2013 Min/Max)



SOURCES:
EIA; FERC; SNL Financial; *Natural Gas Week*; Wood Mackenzie; Charles River Associates; industry news

The ScottMadden Energy Industry Update

RATE AND REGULATORY DEVELOPMENTS

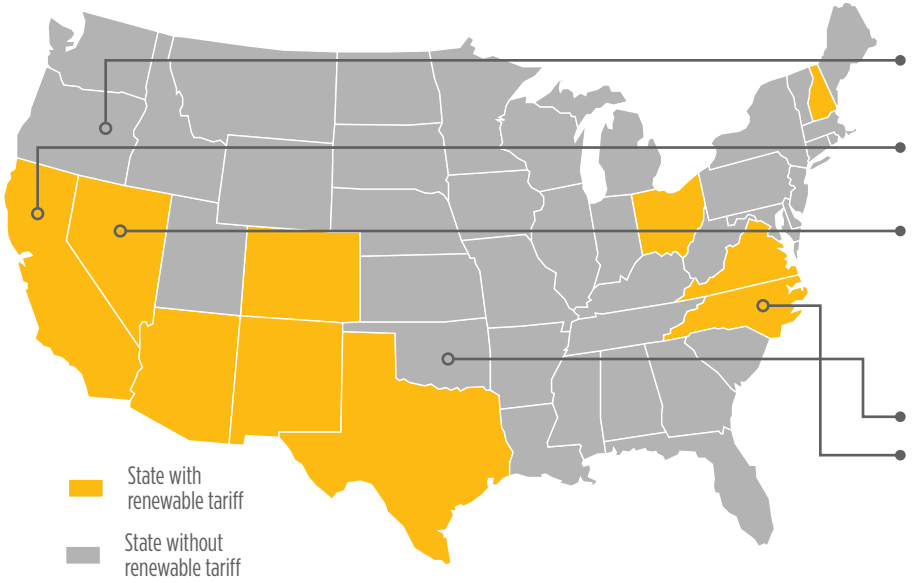
RENEWABLE ENERGY TARIFFS:
UTILITIES EXPLORE ALTERNATIVE RATE STRUCTURES

RENEWABLE ENERGY TARIFFS CAN PROVIDE AN ADDITIONAL RENEWABLE ENERGY OPTION TO KEY ACCOUNT CUSTOMERS (I.E., CUSTOMERS WITH THE HIGHEST ENERGY USE)

PROGRAM DESIGNS OFTEN INCLUDE THE FOLLOWING FEATURES:

- **Flexibility:** Tariffs can be attractive to customers unable to build on-site generation or those interested in an option with low risks and transactions costs
- **Targeted Costs:** Designs typically ensure all generation and administrative costs are incurred by participating customers; tariff does not impact the rates of non-participating customers
- **Cost Savings:** The development of larger, utility-scale projects should result in economies of scale and lower costs to participating key account customers
- **Additionality:** Tariffs can support new projects outside of policy mandates, an attractive feature to many key account customers

Renewable Energy Tariffs for Large Customers: Existing Tariffs and Selected Recent Activity



Oregon: HB 4126 requires the Public Utilities Commission to study the impact of allowing utilities to offer voluntary renewable energy tariffs to non-residential customers

California: California Public Utilities Commission is implementing SB 43, which requires utilities with at least 100,000 customers to offer a renewable energy tariff option

Nevada: Sierra Pacific Power's Northern NV Green Energy Rider is open to all customers, but commercial customers may contract with the utility to build a power plant to offset their specific use. Apple plans to construct a 20-MW PV solar facility at Sierra's Ft. Churchill Generating Station. Apple would initially own the plant, with NV Energy (Sierra's parent company) leasing, operating, and maintaining the facility. NV Energy has the option to purchase the plant after five years

Oklahoma: Google is lobbying the Public Service Commission to offer a renewable energy tariff for large customers

North Carolina: Duke Energy's Green Source Rider began in 2014. This pilot program allows qualifying, energy-intensive customers to offset new load with renewable energy generation; the program's cap is set at 1,000 GWh or three years. Duke Energy provides renewable power through power purchase agreements or utility-owned generation. Participating customers pay an application fee, monthly administration charge, and premium over retail electricity price

SOURCES:
North Carolina Clean Energy Technology Center; NV Energy; Solar Electric Power Association; ScottMadden analysis

EPA FINALIZES COAL COMBUSTION RESIDUALS RULE

AFTER MORE THAN FOUR YEARS OF CONSIDERATION, AND MISSED DEADLINES, EPA ISSUED A FINAL RULE REGULATING COAL COMBUSTION RESIDUALS (CCRs) AS SOLID RATHER THAN HAZARDOUS WASTE

The rule:

- Regulates ash as a solid waste under subtitle D of the Resource Conservation & Recovery Act (RCRA), rather than more restrictive hazardous waste under subtitle C of RCRA
- Will leave facilities open to civil suits
- Applies also to sites with plants no longer in operation
- Partially delegates enforcement of the rule's requirements to the states

The rule's compliance requirements incorporate more stringent handling and disposal requirements calling for the following:

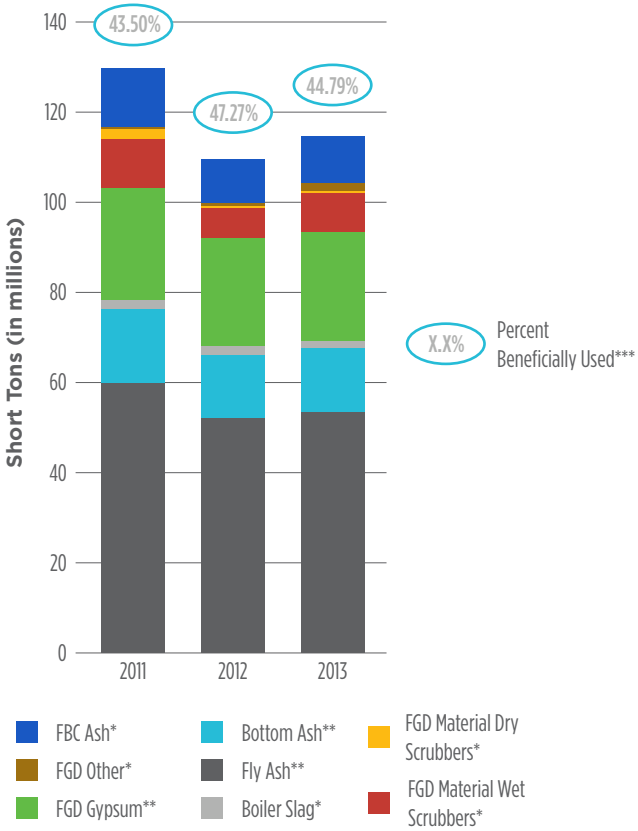
- Regular inspections of coal ash sites for structural integrity
- Closure of coal ash sites that fail to meet new engineering and structural standards
- Mandatory monitoring of groundwater around coal ash waste sites
- Controls to stop fugitive dust
- Liners for coal ash sites for new units
- New rules for proper closure of coal ponds and for coal ash at landfills

IMPLICATIONS OF THE NEW RULE

- Power producers (the largest producers of CCRs) now have some degree of certainty in treatment of CCRs
- The new rule applies more restrictive standards to legacy sites, which will require utilities to evaluate their CCR disposal and containment strategies
- States will drive oversight and enforcement, under federal minimum standards, but there may still be differences in degree and manner of enforcement under different state regimes
- Potential exists for nuisance civil suits against CCR producers; it is unclear that compliance with state requirements will provide a legal shield

> **Nearly half of coal combustion residuals are beneficially used in other products such as cement and wallboard.**

Coal Combustion Product (CCP) Production Totals (Short Tons) and Percent of CCP Beneficially Used



NOTES:
*These are actual tonnages reported by utilities responding and do not reflect estimates for utilities that did not respond this year.
**Utilization estimates are based on actual tons reported and on extrapolated estimates and other sources only for fly ash, bottom ash, and FGD gypsum.
***These numbers are derived from previous, current and applicable industry-wide available data, including EIA Reports 923 and 860 and other outside sources.
SOURCES:
American Coal Ash Association, Coal Combustion Product (CCP) Production & Use Survey Report; *Inside EPA*; U.S. EPA; ScottMadden analysis

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CLEAN TECH AND ENVIRONMENT

SEPA/SCOTTMADDEN MISSION TO GERMANY:
FACTS FOUND AND LESSONS LEARNED

A TRIP TO GERMANY LOOKS AT FACTS ON THE GROUND BEHIND GERMANY'S AMBITIOUS ENERGIEWENDE

GERMANY HAS SET AGGRESSIVE RENEWABLES, EFFICIENCY, AND CLIMATE GOALS

- The Solar Electric Power Association (SEPA) and ScottMadden co-sponsored a fact-finding mission to Germany to explore the impact of its energy transition (or "Energiewende") and how lessons learned could be transferred to the United States
- Thirty U.S. executives from various types of organizations attended: investor-owned utilities, public power companies, vertically integrated utilities, public service commissions, solar industry participants, the Edison Electric Institute, and the Electric Power Research Institute
- Mission participants spent three days in Düsseldorf meeting with German energy participants: government policymakers, utilities, and industry organizations (such as the European Photovoltaic Association and Eurelectric)

Energiewende Targets: Some Progress, Much More Planned[1]

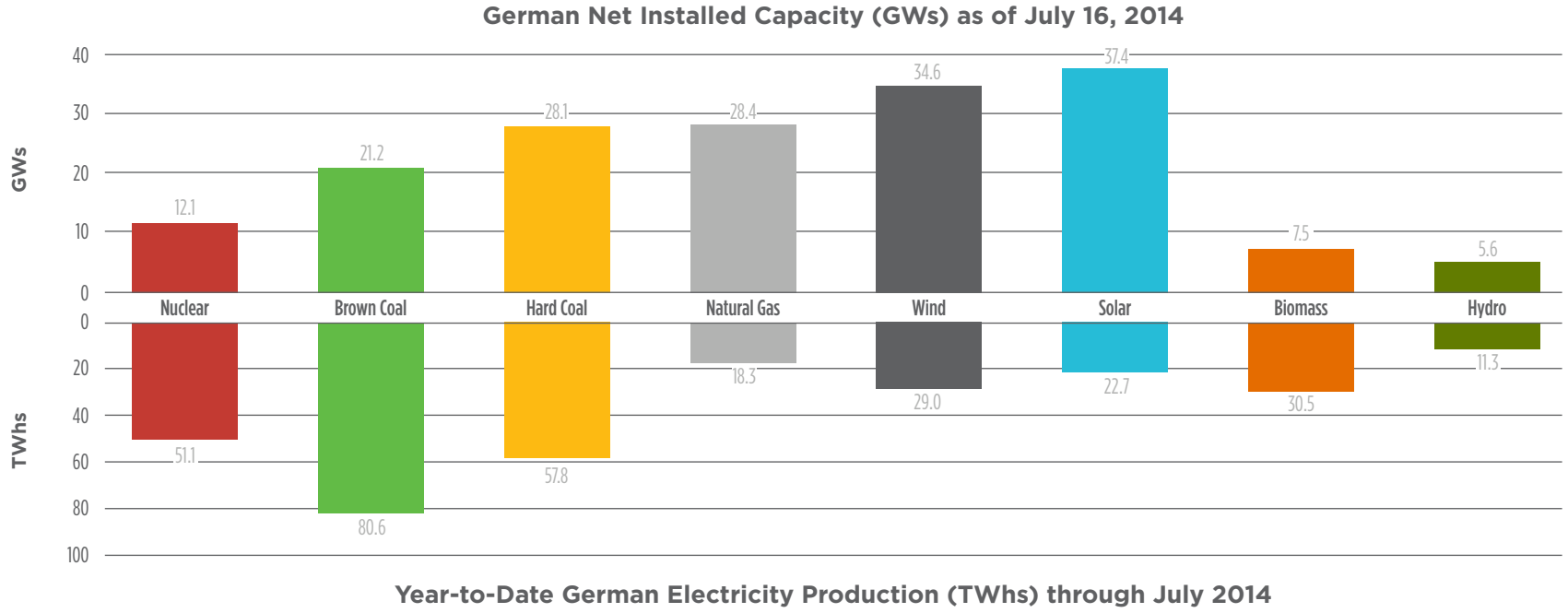
		Achieved 2013	2020	2025	2030	2035	2040	2045	2050
Climate	% of Greenhouse Gas Reduction (vs. 1990)	-23.8% (estimated)	-40%		-55%		-70%		-80% to -95%
Renewable Energy	% of Electricity Consumption	25.4%	35%	40% to 45%	50%	55% to 60%	65%		80%
	% of Final Energy Consumption	12.4% (2012)	18%		30%		45%		60%
Energy Efficiency	% of Primary Energy Consumption (vs. 2008)	-3.3%	-20%						-50%
	Energy Productivity	+1.1% per year	+2.1% per year						
	Building Renovation	~1% per year	Doubling of Renovation Rate: 1% ⟶ 2%						

SOURCES:
[1] "Costs and Benefits of the Energy Transition," Dr. Martin Schöpe, Federal Ministry for Economic Affairs and Energy

UNDERSTANDING THE ENERGIEWENDE: THE GERMAN MARKET IN CONTEXT

- **Deregulation:** A dis-integrated market with generators (utility scale and individuals), retailers, distribution system operators (~800), and transmission system operators (4)
- **Nuclear Shutdown:** All nuclear to be retired by 2022, with incumbent generators investing heavily in gas-fired generation
- **High Natural Gas Prices:** For midsize businesses, for example, natural gas prices have risen from €6.96/gigajoule (2003-05 avg.) to €10.93 (2012-14 avg.) (or from $8.80 to $13.82 per MMBtu)
- **Increase in Renewables:** Targeting 35% of electricity consumption from renewables by 2020; 80% by 2050
- **Not an Island:** Interconnected with its neighbors and subject to European Union policies and carbon trading scheme
- **Long-Range Policy:** Germany's policies are driven by a long-term strategy of "invest now" for later reward
- **Other Factors:** Other issues are driving energy policy, such as energy security and anti-nuclear sentiment

AS OF MID-2014, FOSSIL FUELED ABOUT 44% OF CAPACITY AND GENERATED ABOUT 52% OF ELECTRIC POWER IN GERMANY.



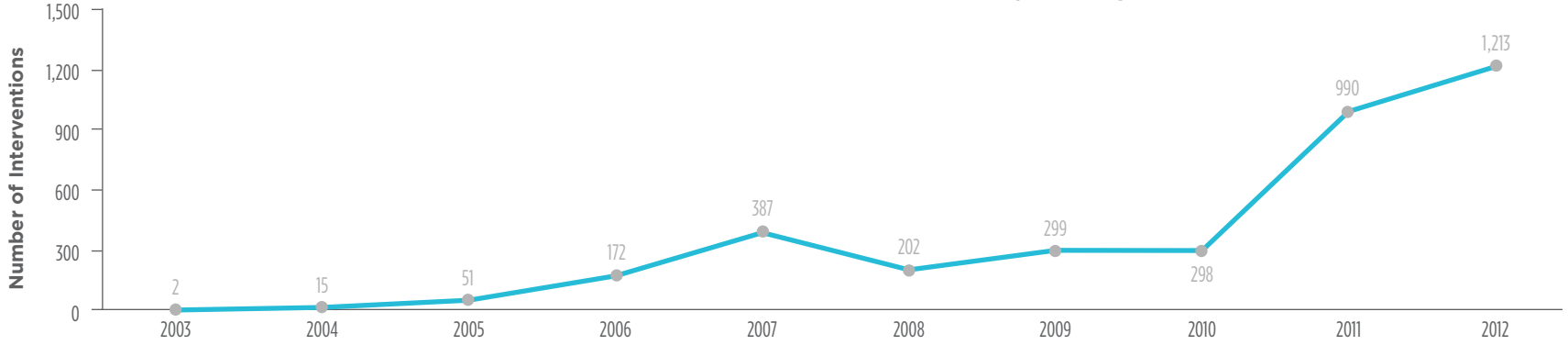
SOURCES:
Natural gas prices per http://epp.eurostat.ec.europa.eu/portal/page/portal/energy/data/main_tables; conversion rates from www.unitconversion.org (as of Nov. 23, 2014); ScottMadden analysis; company interviews; Fraunhofer Institute for Solar Energy Systems

LESSONS LEARNED FOR THE UNITED STATES

Successful Integration of Renewables

- Germany has, to date, successfully integrated high levels of renewables while maintaining high reliability with more active management of the grid

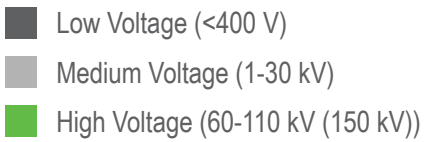
Number of Grid Interventions to Stabilize the Grid by Grid Operator TenneT



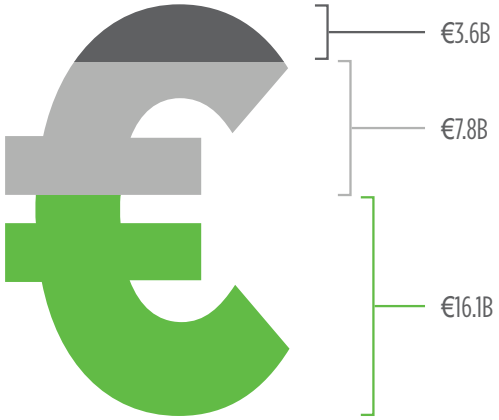
Significant Investment in Transmission and Distribution is Needed

- Investment in distribution is estimated to be as high as €42.5 billion through 2030 to support the new mix of renewables
- Imports/exports with neighboring countries are currently relieving some bottlenecks

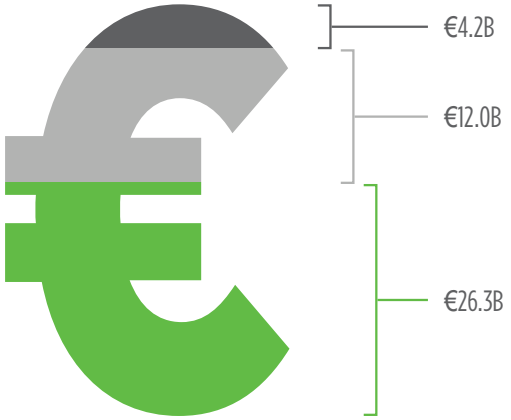
ESTIMATES FOR GRID INVESTMENT ENVISION SIGNIFICANT DISTRIBUTION CAPEX THROUGH 2030.



Conservative Estimate: €27.5B (Slower Renewables Penetration)



Higher and Faster Renewables Penetration: €42.5B



SOURCES:
TenneT; German Energy Agency (DENA), Distribution Grid Study (2012)

Greenhouse Gas Reductions Stalled

- With continued dependence on coal for backstopping renewables, greenhouse gas (GHG) reductions have stalled
- Continued nuclear shutdowns will further challenge GHG reductions

Slow Reaction by Incumbents

- Incumbents did not anticipate such a large, rapid decrease in the cost of solar (equipment and installation) and resulting expansion of the distributed photovoltaic (PV) market—through government support, solar costs have fallen 80% in five years
- The conventional generation business was impacted the most: renewables disrupted the merit order of the conventional pricing structure and dropped the overall wholesale price of electricity, severely impacting the revenues of all the large incumbents (€300 billion loss of market capitalization since 2007)
- Utilities mistakenly held to the view that they were still setting the agenda and that the government would step in and make them whole
  - › Incumbents invested in traditional generation while the market was collapsing around them
  - › Nuclear shutdowns were forced on them with no compensation

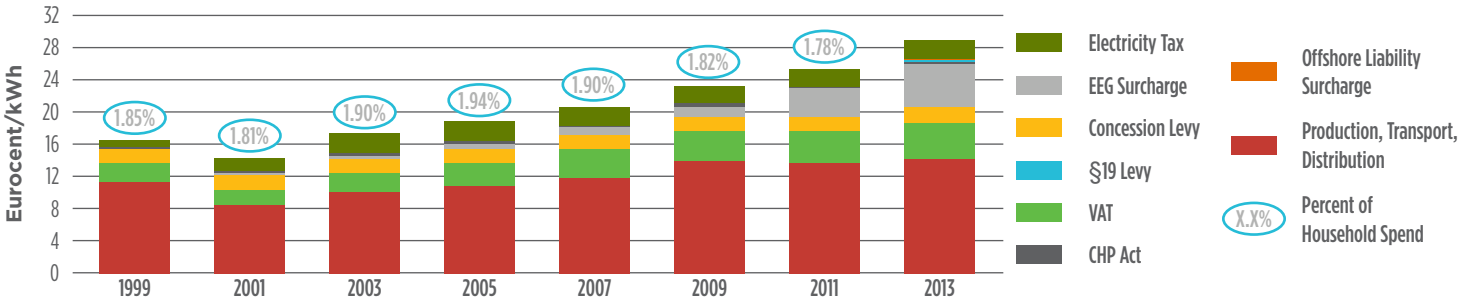
German Utilities Missed Opportunities to Lead the Transition

- Utilities failed to invest in renewables, which would have diversified their risk
- Incumbent utilities couldn't, or wouldn't, invest in solar PV since those investments did not fit their business model or investment hurdle rates
- German utilities are now looking outside of Germany to grow their renewable portfolios

Increased Cost Has Not Dampened Enthusiasm

- Residential rates have increased significantly, but have remained stable as a percentage of household spending and help encourage conservation
- Rates for large industrials have been spared to protect jobs
- Germany has a relatively cohesive energy public policy environment as compared with the United States where public policy interests are more divergent

German Household Electricity Prices (and as Percent of Household Spend)*



THE GERMAN PUBLIC STRONGLY FAVORS THE ENERGY TRANSITION AND SOME SUGGEST NO GOVERNMENT COULD BE ELECTED THAT WAS NOT PRO-ENERGIEWENDE.

NOTES:
*Data for percent household spend is available through 2012.
SOURCES:
SEPA/ScottMadden fact-finding mission interviews and analysis

CLEAN POWER PLAN:
LATEST DEVELOPMENTS

THE EPA IS FINALIZING ITS EXISTING SOURCE GREENHOUSE GAS REGULATIONS (THE CPP*), AND STAKEHOLDERS ARE REACTING

What It Regulates	How It Works	A Growing List of Issues
• Regulates existing power generation sources, but states may use portfolio approach regulating "outside the fence," e.g., renewables and efficiency providers • Targets reduction of 17% from 2013	• EPA gives states state-specific emissions goals based on "building blocks" • States submit compliance plans for EPA approval using best system of emissions reduction…adequately demonstrated • States may submit multi-state plans • States have choice of mass (total lbs.) or rate (lbs./MWh) emissions limits • Use of "building blocks" not required	• Whether EPA has authority to regulate CO_2, under section 111(d) of the Clean Air Act • Whether EPA can extend obligations beyond plant fence line—"by" rather than "at" facility • How existing and under-construction nuclear assets will be treated • What are rule's true costs and feasibility • How to account for efficiency-based emissions reductions (i.e., what would have been) • Whether CPP's level of federal encroachment on state energy policy is permissible • Given approaching interim compliance timeline (beginning 2020), whether plan can be delayed pending legal challenges to the proposed rule

COMPLIANCE "BUILDING BLOCKS" WERE USED TO SET STATE TARGETS. WHILE NOT REQUIRED TO BE USED BY STATES, THESE "BUILDING BLOCKS" ARE CONTROVERSIAL.

EPA Proposed "Building Blocks" for Compliance

BUILDING BLOCK 1

Heat rate improvement at existing coal-fired generating units
- Assumed 6%

BUILDING BLOCK 2

CO_2 reduction from increased generation at NGCC facilities (vs. coal-fired)**
- Assumed 70% minimum capacity factor
- New NGCC facilities

BUILDING BLOCK 3

Increase in cleaner generation
- Increased nuclear capacity (new units) or avoided retirements (6% at risk)
- Increased renewables (EPA assumed 13% renewable energy by 2030)

BUILDING BLOCK 4

Increased energy efficiency
- Reduced generation through energy efficiency improvements (EPA assumed 1.5% annual savings)

NOTES:
*CPP means the EPA's proposed Clean Power Plan. **NGCC means natural gas combined cycle generating unit.
SOURCES:
SNL Financial; NARUC; RTI International; U.S. EPA

A GROWING FOCUS ON POTENTIAL RELIABILITY IMPACTS OF THE CLEAN POWER PLAN.

RELIABILITY CONCERNS EMERGE

- Combined with MATS*, CPP** could prompt retirement of 10% to 20% of all U.S. generation (1/3 to 2/3 of coal)
- An initial NERC reliability review found that coal retirements may accelerate a reserve margin decline while compliance schedules may not provide sufficient time for transmission planning; NERC recommended more detailed analysis

RTOs AND ISOs ARE STUDYING POTENTIAL IMPACTS

- SPP notes risk of cascading outages as 9 GW of coal and gas retire (vs. 3 GW without rule)
- ERCOT estimates 3.3 GW to 8.7 GW of coal retirements, possible reliability issues near urban centers, and up to 20% increase in energy costs
- PJM finds high levels of renewable and efficiency could reduce retirements as low CO_2 prices allow plants to operate economically for more hours

RELIABILITY SAFETY VALVE IS PROPOSED AS A SOLUTION

- ISOs and RTOs are calling for (i) a reliability safety valve, designed to provide compliance relief, when necessary, to preserve grid reliability and (ii) a reliability study once state plans are filed
- NERC notes a possible model is the one-year compliance extension from MATS deadlines to avoid retirement-related reliability issues
- To date, however, FERC and EPA have had limited formal collaboration regarding reliability

Key Dates in 2015-2016

START OF 2015

Feb.-Mar. 2015: FERC will hold technical conferences on impacts on reliability, infrastructure needs, and markets

Mar. 2015: Final briefs are due in two legal challenges to the proposed rule; both cases will be heard on same date by the same panel***

Mid-summer 2015: EPA will release final CO_2 rules for existing, new, and modified power plants

Early fall 2015: Legal challenges must be filed within 60 days of publication in the *Federal Register*

END OF YEAR 2015

June 2016: State initial compliance plans due and federal implementation plan expected

JUNE 2016

No Shortage of Opinions:
EPA received more than two million comments by its Dec. 1 deadline

EPA's proposed regulations are unlawful at the most fundamental level....[T]he Administration has decided to bypass Congress in implementing far-reaching Executive Branch energy and environmental policy goals.

–National Mining Association

While EPA has made much of the supposed flexibility its 'building blocks' approach would provide, it in fact provides no flexibility for Texas as each of these blocks is likely unachievable, particularly in the timeframes required...

–Public Utilities Commission of Texas

EPA should require full compliance by 2025 because the vast majority of emission reductions can be achieved early on in the compliance period.

–Sierra Club

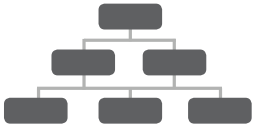
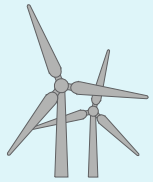
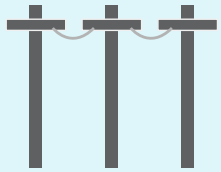
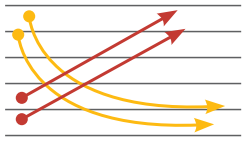
NOTES:
*MATS is EPA's Mercury and Air Toxics Standard. **CPP means EPA's Clean Power Plan. ***Current legal challenges include *Murray Energy Corp. v. EPA* (14-1112) and *West Virginia v. EPA* (14-1146) in the U.S. Court of Appeals for the D.C. Circuit.
SOURCES:
U.S. Gov't Accountability Office; EPA; FERC; NERC; ERCOT; PJM; SPP; *RTO Insider*; SNL Financial; *The Wall Street Journal*; ScottMadden analysis

The ScottMadden Energy Industry Update

MANAGING THE UTILITY ENTERPRISE

EVOLVING UTILITY BUSINESS MODELS:
DIFFERING REGULATORY AND INCENTIVE CONSTRUCTS MATTER

UTILITY BUSINESS MODEL EVOLUTIONS WILL BE GOVERNED BY REGULATORY AND MARKET ENVIRONMENTS—AND IT IS STRIKING HOW DIFFERENT THESE ENVIRONMENTS ARE BECOMING

		What It Is	Some Examples (States)
Central Planning		Regulators establish comprehensive regulatory framework and compact that defines utility roles, responsibilities, and financial incentives and penalties	• Utilities as platforms for technology (NY) • Demonstration projects (NY) • Fundamental redesign of ratemaking process (NY) • Distribution-level demand response programs (NY) • Community choice aggregation (NY)
Technology-Rich		Legal or regulatory requirements are established that put a "finger on the scale" for certain technologies	• Aggressive renewable portfolio standards (CA) • Solar carve-out in RPS (MN, NJ) • Smart grid requirement (CA) • Storage requirement (CA)
Incentive Subsidies		Special tariff or other subsidies (including tax credits) are established to encourage certain types of resources or utility behaviors	• Value of solar tariff (MN, TN) • Tariff for customer-sited generation (CA) • Applicable retail rates for solar gardens (MN) • Federal subsidies (tax and other)/loan guarantees • Net metering (various) • Voluntary RPS cost recovery, increased rate of return (VA)
Infrastructure Incentives		Programs and mechanisms to promote development of certain kinds of energy infrastructure are established	• Energy-tech venture fund (IL, NY) • Performance-based formula rates (IL) • Special (IL) or accelerated (MA) infrastructure cost recovery programs • Grants for projects to increase resiliency (MD) • Electric vehicles (CA, WA, et al.)
Market-Based		Market and competitive forces are relied upon to allocate resources, select technologies, and compensate market participants	• Highly market-driven environment (TX, GA) • Few permitting requirements (TX) • Minimal subsidies and mandates (TX, GA) • Direct access/retail choice for industrial customers (TX) • Time-varying rates (MA)

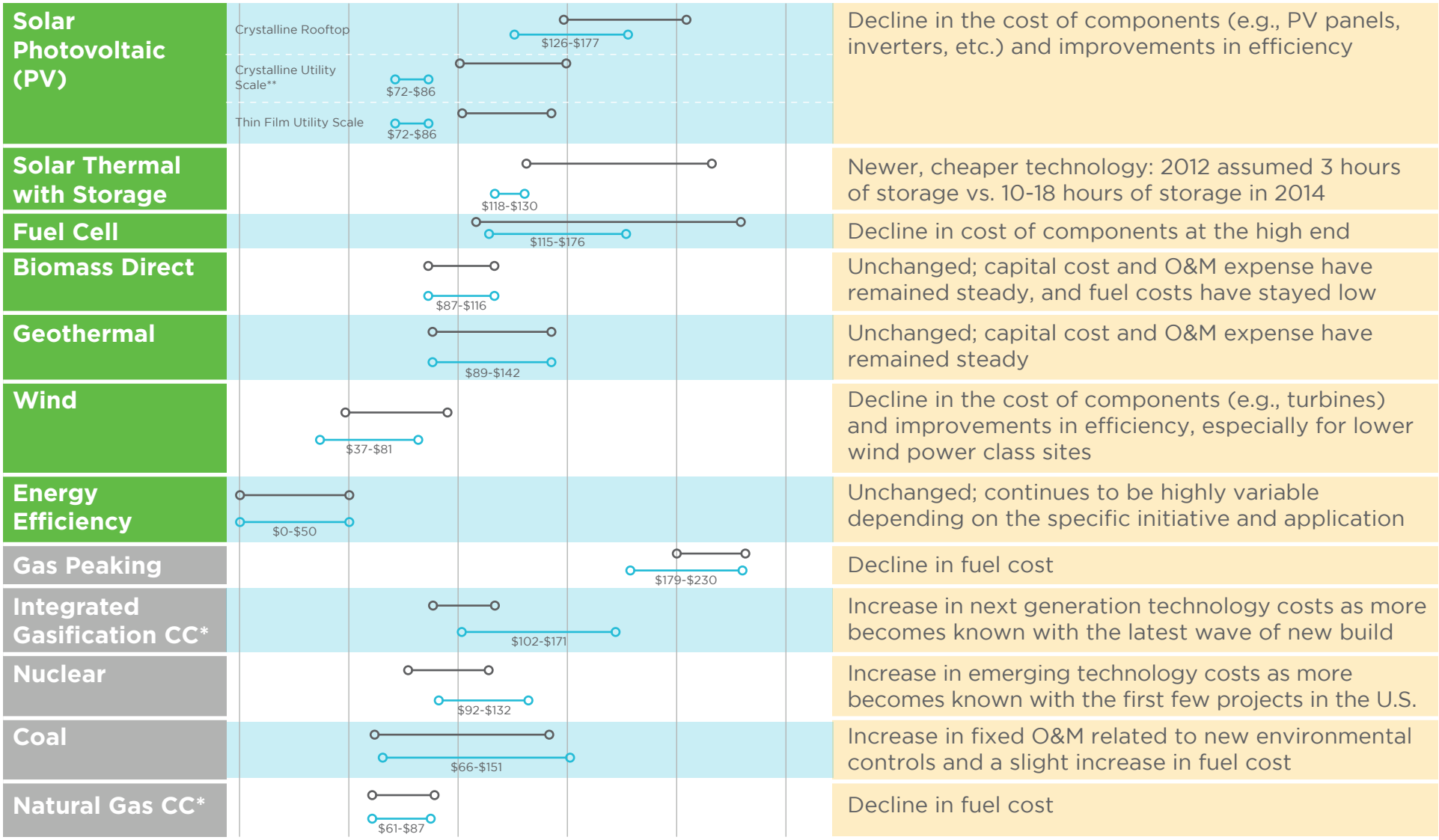
LEVELIZED COST OF ENERGY:
THE TRENDS, THE DEBATE, AND THE OUTCOME

THE ELECTRIC INDUSTRY CONTINUES TO LOOK AT HOW VARIOUS GENERATION TECHNOLOGIES STACK UP ON AN UNSUBSIDIZED COST BASIS

Legend and Notes

- 2012 Estimates
- 2014 Estimates
- Alternative Energy
- Conventional

* Combined cycle
**Commercial and industrial customers only (2014)



Decline in the cost of components (e.g., PV panels, inverters, etc.) and improvements in efficiency

Newer, cheaper technology: 2012 assumed 3 hours of storage vs. 10-18 hours of storage in 2014

Decline in cost of components at the high end

Unchanged; capital cost and O&M expense have remained steady, and fuel costs have stayed low

Unchanged; capital cost and O&M expense have remained steady

Decline in the cost of components (e.g., turbines) and improvements in efficiency, especially for lower wind power class sites

Unchanged; continues to be highly variable depending on the specific initiative and application

Decline in fuel cost

Increase in next generation technology costs as more becomes known with the latest wave of new build

Increase in emerging technology costs as more becomes known with the first few projects in the U.S.

Increase in fixed O&M related to new environmental controls and a slight increase in fuel cost

Decline in fuel cost

SOURCE: Lazard

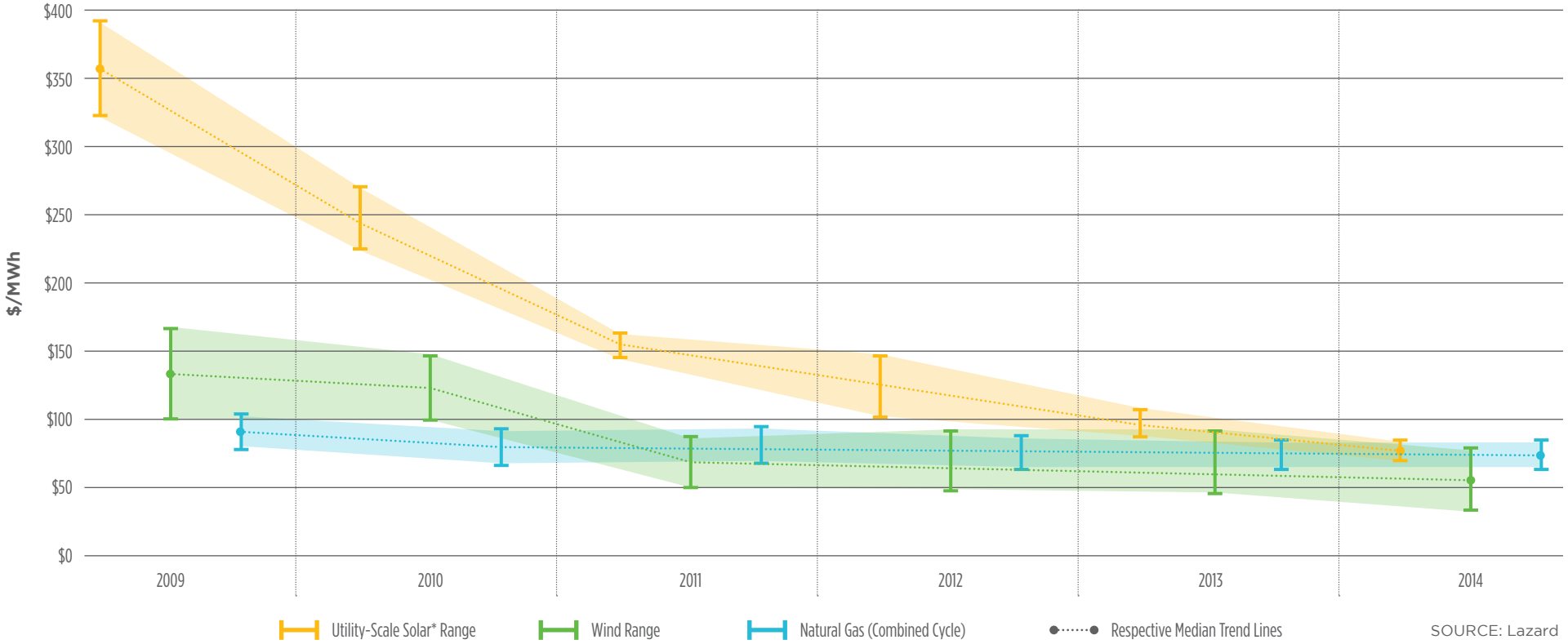
A BROOKINGS INSTITUTION WHITE PAPER HAS LED TO A SPIRITED DISCUSSION OF WHETHER LEVELIZED COSTS CAPTURE "TRUE" ENERGY COSTS AND CAPACITY AND OTHER BENEFITS PROVIDED WHEN INTERMITTENCY IS FACTORED IN.

	Point	Counterpoint
Themes	**Intermittency Matters (Frank)**	**Intermittency Effects Are Overstated (Lovins)**
Levelized Cost Analysis is Flawed	• Levelized cost analysis does not account for the time-varying benefits and varying capacity factors • Resources should be evaluated by the net benefits they provide and resources they displace, especially baseload • Nuclear and gas NGCC* benefits are undervalued for CO_2 reductions	• Counting time-of-day value and grid-integration costs yields the same result as levelized cost: grid integration costs are small, and solar is cheap enough to beat gas-fired plants • Renewables' intermittency effects will be manageable even with increased penetration: variability ≠ unpredictability
Storage is Essential for Renewable Integration	• Solar PV and wind cannot contribute reliable supply without bulk electricity storage and impose balancing and cycling costs on the system	• Load can be made smaller and less "peaky" with increased asset efficiency • Bulk electricity storage and fossil-fuel backup are the costliest sources of grid flexibility
New Natural Gas-Fired CCs (NGCCs) Can Replace Baseload Coal Generation	• New, highly efficient units would rank higher in the merit order vs. existing NGCCs: do not use historical capacity factors • NGCC benefits are highest due to low capacity and energy costs • A CO_2 emissions price would result in NGCCs swapping places with coal in the stack	• 92% capacity factor for NGCCs is unreasonable: historical capacity factors have been 45%-50% • NGCC dispatch is less economical where gas prices are higher, displaceable coal generation is overstated, and improvements in efficiency are driving down overall demand
Wind and Solar Are Costly and Unreliable	• Wind and solar, even with zero fuel costs and more recent cost improvements, have lowest avoided energy and capacity costs due to high capital costs and low capacity factors	• Cost and performance of wind and solar, including balance of system solar costs, have improved dramatically in recent years • Operating lives for wind and solar are longer than assumed
Nuclear Generation is Undervalued	• Nuclear net benefits are among highest: high capital costs offset by avoided carbon, energy, and capacity costs, low energy costs, and high capacity factors	• Nuclear costs, including capital, fixed O&M, and decommissioning costs, are dramatically understated • Avoided capacity cost is moot – the U.S. is long on generation

NOTES:
*Natural gas combined cycle generating unit.
Analysis excludes integration costs for intermittent technologies. A variety of studies suggest integration costs ranging from $2.00 to $10.00 per MWh per Lazard. Unless otherwise indicated, analysis assumes 60% debt at 8% interest rate and 40% equity at 12% cost for conventional and alternative energy generation technologies. Assumes Powder River Basin coal price of $1.99 per MMBtu and natural gas price of $4.50 per MMBtu. Analysis does not reflect potential impact of recent draft rule to regulate carbon emissions under Section 111(d).
SOURCES:
Brookings Institution, Alternative Energies Debate; ScottMadden analysis

UNSUBSIDIZED LEVELIZED COST OF ENERGY FOR SOLAR AND WIND HAS FALLEN SIGNIFICANTLY AND NOW RIVALS THAT OF NATURAL GAS COMBINED CYCLE UNITS.

Ranges of Unsubsidized Levelized Cost of Energy (2009-2014): Natural Gas (Combined Cycle), Utility-Scale Solar*, and Wind



RENEWABLES SHOW COST IMPROVEMENT

- Historically, economics (i.e., least cost) was the primary point of debate regarding renewables; integration (i.e., reliability effects) has largely been in the background as penetration levels remained small
- Declining costs (see above) are expected to continue to encourage more renewable resource expansion
- Going forward, one might expect the economics debate to move from the cost of energy to the full cost including integration costs
- The point/counterpoint on intermittency (see previous page) offers a preview of the industry dialogue we expect to see in the future

NOTES:
*Utility-scale solar PV assumes high insolation jurisdiction (e.g., southwest U.S.); low end represents the average costs of single-axis tracking (the most efficient utility-scale solar); high end represents the average costs of fixed-tilt installation (the least efficient utility-scale solar).
SOURCES:
Lazard; ScottMadden analysis

RECENT INSIGHTS:
AVAILABLE AT SCOTTMADDEN.COM

ScottMadden posts energy and utility industry-relevant content and publications on a regular basis. The list below is a sample of recent insights prepared by our consultants.

To view these and other insights, please visit **http://www.scottmadden.com/page/81/insight.html**.

Utility Strategy	***Consultant: Utilities Should Avoid 'Victim Mentality' and Lead on DG***
Fossil Generation	***Coal's Twilight Gets Expensive***
Nuclear Generation	***Bruce Power: Improving Nuclear Power's Emergency Response*** ***NRC Finalizes Spent Nuclear Fuel Storage Rule***
Rates and Regulation	***The Evolution of Demand Response: PJM Proposes Alternative to FERC Order No. 745*** ***Creativity in Rate Design as an Enabler for Expanded Distributed Resources*** ***Setback for Demand Response in Organized Markets*** ***Rate Freezes: Historical Context and their Prevalence Today***
Natural Gas	***ScottMadden's Operating Model Assessment*** ***Kinder Morgan Inc. Abandons Master Limited Partnership Structure in Consolidation of Three Subsidiaries*** ***Proposed LNG Export Policy Changes and H.R. 6***
Clean Tech and Sustainability	***Overview of Utility Challenges and Responses to Distributed Solar Energy*** ***How Renewables and Distributed Resources Have Impacted Transmission in Germany*** ***Hawaii's Updated Integrated Resource Plan includes Robust Renewables and LNG*** ***Renewables Becoming Cost Competitive; Other Challenges Remain*** ***Germany's Energiewende***
Organizational Management	***Capital Program Assessment Overview*** ***Downsizing: Fairly, Legally, Ethically, and Respectfully***

ENERGY PRACTICE:
SCOTTMADDEN KNOWS ENERGY.

Since 1983, we have been energy consultants. We have served more than 300 clients, including 20 of the top 20 energy utilities. We have performed more than 2,400 projects across every energy utility business unit and every function. We have helped our clients develop strategies, improve operations, reorganize companies, and implement initiatives. Our broad and deep energy utility expertise is not theoretical—it is experience based.

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.

Our clients trust us with their most important challenges. They know that, chances are, we have seen and solved a problem similar to theirs. They know we will do what we say we will do, with integrity and tenacity, and we will produce real results.

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

For more information about our Energy Practice, contact Stuart Pearman.

RESEARCH

ScottMadden Research provides clients with valuable insight on developments, trends, and practices in energy and sustainability. Through its semi-annual ScottMadden Energy Industry Update and other publications, our research team helps clients discern and analyze critical issues and inform their business decisions.

We also provide customized, project-based research and analytical support on matters of interest to our clients.

For more information about our research capabilities or content, see the Insight section of our web site or contact us.

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