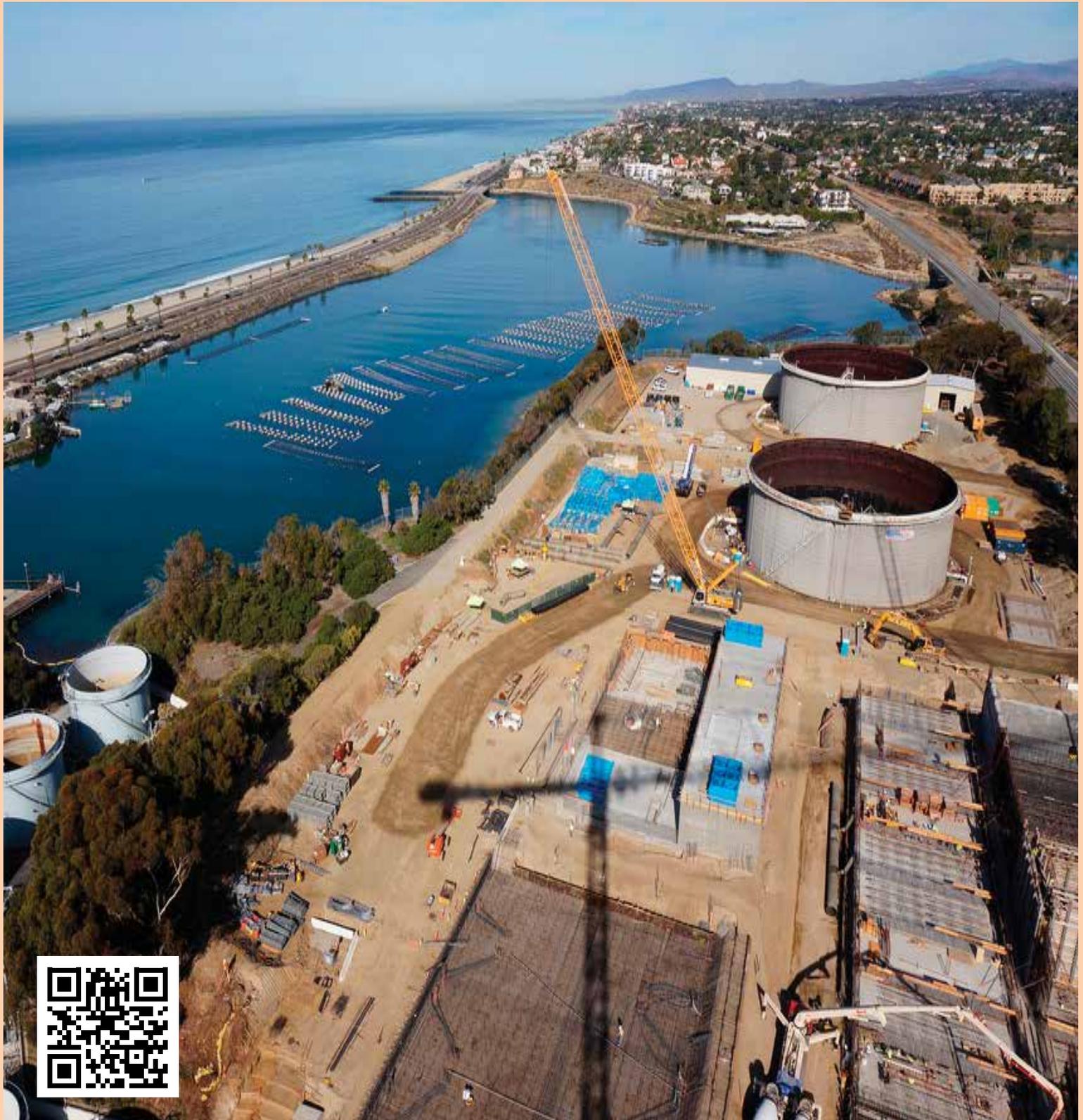


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Desalination Plant, Carlsbad, CA

Photo: Courtesy of Poseidon Water

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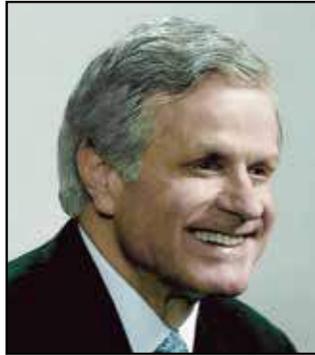


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Dick Flanagan

The cover photo pictures the largest US desalination plant being built in California. Lyn Corum reports on page 5 that when the plant is completed later this year, 50 million gallons per day of drinking water will be produced for San Diego residents.

Jaime Foose said on page 7 that cyber threats targeted to the power generation industry are growing in both frequency and complexity. Emerson's Security Solutions group expanded its cybersecurity portfolio to include cybersecurity assessments, scheduled cybersecurity services and security program and compliance services.

Marvin Fertel asserts on page 9 that nuclear units performed admirably, on average running at capacity factors in the mid-90 percent range during Polar Vortex. There are 69 nuclear reactors under construction globally and 183 new nuclear projects in advanced planning stages.

Tom Kuhn, EEI's president, said on page 11 that innovation is powering change across the electric power industry. EEI's members are transitioning to a low carbon and digital future, integrating renewables and enhancing the electric power grid.

Elliot Roseman and his team at ICF International explore two forces moving electric transmission in new directions on page 13. They look at who will build new high-voltage transmission facilities and the impact of proposed regulatory policies.

Eli Katz and Michael Masri at Chadbourne & Parke explain how yieldcos are reshaping the tax equity market. They project on page 15 that yieldcos are a prime customer for tax equity investors and will likely continue to grow in importance in the future.

Tom Kiernan writes on page 17, AWEA'S Annual Market Report, that in 2014 the wind industry rebounded with a record amount of wind under construction. He added that wind energy generation reduced water consumption at existing power plants by approximately 68 billion gallons of water.

Marlene Motyka and Brian Boufarah of DeLoitte view renewable power becoming a mainstream source as opposed to an alternative one on page 19. M&A activity in renewable power increased with 37 percent more capacity involved in deals over 2013.

Raj Prabhu, CEO of Mercom Capital Group released the Mercom report on funding and M&A activity for the Smart Grid, Battery Storage and Energy Efficiency sectors for Q1-2015. All three sectors showed increases in VC funding deals on page 21.

Michael Herzig of Locus Energy highlights SolarNOC allowing asset managers to analyze performance data from a diverse set of solar PV assets. The solar industry will need increased access to real-time intelligence to improve O&M workflow, he offers on page 22.

Claes Fornell of ACSI measures utilities for customer satisfaction. The three utility groups are ranked and listed with scores on page 23.

Our new editorial department, "Back on Campus," for alums from the Classes of 2000 has updates on page 25.

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TWO CHALLENGES: DROUGHT & RENEWABLES

BY LYN CORUM, CLASS OF 2003



The largest desalination plant in the US, once it is completed in Carlsbad California, to be followed soon by a similar desalination plant in Huntington Beach, will be selling drinking water to parched Southern Californians. Each will produce 50 million gallons/day of desalinated water.

Both plants, located on the Pacific Coast, will require large amounts of power around the clock to desalinate ocean water using the latest pressure vessels and reverse osmosis technologies.

At the same time, state energy agencies are studying what the profusion of renewable resources coming into the grid will do for reliability and grid stability. The California Independent System Operator, as manager of 70% of California's transmission system, is analyzing how to integrate into that system the intermittent solar and wind resources that will make up 30% of the state's total electricity supply by 2020, and 50% by 2030.

Cal-ISO has produced "The Duck Chart" to illustrate what the diverse energy supply will produce in terms of net generation in the years leading up to 2020.

As more renewable resources, primarily wind and solar, are added to the grid, an over-abundance of generation will occur in early mornings and mid-afternoons when

users are away from home and appliances are turned off. This will produce spot market prices of zero or negative dollars during those periods.

A few forward-thinking people are now asking, "Why can't the over-generation of renewables be used to power desalination plants, reduce their power costs, and solve both problems." It may be too late to consider this solution for the plant under construction. But perhaps for the Huntington Beach plant being planned?

Due to the structure of our distribution and transmission systems and the traditional utility system, the renewable resources and the plants need to be next to each other. In the case of the Carlsberg desalination plant, SDG&E will provide the power and absorb the no-cost renewable resources for its rate payers.

TWO DESALINATION PLANTS EMERGE IN SOUTHERN CALIFORNIA

First, let's look at the two desalination plants coming to the California drought's rescue. The Carlsbad Desalination Plant, located north of San Diego and projected to start operating later this year, represents a \$1 billion investment that will infuse \$350 million into the local economy.

Poseidon Water, the owner/developer has signed a 30-year water agreement with San Diego County Water Authority for which it will produce 50 million gallons/day of drinking water for San Diego area residents – the area at the end of the state's water pipeline and most threatened by shrinking water resources. This will provide San Diego County with approximately 8% of its total water supply by 2020. The water will be expensive and will add about \$5.00 to San Diego residents' water bills.

Poseidon Water has also signed a 60-year lease on the project site it shares with the Encina Power Station owned by NRG West which intends to build the 632-MW Carlsbad Energy Center that will

replace the Encina plant. The Carlsberg Energy Center, in the latter stages of the licensing process at the California Energy Commission, will be a flexible fast-start simple-cycle facility.

The Huntington Beach Desalination Plant is still in the planning stage, but it promises to supply Orange County also with 50 million gallons of drinking water/day. It will be located on the property adjacent to the AES Generating Station in Huntington Beach. That generating station will also be replaced by the 939-MW Huntington Beach Energy Project which was approved for licensing by the CEC in October 2014.

The Orange County Water District Board of Directors released a draft term paper in March agreeing to buy Huntington Beach's desalinated drinking water from Poseidon and will decide in mid-May on a framework for the agreement with the company. Presumably, Southern California Edison would supply power to the proposed plant, but there has been no public announcement confirming that.

According to Poseidon Water, recent improvements in desalination technology have resulted in reducing energy consumption from 50% of the cost of plant operations to 25% of operating costs, with the utilization of pressure exchanger devices made by Energy Recovery Inc. of San Leandro California. Still, the plant will use 31.3 MW to operate the desalination technology.

The energy savings will also reduce carbon dioxide emissions by 41,000 metric tons/year, roughly the amount of greenhouse gas emissions 8,542 passenger vehicles would produce, again according to Poseidon Water.

Kiewit Shea is building the Carlsbad plant under a fully-wrapped, turn-key fixed price date-certain EPC contract including a 10-mile pipeline to connect the plant to San Diego County Water Authority's existing distribution network.

IDE Technologies, headquartered in Israel, will operate the Carlsbad plant. IDE selected Protec Arisawa and Dow Water & Process Solutions to provide the pressure vessels and reverse osmosis membranes.

(continued page 6)

Protec is considered a global leader in the design and manufacturing of fiber reinforced plastic pressure vessels for membrane filtration systems. It has sales offices in Vista, California, Tokyo and Munguia, Spain. Dow's reverse osmosis membranes will work with the pressure vessels to squeeze out the salts of the Pacific Ocean seawater. This portion of its business is located in Edina, Minnesota and in Saudi Arabia.

REDUCE OVERGENERATION WITH DESALINATION?

What is over-generation? As discussed earlier, it occurs when more electricity is supplied than is needed during certain hours of the day. It is not an issue at the moment but it will grow as more intermittent renewable resources, such as wind and solar, come online to meet the state requirements for 30% renewables by 2020 and 50% renewables by 2030.

Cal-ISO has demonstrated its challenge with its Duck Chart. In the morning when everyone is getting ready for work electricity usage ramps up, then dips

and ramps up again in the late afternoon when electricity users arrive home and turn on appliances. In the chart, the belly of the duck gets deeper in the afternoons as more renewables come online in the years leading up to 2020 reflecting the difference between over-generation and lack of demand.

Cal-ISO's job is to use flexible generation resources that can meet short, steep ramps. But until technology is developed to ramp wind and solar up and down, gas-fired plants must do that job.

The Independent Energy Producers Association has come up with an intriguing idea in the brief it contributed to the CEC's 2015 Independent Energy Policy Report docket in April. IEP suggested that repurposing clean energy into other sectors of the economy will allow for expansion while displacing direct petroleum use (with clean alternative fuels) and creating new sources of local water.

In particular, IEP argued that renewable energy could be considered as a critical power source for expanding California's water supply infrastructure in the form of desalination plants. It

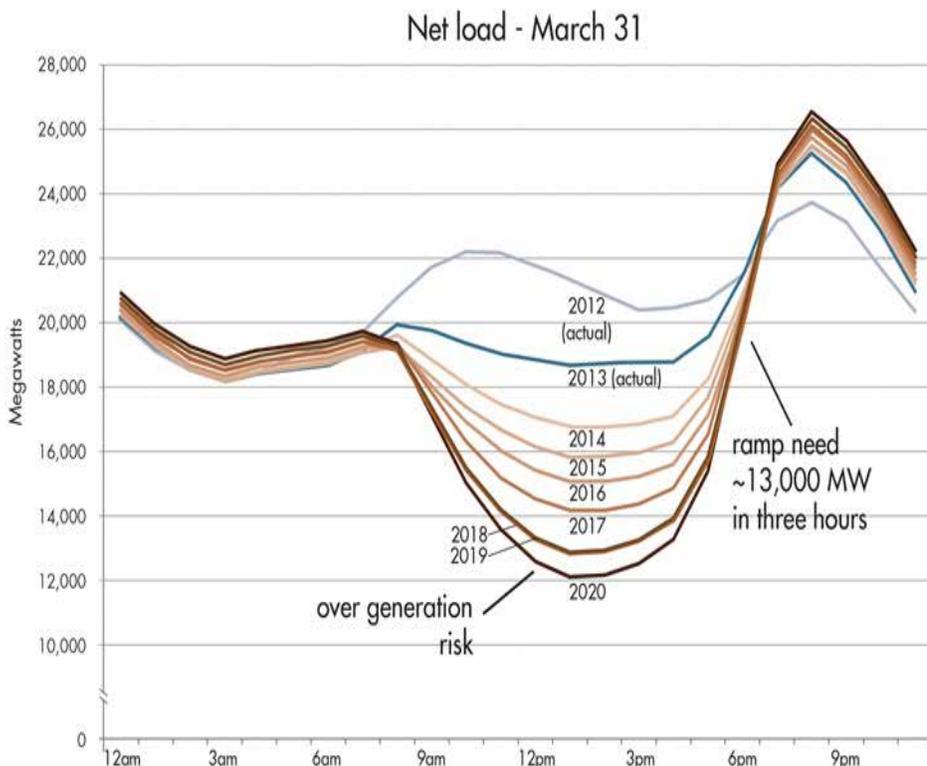
suggested that 15 desalination plants would absorb over 30% of the over-generation forecast to occur by 2030 under the 50% renewable requirement. These plants would supply additional water to meet 12% of the state's current public water demand and meet 3% of current irrigation needs.

However, this intriguing suggestion is not on the radar of either SDG&E or Cal-ISO. SDG&E will be adding the Carlsbad desalination plant as a customer and would not be able to separate out the wind and solar generation being supplied to its grid in order to direct it to the desalination plant. Furthermore, Cal-ISO has control of the state's grids and manages the power on a macro level.

To implement IEP's idea would require siting renewable resources near or adjacent to the desalination plants which would require being close to salty or brackish water sources. Perhaps off-shore wind projects, such as those being developed off the east coast, could be built along the California coast near the Carlsbad desalination plant now under construction and the Huntington Beach plant being planned.

In its 2007 environmental impact statement, Poseidon contemplated installing a solar system on the roof of Carlsbad's main desalination plant building which would generate approximately 777 MWh/year, about 0.3% of the plant's projected annual electrical need of 274,400 MWh/year. There is currently no mention of a plan to install such a solar system.

Santa Barbara is brushing off and updating the desalination plant it built during the last drought and promptly shut down when the rains came. Other cities along the California coast have contemplated building desalination plants but dropped the plans after analyzing the large costs to develop them. Perhaps if the drought persists for a few more years, new interest will emerge and developers will venture to propose partnerships for off-shore wind projects near the planned sites for desalination projects. It is a provoking thought.



OPERATING PLANTS SECURELY IN A “NEW NORMAL” ENVIRONMENT

BY JAIME FOOSE



*Manager, Security Systems
Emerson Process Management*

Call it the “new normal.” Cyber threats targeted to the power generation industry are growing in both frequency and complexity. Meanwhile, cybersecurity compliance obligations continue to evolve.

In this environment, there is increased urgency for utilities to secure their systems, establish security programs and comply with regulations. This can be daunting, as power plant staffing is often lean, with personnel facing many demands on their time. More and more, utilities are turning to control system suppliers for help.

With a staff that offers a rare combination of necessary skills, a blend of cybersecurity, control system and power industry experience, control system suppliers are uniquely qualified to help utilities identify areas of risk related to automation and control within their plants. While Emerson has always worked closely with customers on security matters, the company’s Security Solutions group recently expanded its cybersecurity services portfolio, offering a best practices approach for helping power generators achieve a strong security posture. The portfolio includes: cybersecurity assessments, scheduled cybersecurity services, and security program & compliance services.

CYBERSECURITY ASSESSMENTS

Cybersecurity assessments are designed to assist power generators in identifying their cyber assets, assessing vulnerabilities, and providing recommendations to mitigate cybersecurity risks through the deployment of appropriate security controls and safeguards. The cybersecurity assessment service includes:

- Initial site walk down to identify targeted systems and key deliverables
- Detailed assessment plan
- Plant-wide cyber asset inventory and audit
- Network mapping of targeted systems
- Host-based vulnerability assessment with port, protocol, service and system scanning
- Network security analysis
- Risk mitigation analysis, review and reporting
- Mitigation and remediation recommendations

Assessments are recommended annually to evaluate and track continuous improvement of an organization’s security posture.

SCHEDULED CYBERSECURITY SERVICES

Patch management, antivirus protection, and backup and recovery initiatives are often at the core of an organization’s security program. Industry best practices suggest deploying patches monthly, updating antivirus definitions weekly, and performing frequent backups. Unfortunately, the work required to complete these updates adds to the workload of plant staff.

Scheduled cybersecurity services include regularly scheduled visits to customer sites to deploy patches; update and install antivirus definitions; and generate, verify, and archive backups – all without diverting essential manpower from other

important assignments. This service can also be customized to include other cybersecurity or preventive maintenance tasks that require regular attention, such as review of overall health and diagnostics for key control system components including servers, workstations, controllers and network equipment.

SECURITY PROGRAM & COMPLIANCE SERVICES

They say the devil is in the details, and that is certainly true for security programs and compliance – particularly in light of the ongoing evolution of the North American Electric Reliability Corporation’s (NERC) Critical Infrastructure Protection (CIP) standards. This service area is focused on helping utilities evaluate, develop and implement security and compliance programs that meet compliance obligations while also following power industry best practices. This is an important distinction, as an established best practice followed in the financial or IT industry is not necessarily a best practice for the power-generation industry, and may in fact be detrimental. For example, in many office environments it is considered an IT best practice to lock users out of their workstations after a defined period of inactivity. However, this could have serious consequences in a control room, particularly if the operator forgets the password and cannot log back in. This is a good illustration of why common sense and power industry best practices should prevail.

Tasks related to security programs may include:

- * Identifying compliance gaps
- * Gathering evidence and supporting documentation required for compliance audits
- * Developing and revising security processes & procedures as needed
- * Conducting cybersecurity awareness training

NO SINGLE SOLUTION

Just as no two power plants are

(continued page 8)

OPERATING PLANTS SECURELY CONTINUED FROM PAGE 7

identical, there is no single solution for addressing evolving cybersecurity threats. As such, cybersecurity services should be customized to fit within the framework of an organization's existing programs and initiatives whether they are at a single location or across an entire fleet.

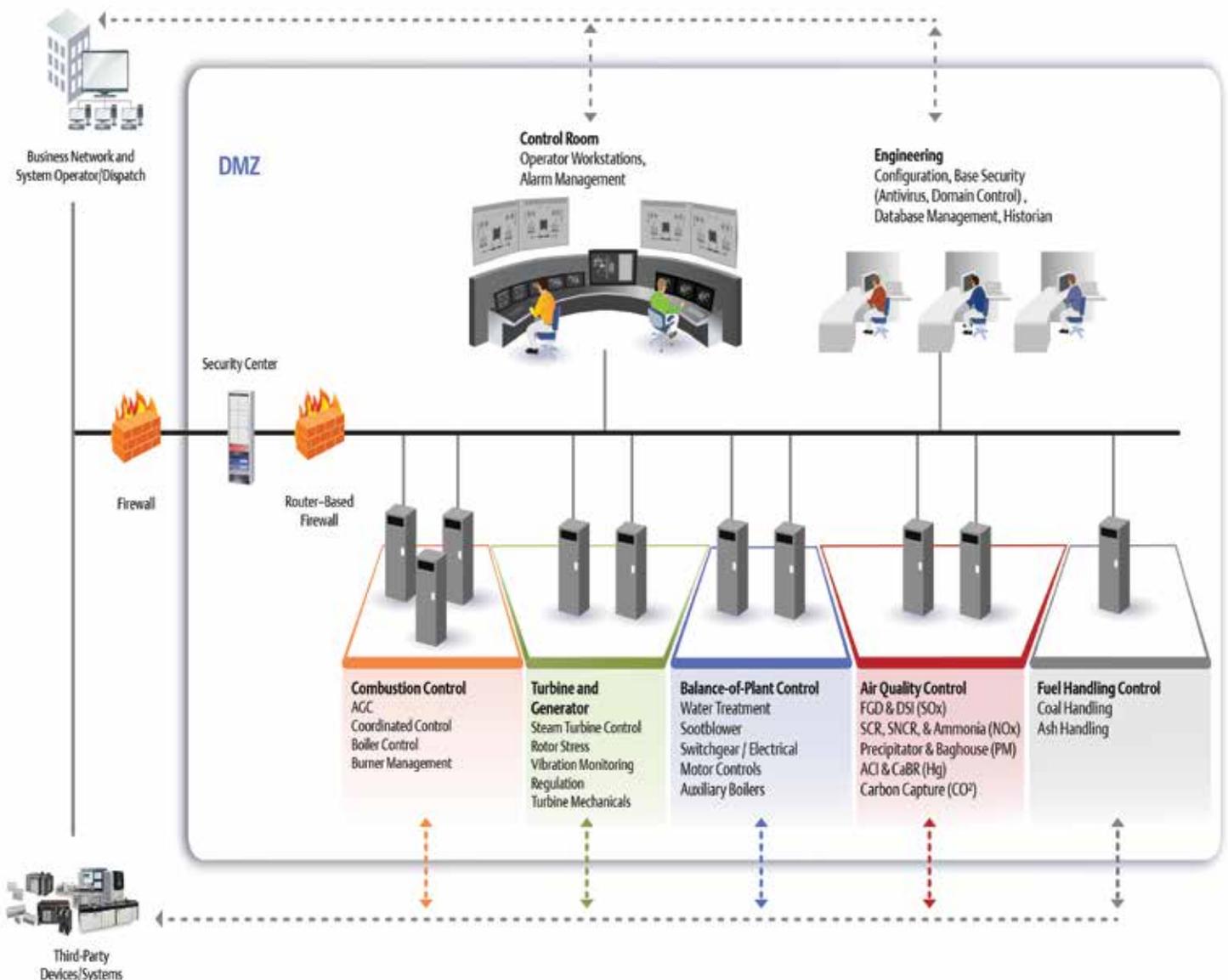
For certain, the power industry will continue to face increasing cybersecurity threats, as well as evolving compliance obligations. In the face of these pressures, it is prudent to develop security programs based

on compliance obligations and security best practices. This is the best approach to ensure systems are truly secure, organizations are compliance-ready and reliable megawatt production is maintained.

JAIME FOOSE

Jaime Foose is the manager of the Security Solutions group at Emerson Process Management Power & Water Solutions. This group is focused on ensuring a strong security posture and supporting clients needs as they meet the challenges of NERC CIP compliance and cybersecu-

urity in general. She has 14 years of extensive and varied experience in program and project management, project execution and software development, including work in the areas of cybersecurity/NERC CIP, digital bus technologies, SCADA, Ethernet and serial communication interfaces for power applications. Jaime holds a Bachelor of Science degree in computer science from University of Pittsburgh, as well as a Master of Science degree in information technology and project management and a Master of Business Administration degree, both from Robert Morris University.



NUCLEAR ENERGY EXPANDS

BY MARVIN FERTEL, CLASS OF 2012



*President and CEO
Nuclear Energy Institute (NEI)*

Last year we lost the Kewaunee nuclear plant in Wisconsin to adverse market conditions. We knew the Vermont Yankee plant would close at the end of 2014 for the same reasons. We also knew that other nuclear generating assets in Illinois and in other competitive markets are at risk.

The electricity markets have changed significantly since they were restructured. Grid operators today must balance a dynamic and complex set of circumstances: low gas prices, which result in reduced energy market revenues; slow (or, in some regions, zero) growth in electricity demand; state policies that mandate production from certain sources of electricity; growing reliance on renewable and intermittent resources, which creates operational challenges; growing reliance on out-of-market revenues; and greater reliance on demand resources, which represent a challenge to the definition of the capacity product.

This combination of factors has led to sustained economic stress on some existing generating capacity, particularly baseload capacity. At a time when the surplus of generating capacity in the eastern United States is decreasing, as existing capacity retires, effective and efficient market design and operating practices in the capacity and energy markets are more critical than ever.

First, there was nothing wrong with any of the plants at risk. Kewaunee, Vermont Yankee and others at risk were all solid performers – all of them highly reliable plants with high capacity factors and relatively low generating costs. When Vermont Yankee closed last month, it had just completed a 633-day continuous run.

Second, it made no economic sense to allow these facilities to close because replacement generating capacity, when needed, would likely produce more costly electricity, fewer jobs paying less, and more pollution.

Third, goods and services will only be produced in a competitive market when they are priced and valued in the market. This is straightforward, practical economics.

We are accustomed to thinking of electricity as an undifferentiated bulk commodity. That is a mistake. Every kilowatt-hour of electricity on the grid has a unique pedigree or set of attributes, and all resources are not equal. Demand resources that can be called only on limited occasions for short periods of time do not have the same reliability or resource value as a generating plant. And all generating capacity is not the same. Each source of electricity has its own set of attributes that provide varying degrees of value to the grid, and those attributes must be reflected in the total compensation provided to each generator.

Nuclear generating capacity has its own set of attributes, starting with production of large quantities of electricity around the clock, safely and reliably. Nuclear power plants have fuel on site and will run when needed. They also provide price stability, and portfolio value, and clean air compliance value. All these attributes are valuable. Many are not paid for.

Fourth, and finally, sustainable market design demands consideration of all the factors that constitute a robust and resilient market. Among other things, those factors include short-term price, long-term price stability, the value of fuel and technology

diversity, environmental factors and others. Short-run cost is an important and necessary metric, but solving this complex equation for that one variable only – lowest possible short-run electricity price – will not produce a reliable, resilient and affordable system for the long-term.

POLAR VORTEX

Although we know the Nuclear Matters campaign and our other advocacy programs have had an impact, two other events last year had as much – if not more – impact on the policy-making process. One was the succession of five periods of extreme cold in January, February and March that we refer to collectively as the Polar Vortex. The other was the proposal by the Obama Administration's Environmental Protection Agency to reduce carbon emissions from operating coal-fired power plants under section 111(d) of the Clean Air Act.

Both focused attention squarely on the value of our nuclear power plants. One served as a reminder that assured fuel on site – or, in our case, 12 to 24 months of fuel in the reactor core – is a valuable attribute, and that the nuclear plants run when needed, whether or not the wind is blowing, or the sun shining, whether or not fuel arrives just in time through a pipeline.

EPA's proposed 111(d) rule shone a bright light on the fact that nuclear energy is our largest carbon-free source of electricity, and that any credible program to reduce carbon emissions would be seriously compromised if we lose operating plants.

As you know, the Polar Vortex uncovered some significant vulnerabilities in the electric supply system. In PJM, during the extreme cold in early January 2014, a little over 40,000 megawatts – 22 percent of PJM's installed capacity – was forced out of service because coal piles and coal-handling equipment froze, gas wells froze at the wellhead, fuel oil deliveries and barge traffic were interrupted, or gas-fired plants simply could not get natural gas at any price. Almost 10,000 megawatts of gas-fired capacity in PJM could not run for lack of fuel. In MISO, approximately 33,000 megawatts of capacity was forced out of service

(continued page 10)

NUCLEAR ENERGY EXPANDS CONTINUED FROM PAGE 9

and, again, roughly one-quarter of that was gas-fired capacity that could not get gas.

Through it all, the nuclear units performed admirably – on average running at capacity factors in the mid-90 percent range. We expect that from them, of course, and the point here is not that one source of electricity is necessarily better than another. The point is that fuel and technology diversity is the bedrock of a reliable, resilient system, and premature shutdown of nuclear units compromises that portfolio value.

In April, at FERC’s conference on the Polar Vortex, a PJM executive suggested that the RTO might be coming back to FERC with changes to reflect the value of fuel assurance.

According to analysis conducted by PJM for the Illinois Commerce Commission, if Byron, Quad Cities and Clinton retired prematurely, locational marginal prices would likely increase between \$2.70 and \$3.80 per megawatt-hour in the ComEd zone, and between \$0.90 and \$1.50 per megawatt-hour in PJM, depending on the different scenarios and sensitivities analyzed. In addition, load payments would increase between \$307 million and \$437 million in the ComEd zone, and between \$752 million and \$1.3 billion in PJM. That is one year’s impact. Remember that these plants have several decades’ useful life left in them. PJM also confirmed in its analysis that the system would be “unreliable” in 2019 under all retirement scenarios studied, with “significant thermal and voltage violations” that would require “substantial time to correct.”

These impacts generally comport with our own analyses of nuclear power stations at risk. In Illinois, losing all five reactors at risk would eliminate 2,500 direct jobs – those people working at the plants. Total job losses, direct and indirect, in the first year would be 9,000. The direct economic value lost in the first year would be \$2.4 billion. Add to this another \$1.2 billion in indirect economic value in Illinois. That would be the value created in the counties and state from having the plants there, and those losses ripple through time, year upon year.

We have also analyzed the economic impacts of losing other nuclear plants at risk. The Davis-Besse plant in Ohio generated nearly \$500 million in direct economic value in 2014 and total direct and indirect economic value of \$1.1 billion in Ohio. In addition, the facility represents 700 jobs at the station, which creates an additional 4,600 jobs in other industries.

In upstate New York, Ginna produces approximately \$230 million in direct economic value, and total economic value to the state – direct and indirect – of \$365 million. In addition, Ginna provides 700 direct jobs and an additional 800 indirect jobs in the state. This does not include taxes paid to county, state and federal governments. Exelon’s nuclear operations in Illinois generate nearly \$1.1 billion in federal taxes every year, and about \$290 million in state taxes.

EPA PROPOSAL

EPA’s proposal is designed to reduce carbon emissions by 30 percent from 2005 levels by 2030, and that goal simply cannot be achieved without preserving the nuclear power plants that provide approximately 20 percent of America’s electricity, and 63 percent of America’s carbon-free electricity. EPA’s proposal recognizes this fact, and attempts to provide states with an incentive to preserve existing nuclear generating capacity.

TRIPLE CARBON FREE

Nuclear energy provides three times more carbon-free electricity than hydropower and nearly five times more than wind energy. Without nuclear power plants operating in 31 states, carbon emissions from the U.S. electric sector would be approximately 25 percent higher.

For perspective, the five reactors at risk in Illinois, by themselves, produced approximately 40 billion kilowatt-hours of carbon-free electricity in 2013 – four times total U.S. solar electricity production, and roughly one-fourth as much electricity as America’s entire wind generation.

EPA also recognized that maintaining the existing nuclear fleet is a cost-effective

carbon abatement strategy. In its proposed rule, EPA estimated that the cost of keeping “at risk” nuclear plants operating is \$12 to \$17 per metric ton of CO₂ abated – lower than EPA’s estimate that adding renewable capacity costs \$10-\$40 per metric ton of CO₂ abated; increasing natural gas combined cycle power plant utilization rates to 70 percent costs \$30 per metric ton of CO₂ abated; and implementing demand-side management programs costs \$16-\$24 per metric of CO₂ abated. In addition, we believe that power uprates and license renewals should be considered new capacity and count toward compliance, as an incentive to preserve and expand existing nuclear generating capacity.

Nuclear generation in 2014 was 1.2 percent higher than 2013. According to our estimates, the fleet operated at an all-time record capacity factor – 91.9 percent. We have five reactors under construction.

Unit 2 at the Tennessee Valley Authority’s Watts Bar station will be the first to reach commercial operation. Watts Bar 2, an 1100-megawatt reactor, will be TVA’s seventh nuclear plant. TVA halted construction at Watts Bar 2 in 1985, with about \$1.7 billion invested and the plant about 80 percent complete.

TVA estimates Watts Bar 2 will be completed between September 2015 and June 2016, with a most likely completion date of December 2015, at an expected cost between \$4 billion and \$4.5 billion.

TVA’s nuclear ambitions extend beyond Watts Bar 2. The company also plans to apply to the NRC for an early site permit – the first step in the licensing process – to build a small modular reactor at its Clinch River site in Tennessee. Also, we will continue to develop a pipeline of new projects – options that can be exercised in the future when needed.

Last year, the NRC completed its safety review of GE-Hitachi’s advanced ESBWR design, and certified that design as ready for market. It is the reactor of choice for Dominion and DTE Energy. DTE recently completed the final hearing on its license for Fermi Unit 3, the last step before NRC issues the combined construction/operating license.

(continued page 27)

POWERING INNOVATION

BY THOMAS R. KUHN, CLASS OF 2005



*President
Edison Electric Institute*

Innovation is driving change all across the electric power industry. More than any time in recent memory, the industry is in the midst of a major, long-term transformation, as we adapt to meet growing customer needs to be connected all the time and everywhere.

FOREFRONT OF CHANGE

At the forefront of change, EEI's investor-owned utility members are transitioning to a low-carbon and digital future; steadily integrating more renewables, particularly wind and solar, into their generation fleets; and enhancing the electric power grid to accommodate all of the new technologies coming to market.

At the same time, utilities are focused on serving their customers and ensuring that they are able to plug in all of their new devices or access new services, while also having flexibility and choice in how they use energy.

Increasingly, the grid is evolving to become a multi-directional network that interconnects millions of consuming devices, flexible distributed energy resources including distributed generation, and backup generation. It is enabling a wide array of new technologies and innovations, including

energy efficiency, electric vehicles, electricity storage, and microgrids to help customers better manage their energy use.

MAJOR INVESTMENTS NEEDED

Transforming the grid requires utilities to make major investments to strengthen reliability, enhance outage detection and restoration, improve distribution system monitoring, increase operational efficiency, and integrate new resources. In 2014, our industry was projected to spend \$103.3 billion in total capital expenditures, which would set another record. With renewed focus on infrastructure, it is not surprising that transmission and distribution are increasingly more important to overall investment. Spending in both of these categories is expected to steadily increase in relative importance over the next few years.

EEI's members are also leading the way on electrifying the transportation sector, which enables utilities to support environmental goals, builds customer satisfaction, reduces operating costs, and enhances national security by using more of our national energy resources. In fact, more than 70 EEI members have committed to dedicate at least five percent of their fleet acquisition budgets to EVs and technologies each year—that represents an annual investment of approximately \$50 million.

Not only is the electric power industry electrifying vehicles, but transportation electrification is becoming more and more prevalent at our airports and seaports—and utilities are making it happen.

As we continue to work to integrate new innovations and technologies into the grid, we are looking at change in an evolutionary, not revolutionary, way. It is important that large-scale systems work hand-in-hand with distributed generation technologies; that fuel diversity and flexibility are maintained; and that microgrids and storage batteries are in balance with traditional transmission towers and lines—complementing one

another, instead of competing against the other.

Thoughtful planning and strategy will be needed to construct a balanced, aligned system. This is where partnerships will be critical.

Since utilities already plan, build, and operate the grid, it just makes good business sense that they should continue to be the planners, builders, and operators of the power grid, working in partnership with third-party technology providers and customers. Not only is this the most cost-effective solution, it will also ensure that the reliability and resiliency of the system are maintained.

PUBLIC POLICY DRIVES CHANGE

While new technologies and customer expectations play critical roles in the industry's ongoing transformation, public policy is also a major driver of change. Going forward, it is essential that policies continue to recognize the value that the grid provides both as a platform for diverse, reliable, and affordable electricity, and as a facilitator for new technologies that give customers more choices and more control over their energy usage.

At the end of the day, safe, reliable, affordable, and increasingly clean electricity is essential to nearly everything we do. Electricity's value is unmatched, and the electric grid powers endless possibilities. As the grid continues to evolve, it is important that customers, utilities, technology providers, and policymakers join forces to drive its transformation.

Thomas Edison once said, "What you are will show in what you do." With so many customer-focused innovations happening across the United States, the future of the electric power industry is rapidly unfolding—that future is happening now.

Mr. Kuhn received a BA in Economics in 1968 from Yale University, served as a Naval Officer following his graduation, and completed a Masters in Business Administration in 1972 from George Washington University. He completed the Stanford University Graduate School of Business Senior Executive Program in 1989.

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WHO GETS TO BUILD TRANSMISSION AND WHY?

BY ELLIOT ROSEMAN, KEN COLLISON AND KIRAN KUMARASWAMY



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A number of tectonic forces are moving electric transmission in new directions, and this article explores two of them: 1) the emergence of solicitations to determine who will build new high-voltage transmission facilities (this is the “who” in the title); and 2) the impact of proposed regulatory policies, specifically, the Clean Power Plan (CPP, this is the “why”). We see these two forces as major drivers in creating new opportunities for transmission developers and incumbent utilities over the next decade, within the context of the ongoing challenges to the approval and construction of transmission that continue to exist.

While FERC Order 1000 does not require them, transmission solicitations or RFPs have – in selected organized markets – become the default method to allocate the development and construction of new regional transmission facilities to the winning bidder(s). The active markets for such approaches are: California ISO (CAISO); PJM; Alberta and Ontario, with other markets (e.g., MISO, ISO-NE, NYISO) in active development, or ready to be implemented (SPP). The non-RTO (or bilateral) regions are in earlier stages of carrying out regional transmission planning under Order 1000.

For those regions that use them, what are some of the key lessons learned from the early RFPs, and where do we expect such solicitations to head? To address this, let’s look at an analogous process - the development of competitive bidding for power generation over three decades ago. Figure 1 below depicts that comparability.

What does this analogy tell us? Let’s look at the role out of generation bids to find the points of comparability to transmission:

The Launching Pad. In power generation, the catalyst for competition was the Public Utilities Regulatory Policy Act (PURPA) of 1978, as this law required utilities to purchase efficient types of generation at the utility’s “avoided cost”. In the same way, FERC Order 1000 was the kick-off document for competitive transmission by not allowing utilities the “right of first refusal (ROFR)” at the federal level.

The Gold Rush. In the advent of PURPA, in the early-to-mid 1980s, developers offered hundreds of generation projects to utilities, demanding to be paid, swamping some utilities (e.g., Niagara Mohawk). The question of how to pay them became critical, and states developed responses (e.g., the New York 6-cent law, California’s standard offer contracts), some of which were impractical or unsustainable. In the same way, states and RTOs (which did not exist in the 1980s) have been assessing how to implement Order 1000’s ROFR requirement in an orderly manner,

(continued page 14)

PURPA – Opening Gun

Figure 1 – Transmission RFPs as a Parallel to Generation Bids



WHO GETS TO BUILD TRANSMISSION? CONTINUED FROM PAGE 13

as transmission developers have clamored for the right to offer alternatives to the utilities' construction of high-voltage projects subject to cost allocation in their regions.

The Adolescence of RFPs. From the mid-late 1980s to the mid-90s, RFPs for generation mushroomed. There were early unsuccessful attempts as utilities and regulators tried to determine the right criteria, relative weightings, and evaluation processes for those RFPs. Conducting such RFPs required the utilities to be explicit about the basis for the “need” that was being satisfied with such capacity. In transmission, we are now in this stage, as some RTOs/ISOs have issued one or more RFPs, with very different models of such processes, and questions about how to satisfy transmission reliability, economic, and public policy needs.

Expansion Phase. As generation RFPs grew common, many utilities formed subsidiaries to compete outside of their “home turf”, and often formed joint ventures (JVs) to bid with independent firms on these opportunities. This has already happened in transmission, with more than a dozen such entities at the utility holding company level, and many JVs for specific projects or broader efforts (e.g., Duke-ATC, Transource). The number of opportunities in transmission is notably less than for generation, as generation RFPs

were utility-specific, while transmission RFPs are regional, state-wide or province-wide to serve multiple utilities' needs. Still, there will be more transmission solicitations as this phase plays out.

Maximum Industry Size, Consolidation, and Strategy. As in generation, the size of the transmission industry will be self-limiting, as the number and scale of opportunities (and projects outside of the RFP process) will dictate how many firms do well, and how many decide to fold their tent. Each solicitation has more losers than winners. Putting together bids is expensive, and companies will pursue only the ones where they believe they have a good chance of success. Some firms will adopt a regional (closer to home) strategy and others a national or North American one; in fact, this is already happening.

Competition Becomes the Norm. In the final stage, the RFP process will become independent of the original law or regulation that started it. Competitive generation now represents over 40% of all power produced in the US, and it is not dependent on PURPA for its vitality and growth. If RFPs for transmission produce benefits for customers, as recognized by state regulators and RTOs, then such solicitations will become commonplace, without regard to FERC Order 1000.

Thus, though they are being applied for the first time in North America, transmission RFPs are following a predictable path. Let's now look to the present and future.

What do the transmission solicitations look like and how should we expect these RFPs and indeed the overall transmission industry to develop?

JVs Will be Common. As suggested above, JVs often make it easier to bring together all the qualities deemed necessary for success, given the evaluation criteria (e.g., permitting, siting, costing, financing, operating, etc.). However, JVs are not always necessary. One company, NextEra Energy Transmission, has been successful both on its own (in California), and in a JV (in Ontario). The figure below depicts the teams selected to bid in the most recent bid in Alberta, where local (Alberta-based) firms combined with US-based firms or financial institutions in the Fort McMurray West solicitation.

An important element of success in the solicitation process – and indeed in the competitive transmission industry – will be to choose the right partner(s).

There are two primary forms of solicitations, which we call “open” and “closed”. Open RFPs are ones where the evaluator indicates that they have a reliability or congestion problem at a certain point in the grid, and they ask for bids to alleviate that concern. This can lead to a great diversity of bids, and is the approach the PJM adopted in the Artificial Island and market efficiency bids. PJM received 26 bids in response to the Artificial Island solicitation, with solutions ranging from installation of reactive power devices to construction of various configurations of 500 kV lines, and costs ranging from \$115 million to about \$1.5 billion. The “closed” form is where the evaluator specifies that the needed solution is a specific line or substation at a specific point on the grid (e.g., between two substations) for a certain delivery date. This is the approach that CAISO, Ontario and Alberta have utilized to date. While this approach limits the bidders, it makes sense where the solution to the system need is clear. Both forms of solicitations have resulted in awards to winning bidders.

What we expect is that as competitive transmission expands, the RTOs and their evaluators will increasingly divide their evaluation process into two major steps, as

(continued page 27)

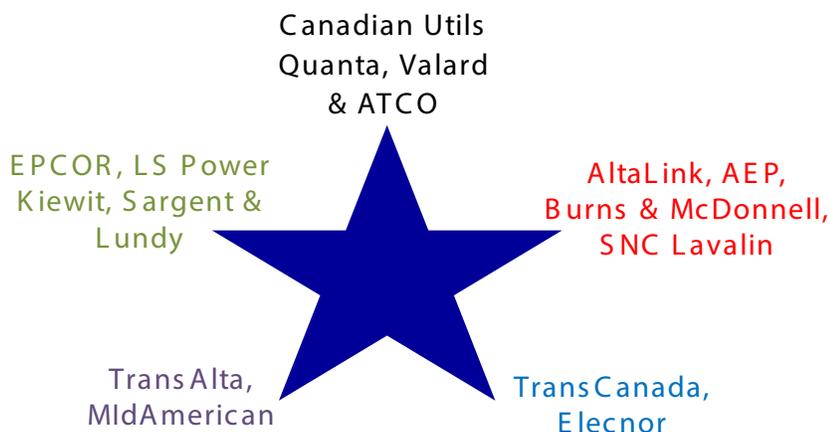


Figure 2 - Bids in the Fort McMurray West 500 kV Line Solicitation – Joint Ventures Abounded

GROWTH OF YIELDCOS

BY ELI KATZ AND MICHAEL MASRI, CHADBOURNE & PARKE, LLP



Eli Katz



Michael Masri

The recent proliferation of yieldcos has begun to change the renewable energy landscape by ramping up the demand and price for renewable energy operating assets and accelerating a long-anticipated consolidation in the sector. The growth of this investment vehicle is also reshaping traditional project finance capital structures, most notably the tax equity structures used by yieldcos to monetize the tax benefits from their renewable energy assets. When choosing tax equity structures, we expect yieldcos to gravitate towards lease pass-through transactions and modified partnership flip structure,

while largely avoiding sale-leaseback transactions.

This article explores some of the factors contributing to the growth of the yieldco vehicle, the tax profile of these entities and how tax equity structures are being redesigned to accommodate the needs of this new investor class.

For a host of reasons, yieldcos are a prime customer for tax equity investors and likely to continue to grow in importance in the foreseeable future. First, yieldcos generally do not have the ability to make optimal use of the tax credits and depreciation deductions generated by renewable energy projects. Second, yieldcos are, for the most part, power developers with significant and growing asset pipelines and strong access to the project debt and equity markets needed to round out a project's capital structure. Lastly, yieldcos or their sponsors generally have the experience to supply reliable asset management and operation services to its asset portfolio and the financial stability to provide the necessary guaranties and indemnities sought by tax equity investors.

The key tension point in structuring tax equity arrangements with yieldcos is the need to preserve a steady and predictable cash flow to the shareholders of the yieldco. This need for predictable and unimpeded cash flows means that yieldcos will generally gravitate towards tax equity products that are structured so that most of the project cash flow is distributed to the sponsor. Additionally, yieldcos are most sensitive to any feature in a tax equity arrangement that can divert cash flow away from its shareholders, such as project underperformance or the occurrence of indemnity events. Finding the right balance between the investment needs of yieldco shareholders and tax equity investors continues to be one of the principal challenges to the growth of yieldcos.

BACKGROUND ON YIELDCOS

Over the last 18 months, six yieldcos have gone public. NRG Yield was the first to access the public markets, followed by TranAlta Renewables, Pattern Energy, Abengoa Yield, NextEra Energy Partners and TerraForm. Initially designed as investment vehicles to acquire and hold operating projects developed by its sponsor, yieldcos have quickly morphed into acquisition vehicles, buying an increasing share of operating renewable energy assets. According to Bloomberg New Energy Finance, yieldcos already hold more than 7,000 MW of operating power assets, including hydro, small PV, wind, utility scale PV, solar thermal, gas and thermal energy. Based on planned expectations, operating assets held by yieldcos could exceed 15,000 MW in the near future. Some analysts are predicting the launch of up to 10 additional yieldcos in the next two to three years.

A confluence of market forces have resulted in a significant portion of yieldco holdings being concentrated in renewable energy assets. First among those is the high demand for dividend yielding assets in today's low interest environment. Also, renewable energy assets comprise a growing share of newly built power assets in the U.S., far outstripping the growth of other power sources. Yieldcos are a natural owner for renewable energy assets given their need to acquire a portfolio of long-term operating assets. Further, yieldcos solve a challenge for the renewable energy industry that has been struggling to access the capital markets through a tax-efficient vehicle. Industry groups have been actively lobbying for the expansion of real estate investment trusts and master limited partnerships. REITs and MLPs enable specialized industry groups (real estate in the case of REITs and oil and gas pipeline assets in the case of MLPs) to access the capital markets through a funding entity that is not subject to the corporate income tax. Without the benefit of a special funding vehicle, renewable energy developers seeking to access the capital markets would subject themselves to tax at both the entity and shareholder level significantly eroding

(continued page 16)

GROWTH OF YIELDCOS CONTINUED FROM PAGE 15

the benefit of a lower cost of capital.

Despite some recent favorable U.S. Department of Treasury regulations and legislative initiatives, the renewables industry has largely come up empty on this front. Yieldcos can then be viewed as a self-help measure where sponsors use the tax benefits from renewable energy assets to synthetically create an entity that is not burdened by the corporate income tax. In their offering documents, most yieldcos have promised their shareholders a 10-year income stream that will be free from corporate level taxes.

YIELDCOS AND RENEWABLE ENERGY TAX BENEFITS

The tax benefits available to most renewable energy projects include tax credits and accelerated depreciation. Solar projects are entitled to an investment tax credit equal to 30% of project cost in the year it is placed in service. Wind, biomass, geothermal and other projects that began construction by the end of 2013 are eligible for either the investment tax credit or the production tax credit, a credit based on the amount of power produced. Most renewable energy projects are also eligible for accelerated depreciation, permitting a deduction for almost all of the cost of these projects over the first five to seven years of operation.

Most developers are unable to use all of the tax benefits and commonly finance their projects through various tax equity investments where they effectively barter these tax benefits to banks and insurance companies that can use them on a current basis. As explained previously, yieldcos cannot trade away all the tax benefits from their assets because they need enough to shelter their income from the corporate tax. Yieldcos therefore are typically interested in holding some of their assets outside of tax equity financings, or structuring tax equity arrangements where some share of the tax benefits are retained.

Most renewable energy assets current-

ly held by yieldcos have largely avoided the challenges of tax equity by acquiring projects that previously claimed the Treasury cash grant. The Treasury cash grant program expired at the end of 2011 with generous grandfathering rules. While this program was in effect, most developers elected to take a cash grant from the Treasury equal to 30% of the cost of a solar or wind project rather than entering into complex tax equity transactions with banks and insurance companies. A project that claimed the cash grant is ideal for a yieldco because the tax credit has already been monetized through the grant program, but the depreciation tax benefits remain available to the yieldco to shelter its income from the corporate tax. When the yieldco acquires the project, it will typically step-up the tax basis of the assets to its purchase price and then write off the purchase price over the next five to seven years. These assets are also not subject to the tax credit recapture rules that apply to projects that claimed the investment tax credit, making them easier to move in and out of a yieldco.

While yieldcos are expected to continue acquiring projects that claimed the cash grant, the availability of these projects are rapidly drying up, forcing yieldcos to find suitable investment products within the tax equity markets.

WHICH TAX EQUITY STRUCTURES WORK BEST FOR YIELDCOS

The three most common tax equity structures are the partnership flip, the lease pass through and the sale-leaseback. Yieldcos are likely to gravitate towards lease pass-through structures and modified partnership flip transactions while largely eschewing sale-leasebacks.

LEASE PASS-THROUGH

In a lease pass-through structure, the developer owns the asset and leases it to a tax equity investor. The tax equity investor typically agrees to make a large upfront rental payment to the developer and to then pay periodic rental payments under the lease as the project generates free cash

flow. The developer and tax equity investor then elect to pass the tax credit thorough to the tax equity investor. While the tax credit may be passed through with this election, the depreciation deductions remain with the lessor who is considered the asset's owner for tax purposes. In some variations of this structure, the tax equity investor may also acquire an ownership interest in the lessor entity, thereby enabling it to claim some portion of the depreciation deductions.

The popularity of the lease pass-through structure has been increasing among yieldco investors. This structure fits well with the yieldco because it enables the yieldco to monetize the tax credits while retaining the less valuable depreciation deductions that can be used to shield its investors from the corporate income tax. In situations where the yieldco does not require all the depreciation deductions, it can divert some of these tax deductions to the tax equity investor by selling a share of its interest in the lessor entity. Moreover, the lease pass-through structure enables the yieldco to rely on a steady and predictable stream of cash flow from the rentals paid under the lease, with little risk of the cash being diverted away to service the tax equity investor.

PARTNERSHIP FLIP

The partnership flip structure has also drawn considerable interest from yieldcos, although the structures have changed somewhat to accommodate the needs of yieldcos.

In a typical partnership flip transaction, the investor is allocated 99% of the tax benefits during the first six years of operation, which amounts to nearly all of the tax credits and depreciation deductions available to the project. After the investor achieves an agreed upon yield, or in some deals, after a set period of time, the investor's share of the tax benefits is reduced to as low as 5%. Cash flow from the project is distributed among the tax investor and sponsor according to a specified formula that may vary widely from deal to deal. In some transactions, it is common for the developer to

(continued page 30)

WIND INDUSTRY REBOUNDS

BY TOM KIERNAN, CLASS OF 2014



Tom Kiernan
CEO, AWEA

The wind industry rebounded in 2014 with a record amount of wind under construction.

The 4,854 MW of wind capacity added during 2014 was more than four times the small amount installed in 2013.

There was more wind power capacity under construction at the end of 2014 than at the end of any other year, with over 12,700 MW across nearly 100 wind projects under construction. An additional 5,000 MW of project capacity secured long-term offtake during the year but had yet to start construction by the end of 2014.

Boom Bust Cycle Continues: The lapse of the PTC at the end of 2012 drove a 92% drop in installations in 2013.

The PTC extension in January 2013 allowed projects that were started in 2013 to qualify, which drove many of the projects that were completed in 2014. PTC uncertainty continues with an extension through the end of 2014 that came only two weeks before the end of the year.

Wind Jobs Regained: 2014 saw a rebound of the wind industry jobs that were lost due to PTC uncertainty in 2013—the U.S. wind energy industry added over 22,500 full-time equivalent jobs in 2014, bringing the total to 73,000. This is a par-

tial rebound from the nearly 30,000 jobs that were lost in 2013 due to the lapse of the PTC at the end of 2012.

Wind Benefits Every State: Over 70% of U.S. Congressional districts have operational wind energy projects or active wind-related manufacturing facilities, with the 73,000 wind industry jobs spread across all 50 states.

Since 2008, the U.S. wind energy industry has invested over \$100 billion in new wind power projects.

Costs Plummet: The cost of wind energy dropped over 50 percent between 2009 and 2013, with the industry continuing to advance technology in several areas, from improved siting techniques to larger rotor diameters and taller towers that are increasing energy production across the country and opening up new regions for development.

Southeast Open for Business: The Southeast has long benefited from wind manufacturing jobs and wind energy purchases from other regions reducing consumers' electric bills. However, taller turbine towers are raising the prospect of significant wind development occurring in the Southeast in the near future. New NREL wind resources maps released in 2014 indicate the Southeast has excellent wind resources at heights above 110 meters, which is emerging as the new frontier for wind development.

Wind Top Source of New U.S. Generation: Wind energy was the largest source of new generation in the U.S. It was the primary choice for new power in the wind rich regions of the Midwest, Pacific Northwest, and Plains states, providing 60% or more of all new electric generation capacity between 2011 and 2014. Wind's market share was as high as 80% in the Midwest.

Corporations Want Wind: Over 23% of the power purchase agreements signed during 2014 were with nonutility off-tak-

ers including Amazon, Microsoft, the General Services Administration (GSA), Walmart and Yahoo! Many of these companies and organizations explained that they were attracted by wind energy's unique ability to offer stably-priced energy, given its lack of fuel cost uncertainty.

Record Number of Long Term Wind Contracts Signed: More than 13,000 MW of new power purchase agreements were signed in 2013-2014, with utilities citing the value of wind for hedging against fuel price uncertainty, along with historically low wind prices.

Carbon and Water Savings Greater Than Previously Thought: Wind energy production avoided an estimated 125 million metric tons of carbon dioxide during 2014 – more than 5.7% of U.S. power sector emissions – while avoiding the consumption of over 68 billion gallons of water. This was estimated with a new tool that shows these benefits are even greater than previously thought.

New Transmission Opens New Areas for Development: Texas is currently undergoing a wind boom thanks to the realization of the Competitive Renewable Energy Zone (CREZ) network of new transmission lines.

That success will soon be replicated in SPP and MISO, which have adopted similar policies for planning and paying for transmission and are beginning to build major new transmission upgrades.

New Wind Records Show Wind's Reliability: Three states (Iowa, South Dakota and Kansas) now reliably generate more than 20% of their electricity from wind power. At times, wind energy has provided more than 60% of electricity on the main Colorado power system, and nearly 40% on the main Texas power system. Record wind output also helped to keep the lights on during extreme cold snaps in January 2014 and 2015.

U.S. Leads World In Wind: The U.S. leads the world in wind energy generation, producing over 181 billion kWh of wind energy during 2014 or enough electricity to power over 16.7 million homes.



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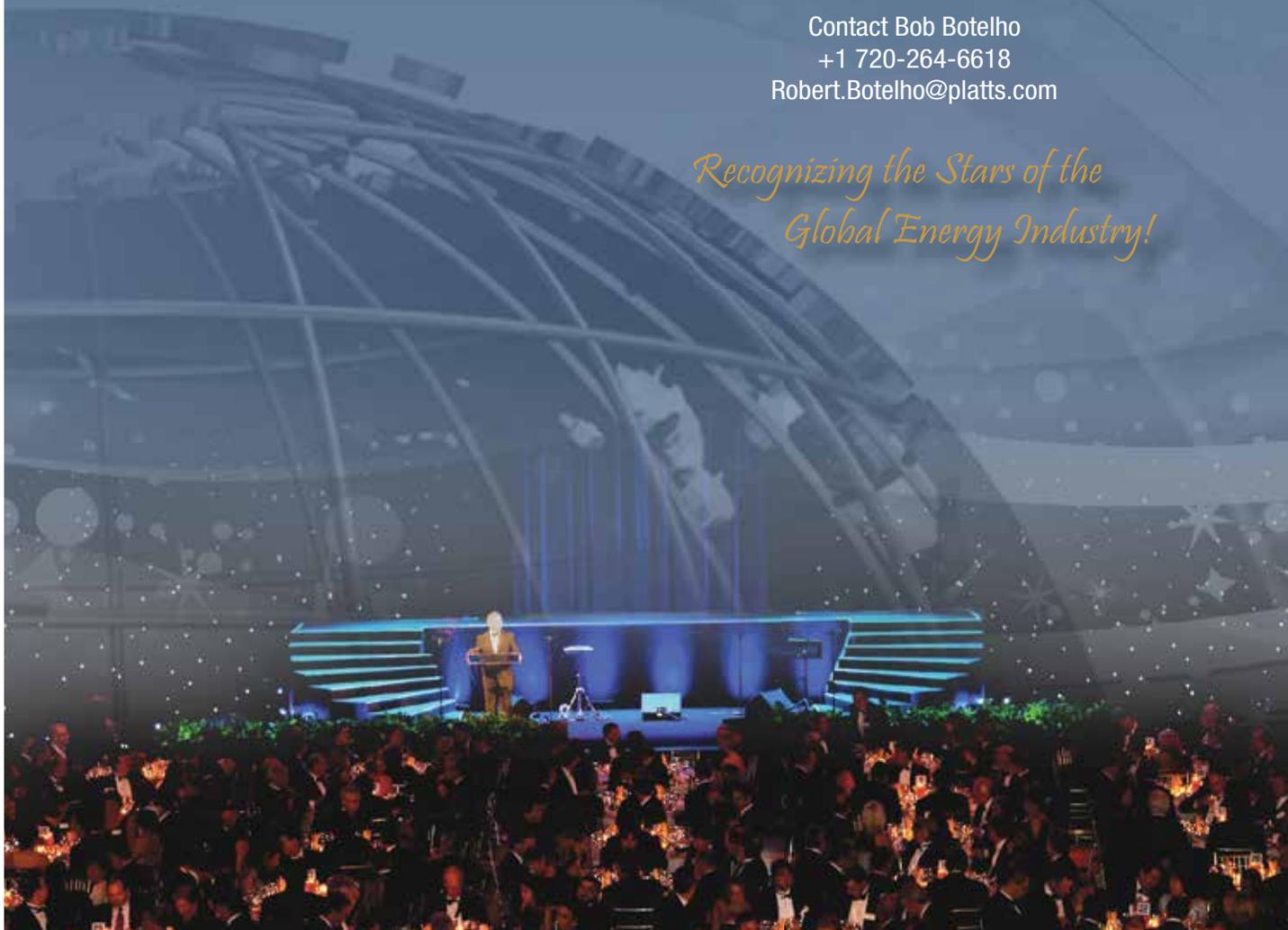
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RENEWABLES ENTER THE MAINSTREAM

BY MARLENE MOTYKA AND BRIAN BOUFARAH
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OVERVIEW

- The renewables industry faced strong headwinds in 2014 – from uncertain tax policy to lackluster electricity demand growth and competition from natural gas.
- Instead of idling, renewable M&A activity revved up, with 37% more capacity changing hands than the prior year, in 115 deals.
- This was largely due to financing innovations, rapidly declining costs, and pending tax credit deadlines, as well as increasing investor confidence in wind and solar technologies.
- Overall, wind and solar accounted for approximately 5 percent of U.S. electric

generation in 2014.

- Looking ahead, M&A activity is poised for continued growth, as investor interest flourishes and renewables move further into the mainstream.

DEAL-MAKING & BUYER TRENDS

- There is a broader trend of increasing investor interest in the renewable energy sector, with M&A activity generally moving upward over the last five years (2010-2014).
- Independent Power Producers (IPPs) voraciously added renewable capacity, overtaking utilities as the lead buyers in the renewables space.
- IPPs acquired more than 101. GW of capacity, a stunning 147% increase from 2013.

MARKET CONDITIONS

- Nearly every type of investor has become more comfortable with renewables as an asset class.
- After two consecutive years of decline, U.S. clean energy investment rose nearly 20% in 2014.

FINANCIAL INNOVATIONS

- YieldCos doubled from 3 to 6 in 2014 and increased investment to \$3.2 billion. A YieldCo is a publicly traded company formed to own operating assets that produce cash flows. YieldCos are typically designed to have minimal taxable income to limit their cash tax requirements, much like MLPs.
- Capital raised through “Green bonds,” corporate bonds with proceeds ring-fenced for clean energy investments, more than doubled, to \$32.9 billion in 2014, compared with \$500 million in 2013.
- Crowdfunding has helped the growth of the rooftop solar industry. Non-profit crowdfunds, are putting solar photovoltaic projects within reach of churches, schools, and other organizations.

TRADITIONAL FINANCING

- Asset financing – investors poured more than \$12 billion into wind and solar projects.
- Venture capital investment in renewable companies rose 105% to more than \$1 billion, 75% in solar.
- Public markets – Investment in solar and wind companies jumped 68% to \$5.13 billion.

SOLAR

- The US residential solar market added 1.2 GW – more than 50 percent growth for the third consecutive year.
- For the first time ever, more than half a gigawatt of resident solar installations came online without any state incentive in 2014.
- Utility-scale development is also breaking records: in Q4 of 2014, 1.5 GW of utility-scale PV projects came online – the largest quarterly total for any market segment.

WIND

- Approximately 4.9 GW of wind power came online in 2014, and 12.7 GW are under construction.
- Texas presently accounts for the majority of wind construction activity, though New Mexico, Kansas, Iowa and North Dakota are also very active.
- The cost of wind power is competitive with other sources of generation, and is likely to be driven lower with increasing technological innovations.

POLICY DEVELOPMENTS

- The Production Tax Credit (PTC) came too late to stimulate large wind developments in 2014 and had little effect on new wind development or deal-making activity.
- The Investment Tax Credit (ITC) did not change in 2014, given its extension to 2016. The ITC continues to provide a strong incentive for solar development, especially ahead of the end of 2016 deadline.
- Renewable development will likely have more support in regulatory developments.
- Many states are experimenting with

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FUNDING IN Q1 2015

BY RAJ PRABHU

CEO, MERCOM CAPITAL GROUP



Mercom Capital Group released its report on funding and mergers and acquisitions (M&A) activity for the Smart Grid, Battery/Storage and Energy Efficiency sectors for the first quarter of 2015.

SMART GRID

Venture Capital (VC) funding in the Smart Grid sector in Q1 2015 came in at \$185 million in 15 deals, compared to \$59 million in 13 deals in Q4 2014. There were four early stage deals, including three Series A and one Seed funding deal in Q1.

There were 37 total VC investors including one accelerator who participated in VC funding rounds this quarter. Within Smart Grid, Smart Grid Communications Technology companies received the most funding. EnerTech Capital was the only investor participating in multiple deals this quarter with three.

The top VC funded deal in Q1 2015 was the \$115 million raised by SIGFOX, a wireless connectivity solutions provider for smart metering, building intelligence and M2M using ultra narrow band technology. Other top deals for the quarter were the \$15 million raised by Tempered Networks, a cyber-security company; the \$14 million raised by Blue Pillar, a provider of software-based solutions for real-time visibility and

control into distributed energy assets; the \$11 million raised by Enbala Power Networks, a provider of demand-side grid optimization services for commercial and industrial large-scale electricity users; and the \$8.4 million raised by TROVE Predictive Data Science, a provider of applications for load forecasting, revenue protection, demand-side management and program planning for utilities.

There were seven Smart Grid M&A transactions (four disclosed) totaling \$196 million. The top disclosed transaction was the acquisition of AlertMe, a home automation platform, energy monitoring and control, and analytics provider, by British Gas (part of the Centrica plc group) for \$100 million. Bluegiga Technologies, a Finland-based provider of short-range wireless connectivity and software solutions for home automation and industrial automation, was acquired by Silicon Labs for \$61 million. RadioPulse, a Seoul-based developer of ZigBEE for AMR, wireless automation, home network and high technology markets, was acquired by IXYS for \$22.5 million. Detectent, a provider of utility data analytics solutions, was acquired by Silver Spring Networks for \$12 million.

BATTERY/STORAGE

VC funding for Battery/Storage companies came to \$69 million in seven deals, compared to \$47 million in seven deals in Q4 2014. The top deals include the \$20 million raised by Boston Power, a manufacturer of lithium-ion batteries for electric vehicles and stationary energy storage, and the \$20 million raised by Sakti3, a developer of solid-state rechargeable lithium-ion battery technology. Eos Energy Storage, a developer and manufacturer of zinc hybrid cathode energy storage solutions for electric utilities, raised \$15 million. TAS Energy, an energy storage solutions provider that combines turbine chilling with thermal energy storage tanks, raised \$10 million, and ZAF Energy Systems, a developer of nickel-zinc and zinc-air battery technologies, raised \$2.2 million.

There was just one debt and public market financing deal announced for Battery/Storage technology, the \$130

million raised by Bloom Energy, a manufacturer of solid oxide fuel cell technology products.

There were five M&A transactions in the Battery/Storage category, of which only two disclosed funding amounts totaling \$2.3 billion.

ENERGY EFFICIENCY

VC funding for the Efficiency sector came to \$140 million in 15 deals, compared to \$192 million in 25 deals in the previous quarter. The top VC deal was by Verne Global, a developer of energy efficient data centers, securing \$98 million, followed by Terralux, a designer and manufacturer of LED lighting and building intelligence solutions, which raised \$11 million. RayVio, a solid state ultraviolet LED solutions provider, raised \$9.3 million. Tendril, a provider of an open, cloud-based energy services management software platform that delivers the infrastructure, analytics and understanding required to personalize energy usage, raised \$7.2 million; and Lucid Design Group, a provider of a building operating system platform for intelligent buildings that connects hardware, software and people through a collaborative interface, raised \$5.9 million.

Efficiency companies also raised \$183 million in debt and public market financing in three deals in Q1 including one IPO. MLS, a Chinese LED manufacturer and the parent company of USA-based Forest Lighting, raised \$154 million through its initial public offering and began trading on the Shenzhen Stock Exchange in China in March 2015.

There were 11 M&A transactions in the Efficiency sector, of which five disclosed details totaling \$3.1 billion, compared to 10 transactions disclosed for \$131 million in Q4 2014. The largest disclosed transaction was the \$2.8 billion acquisition of an 80.1 percent interest in Lumileds, a Royal Philips LED lighting components business, by GO Scale Capital Investment Consortium, an investment fund sponsored by GSR Ventures and Oak Investment Partners.

ANALYTICS: THE KEY TO ACCELERATING THE ADOPTION OF SOLAR

BY MICHAEL HERZIG, FOUNDER AND CEO, LOCUS ENERGY



In the early days of the solar industry, the focus was on getting solar photovoltaic PV systems up and running. But now that solar PV is entering the mainstream, the focus is on getting the best financial return. With the expansion in fleet sizes — many owners and operators are running fleets consisting of thousands of systems — even small increases in performance, cost-cutting measures and improvements in operations and maintenance (O&M) functions can translate to a big effect on the bottom line.

Until recently, owners and operators of fleets spread across wide geographical areas have relied on inefficient in-house asset management solutions due to the lack of other options, but that is now changing with the introduction of sophisticated fleet management and analytics software that provides them with clear, actionable data on which to base O&M decisions. By collecting and analyzing data from a wide range of sources, solar analytics software provides asset managers with insight into whether a system is performing up to expectations and the causes behind a system's failure to perform. The access to such intelligence can boost energy output and save on O&M costs, thus increasing return on investment.

Locus Energy's cloud-based software application, SolarNOC (Network Operation Center), allows asset managers to collect, organize and analyze performance data

from a diverse set of solar PV assets. SolarNOC provides asset managers with an unprecedented level of control over how performance data is aggregated and displayed through filters that are accessed from a customized dashboard. Fleets can be managed across multiple dimensions by installer, geographical region, system size, equipment type, install date, finance partner and many other criteria. For example, a filter can be created that tracks all projects in New Jersey with inverters from a specific manufacturer that have been installed in the last 60 days. Another strength of SolarNOC is its ability to handle data from a wide range of sources, including inverter direct data, legacy monitoring systems and third-party performance data sets.

But while SolarNOC lets asset managers know if a system isn't performing up to expectations, it doesn't tell them why a system isn't performing up to expectations. Which is where Locus' PVIQ data analytics suite comes in. PVIQ can be added to SolarNOC or other fleet management software platforms, providing additional layers of system intelligence. PVIQ consists of three elements. The first, the Virtual Irradiance (VI) tool, draws on private and public historical and real-time data from weather stations, satellite imagery, federal agencies such as NASA and NOAA and other sources, to provide highly accurate, ground-level irradiance data across an install base or a geographic region on a 15-minute basis. When used with other modeling data — i.e., the type of panel or inverter — Locus' VI tool provides asset managers with a truly accurate assessment of how much energy their systems should be producing based on the amount of sunlight that is hitting the ground at a specific location. This "big data" tool functions in a similar manner to the gauge on a gas pump: Just as a driver needs to know how much fuel goes into the tank in order to calculate mileage, the VI tool, which measures the "fuel" that goes into a solar PV system,

allows stakeholders to determine if a solar PV system is performing as it should.

The use of VI also eliminates the need for on-site sensors, which are cost-prohibitive for small systems. In the case of systems where onsite sensors have already been installed, VI validates sensor data, which can become skewed due to factors such as soiling or miscalibration.

The second element of PVIQ, the Waterfall report, is unique in the industry. The Waterfall report identifies the causes behind a system's failure to perform, including factors such as weather uncertainty, snow downtime, shading, equipment downtime, equipment degradation and inverter problems. The prescriptive analysis provided by Waterfall enables a specific, detailed understanding of which factors are most affecting the performance of a solar PV system and how the causes of the underperformance can best be addressed. Locus' plug-in software, the third element of PVIQ, provides direct access to Locus' databases through an Excel spreadsheet, dramatically reducing the time required to prepare periodic performance reports.

An important feature of PVIQ is that its open software platform allows it to be integrated with any solar performance dataset, including a customer's own. It can also be integrated with other types of software, including O&M ticketing software. Users can use PVIQ to identify problems that lead to reduced performance, then create maintenance tickets through O&M software that defines the most appropriate next steps, including activities such as ordering and stocking critical parts or tracking equipment repairs, materials and labor costs. The integration of PVIQ with O&M software enhances the ability of asset managers to identify systems that aren't meeting performance expectations and to streamline O&M processes to improve workflow, minimize

(continued page 26)

ACSI SCORES UTILITIES

BY CLAES FORNELL



*Claes Fornell
ACSI Chairman and Founder*

The American Customer Satisfaction Index (ACSI) is an independent national benchmark of customer satisfaction with the quality of products and services available to household consumers in the United States.

Following another harsh winter, customer satisfaction with gas and electric service providers is down 2.7 percent to an ACSI score of 74.3 on a 0-100 scale, according to the American Customer Satisfaction Index (ACSI).

“Higher cost tends to weaken customer satisfaction, particularly when spending is not discretionary, as is the case with commodities such as energy,” says Claes Fornell, ACSI Chairman and founder. “It is not as much the cost of energy per se, but that usage was high and took a bigger bite out of household income.”

The ACSI report covers customer satisfaction with three utility categories (cooperative, investor-owned and municipal) and two health care service industries (hospitals and ambulatory care), along with consumer shipping and the mail services of the U.S. Postal Service (USPS).

INVESTOR-OWNED UTILITIES: RISING COST OF ELECTRICITY AND NATURAL GAS DAMPENS SATISFACTION

Household satisfaction with investor-owned utilities falls 1.3 percent to an ACSI score of 74. Among the largest investor-owned utilities, the highest-scoring companies are both natural gas suppliers – Atmos Energy (ACSI score of 82) and CenterPoint Energy (81).

FirstEnergy is next at 79 and posts the largest gain (+8%); it now ties Sempra Energy. Dominion Resources, PPL and NiSource all come in at 78, followed by Southern Company, Entergy (+1%) and NextEra Energy (+1%) at 77. The only other providers to improve are Xcel Energy (+1% to 76), Public Service Enterprise Group (+3% to 72), and PG&E (+1% to 71).

Most utilities have moved in the opposite direction, with DTE Energy and Exelon deteriorating the most (-8%). Duke Energy (-6%) also declines, while Eversource Energy (formerly Northeast Utilities), hurt particularly hard by winter storms, falls 7 percent to the industry low of 66.

MUNICIPAL UTILITIES: SMALLER COMPANIES HIT HARDEST; SALT RIVER PROJECT MAINTAINS LEAD

Most large municipal utilities improve from a year ago, but smaller providers, which make up a majority of the market, drop to a combined ACSI score of 73. The Salt River Project (SRP) leads in customer satisfaction for a fifth straight year, edging up 1 percent to 80, and CPS Energy advances 3 percent to 77. Meanwhile, the Los Angeles Department of Water & Power (LADWP) slips 1 percent and scores far below for customer satisfaction at 68.

COOPERATIVE UTILITIES: BEST IN CATEGORY

Smaller rural cooperative utilities hold a strong lead over the other utility categories, but slip 1.2 percent to an ACSI score of 80. Despite a 1 percent downturn, Touchstone Energy Cooperatives remains one of the Index’s top-scoring energy utilities at 80, followed by the aggregate of smaller co-ops (-3% to 78).

ABOUT ACSI

The American Customer Satisfaction Index (ACSI) is a national economic indicator of customer evaluations of the quality of products and services available to household consumers in the United States.

The ACSI uses data from interviews with roughly 70,000 customers annually as inputs to an econometric model for analyzing customer satisfaction with more than 300 companies in 43 industries and 10 economic sectors, including various services of federal and local government agencies.

ACSI results are released throughout the year, with all measures reported on a scale of 0 to 100. ACSI data have proven to be strongly related to a number of essential indicators of micro and macro-economic performance. For example, firms with higher levels of customer satisfaction tend to have higher earnings and stock returns relative to competitors.

Stock portfolios based on companies that show strong performance in ACSI deliver excess returns in up markets as well as down markets.

At the macro level, customer satisfaction has been shown to be predictive of both consumer spending and GDP growth.

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BACK ON CAMPUS

Dear Friends,

I am writing to let you know that, effective January 1, I have left Akin Gump and the practice of law in order to create a new company in the electric power distribution business. The company, US Grid Company (USGRDCO), is focused on strengthening the reliability, resilience, cybersecurity, efficiency and renewable integration of the nation's electric distribution system.

I will be creating this company with two cofounders – Ray Gogel, former Chief Information Officer, Chief Administrative Officer and President of Customer and Enterprise Solutions of Xcel Energy, and David Mohler, who served as Chief Technology Officer of Duke Energy, among other senior roles – as well as other senior professionals in the system design, project management and finance areas.

Our objective in forming USGRDCO is to transform today's power delivery system by paving the way to the utility of the future in a way that customers can afford and that protects the utilities' financial health so that they can serve the needs of all segments of society.

In particular, USGRDCO will focus on:

1. Financing and ownership of distribution system improvements through innovative ownership and financing structures that will facilitate the making and regulatory approval of the investments required to strengthen the distribution system.

2. Design and implementation of the system upgrades needed to resolve the challenges to the nation's electric distribution system and to provide greater physical and cyber-security reliability, greater certainty of system performance, and cost and operating efficiencies that lead to lower costs.

3. Commercial development of reliability resources, including micro-grids, energy storage for grid management and stability, micro-turbines and energy efficiency and demand side management.

4. Investment in excellent grid companies.

5. Regulatory, legislative, executive and public advocacy in support of policies to strengthen the nation's electric distribution system infrastructure and to help create the utility model of the future.

I can be reached at:

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My best wishes to each of you. I look forward to staying in touch.

Jay

BACK ON CAMPUS

Since joining the MISTRAS Group in March of 2009 as a Group Executive Vice President we've experience explosive revenue and earnings growth as a result of robust oil & gas energy market spending, and in the later years from the power generation market. The advent of inexpensive natural gas drove capital spending for new combined cycle plants, the repowering of existing units to switch to natural gas, and the upgrading of aging fossil fueled fleets in addition to the NRC resumed license issuance renewals for nuclear power are all contributing factors that continue to help drive our maintenance products & services business.

Today our power generation business unit continues to thrive due to our innovative one source capability that uniquely qualifies MISTRAS as a global industry leader in the areas of nondestructive inspection & engineering services as well as products and systems to support these services. Our business model delivers tangible benefits to our customers in the form of reducing contracting cost; reducing production cost; increased safety; being a turnkey product and service provider; providing technical expertise and experience; and adaptation to customer culture and process.

The addition of services such as PdM & Reliability Centered Maintenance, Materials Testing, Engineering Services (including FAC and HEP) and Capital Project Services all provide customer value and is a key differentiator in the market for MISTRAS.

Ralph Genesi, Class of 2003

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BACK ON CAMPUS

Doesn't any alum returning to his hallowed halls experience reflection, inner thought, and self-evaluation? Revisiting the honor of becoming a member of *World-Generation's* Class of 2011 has caused me similar introspection. This "Back on Campus" journey has resulted in asking and answering questions based on the four years that have passed since my induction. Questions I asked: were my insights accurate, has my company served the industry and our clients honorably, have technical and spiritual gains been offered through my organization's work, and most importantly, have we given back for the incredible success we've been able to achieve? Fortunately, most of the answers to these questions are positive, or much progress has been made.

Four years ago, my predictions included that the industry would experience delayed retirements caused by the downturn in financial markets, a growing appetite for qualified workers, and reduced new-staff budgets. In 2011 it appeared that the issues with the most potential impact on the workplace included hiring

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BACK ON CAMPUS CONTINUED FROM PAGE 25

decisions that would be based primarily on immediate need vs. planned growth, and the unknown impact of the then-new healthcare initiative.

While I, and others, stand by our predictions of a huge vacuum caused by retiring operations workers, since that time my company has actually received more recruiting assignments based on growing our clients' non-technical staff. However, these requests have been more from vendors supporting the power industry rather than from those generating and/or distributing power. We have been working to support our clients' efforts to grow market share (marketing and sales talent), improve operations (HSE and operational managers), and equipment betterment (construction managers, project managers, commissioning technicians). While to a certain degree the industry and its workers have delayed its need for replacement staff, there has not been a long-term solution found for the issue.

Our success has exceeded both expectations and dreams, but this success has been limited to identifying and moving existing industry talent from within the industry to client companies. As I continue to believe that the power industry will experience a severe loss of talent, my focus and hope is to have much more impact in helping to train and draw new qualified talent to the power industry. From designers to operators, welders to project managers, commissioning engineers to safety experts we are and will continue to lose (at an accelerating pace) the foundation of experience as retirements occur.

Unfortunately, as an industry, we just have not done enough to counter these losses. SCR continues to try to do our part by working with local technical schools, supporting diversity worker recruitment, writing and presenting articles and speeches on the benefits of a career in the power industry, and working toward developing new talent. We intend to continue to expand this effort and ask that the industry at-large also make a concerted effort to help this process along. I believe three areas of focus can have a big positive impact:

- 1) Investing in using college level interns
- 2) Hiring and converting related-industry workers (petrochemical, pulp & paper, refinery, LNG) to our industry
- 3) Creating environments where well-tenured workers mentor new workers

These programs come with associated costs, but in the long run they are imperative to the ongoing health of our industry.

Speaking of mentoring, it's interesting to note that those who seem most concerned about the issue are in fact those nearing retirement. They recognize that the incoming workforce, while well

educated, is operating with a limited view of function-cause-result of the industry processes. Although these lessons will eventually be learned, the reality is that these "old dogs" could train the "pups" so much more quickly with a focused effort of passing the knowledge on through person-to-person interaction.

An environment conducive to this type of knowledge-share can be created through short weekly coffee meetings, break-out periods, or any other time where junior staff can simply ask the more tenured people to "tell us something important that you've learned during your career that can't be learned from a book."

SCR and I also ask that you join us in selecting an industry-focused scholarship program to support which will help spread the word about available power industry careers. As we are happy to help you identify the people who work in the areas served by *World-Generation*, we are also happy to help you identify worthy sponsorships to invest in, and events to attend which promote the well-being of our industry. By joining us in this initiative, you will be helping us all, as together, we ensure that the next generation of industry talent is established.

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ANALYTICS CONTINUED FROM PAGE 22

the time and expense of addressing problems and reduce costly system downtime.

PVIQ also provides project developers with detailed information on the relative performance of systems that use different hardware types, that are installed under different climatic conditions and that are installed by different businesses. This creates a powerful feedback loop that drives best practices in system design and installation, further decreasing the cost of solar PV by improving factors such as site selection, hardware vendor choice, warranty and insurance product structuring and financing optimizing. These insights allow solar installers to price their services more competitively and increase their addressable markets.

While solar PV is growing rapidly, it still comprises only a tiny percent of the U.S. energy supply. In order for solar PV to play a significant role in the generation of electricity, the industry will need increased access to real-time intelligence to optimize production at the point of use, save on costs and improve O&M workflow. This can only come from sophisticated fleet management and data analytics software that draws on a wide range of available data to provide asset managers with the insight they need to get the most out of their solar PV assets.

NUCLEAR ENERGY EXPANDS CONTINUED FROM PAGE 10

We have 10 reactors – 12,500 megawatts – in active licensing now at the NRC. Obtaining a combined construction/operating license is a non-trivial \$150 million to \$200 million commitment. Three of these projects are maintaining their loan guarantee applications with the Department of Energy – Dominion Resources’ North Anna 3 project (a single-unit ESBWR); Duke Energy’s William S. Lee project (twin AP1000s), and Nuclear Innovation North America’s South Texas Project 3 and 4 (twin ABWRs).

There is \$10.6 billion remaining from the \$18.5 billion in loan guarantee authority originally authorized, after accounting for the \$8.3 billion in guarantees to the Vogtle nuclear project in Georgia. The \$10.6 billion in remaining loan volume is clearly not sufficient to cover the needs of all three projects, and we have urged DOE to seek additional loan guarantee authority to cover their needs, if and when the project sponsors choose to proceed. It is important that current applicants retain line-of-sight on potential financing through the loan guarantee program.

The loan guarantee program deserves serious attention because it will become more important, not less, in the future. With 69 nuclear reactors currently under construction around the world and 183 new nuclear plant projects in the licensing and advanced planning stage, commercial opportunities for U.S. vendors and suppliers are found increasingly in international markets.

All the major forecasts point to a major expansion in nuclear energy around the world over the next 20 years.

The International Energy Agency, the World Energy Council, and major oil companies like Exxon-Mobil and Royal Dutch Shell all forecast a doubling of nuclear generating capacity worldwide in the next 15-20 years, and more than that in a carbon-constrained environment.

WHO GETS TO BUILD TRANSMISSION? CONTINUED FROM PAGE 14

occurred in generation RFPs:

First, the screening factors needed to “get in the door”, which will be designed to show that the team has the necessary experience and financial capability to successfully develop the project, if chosen. In bids that ICF has managed, we call these “threshold” criteria.

Second, if they pass the first screen, the evaluation factors would assess the means to bring this specific project to fruition (e.g., how this project would be permitted, financed, constructed and operated). Even then, bids could be subject to a “fatal flaw” dismissal, if their offer is not responsive to one of the key criteria (e.g., their permitting plan does not reflect local realities).

In this context, we anticipate that bids will become more explicit with regard to the factors and weights being used for analysis, and their impact on the evaluation. The evaluation should also become more reliant on price (or price ceiling) in the second step of the two-step process above, since all of the company-level uncertainties will have been resolved in step one.

We already see these trends emerging. In terms of higher weightings on price in the evaluation criteria, for example, the life cycle cost bid was just about the only evaluation criterion once the teams were qualified in the Alberta solicitation. A focus on price puts the developer or JV at more risk given the uncertainties of actually permitting and building transmission. Even so, we expect large projects will remain attractive to bidders due to the size of the projects (the Alberta winning bid was for \$1.433 billion) and the ability of bidders to differentiate their bids and be creative in specifying how they would construct, finance, operate and maintain, and the return on equity they are willing to accept.

With regard to being more explicit on evaluation criteria, the evaluation process to be implemented in the SPP region will in fact have this format, as shown below¹.

1 Note that the total is a maximum of 1100 points, rather than 1000. The 100 points for “participation in planning” would be awarded to a developer who

Thus, the format and criteria for evaluating bids in these solicitations will evolve. Successful bidders will need to respond so as to maximize their points in the evaluation process, without putting themselves at undue risk by bidding too low for a project that may end up costing more than anticipated.

What to Expect? We expect to see the following pathways for the competitive transmission industry in the next 2-4 years:

- More near-term transmission opportunities in selected markets, more organized around solicitations, with:
- More non-incumbent participation
- More financial players and joint ventures
- More targeted lines and substations opportunities
- More prospects arising from the advent of EPA regulations
- Both open and closed RFPs for reliability and congestion, with greater transparency in the evaluation criteria and a greater focus on price in the evaluation
- Potential inter-regional merchant opportunities (Order 1000 has not focused yet on organizing the inter-regional planning process)
- More mergers and acquisitions among transcos, including spinoffs and acquisitions, as some firms decide to refocus on their core businesses
- Possible utility spinoffs of transmission
- More consolidated resource planning that synthesizes generation, transmission and distributed energy resources (DERs) into a single planning process

The more prepared transmission companies are for this transition, and for the need to adapt their strategies so that they are taking a long-term view in addition to seeking to win near term RFPs and other projects, the better they will be positioned for the future.

offers a solution in the planning process that SPP selects for a solicitation. SPP has also adopted a feature that other RFPs have not, and that is the use of an independent expert panel to evaluate and assign points in these categories, and make recommendations to the SPP Board.

(continued page 28)

WHO GETS TO BUILD TRANSMISSION? CONTINUED FROM PAGE 27

We now shift gears to another critical aspect of what will affect transmission in the coming years – environmental regulations, and specifically, the Clean Power Plan (CPP).

Overall CPP Impacts on Transmission. The CPP is likely to drive retirements and changes in generating resource mix and dispatch patterns that could alter transmission flows and impact overall system reliability. Each one of the CPP's building blocks, to the extent they are relied upon by a state or company for compliance, could have an effect on transmission.

ICF continuously monitors and analyzes the outlook for generation, and the likely level of retirements and resources available to meet the demand for power. The figure below indicates ICF's projections of which plants will retire and which ones will stay on line based on explicit limits on CO2 emissions. Overall the older and smaller the plant, the more likely it is to retire rather than make the investments required to comply with emissions regulations. From an installed base of just over 300 GW, ICF anticipates that the CPP will lead to dozens of GW of early retirements, on top of dozens of GW that will be retired by 2020 in response to the Mercury and Air Toxics (MATS) rule. The EPA itself has projected that the CPP could result in an additional 49 GW of coal retirements by 2030.² Of course, the final form of the CPP and factors such as the level of gas prices will affect the level of coal retirements.

In general, if there is a healthy surplus of power capacity available in a region and new generating units are in the pipeline, generation unit retirement may have a minimal impact on the reliability of the grid. However, significant retirements and changes in generating resource mix, locations and dispatch can cause changes in transmission flow patterns and/or changes in substation voltages, resulting in usage of the transmis-

² Source: EPA's "Regulatory Impact Analysis for the Proposed Carbon Pollution Guidelines for Existing Power Plants and Emission Standards for Modified and Reconstructed Power Plants", Table 3-12

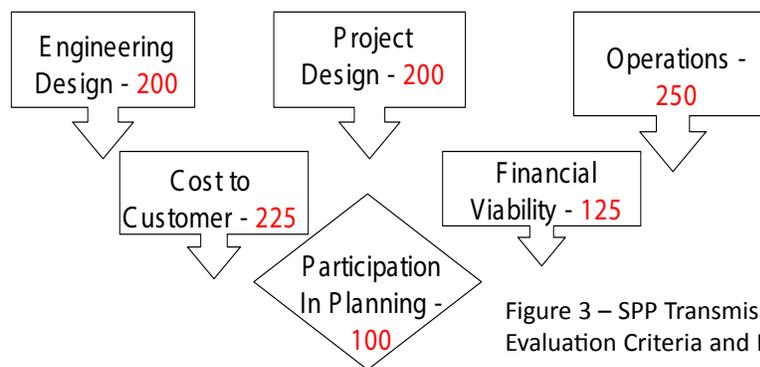
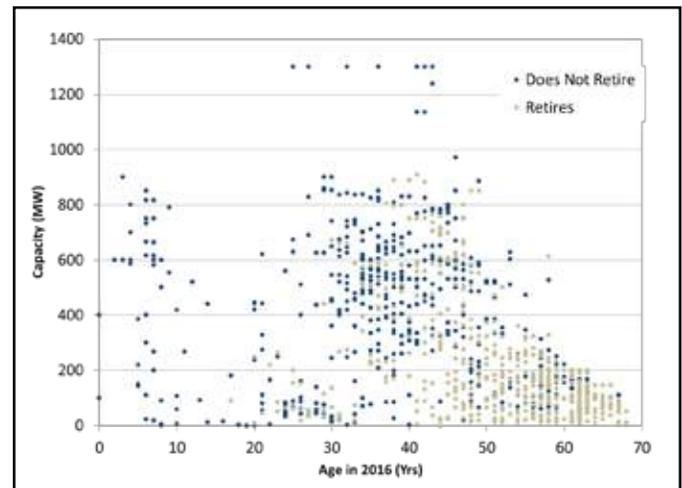


Figure 3 – SPP Transmission Bid Evaluation Criteria and Maximum Points

Figure 4 – ICF Projected Coal Retirements by 2020



sion system that is different from what it was designed for. Indeed, the retirement of a single generating facility may be considered critical to the operation of the grid if it increases power flows over certain transmission lines to the point where it causes them to overload or creates variations in substation voltages beyond the reliable operating limits. In fact, many power plants are currently located in load pockets or otherwise constrained areas where they are needed to support system reliability.

Retirements and other elements of the CPP will certainly affect the level of investment required in the transmission system, as the dispatch of the system, and the operation of the system to maintain reliability, minimize congestion and provide access to renewable power will all need to change, as coal plants are removed and more natural gas and renewables come on stream.

How large is the required transmission investment? In a word, it could be considerable. Recently, ICF undertook a study to

assess the impact of the CPP on the need for investment on just one of the functions of the transmission system – that of transmission security. By transmission security, we refer to the ability of the grid to continue operating reliably following sudden and unanticipated events, such as the loss of power from a major generating station or the loss of a key transformer. The investments required for such security would include new transmission lines, transmission system upgrades, and reactive power devices to resolve the line overloads and excessive voltage variations that could occur.

ICF selected one region – MISO – and assessed the need for transmission security investment that would arise from the CPP. What we found was that such investment was vital to maintaining such security. In fact, as Figure 5 shows, without such timely investment, the system would experience a high number and intensity of thermal line overloads (12 such overloads at 120% or

(continued page 29)

WHO GETS TO BUILD TRANSMISSION?
CONTINUED FROM PAGE 28

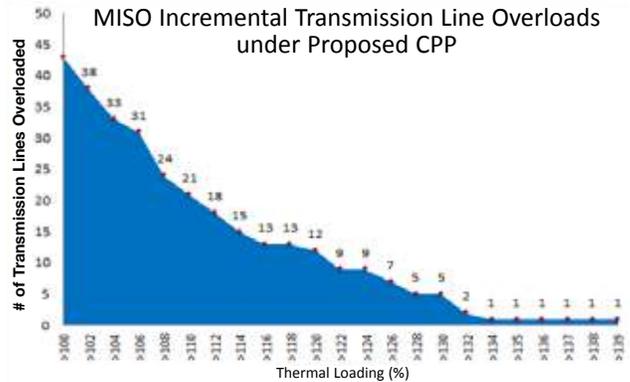
more of system capacity) in 2020, both being considerably higher than system operators would want to experience, and 43 such overloads for the year as a whole. We found that the MISO region would need at least \$500 to \$750 million in transmission investments in order to address transmission security issues from the implementation of the proposed CPP, not including transmission projects that have already been approved.

To develop a nationwide estimate of the investment needs, we then extrapolated our MISO findings by assuming that the average impact of a generator retirement on transmission security is similar in other regions. For just this one function, we found that the CPP would precipitate the need for \$1.5 to \$2.5 billion nationwide in additional investment by 2020. Figure 6 is a color contour showing the nationwide investments by region. Clearly some regions will be more affected than others. Darker shades represent larger investments.

Since we used single (N-1) contingency analysis, we believe that this estimate is conservative because system planners will analyze contingencies more severe than those included in our assessment. In addition, this analysis did not include the incremental investment required by 2020 for two other primary grid functions: 1) resource adequacy (maintaining sufficient capacity to meet customer needs in spite of scheduled and unscheduled outages); and 2) transmission adequacy (having sufficient transmission capacity to move power across key interfaces in the system). We further did not include transmission required to interconnect new generation that CPP-stimulated retirements would bring forward in time.

How much could these investments be? They could be considerable. Transmission security generally requires less investment than either of the other grid functions mentioned, and the need for interconnection (particularly of renewables) and the use of N-1-1 criteria will increase the investment required. Thus, we expect that the incre-

Figure 5 – Without Investment there would be Many Transmission Security Thermal Overloads



CPP Projected to Drive \$1.5 to \$2.5 Billion in Transmission Security Investments

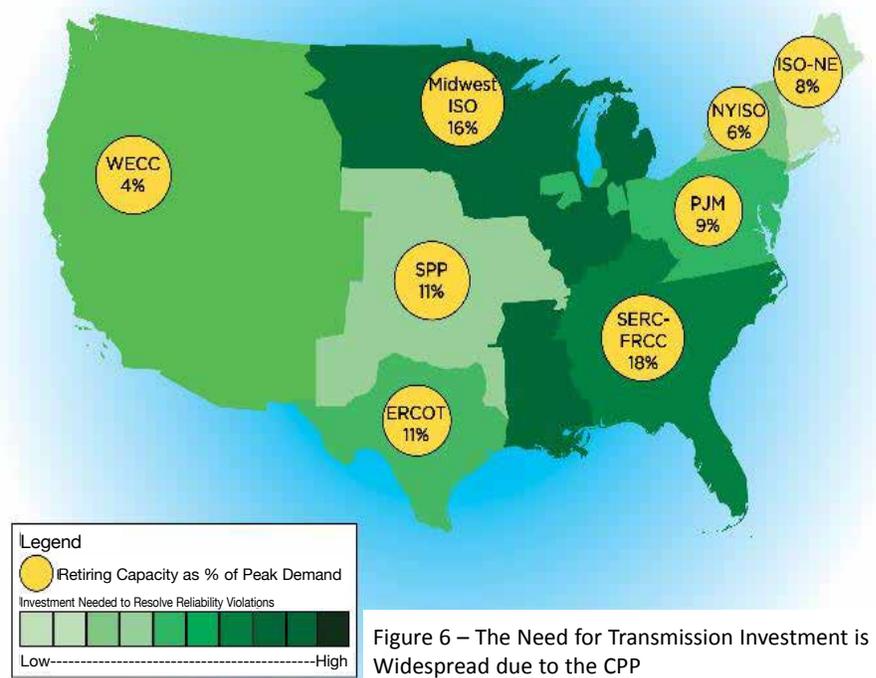


Figure 6 – The Need for Transmission Investment is Widespread due to the CPP

mental transmission investment could be quite a few multiples of the amount required for transmission security. ICF can evaluate those requirements based on assessments of the CPP in specific cases to help companies identify such needs and opportunities.

Could these needs be satisfied? Absolutely. An incremental \$1.5 to \$2.5 billion investment stemming from transmission security spread over several years represents a small fraction of the national 5-year capital expenditure on transmission — less than 3% — and will not be an impediment to CPP implementation. The challenge is not making the investments needed, but rather the time frame in which

they would need to be carried out. High-voltage transmission investment from start to finish can easily take 10 years, and that does not count the time required for the solicitation processes described above. It may be quite challenging (some would say infeasible) for transmission owners to make the investment required in the time frame required to avoid the kind of system violations described above, which could put the reliability of power supply at risk. Thus, it's not a question of "how much?," but rather, "how soon?"

ICF is regularly evaluating such scenarios and continues to work with clients to analyze the specifics of each region and the magnitude of such requirements.

GROWTH OF YELDCOS CONTINUED FROM PAGE 16

take 100% of the cash distributions until it recovers its capital investment after which 100% of the cash is distributed to the tax equity investor until it reaches a target yield. In other deals, the tax equity investor may take a specified share of the cash flow, say 40%, or a preferred distribution expressed as a percentage of its investment (say, 2% of its capital investment each year).

DRY PERIODS

Historically, partnership flip transactions have been structured with sponsor “dry periods” during which most or all of the cash flow from the project is used to repay the tax equity investor’s preferred return. Also, these transactions often contain cash override provisions, where the tax equity investor can sweep all or most of the cash flow upon the occurrence of certain specified events, such as project underperformance, change in tax assumptions or a breach of the sponsor representations or covenants. These dry periods typically don’t work well for yieldcos that require a steady and predictable cash flow stream to pay dividends to its shareholders. Compromises emerged where tax equity investors have begun to structure transactions with cash sharing provisions that pay the sponsor some significant percentage of project cash flow and do not permit cash diversions to the tax equity investor beyond a certain cap, say 50% of project cash flow, regardless of circumstance. Some yieldcos have offered upstream guaranties to tax equity investors as a trade off to preserve consistent cash flow from their project companies.

SALE-LEASEBACK

Sale-leaseback transactions are likely to be the least hospitable tax monetization structure for yieldcos. In a sale-leaseback transaction, the developer sells its project to a tax equity investor and immediately leases it back. The sale transfers to the tax equity investor all the tax benefits associat-

ed with the project. The tax equity investor compensates the developer for these tax benefits in the form of reduced rental payments throughout the lease term. Sale-leasebacks are typically structured with long-term leases to permit the maximum tax deferral period and price based on a rent coverage ratio that requires most of the project cash flow to be used to make rental payments under the lease. Most sale-leasebacks in the market are sized in the neighborhood of 1.2 to 1.4 rent coverage ratios, resulting in little excess cash flow available to the sponsor. Yieldco investors looking for a steady stream of cash flow are therefore likely to be less enthused with this financing structure. Some sale-leaseback structures, however, particularly those with very high-coverage ratios may allow for sufficient sponsor cash flow for a yieldco. High-coverage leases, however, generally correlate with lower purchase prices, creating a less than optimal tax structures to the seller/lessee (e.g., lower tax basis and investment tax credit).

Yieldcos can therefore be expected to build asset portfolios that provide for steady cash flow and shelter from corporate income tax. The balance of their tax benefits are likely to be monetized with tax equity investors using structures that permit maximum cash flow certainty to its shareholders.

BIOS

Mr. Katz joined Chadbourne from GE Energy Financial Services where he was Vice President and Tax Counsel. He regularly publishes articles in tax and energy periodicals. He received a BS from Touro College, his JD from Fordham University School of Law and his LL.M from New York University School of Law.

Prior to joining Chadbourne & Parke, Mr. Masri was a tax associate at another large international law firm. He graduated from Baruch College of the City of New York and Fordham University School of Law. He is also approved as a Certified Public Accountant.

RENEWABLES ENTER THE MAINSTREAM CONTINUED FROM PAGE 19

policies and tax credits favorable to renewable investments and developments.

OUTLOOK/CHALLENGES

- Grid Integration & Stability
How flexible do grids need to be to use the maximum amount of renewable energy?
Should there be a ceiling on renewables development to help with regulating frequency and distribution?
- Electricity Demand
Utilities often operate on the premise of increasing electric demand – is this still an acceptable premise, given the small 1% increase in demand for electricity each year until 2020?
- Utility’s role in balancing first two challenges
Who will pay for shared infrastructure changes as renewable power use increases?
Are costs being unfairly shifted on non-renewable customers?

OPPORTUNITIES

Electricity storage is already being used across the grid, as one of several options to smooth the effects of variable resources like wind and solar.

Storage technologies like batteries are gaining traction quickly, as performance improves and costs decline.

Energy storage growth is projected to explode from 0.34 GW in 2012-2013 to 6 GW by 2017 and over 40 GW by 2022.

Clean Power Plan – If approved, states will be required to cut CO₂, and would have to use renewable sources of power

Other Clean Air Act rules, such as CSAPR and MATS, depending on court rulings

US-China Climate Accord – US pledged to cut CO₂ more than 25% by 2025, with incentives for wind and solar development.

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