Welcome to the EDGE Finance Distributed Energy Report for Q4 2014. The EDGE Report provides current, actionable market intelligence for investors, project developers and companies bringing distributed energy technologies and services to market.

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The DER Confluence Accelerates

2014 has seen unprecedented acceleration in deployment of distributed energy resources (DER) – which we define to include both localized generation technologies (solar, small and modular wind, combined heat and power, waste heat recovery, fuel cells and microturbines) as well as other distributed energy assets such as energy storage, microgrids, virtual power plants, energy efficiency, demand response and advanced energy management information technologies. The confluence of technology advancements, increasingly stringent environmental regulations and market forces is driving an ongoing fundamental industry shift towards distributed energy, with continued expansion, innovation and market disruption on multiple fronts.
In this issue:

<table>
<thead>
<tr>
<th>Section</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market Reports - Page 3</td>
<td>Highlights from the latest in quantitative trends and market assessments.</td>
</tr>
<tr>
<td>Recent Transactions - Page 4</td>
<td>The distributed energy confluence is creating major opportunities (and related threats) in a variety of industry sectors. We highlight some of the major private sector announcements of the last quarter.</td>
</tr>
<tr>
<td>Innovations in Distributed Energy Finance - Page 6</td>
<td>Innovative financial models and mechanisms are a key to successful deployment of DER. In this report we focus on recent developments in DER securitization and leasing models; crowdfunding; green bonds; green banks; and progress in contract standardization to reduce transaction costs.</td>
</tr>
<tr>
<td>Federal Policies and Regulations - Page 14</td>
<td>While Congress has remained inactive on the energy front, the Obama Administration has continued to strongly advance DER-supportive policies. Our Federal Report discusses recent major actions by the White House under President Obama’s leadership, as well as vitally important regulatory developments at EPA and FERC.</td>
</tr>
<tr>
<td>Report from the States - Page 18</td>
<td>State legislatures and public utility commissions are cutting new ground facilitating DER. Utilities are continuing to push back, as net metering and ratemaking controversies continue. We summarize key developments in the states and discuss pending regulatory changes.</td>
</tr>
<tr>
<td>International Developments - Page 22</td>
<td>Developing countries are prime markets for DER, but bring major challenges. In this issue, we review recent developments in several key markets and regions: China, Africa and the Caribbean.</td>
</tr>
<tr>
<td>Looking Forward - Page 24</td>
<td>Finally, in our last segment, we highlight recent thought leadership and predictive assessments for DER in the coming years.</td>
</tr>
</tbody>
</table>
MARKET REPORTS

In August, Navigant Consulting released a “Global Distributed Generation Deployment Forecast.” Highlights from Navigant include:

- Annual installed capacity in the global distributed generation (DG) market is expected to grow from 87.3 GW in 2014 to 165.5 GW in 2023.
- Revenues from DG are set to grow from $97 billion in 2014 to $182 billion in 2023.
- To date, DG has been more disruptive in Western Europe than in any other region. Utilities are losing hundreds of billions of dollars in market capitalization as DG reaches higher levels of penetration in leading countries such as Germany, the United Kingdom, and Italy.
- The prospect of similar losses by utilities in the United States is prompting a battle among utilities, the DG industry, and regulators seeking to strike a balance that allows for DG growth while allowing utilities to benefit.
- Navigant also reported that residential generation and storage (RGS) – solar PV, energy storage, electric vehicles (EVs), and residential combined heat and power (resCHP) forecasted revenue will grow from $54.7 billion in 2013 to $71.6 billion in 2023.

CitiGroup issued a report in August calling for an “increasingly bright” long-term outlook for the solar industry. According to the report, solar will see continued growth in energy generation market share and will become more competitive with fossil fuels, led by (i) favorable economics, (ii) required fuel diversification by utilities, and (iii) advantageous emerging financing structures and vehicles.

CitiGroup predicts that global solar industry projections from the International Energy Agency – 662 GW of installed generation capacity from 2012-2035 – are conservative. Even at those numbers, solar energy would represent 11.2% of all newly installed generation in that timeframe and would require $1.3 trillion in investment.

The utility industry has also acknowledged these market trends. Edison Electric Institute predicts that U.S. distributed solar energy capacity will grow at a rate of 22% annually through 2020. A survey of utility executives by DNV GL reported that increased interconnection of distributed generation poses the single most significant challenge facing the utility industry over the next 5 years (40%), followed by lack of clarity on federal energy and environmental policies (32%).
In late August, Vivint Solar registered for its initial public offering, valued at $200 million. The Vivint announcement follows the very successful run in SolarCity stock since its IPO in late 2012. Rumors of another, even larger residential solar company filing for a public offering are swirling around the industry.

So what is driving all this investor interest? Solar is still a relatively immature industry. Less than 0.3% of electricity in the U.S. comes from solar generation and solar has been installed on less than 400,000 homes in the U.S. But the residential market potential is immense: there are more than 90 million single family homes in the U.S. and as many as 50 million more households in multi-family structures, along with several million more commercial and other non-residential structures. While solar may not work on every structure in the U.S., just a small wedge of this market is worth hundreds of billions of dollars.

Vivint has seen rapid growth, going from 2669 systems installed in 2012 to more than 8000 in the first six months of 2014. The success is cyclical – as the industry grows and taps into new investors, the cost these companies pay for the money necessary to build and operate these thousands of rooftop solar systems drops, making solar even more competitive with the electricity that consumers buy from their utilities.

All this money coming into the residential solar space will demand even faster growth to support investor expectations. Vivint’s announcement is just part of a trend that will soon see solar become a major part of the American energy industry.
Utility Industry Deals

**NRG Energy** announced the restructuring of its retail business into three units - NRG Business, NRG Home and NRG Renew. NRG Business incorporates NRG’s conventional fossil generation portfolio in the wholesale markets. NRG Renew will take its utility-scale renewables projects. NRG Home will now combine NRG’s retail electricity business with a number of NRG’s unregulated subsidiaries, including rooftop solar, home energy management, and electric vehicle charging businesses, as well as its recent acquisition of portable solar company Goal Zero. NRG sees capacity moving towards DER via rooftop solar, fuel cells, and microturbines, particularly in the Northeast.

**Exelon Corporation** also has made private equity investments in DER through its unregulated subsidiaries. In July, Exelon became the first energy company to invest in Bloom Energy’s electrons-as-a-service program, financing 21 MW of fuel cell projects at 75 commercial facilities in California, Connecticut, New Jersey and New York.

In a “if you can’t beat ‘em, join ‘em” strategy, **Arizona Public Service (APS)**, which last year was rebuffed in its attempt to impose large fixed fees on third party solar installations, is now seeking approval for its own rate-based rooftop solar deployment program from the Arizona Corporation Commission. APS would finance, install, own, and maintain 3,000 rooftop solar systems – about 20 MW in total. APS would lease rooftop space in exchange for a $30 monthly bill credit for the entire 20-year program. Solar City and other private solar companies oppose the APS proposal, arguing that as a monopoly utility APS has unfair competitive advantage.

Other recent announcements

On August 21, **SunEdison Inc.** closed a $160 million fund with Barclays and Citi to finance 40 distributed generation projects in the U.S., including photovoltaic (PV) systems at an average size of 1.1 MW per system. **Capstone Turbine Corporation** announced orders for 25 Capstone C65 microturbines, totaling 1.6 MW, for use in various commercial industrial combined heat and power (CHP) and oil and gas applications in the U.S. Mid-Atlantic. **Northern Power Systems** announced a new generation of 100 kilowatt magnet/direct drive distributed wind turbines, available for delivery in the fourth quarter of 2014.

On July 29, energy services company **Direct Energy** announced it was acquiring **Astrum Solar** for $54 million, combining Astrum’s residential solar offerings with the existing Direct Energy platform of more than 6 million residential customers.
Innovations in Distributed Energy Finance

According to the U.S. Energy Information Administration (EIA), 42 gigawatts of new peak power generation capacity will be needed in the next twenty years. EIA estimates more than $2 trillion will be invested in this generation capacity, with at least another $1 to $2 trillion in necessary transmission and distribution upgrades.

These investments will be made against fundamental shifts in the industry. The transition toward distributed energy is creating major opportunities for investors. At the same time, the combination of small and localized assets, new technologies, and challenges to incumbent interests is creating increased uncertainty. Innovative financial models can be used to structure distributed energy investments, particularly those focused on aggregating pools of assets for investment and securitization. Given the complexities of distributed energy and the changing regulatory and market landscape, identifying risks and opportunities to mitigate these risks will be increasingly important in the context of distributed energy investments.

Contract and Data Standardization to Reduce Transaction Costs

For developers of solar, CHP and other distributed energy projects, developing standard transaction documents and processes can be critically important to the bottom line. Inefficient transaction processes drive up costs: not only the direct costs of lawyers, accountants and consultants, but also the opportunity costs as executive time is focused on protracted negotiations and documentation exercises.

The U.S. National Renewable Energy Laboratory (NREL) has developed a set of model contracts for solar projects. The contracts include commercial power purchase agreements (PPAs) as well as lease agreements for residential solar systems offered by third-party solar leasing companies. They were developed by a working group of approximately 25 companies organized by NREL called Solar Access to Public Capital (SAPC).

SAPC brought together representatives of solar developers, investment banks, rating agencies, software companies, and lawyers to collaborate on standard power-purchase agreements, leases, protocols, and operations and maintenance best practices.

A related NREL project, called TruSolar, seeks to standardize performance data for solar systems, to provide greater confidence in projecting future revenues and ultimately reduce the cost of capital.
As state and federal support for renewables shrinks, the industry is continuing to find ways to reduce costs. Access to less expensive capital is a vital piece of this process. The use of solar securitizations (also called "asset-backed securitizations" or "ABS") is enabling the solar industry to access a larger and more diverse investor base, which will eventually help to reduce the long-term cost of capital to a likely range of 3% to 7%, compared with the 8% to 20% rate required by some project finance equity and tax equity investors in the current market.

In late 2013, SolarCity offered the first distributed generation securitization, a $54.4 million portfolio. It issued a second ABS of $70.2 million in March 2014.

Also in March 2014, Deutsche Bank sold the first securitized portfolio of efficiency projects, a $104 million bond comprising 5,900 residential property loans under the Riverside, California property-assessed clean energy (PACE) program.

In the last quarter, securitizations have continued to grow. In late July, Solar City offered a further solar securitization in the amount of $201.5 million. The notes are secured by cash flow generated by a pool of photovoltaic systems that will be owned by a SolarCity affiliate as lessor under a master lease agreement, including rent and other payments to be made by the lessees. As reported by Bloomberg New Energy Finance, total sustainable ABS offerings since 2013 have now exceeded $2 billion.

For investors who seek to exit portfolios of solar assets or remove the assets and accompanying risk from their balance sheets, securitization will increase liquidity and free up cash to make additional investments. In the end, these reductions will be good for consumers as well. The U.S. Department of Energy estimates that securitization will lower the levelized cost of energy from 8% to 16%.

In the most basic form of a solar securitization, the holder, or "originator," of a portfolio of solar assets identifies and isolates contracted revenues from a series of solar projects. The originator then bundles the contracted revenues into a "reference portfolio," and sells the revenue stream (but not the physical solar asset itself) to an issuer, typically a special purpose vehicle (SPV). The SPV then issues a tradable, interest-bearing security to investors in the capital markets. The revenues generated by the reference portfolio fund a trustee account that passes through payments, either fixed or floating, to the investors in the new security. These investors are senior to equity investments and for stable income producing assets like solar projects represent a relatively low risk investment.

In order to obtain an investment-grade rating for the securitization, as required by the investors best positioned to buy long tenor fixed-rate securities, such as pensions and insurance funds, the sponsor will need to develop a large enough portfolio with geographical diversity and a credit worthy source of underlying revenue (the buyers of the solar electricity).
Successful securitization models depend on a number of key factors:

1. **Scale and Geographic Diversity.**
   For securitization to work, assets should be pooled across a geographically-diverse area, such as numerous states in different regions. This reduces the risk that individual regulatory regimes and market forces will materially affect the value of assets in the pool.

2. **Standardization of Asset Structures and Documentation.**
   Pools need to be standardized and consistently documented in order for underwriters and investors to have comfort in the underlying revenue streams without having to review a diverse range ownership structures and contractual terms.

3. **Off-take Risk.**
   Most residential solar sponsors manage off-take risk by limiting their eligible pool of potential customers to homeowners with a minimum FICO score. For sponsors selling power to commercial and industrial (C&I) customers, off-take risk is managed in a less standardized way, which makes the C&I solar asset more difficult to securitize. Sponsors are managing off-take risk by installing solar on multiple sites of large rated and creditworthy counterparties.

4. **Technology Risk.**
   Distributed solar asset revenue streams have tenors of 15 to 20 years, but there is currently less than 10 years of historical data upon which to rate the performance of most solar panels. Passage of time and improved operating data will enable further de-risking of solar securities.

5. **Sponsor Risk.**
   Sponsors are still relatively new to the market. Even leading sponsors who are likely to securitize their assets such as Solar City, SunRun, Sungevity, and Viridity have been operational for less than a decade. One way to overcome sponsor risk is to take the approach that Solar City is pursuing as it prepares an initial securitization – i.e., put in place a backup service agreement to ensure that if the sponsor is not able to service its agreements, there will be a well-rated, larger company to take over.
Market Risk.
There is also the risk that solar energy might be less economical than traditional energy sources during the tenor of the asset. Sponsors will need to find ways to convince the capital markets that their solar assets will continue to generate electricity at a price that is competitive to traditional energy, or find other ways to ensure that market risk won’t jeopardize the value of the asset. While hedges on the aggregated pool of assets may offer a short-term solution, the duration of any available hedge (generally 3 to 7 years) will typically be much shorter than the tenor of the asset.

Regulatory Risk.
In order to facilitate the growth of solar securitizations, government agencies will need to update regulations, such as disclosure and liability rules. Also, assignee rights under government energy programs such as net metering rules may need to be updated to ensure that investors in solar securitizations are protected against risk of obligor default. The government may also provide credit enhancement through various methods, including loss reserves, or investments through entities like a government backed “green bank” program.
Crowdfunding for Distributed Generation

Solar and other distributed energy projects offer asset attributes and capital investment profiles that are well suited to crowdfunding. Projects of 1 MW and less can be supported by equity that is readily obtained from multiple small investors. Such projects also come with social incentives for investment and are further supported by intangibles associated with carbon emissions reductions. Bloomberg New Energy Finance projects that crowdfunding for rooftop solar projects will raise $5 billion of investment within five years, more than 50 times the amount raised to date. Growth is estimated at a rate of more than 75% year to year.

SEC Regulations Are Key

While the U.S. securities laws do not permit equity based crowdfunding in the general sense, i.e. selling unregistered securities to the public at large, in July of 2013, as required by the JOBS Act, the SEC adopted final rules lifting the ban on general solicitation and general advertising for certain private securities offerings under Rules 506 of Regulation D.

The new rules left in place the traditional private placement exemption, now commonly referred to as 506(b), which permitted the offering of an unlimited amount of securities with no technical disclosure requirements provided that the offering is limited to accredited investors. Up to 35 non-accredited investors may participate in the offering, but that requires extensive disclosure. The catch is that the offering must be private, in other words no general solicitation or advertising.

Under the new Rule 506(c), companies can offer securities by means of general solicitation, provided that they satisfy all of the conditions of the exemption, including:

- All purchasers of securities must be accredited investors, and
- The company must take reasonable steps to verify that the purchasers of the securities are accredited investors.

Essentially, by lifting the ban on general solicitation with Rule 506(c), the SEC permitted crowdfunding by accredited investors. With uncertainty as to what constitutes the reasonable steps required to be taken in order to verify accredited investor status, companies have been hesitant to rely on the 506(c) exemption and instead have been trying to continue to rely on 506(b), even when they are essentially crowdfunding. This requires the development of a pre-existing relationship with investors prior to the offering of securities, which is practical matter has limited application of this concept. As more and more companies start to rely on 506(c) and creative entrepreneurs develop innovative ways to verify accredited investor status, crowdfunding of accredited investors will become commonplace.

SEC continues to work on the issuance of regulations implementing the provisions of the JOBS Act of 2012 and the Dodd-Frank legislation. Among others, current pending regulations include:

- The long-awaited redefinition of "accredited investor."
- Regulations implementing the equity crowdfunding provisions of the JOBS Act for non-accredited investors.
- Regulations implementing the new Regulation A+, allowing quasi-public offerings of up to $50 million.

How SEC determines these issues will have a huge impact on continued expansion of the crowdfunding model.
Recent Crowdfunding Developments

Innovative crowdfunding mechanisms are proliferating in the U.S., and even more in the UK and Europe. As the examples below demonstrate, innovation in financing models is becoming as important as technology advancement to the success of distributed energy projects.

- **Mosaic**, [https://joinmosaic.com](https://joinmosaic.com), heralded as the “Kickstarter of solar,” has now launched a portal for investors to provide capital for solar installation projects developed by Mosaic, and which also enables communities to propose buildings and solar installations for potential funding.


- **CrowdSun**, [https://crowdsun.com/](https://crowdsun.com/), connects qualified funders to projects that it certifies based on detailed project review.


- **Palmetto Group**, [https://www.palmetto.com/](https://www.palmetto.com/), based in Charleston, South Carolina, offers a distributed energy investment platform based on secured-debt like instruments.

- In the UK, **Good Energy** [http://www.goodenergy.co.uk/](http://www.goodenergy.co.uk/), an incumbent utility, launched a crowdfunding offer, announcing that it is hoping to raise £1m through renewable energy crowdfunding platform Trillion Fund.

- This October, the first Renewable Energy Crowdfunding Conference, [http://www.recrowdfunding.eu/#](http://www.recrowdfunding.eu/#), is taking place in London. With more than 450 platforms worldwide, the conference hopes to bring together the industry and discuss its future—one that is certain to see crowdfunding become more prominent. We expect to be seeing the first clean energy crowdfunding conference in the U.S. very soon.

Green Bonds

Following the model of the World Bank and the International Finance Corporation, state and local governments are ramping up their issuance of green bonds to finance low-carbon projects in renewable energy, clean water, and infrastructure. These governments face a host of needs driven by the impacts of climate change. But with already stretched budgets, financing sustainable infrastructure has been a challenge.

Green bonds are earmarked specially for environment-friendly projects. Municipal bonds, with certain exceptions, have traditionally been non-project specific. The sustainability linkage taps into investors’ increasing desires both for more transparency and to become good stewards of the environment.

By mid-year, Bloomberg New Energy Finance reported that a record $16.6 billion in green bonds had been issued in 2014. BNEF notes “a surge in corporate self-labeled bonds and high volumes from large international and supranational institutions like the World Bank.” At its current pace, BNEF says total 2014 volume could surpass $40 billion, triple the $14 billion issued in 2013.
In 2013 Massachusetts became the first state with a green bond facility. The offering was so successful that Massachusetts has now tripled the volume of green bonds offered in 2014, reportedly receiving $1 billion in buy orders for the $350 million in bonds offered. Other states, including California, New York and the District of Columbia, are following suit. California recently issued new debt that initially included $200 million of green bonds to finance projects that strengthen and protect the environment, such as clean energy, clean water and public-transit infrastructure. California quickly expanded the offering to $300 million in response to strong investor demand.

Private companies are also launching major green finance initiatives.

- **Abengoa SA**, Spanish energy company and global leader in the development of solar-thermal power plants, plans to issue the first European green bonds to raise $642 million to finance renewable energy, water, power transmission, energy efficiency, bioenergy, and waste-to-energy projects.

- **GDF Suez**, a French utility company, recently issued green bonds for its renewable energy and energy efficiency projects.

- Earlier this year, **Toyota** also became the first car maker to issue green bonds to fund electric vehicle and hybrid car loans.

- **Bank of America/Merrill Lynch** has been both an issuer and an underwriter of these types of bonds. In terms of issuance, it kicked-off the corporate self-labeled space in early November 2013 with a $500 million green bond, the proceeds of which are to be used to finance renewables and energy efficiency via loans and credit lines to industry participants. Since then, about $9.7 billion in corporate self-labeled green bonds have been issued by nine companies in Europe and the United States. Bank of America also announced plans to attract $10B of new investments into energy efficiency, renewable energy, and energy access. Through its new Catalytic Finance Initiative, the bank committed $1 billion to develop investment structures and de-risking tools and will work with development finance institutions, insurance firms, foundations, impact investors, and institutional investors on the initiative.

- **Barclays** announced that it will invest $1.3 billion in green bonds to finance environmentally friendly projects by November 2015 making it one of the largest commitments to green bonds by a bank.

To foster transparency and standardization of green bond investments, several private financial institutions have signed on to the Green Bond Principles, a set of voluntary guidelines developed by Ceres and bond issuers such as the World Bank and the International Finance Corporation. The Principles focus on four key areas — use of proceeds, project evaluation and selection, management of proceeds, and reporting.

**Institutional Investors**

Major pension funds and other large investors are increasingly focusing on clean energy and sustainability in crafting investment guidelines. Recent developments include:
A recent report by Arabella Advisors showed that 181 institutional investors have pledged to divest from fossil fuels so far, more than doubling the count since January.

Dutch public pension manager APG Asset Management, with $377 billion in assets, said that it will double investments in “sustainable energy generation” to $2.6 billion over the next 3 years, including investments in sustainable real estate, solar, and wind.

The California State Teachers’ Retirement System pension fund (CalSTRS), which manages $188 billion assets, announced plans to triple its investments in “clean energy and technology” to $3.7 billion over the next five years. It currently has $1.4 billion invested in cleantech, with $500 million in the sector through private equity and $200 million through infrastructure, including solar, wind and hydro projects.

The California Public Employees’ Retirement System (CalPERS), the largest public pension fund with $360 billion in assets, signed the new Montreal Carbon Pledge, committing to measure and disclose the carbon footprint of its investment portfolio. Several other large pension funds, totaling $850 billion in assets, signed the pledge as well, which will be overseen by the U.N. Principles for Responsible Investing.

And the movement to divest from fossil fuels by endowments, foundations, and corporations gained steam, with the Rockefeller Brothers Fund announcing that it is divesting its $860 million philanthropic fund of investments in fossil fuels and focusing more on clean energy. They join Stanford University’s endowment, which divested from its coal investments in May.

The University of North Carolina at Chapel Hill’s board of trustees passed a resolution last month directing the university’s $2.4 billion endowment to focus on clean energy investments over fossil fuels, although there’s no plan to divest at the moment.

New York announced plans to launch a 10-year, $5 billion Clean Energy Fund to invest in distributed generation, energy efficiency, and transportation projects that it hopes will reduce greenhouse gas emissions by 50% in the state by 2030 and make New York a national clean energy leader. The fund will replace state mandates set to expire next year, and is designed to attract private capital to will replace taxpayer funding of clean energy projects.

Green Banks

Another increasingly important source of financing are so called “green banks” – financial institutions chartered with an express mission of funding clean and distributed energy projects. Again, key states are leading in this area.

- New York announced the creation of a state-owned start-up $1 billion Green Bank to help spur New York’s initiatives through strategic lending for smaller-scale projects that more traditional financial institutions shy away from. By offering “gap” financing, the NY Green Bank will provide loans, debt guarantees, securitization, and other financial products to help private-sector bankers fund more smaller-scale clean-tech deals. The Green Bank is seen as important support in meeting New York State’s target of 3,000 MW of installed solar capacity by 2023.
- As part of New Jersey’s post-Superstorm Sandy plan to prevent energy disruptions and build energy resilience, New Jersey established a $200 million Energy Resiliency Bank (ERB) to support distributed energy resources, with an early focus on water and wastewater treatment. The ERB intends to finance a broad range of commercially available and cost effective distributed energy resources technologies through revolving loans and grants, including combined heat and power, fuel cells, and renewables.
- Connecticut launched a similar bank in 2011, but on a smaller scale. Other states such as Hawaii, Maryland, and California are also exploring similar legislation or proposals.
FEDERAL POLICIES AND REGULATIONS

While Congress has remained inert, the Obama Administration has continued to promote clean energy and DER-friendly policies on several fronts, including actions taken by the White House and important regulatory developments at EPA, FERC, and DOE.

EPA Power Plant Carbon Proposal

Four months after EPA announced its proposal to limit carbon emissions from power plants, 79 Fed. Reg. 34,830 (June 18, 2014), outlines of the coming legal battles are emerging. EPA's rule would require states to limit power plant carbon emissions through a variety of system-wide “building block” measures, including plant improvements; increased deployment of natural gas, renewable and zero-carbon energy sources; and programs for demand management and energy efficiency. State programs -- or EPA backstops, in the event states do not act -- would be required to meet interim targets by 2020, and ultimately achieve 30% reductions below 2005 emissions levels by 2030.

Not surprisingly, the proposal has generated massive controversy. Less than halfway through the comment period, which has been extended to December, EPA reported receiving more than a million submissions.

EPA's rule has the potential to fundamentally reshape state energy markets. EPA projects that the rule will result in deployment of an additional 12 gigawatts of renewables generation by 2020; add 5% to annual U.S. demand for natural gas; and accelerate the ongoing shifts towards demand management and energy efficiency. Clean energy companies, project developers and investors will see major opportunities if this rule is implemented, and should seek to incorporate potential outcomes in their strategic planning.

EPA's final rule is expected to be issued in late 2015. Given the Administration's policies, it likely will include the kind of comprehensive framework outlined in the proposal. The real uncertainty is in the courts. Litigation already has commenced, and much more will come after the rule is final. Given the enormous stakes, the broad sweep of the rule and the innovative approaches EPA is proposing, the final decision likely will rest with the Supreme Court. Given the sweeping and innovative “building block” approach, there is a significant chance the courts may cut back or even overturn EPA's rule. However, the timing is important. Once EPA finalizes the rule in 2015, initial challenges could take up to two years. In the event the rule is largely upheld by the full D.C. Circuit (a good prospect, given its composition), there may be substantial implementation at the state level before the case even reaches the Supreme Court, perhaps in 2018 or later.

Thus, before there is any final judicial outcome, many states may make decisions whether to go forward with legislative and regulatory actions to implement the programs. Those actions then could take on a life of their own, with new structures, incentives, and compliance paths under state law that may survive regardless of court rulings imposed on EPA. Thus, state political outcomes in the next two years likely will as important as court decisions in shaping business opportunities.

Administrator McCarthy recently said EPA still expects to issue the final rule in June 2015 as required by President Barack Obama as part of the Administration’s Climate Action Plan. Opportunities to shape the proposal appear to be quite real. In a news conference on September 25, EPA Administrator Gina McCarthy acknowledged that significant have been raised with respect to the current proposed design, saying that when a final proposal is issued, “you may see adjustments in state levels. You may see adjustments in the framework.” At an event hosted by the Bipartisan Policy Center in Washington on September 25, states and utilities argued that the current proposal would actually have the effect of penalizing states that have already taken steps to reduce their carbon dioxide emissions by not giving them full credit for those programs.
Tax credits for renewable energy likely to remain in limbo in 2015.

With Congress adjourned for the 2014 mid-term elections, Senate Majority Leader Harry Reid’s (D-NV) stated goal of passing a bill to extend the deadline to start construction of new wind, geothermal, biomass, landfill gas and ocean energy projects by another two years through December 2015 to qualify for federal tax credits, will not be taken up until November at the earliest, part of a broader tax extenders bill that would extend more than 50 tax benefits that expired in 2013 or are scheduled to expire this year. The Senate Finance Committee voted on April 3 to allow another two years through 2015 to start construction. However, Republicans blocked the bill from being taken up by the full Senate. With Republicans now having taken control of the Senate, it is possible tax extenders will be delayed into the new Congress that starts in January 2015. Meanwhile, the Internal Revenue Service released guidance over the summer on the issue of how much work had to be done in 2013 for a project to be considered under construction under the physical work test. IRS’s issuance of this guidance has revitalized tax equity markets that had largely been shut down for projects that relied on physical work commencing in 2013.
POLICY DEVELOPMENTS AND TRENDS

Interview with 38 North Solutions

In early November the EDGE Newsletter editors spoke with Katherine Hamilton, Principal at 38 North Solutions and a co-host of the Energy Gang podcast, and her colleague Jeff Cramer, also a Principal at 38 North Solutions, to talk about what is happening on the policy front in Washington DC and key states.

**EDGE:** The outcome for federal clean energy tax incentives is hanging in the balance in Congress after the elections. What are the potential scenarios you are anticipating?

**KH:** The bright shiny object for the lame duck is the EXPIRE Act, which includes several clean energy provisions, including the wind Production Tax Credit. There is a Business Tax Coalition that includes a broad cross section of business interests supporting tax incentives in a cross-sector advocacy campaign. Their goal is to maintain unity in supporting passage of the EXPIRE Act as a whole. Senators Hatch and Wyden are working with bipartisan support to bring the package intact to the Senate floor for approval.

The stumbling block at this point is the House, which has passed several tax provisions with permanent extensions totaling nearly $1 trillion, without offset. There is an effort to rally (at least Democrats) around the Blumenauer bill, which could move soon. The second is to be taken up in some form of grand tax reform package, heading towards the end of 2016. That includes all forms of clean energy tax incentives – from wind, solar, and biofuels to charging stations for electric vehicles. The question is whether it goes the direction of some kind of technology neutral tax credit that is based on carbon intensity, or we go the complete other direction, and all tax incentives are lost. We are at a fork in the road.

**JC:** The outcome for federal clean energy tax incentives is basically on two schedules. One is in the extenders bill, which could move soon. The second is to be taken up in some form of grand tax reform package, heading towards the end of 2016. That includes all forms of clean energy tax incentives – from wind, solar, and biofuels to charging stations for electric vehicles. The question is whether it goes the direction of some kind of technology neutral tax credit that is based on carbon intensity, or we go the complete other direction, and all tax incentives are lost. We are at a fork in the road.

**EDGE:** FERC has had a tumultuous year both on the regulatory front and in the courts. Do you see changes in direction coming? What are the key FERC proceedings readers should be following?

**KH:** On the FERC side, the fallout from the D.C. Circuit decision on Order 745 continues to be an issue. If the U.S. Solicitor General files for review and the Supreme Court takes the case, it could come up as early as next fall. If an appeal to the Supreme Court is unsuccessful, FERC may have to come up with plans on how to dismantle that Order. This case speaks to the entire jurisdictional reach of FERC and could impact energy efficiency, storage, and distributed generation, in addition to demand response. Other changes from FERC look more incremental and technical: how do we make sure that we monetize different types of ancillary services and allow different participants, like voltage response, voltage regulation, and frequency response. Provided FERC is able to have jurisdiction over some of the demand side, there may be continued work on how to allow for energy storage or other types of distributed solutions to participate and provide services to the grid. I don’t expect FERC to be taking any big sweeping regulatory actions soon. I think it will be a more conservative, smaller step approach than in recent years.

**JC:** A lot of the action for FERC is in the courts. There will be significant uncertainty until the current ruling on Order 745 is resolved.

**EDGE:** What do you expect from EPA in responding to the more than 1 million comments that have been filed on the power plant carbon emissions proposal?
KH: EPA is going to try to figure out a way to thread the needle with the comments. All indications are that they are staying on schedule.

JC: Yes, I think EPA is going to stick to its course. There will be a strong push that it should be more stringent. Also, there will be comments asserting they should not be doing this at all. EPA will use the comments to demonstrate that it is taking the middle road with its proposal.

KH: Studies are coming out, including one from the Union of Concerned Scientists this past week, showing that EPA actually set goals in the carbon proposal that are lower than they should be. As EPA moves forward, I think many more distributed technologies will be included, such as demand response and energy storage. More models will be brought to bear to evaluate how tools are working to achieve reduced carbon intensities.

JC: The key to the proposal is EPA’s adoption of a systems approach, rather than the traditional approach of regulating at the stack. This may be an area where EPA would be vulnerable to challenge. But so far, we have not seen anything in the comments that seems to be undermining the systems approach.

EDGE: What are the top policy developments you are following in the states? Where will the action be in early 2015?

KH: California and Hawaii are continuing to be on the bleeding edge. New York REV is huge. Arizona continues to be interesting, and Minnesota as well. There are also some states in the Southeast that I would call sleepers, such as Georgia and Mississippi, where things are changing rapidly and markets are opening for solar and distributed energy.

JC: For states like Mississippi and Louisiana, a key will be keeping an eye out for results in PUC elections. Following the PUC elections in these states is worth watching, as major shifts in distributed energy adoption could result. Also important are pending state policy changes. For example, if California goes forward with the proposed increase in its portfolio standard, that will be a key development showing that California is continuing to drive policies that can increase the market opportunities for clean energy.

KH: Also, Hawaii recently had its first customer who has left the grid, in Maui. It will be interesting to see if the utility, HELCO, can come up with a new model to stay in business. At this point, there are many unhappy customers with unsustainable costs who want to leave the system.

JC: Another bell weather may be Wisconsin. Not because it is going to be a leader, but Wisconsin utilities have put out very controversial proposals for fixed costs for solar that are absolutely prohibitive. Assuming those are defeated, the question is how do states that are on the other side of the spectrum react; if they fold, the rest could fall as well, like dominos.

KH: New York REV is going to be huge; it will be fascinating to watch the utilities construct and implement their distributed energy platforms and to see how consumers are impacted by the reform.
REPORT FROM THE STATES

A number of states are pursuing ambitious programs to provide incentives and regulatory reforms supporting the adoption of distributed energy resources. In some states there is a move to shift away from large, traditional power plants by making the electric system more energy efficient and reliable, empowering customer choice, encouraging renewable energy technologies, and wider deployment of microgrids, on-site power, and energy storage. In other states coal, fossil fuel and utility interests are pushing back.

Valuing DER and the Role of Utilities

Controversies around net metering and similar state policies have continued in a number of states. Utilities have focused on grid charges and the need to share fixed grid costs across participants, including those with DER.

Electric utilities and their trade associations such as Edison Electric Institute have increasingly sought to restrict and impose additional financial charges on DER. They argue that consumers obtaining power through their own generation assets are not paying enough for general grid services.

These debates have generally failed to recognize the value of DER at the system level. DER can improve reliability and reduces the need for capital investment in peaking power facilities.

DER also can assist in providing grid services, such as voltage regulation and reactive power.

On the other hand, DER can increase the burden on utilities. Bi-directional power flows require grid upgrades. Further, variability in distributed generation can create additional challenges for the grid due to the volatility of net demand and the associated requirement to ramp up conventional resources at the end of the day. This is starkly illustrated in the Cal ISO’s "duck curve" from the report Building A Sustainable Energy Future. Utilities will have to make increasing capital investments to modernize the system and create bi-directional power flow capabilities. This creates issues of equity where capital improvements are financed solely or primarily through current rate payer billings.

A number of recent state proceedings have involved increasing assessment of the benefits and values of DER, as well as raising fundamental questions regarding the role of utilities in DER deployment. Below we discuss highlights from recent state proceedings and legislative developments.

Massachusetts

In August, the Massachusetts Legislature increased the cap on solar net metering, which creates additional capacity to advance new projects. The bill raises the net metering cap from 3% to 5% of the utilities’ highest historical peak load for public projects and from 3% to 4% for private projects. It also creates a task force to evaluate the long-term feasibility of net metering in the state and Governor Patrick’s future goals for solar energy generation. Massachusetts ranks sixth amongst U.S. states for installed solar energy capacity, with 464 megawatts (MW) currently installed. In 2013 alone, an additional 237 MW of solar energy was installed, accounting for $789 million in investment for residential, commercial, and utility-scale solar projects – a 50% increase over the previous year. The total MW installed is expected to grow with the additional capacity this bill adds under the cap.
On August 14, 2014, the California Public Utilities Commission announced a new rule-making proceeding aimed at incorporating distributed energy resources into future grid planning. The rulemaking will establish policies and procedures to guide the state’s three regulated investor-owned electric utilities in creating Distribution Resources Plans that leverage distributed energy assets, such as renewable energy generation resources, energy efficiency, energy storage, electric vehicles, and demand response technologies. It is anticipated that the utilities will file their Plans by July 2015 and that final approval by the PUC will come in early 2016. A draft paper titled "More than Smart: A Framework to Make the Distribution Grid More Open, Efficient, and Resilient," that is attached to the CPUC’s order (Appendix B) outlines key principles around distribution grid planning, design build, operations, and DER integration. One significant challenge, among several others recognized by the paper, in the integration of DERs involves the development and implementation of "appropriate value monetization methods." It says that valuation will "necessarily need to consider the local value as well as the net system value given the integrated nature of the electric grid."

As part of the state’s post-Superstorm Sandy plan to prevent energy disputations and build energy resilience, the state established a $200 million Energy Resiliency Bank to support distributed energy resources, with an early focus on water and wastewater treatment. The ERB is being funded initially through the New Jersey’s Community Development Block Grant-Disaster Recovery allocation from the U.S. Department of Housing and Urban Development. The state will allocate money when the ERB funds are depleted with a long-term goal of using private-sector capital. Revolving loans and grants will support potential projects, including microgrids, distributed generation, resilient solar, combined heat and power, smart-grid technologies, and energy storage. New Jersey joins neighboring states Connecticut and New York, which have already established their own versions of “green” banks.

On June 2, 2014, South Carolina Governor Nikki Haley signed the Distributed Energy Resource Program Act (S.B. 1189). The newly enacted law is widely seen as a step forward for solar energy in South Carolina as it will: (1) increase the size of a solar project that qualifies for the state’s net metering program from 100 kilowatts to 1 megawatt; (2) permit non-utilities and utilities to lease solar panels to homeowners and businesses; and (3) require the Public Service Commission to update solar power interconnection standards and the rate utilities must offer to customers who install solar panels at their homes or businesses.
Earlier this year, the Arizona Corporation Commission began studying the costs and benefits of distributed generation (including net metering) to maximize the benefit to all Arizona ratepayers. The study focuses on the non-monetized categories of capacity, grid-support services, avoided cost, financial risk, security, reliability, and environmental and social issues like reduced air pollution and job gains. The investigation is based on the ACC’s finding that there is a cost shift from distributed generation customers to non-distributed generation customers. Arizona’s major electric utility, Arizona Public Service, which had last year sought a charge on solar customers, now is seeking to get into the business itself (see page 5 above).

NEW YORK

Earlier this year, New York State Governor Andrew Cuomo announced that the NY. Public Service Commission will overhaul the state’s energy market regulations with the goal of increasing distributed generation, smart-grid technologies, energy storage, and demand response technologies. Reforming the Energy Vision (REV). “To spur the creation of the electric grid of the 21st century, the commission’s initiative will lead to a top-to-bottom restructuring of the state’s energy-efficiency programs to ensure that New Yorkers have access to reliable, clean and competitively priced electric power,” said New York commissioner Audrey Zibelman. The purpose of REV is to reform New York State’s energy industry and regulatory practices, promote energy-efficiency programs and increase renewable energy resources such as wind and solar. REV also seeks to increase deployment of distributed energy resources such as microgrids, energy storage, and on-site power supplies, as well as encourage customer use of advanced energy management products such as demand response. The NY Public Service Commission (PSC) issued a key report in August that tentatively endorses an active role for utilities, including in the development and ownership of distributed energy resources. On the issue of utility ownership of behind-the-meter DER, the staff “recommends ownership only pursuant to a plan that’s reviewed and approved by the PSC as being in the public interest. But utility subsidiaries would have greater latitude to own behind-the-meter resources subject to some caps and other competitive protections.”

In mid-September the PSC issued a report providing a new framework for benefit-cost analysis for purposes of valuing distributed energy resources such as energy efficiency, demand response, distributed generation like rooftop solar, and energy storage. The report prepared by Synapse Energy Economics, discusses a number of groundbreaking topics relating to DER valuation, including moving from a traditional utility Total Resource Cost Test to a new Societal Cost Test, which considers a broader range of benefits.
Responding to an April 2014 order from the Hawaii Public Utilities Commission (PUC) to lower customers’ electricity bills, the Hawaii Electric Light Co. (HELCO) is accelerating Hawaii’s shift from fossil fuels to solar and other renewables. Hawaii already takes advantage of its natural resources, meeting substantial electricity needs through geothermal, wind, hydro, and solar energy. However, over half of Hawaii’s electricity generation still comes from expensive imported oil. HELCO’s future energy plan, submitted to the PUC last month, proposes to boost electricity from renewable resources to 92% of the portfolio, nearly tripling distributed solar energy generation by 2030. HELCO estimates customers would see their electricity bills lowered by 20% under the plan. HELCO’s energy plan proposes to end the current and popular net metering program, where the utility purchases excess power from customers at market prices, and implement a flat fee for infrastructure and maintenance with additional fees charged to distributed generation customers. These fees would be used to upgrade the electricity grid to increase the integration of solar energy and to optimize control equipment to ensure safety and prevent outages. Under the proposed plan, utility customers would pay fees based on several components. First, every customer would pay a flat fee for services. Second, there would be an energy fee. Customers with solar installations would be eligible to lower their energy component of the fee. However, even though the electricity bills for the customer base, as a whole, will decrease, it appears that customers previously participating in the net metering program will see their bills increase due to the introduction of the flat fee for services.

Earlier this year, Minnesota launched a new regulatory proceeding aiming to create a “value of solar” tariff. The goal is to take grid impacts into account in assessing value of solar to the customers and the utility itself. Minnesota is the first state to fully adopt a value of solar approach to date.

Rate cases were filed in August by three major utilities, We Energies, Madison Gas & Electric and Wisconsin Public Service Corporation. They seek an order from the state Public Service Commission substantially increasing fixed charges and reducing variable charges, based in part on arguments that distribute generation requires greater fixed cost sharing. If approved, these requests would likely result in a major reduction of distributed resources deployment.
INTERNATIONAL DEVELOPMENTS

**CHINA**

Deutsche Bank issued a policy note to investors last month revealing details of a policy document published by China’s National Energy Administration (NEA). The new NEA policy reportedly focuses on rooftop solar DER installations (systems below 20 MW), with local authorities incentivized to install such systems across China in affordable housing, railway stations, motorway services, airports and other transport hubs as well as in sports venues, parking lots and agricultural land. The policy further requires streamlining of interconnection for DER and mandates that utilities plan to incorporate DER in their operations and ensure prompt payment, possibly monthly, for distributed generators. Finally NEA reportedly will support innovative financing models such as solar leasing, based on frameworks implemented by SolarCity.

On the broader policy level, China announced its plan to introduce a nationwide carbon cap-and-trade system two years earlier than planned, in 2016. China further reported in last September that it will move towards imposition of a national carbon tax.

**AFRICA**

In Africa, a continent with a population of approximately 900 million, nearly 70% do not have access to electricity. While this presents many challenges for growth, it offers major opportunities for distributed energy.

Distributed generation has the potential to leapfrog centralized generating facilities and the associated high-voltage transmission lines in certain areas in Africa. This will be particularly feasible in places where there is a perfect storm of factors – i.e. high price of power, frequent power shortages, low capacity for hydropower, lots of sun and relatively stable governance.

Also, as a new consumer class is emerging in Africa, particularly in Sub-Saharan Africa, the mechanics behind payment for distributed generation will be different than it is in the United States and Europe. The “pay-go” model was popularized through telecommunications and banking, but has since been applied to energy systems. Using this model, a consumer can, using his cell phone, make payments for a solar panel that charges throughout the day and provides basic electricity – i.e., for a few light-bulbs and an outlet for mobile phone charging. Through a remote monitoring system, the solar company can turn off the system if the recurring mobile payment is not made on a monthly basis. While distributed generation and related payment programs are relatively new in Africa, these innovations will spur further growth of the distributed generation sector on the continent.
CARIBBEAN

DER has tremendous potential in the Caribbean. More than a dozen island nations in the Caribbean rely on imported oil and coal for electricity generation. Rates for electricity are off the charts – as much as four to eight times rates in the U.S., and increasing. The price of solar power has declined sharply, while performance, output, and reliability continue to improve.

Recent reports highlighting compelling economics of distributed energy investment in the Caribbean have brought renewed attention to the potential of the market. With an estimated capital cost of at least $30 billion over the next decade to modernize and upgrade infrastructure in the Caribbean, the market opportunity for clean generation reducing these investments is huge.

A recent BusinessGreen post discussed Caribbean Development Bank’s (CDB) announcement of a £50 million program for solar and geothermal finance. The White House recently announced a new U.S. policy on Promoting Energy Security in the Caribbean, incentivizing private sector loans through credit support by the Overseas Private Investment Corp. (OPIC). OPIC and the World Bank also have joined forces with the Carbon War Room and Richard Branson, earmarking $300 million for new renewable energy projects in the islands.

The Caribbean unquestionably will present major distributed energy investment and project development opportunities in the coming decade. Investors and developers who can effectively sort projects that meet the key regulatory and licensing variables in the early stages, and then execute to keep transaction costs down, will see large upside profits.
LOOKING FORWARD

The Utility of the Future

As reported by Jesse Berst in SmartGridNews.com, Mahesh Bhave, a visiting professor at the Indian Institute of Management recently published A Requiem for Today’s Grid in Renewable Energy World. The article posits that the utility of the future should not own its own grid. Or, to be more accurate, that there will be two kinds of distribution utilities. One will handle the “common carrier” responsibilities of keeping the grid up and running in our new world of distributed energy. The other type will sell energy services that ride on top of the distribution grid. He wonders if microgrids could be someday co-located at utility substations, the way Competitive Local Exchange Carriers (CLEC) were hosted at telephone company facilities when the telecom industry was deregulated.

Green Tech Media Makes the Case for a National Electricity Council:

Since 1941, the National Petroleum Council (NPC) has acted as the unified voice of the oil and gas industry. This federally chartered but privately funded group has had a substantial impact on the national energy discourse for generations, but nothing akin to the NPC exists for the electricity sector, which accounts for 40% of our energy consumption in the U.S., and the sector has never needed it more than it does today. Our electricity infrastructure is in the midst of a series of dramatic changes, all of which could threaten the stability, reliability, resilience, affordability and environmental impact of this vital source of commerce. President Obama should charter a National Electricity Council (NEC), similar in scope and form to the National Petroleum Council. The National Petroleum Council has been invaluable for over 70 years – now is the time to do the same for electricity.

Energy Storage Technology on the Cusp

Donald Sadoway and colleagues at MIT announced a new technology for electrical-grid-scale liquid batteries, whose layers of molten material automatically separate due to their differing densities. Professor Sadoway says the new formula allows the battery to work at a temperature more than 200 degrees Celsius lower than the previous formulation. Extensive testing has shown that even after 10 years of daily charging and discharging, the system should retain about 85 percent of its initial capacity — a key factor in making such a technology an attractive investment for electric utilities.
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**ABOUT EDGE FINANCE ADVISORY**

**About Sullivan & Worcester, LLP**
S&W is a mid-sized full services law firm with offices in Washington, D.C., New York, Boston, and London. S&W’s Energy Finance Practice designs solutions for complex financing challenges, including the integration of new technologies and related financial innovation for the power generation industry, as well as the deployment and commercialization of advanced energy technologies and distributed generation projects.

**About 38 North Solutions**
38 North Solutions is a boutique consulting firm that provides a suite of business strategy and public policy services to innovative businesses and organizations. Based on our firm’s expertise and deep experience in clean energy, entrepreneurship, environment, sustainability, technology, and venture capital fields, we help our clients navigate market and policy challenges and opportunities.

**About EDGE Finance**
EDGE Finance Quarterly Advisory is a one-stop source for actionable news and intelligence for investors and innovators focused on investments and business opportunities in the distributed energy space. Our news and analysis covers market developments and transactions, innovations in financial models, federal and state policy, technical breakthroughs, and more.