VISTRA ENERGY

Alternative Generation

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ALTERNATIVE GENERATION & STORAGE

Statement of Preferred Public Policy

Vistra Energy believes in the power of competition to spark innovation and unleash customer benefits and value. As such, we believe that markets should be allowed to function freely with minimal oversight and regulated only to the extent needed to ensure a fair and equitable treatment of market participants and customers.

Alternative Generation

In the competitive market, Vistra Energy understands that the generation methods of today will not always be the generation methods of tomorrow. We believe in pursuing economic and appropriate opportunities to integrate new generation technologies (wind, solar, storage, etc.) and approaches (microgrids, distributed generation, etc.) into the grid. We further believe that in competitive areas, such technologies or approaches should be backed by private investment and not subject to market distorting mandates or public subsidization.

Vistra Energy will invest strategically in alternative energy resources and storage opportunities as they become economic and provide competitive opportunities. Our investments to date demonstrate that alternative generation and storage go beyond just “being green”.

Retail Products that Leverage Renewable Opportunities

Competitive retail markets provide increasing opportunities for retail electric companies to leverage renewable generation existing in the market. Beyond the increasing interest by customers (both residential and commercial) of being “green” and sustainable in their energy consumption, retailers are able to provide innovative plans to differentiate themselves in the market and meet consumer preferences.

For example, in ERCOT, Vistra is already in the behind-the-meter solar business by providing customers electricity plans with solar energy in them. Our Texas retail arm has launched four solar plans since 2016, including our community solar offer “SolarClub”, which allows customers to invest in solar energy without the cost or expense of installing solar panels at their residence and our ”Free Nights and Solar Days”, which allows customers to power their homes with off-site solar during the day and take advantage of low-cost wind resources at night. These plans have been highly popular, signing up more customers than all Solar Photovoltaic Rooftops in ERCOT combined. This is an example of Vistra Energy’s integrated model at work—offering innovative renewable products to end use consumers by leveraging generation from our own utility scale solar farm and access to other facilities.

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Vistra Energy has also invested in rooftop solar, launching our TXU Solar from SunPower in 2015. While penetration of rooftop solar is low due to challenged economics, we see rooftop solar continuing to increase in adoption, especially as home energy storage becomes more affordable. Our retail brand also offers "net-metering" to customers with installed solar photovoltaic, regardless of whether the solar photovoltaic system was installed through our own offer or via another provider.

Vista Energy's experience isn't limited to residential customers. We are able to bring our experience in the wholesale market and renewable products to help commercial customers of all sizes meet their renewable and sustainable energy goals. Regardless of whether the customer is a small family or a large data storage facility, Vistra Energy plans to continue to innovate in this space and bring the increasing value that these type of offerings provide to our customers.

Large Scale Renewable Generation & Storage

Vistra Energy is able to offer innovative renewable retail products, in part, due to our investments in renewable energy and storage at the wholesale level.

In June 2018, Vistra Energy announced that its Upton 2 Solar Power Plant in West Texas achieved commercial operations. Capable of generating 180 MW of electricity, Upton 2 is the largest operating solar facility in Texas. The site sits on nearly 1,900 acres (roughly the size of 1,424 football fields) and consists of 718,000 photovotaic panels. The generation capacity of the facility is enough to power approximately 56,700 residences in ERCOT during normal weather conditions and about 27,700 during peak conditions. Vistra Energy purchased Upton 2 in May 2017 while the site was still under development because it provided a perfect fit for the company's integrated business model. It not only enabled the company to enhance its retail solar offerings but also helped diversify the company's generation fleet.

At Vistra Energy's Analyst Day in June 2018, the company announced the coupling of battery storage with the Upton 2 solar generation, targeted for the fourth quarter of 2018. The storage will be a 10 MW / 42 MWh lithium ion battery and will provide several advantages to the solar facility. First and foremost, it will enable any excess energy generated to be beneficially stored for later use. Although the facility is rated for 180 MW, it has the capability to generate more than that amount. In these cases, if the storage was not available, that excess energy would be "clipped" as the grid would only accept up to the rated 180 MW amount. With storage, these times of excess generation can be captured and time-shifted to other periods. Secondly, this time shifting nature allows the facility to provide peak output for more hours of the day than solar alone. This provides "wider shoulders" during peak solar power production, along with more consistent, predictable and slightly extended ramp-up and ramp-down periods (see graphic, next page).

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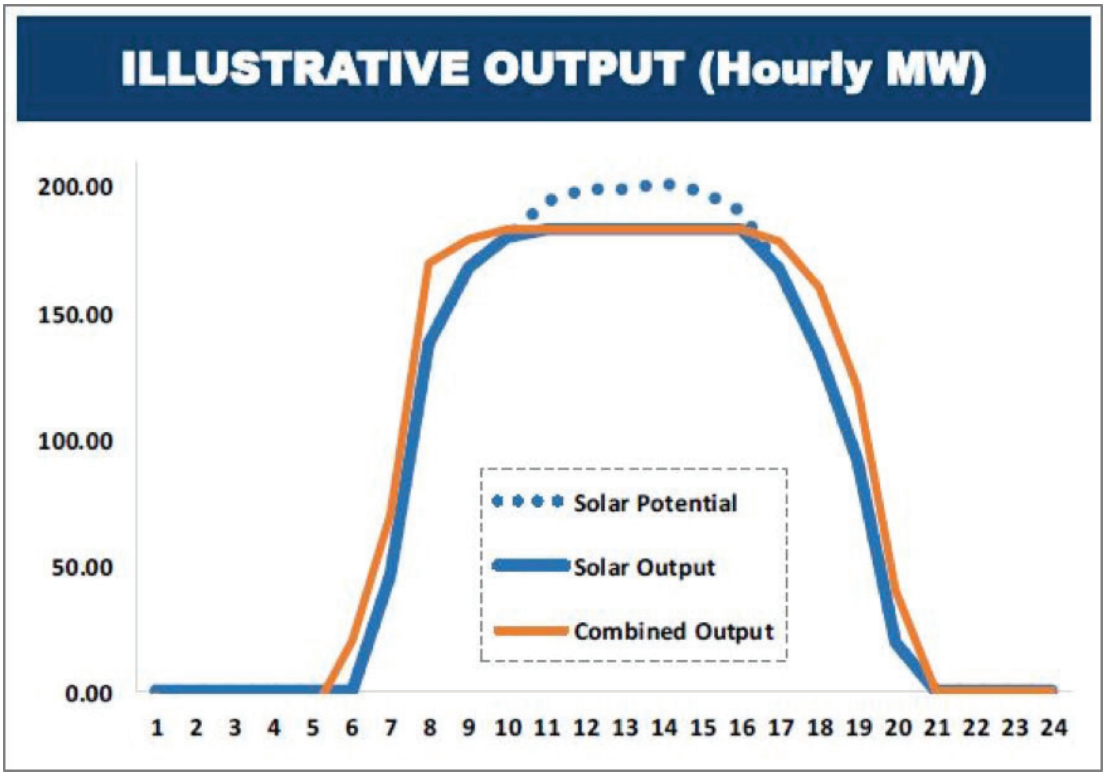

Vistra Energy's investments are not limited to just Texas. Though we started in Texas, the company's recent merger with Dynegy has opened up opportunities in other markets. One such example is the development of battery storage at one of Dynegy's natural gas generation facilities in California. Also in June 2018, the company announced that it planned to enter a 20-year resource adequacy contract with Pacific Gas and Electric Company (PG&E). Under the contract, Vistra will develop a 300 MW/1,200 MWh, battery energy storage project at its Moss Landing Power Plant site in Moss Landing, California. The Moss Landing battery project will be the largest of its kind in the world and will position Vistra as a market leader in utility-scale battery development. This project is consistent with Vistra's strategy to opportunistically invest in new technologies in support of the changing energy supply landscape.

The Moss Landing example shows how existing infrastructure can be leveraged in new ways to facilitate emerging technologies. The battery project will leverage the existing interconnection, reducing regulatory hurdles, and will be able to leverage existing development on the site, reducing construction costs. Pending approval by the California Public Utilities Commission, Vistra anticipates the battery storage project will enter commercial operations by the fourth quarter of 2020.

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The Market for Renewables & Storage

Vistra Energy is making these investments because the market for renewable and storage products is growing. There are a broad range of market drivers, both commercial and political, that are setting the pace of growth in the renewable and storage space, and that pace is accelerating.

Corporate procurement of renewables is virtually a universal trend. Advanced Energy Economy reports that 215 Fortune 500 companies (43 percent) have a sustainability target, a renewable energy target, or both. However, corporate interest in green power isn't limited to large enterprises. Internationally, an array of small- and mid-cap companies is also procuring renewable energy and setting ambitious carbon reduction goals. There are several reasons why companies of all sizes are taking a keen interest in procuring renewable energy. As one might expect, economics are a significant driver. Solar and wind power are now cost-competitive with electricity generated from fossil fuels in many areas of the world. Furthermore, the predictable, rather than fluctuating, costs of renewables can provide a hedge against future fuel price volatility. But there are other forces at work as well. Businesses are setting sustainability goals to enhance their reputations and satisfy their investors and customers, who are increasingly demanding action on environmental stewardship and climate change. While this factor is harder to quantify, more and more companies around the world appear to be embracing the concept that being a good corporate citizen is good business and helping to "green the grid" is an important part of that equation.[1]

Renewable energy has become serious business for corporate buyers, to the extent that many corporate buyers are uniting under a trade group and publishing a set of principles to encourage and simplify access to renewable energy:

- Greater choice in procurement options
- More access to cost-competitive options
- Longer and variable-term contracts
- Access to new projects that reduce emissions beyond business as usual
- Streamlined third-party financing
- Increased purchasing options with utilities

At Vistra, we believe the majority (if not all) of these principles can be met through functioning competitive markets at the retail and wholesale level. However, not all markets are created equal and there are variables to consider in each market for the deployment of renewable and storage facilities.

Most areas with high solar and wind resource potential in the U.S. are located far from population centers, and the PJM[2] and ISO-NE[3] regions have relatively low

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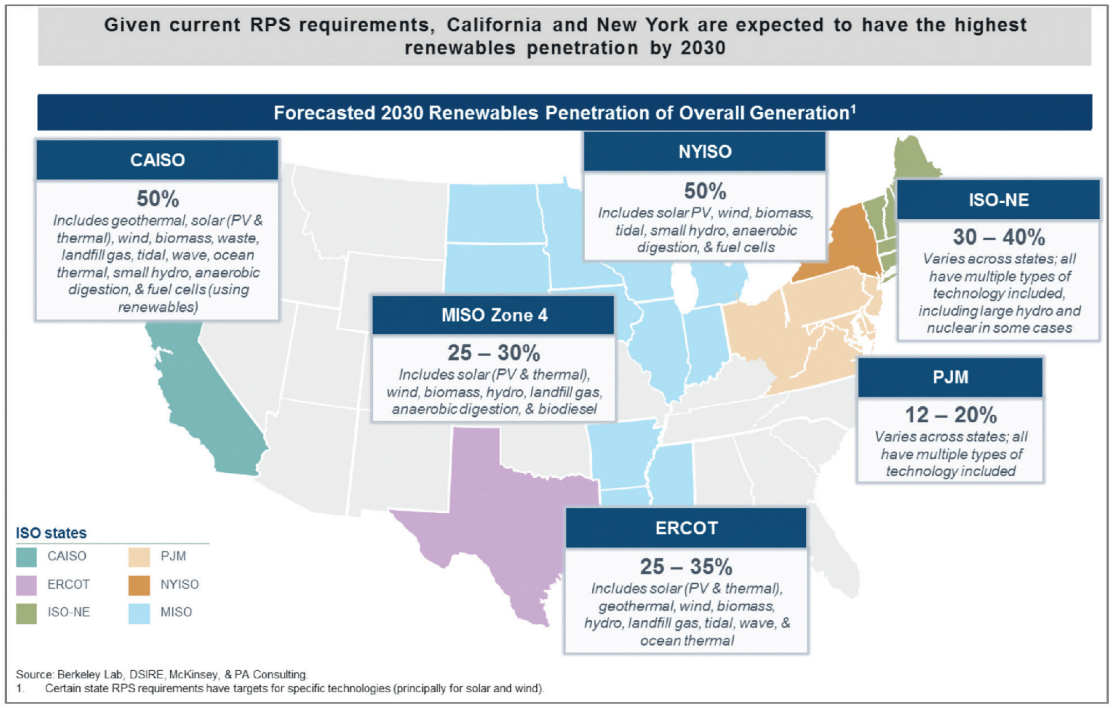
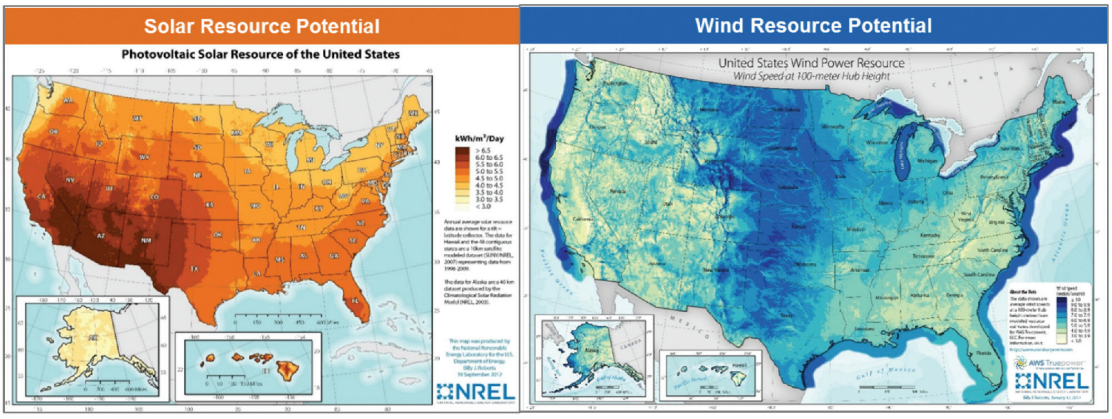
resource potential for both wind and solar. In areas with low resource potential, RPS[4] requirements are more likely to drive renewable development, whereas economics are more likely to drive requirements in areas with high resource potential. RPS policies have driven 70-90% of the growth in renewables in the West, Mid-Atlantic, and Northeast, but in Texas and the Midwest, growth has far outstripped RPS requirements, largely due to attractive wind economics.[5]





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Despite RPS subsidies in Mid-Atlantic and Northeast states, the impact on capacity and energy markets is materially reduced due to mitigation measures and resource effectiveness; in addition, some states have broadened the definition of renewables to meet RPS targets (e.g., large scale hydro)

The Case for Energy Storage

Battery storage is flexible, can be deployed quickly, has multiple applications, and can produce numerous value streams—not to mention that battery prices are falling faster than anticipated. However, the dynamism in the sector is not solely attributable to these factors. Advances in adjacent digital technologies, such as artificial intelligence, blockchain, and predictive analytics, are giving rise to aggregated solutions and innovative business models that were nearly inconceivable a few years ago. Start-ups around the world are rapidly commercializing intelligent networks of "behind-the-meter" batteries to benefit electricity customers, utilities, and grid operators.[6]

Although research and market dynamics have shown increases in company procurement of renewable energy, there are those that have indicated they are not working to procure more renewable energy. However, amongst those companies a survey has found that a solid majority (58 percent) said combining renewables with battery storage would motivate them to do more. This concept particularly appealed to small companies (63 percent). This could potentially be due to the desire of small companies, which are presumably on tight budgets, to avoid demand charges. Battery storage could help by giving more operational flexibility.[7]

As already mentioned, Vistra Energy sees a growing market in coupling energy storage with both renewable and traditional generation facilities. The value chain of deploying energy storage in this way extends from the generation facilities, to the grid, to the end use customer themselves. For example, batteries are often supportive of existing generation where daily cycle requires charging on a day-to-day basis. Furthermore, baseload coal, nuclear, and low-cost gas plants can benefit to the extent that energy storage:

- Charges overnight and can raise off-peak prices; and
- Smooths / eliminates extremely low-priced hours from high renewable penetration.

Near term, energy storage is most likely to threaten investment in new peaking plants where short duration storage may allow existing peaking plants to provide non-spinning reserves[8] (instant start). In these cases, storage can help normalize existing markets from distortive effects and at the same time potentially reduce future costs to consumers by delaying the cost of new build.

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Furthermore, energy storage deployment is not something that has to be a "rate base" investment even in traditional utility territories. Vistra Energy, and companies like ours, can contract with traditional utilities to provide reliability services from battery projects. This way, the value of the batteries can be maximized because the batteries would provide the traditional utilities with electricity transmission and distribution related reliability services while also being able to provide energy and ancillary services. Utilities could conduct competitive bidding processes for the services they require and then the competitive company would be able to optimize other services from the batteries.

Front of the meter (FTM) services, such as the examples above, are not the only area where energy storage brings value. Behind the meter (BTM) is where the customer most directly sees the value of energy storage. This can include better power quality / reliability, pairing with distributed energy generation, microgrids, or demand shaving (helping to reduce demand charges). In the end, multiple value streams contribute to energy storage economics for both FTM and BTM applications.

	Value Streams		
	Value	**Type**	**Storage Can:**
FTM	Energy Price Arbitrage	Optimization	• Charge when power prices are low / discharge when power prices are high
FTM	Ancillary Services	Optimization	• Provide frequency regulation, load following, reserves, etc.
FTM	Policy Incentives	Financial	• Batteries may qualify for investment tax credit ("ITC"), bonus depreciation, and other incentives / subsidies by state / market / locality
FTM	Black Start	Reliability	• Restart offline thermal power plants
FTM	Voltage Regulation	Quality	• Absorb power to balance reactance in the grid
FTM	Defer Investment in Transmission & Distribution ("T&D")	Reliability	• Install at T&D bottlenecks to avoid the need to invest in additional T&D infrastructure
FTM	Renewable Integration	Optimization, Reliability	• Avoid curtailments of renewables and reshape their output to match supply and demand
FTM	Capacity / Peaker Replacement	Reliability	• Provide system capacity similar to a peaking plant
BTM	Avoid Demand Charge	Financial	• Offset peak demand and lower demand charges
BTM	Pair with BTM Solar	Optimization, Reliability	• Optimize output of BTM solar plants and avoid curtailment
BTM	Power Reliability / Quality	Quality, Reliability	• Allow customers to avoid service interruptions due to grid events

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As with renewable generation, we believe the competitive market provides the best venue for realizing the value of energy storage. However, as previously stated, not all markets are equally well suited for competitive energy storage deployment. The graphic below shows Vistra Energy's perspective on the viability and deployment of energy storage amongst the five different markets we compete in, California being the most attractive market, followed by New York:

Value	CAISO	NYISO	ERCOT	ISO-NE	PJM
FTM					
Energy price arbitrage	●	○	◐	◕	○
Ancillary Services	●	◐	○	◐	◐
Policy Incentives	●	●	○	◐	○
Defer Investment in T&D	●	●	◐	◐	◐
Renewable Integration	●	◐	◔	◐	◐
Capacity / Peaker Replacement	●	◐	◕	○	○
BTM					
Avoid Demand Charge	●	●	○	◔	◐
Pair with BTM Solar	●	◐	◕	◐	◐
Power Reliability / Quality	●	◐	◐	◐	◐

[9]

Battery Penetration Estimates by Market

	MW			% Installed Generation		
	2018 Operating Storage Capacity	2018 Projects in Development	Potential 2028 Storage Capacity	2018 Operating Storage Capacity	2018 Projects in Development	Potential 2028 Storage Capacity
CAISO	234	610	4,450 - 8,804	0.45%	1.12%	8.6 - 16.9%
PJM	335	220	475 - 6,886	0.64%	0.42%	0.3 - 4.1%
NYISO	1	115	200 - 2,364	0.00%	0.22%	0.5 - 4.1%
ERCOT	103	10	250 - 2,125	0.20%	0.02%	0.3 - 2.8%
ISO-NE	46	43	160 - 954	0.09%	0.08%	0.5 - 2.7%

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Beyond the Grid: Electrification of Transport

Reductions in battery storage costs are increasing attractiveness of electric vehicles (EVs). EVs, ride-sharing, and automation is a virtuous cycle that we see playing out over the next ~10-15 years. Battery advancement will impact EVs through improvements in battery storage costs, duration, and energy density, which have improved storage economics on the wholesale side, are making EVs more competitive. Over the next ~5 years, EVs as a source of power demand will offset some of the demand reductions from demand response and energy efficiency. In the ~10-15 years, EVs may end up representing a significant source of power demand growth

EV penetration will likely be confined primarily to metropolitan areas, particularly on the coasts. Continued EV penetration will be affected by low gas prices and easing fuel economy regulations, availability of charging infrastructure, improvements to driving range and increased model availability/affordability.

The proliferation of EVs may also help with air quality and greenhouse gas emissions (GHGs). Currently, the transportation and power sectors are the leading sources of greenhouse gas ("GHG") emissions in the United States. However, in 2016, the transportation sector overtook the power sector as the largest contributor of GHG emissions. This was driven in part by coal-gas switching and an increase in renewables generation. It is estimated that for each EV that replaces an internal combustion engine vehicle there will be a 3x savings in GHG emissions.

1) "Serious Business: Corporate Procurement Rivals Policy in Driving Growth of Renewable Energy", Deloitte Center for Energy Solutions. 2017
2) PJM Interconnection coordinates the movement of electricity through all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia.
3) ISO New England (ISO-NE) Interconnection coordinates the movement of electricity through all or parts of Connecticut, Rhode Island, Massachusetts, Vermont, New Hampshire, and Maine.
4) Renewable Portfolio Standards (RPS) require utilities to ensure that a percentage, or a specified amount, of the electricity they sell comes from renewable resources. States have created these standards to diversify their energy resources, promote domestic energy production and encourage economic development. Roughly half of the growth in U.S. renewable energy generation since 2000 can be attributed to state renewable energy requirements. Additional information is available at NCSL website: http://www.ncsl.org/research/energy/renewable-portfolio-standards.aspx.
5) "Supercharged: Challenges and Opportunities in Global Battery Storage Markets", Deloitte Center for Energy Solutions. 2018
6) "Supercharged: Challenges and Opportunities in Global Battery Storage Markets", Deloitte Center for Energy Solutions. 2018
7) "Serious Business: Corporate Procurement Rivals Policy in Driving Growth of Renewable Energy", Deloitte Center for Energy Solutions. 2017
8) Operating reserve, which is made up of the spinning reserve as well as the non-spinning or supplemental reserve, is the generating capacity available to the system operator within a short interval of time to meet demand in case of a disruption to the supply. The non-spinning reserve or supplemental reserve is the reserve that is not currently connected to the system but can be brought online after a short delay. This could be generation available from fast-start generators within the region, importing power from other regions, or retracting power that is currently being exported to other regions. The spinning reserve is the extra generating capacity that is available by increasing the power output of generators that are already generating electricity and have capacity to generate more.
9) Base case estimates developed using fundamental modeling of projected cost decline curves and value propositions by market; high case estimates assume solar-like growth in battery penetration, despite the lack of ITC availability, or other incentives in most locations, for standalone batteries