

Vectren 2016 Integrated Resource Plan (IRP)

July 22, 2016 Stakeholder Meeting 2 Summary

The following is a summary of the second of three Vectren IRP stakeholder meetings in 2016 and is meant to provide a high level overview of the discussion on July 22nd. Stakeholder feedback gathered at these meetings will be considered within Vectren's evolving IRP process.

Welcome (slides 1-2)

Carl Chapman, President and Chief Executive Officer

Mr. Chapman opened the meeting and welcomed guests to Vectren headquarters, located within Vectren's service territory in Evansville, IN. He mentioned that this is an important IRP for Vectren, and several things are setting the stage for this analysis. 1) EPA regulations are putting great pressure on coal resources. Several regulations that were recently finalized (Effluent Limitations Guidelines (ELG), Coal Combustion Residuals (CCR), and the Clean Power Plan (CPP)) are more stringent than expected. 2) Gas prices are low and projected to be stable over the long term. Shale gas has revolutionized the industry, driving these currently low gas prices. This has fueled a surge in gas generation. 3) Renewable costs continue to decline, but they are still expected to be more expensive than other alternatives in the next several years. 4) More than ever, the future is uncertain. Vectren will evaluate a wide range of input assumptions within the risk analysis. 5) Vectren is observing developments in MISO, which is Vectren's regional transmission operator. Within Vectren's zone, MISO is projecting a shortfall in generation or demand side options needed to maintain reliability beginning in 2018 for high certainty resources. The shortfall continues to grow through 2021. Mr. Chapman said that regardless of the final plan, reliability needs to be maintained, and customer cost minimization must be a priority. Mr. Chapman then introduced the moderator, Gary Vicinus.

Vectren IRP Process Overview (Slides 3-6)

Gary Vicinus, Pace Global – Managing Director of Consulting Practice

Mr. Vicinus briefly reviewed the information that was provided at the first public stakeholder meeting and the general IRP process. Materials from the first meeting can be found at www.vectren.com/irp. He also outlined the agenda for the day and discussed the ground rules for the meeting.

Environmental Compliance (Slides 7-15)

Angila Retherford, Vice President Environmental Affairs and Corporate Sustainability

Ms. Retherford reviewed the current environmental controls on Vectren's generation fleet. All units are controlled for SO₂, NO_x, and Soot. She then discussed the recent control enhancements to sorbent injection systems to comply with the Mercury and Air Toxic Standards (MATS) rule. Regarding the Coal Combustion Residuals (CCR) rule, Ms. Retherford pointed out that the majority of Vectren's fly ash is beneficially reused in cement application, and Culley and Brown dams will meet the new, more stringent structural integrity requirements by October 2016. She pointed out that preliminary engineering cost evaluations are underway for compliance with the new Effluent Limitations Guidelines (ELG). Finally, Ms. Retherford commented that Vectren's IRP will assume that the Clean Power Plan (CPP) will be upheld by the US Supreme Court, but compliance will be delayed until 2024.

Stakeholders asked why are there no mercury controls shown on Slide 8. It was noted that mercury control is handled through sorbet injection systems that enhance the mercury removal of the existing scrubbers, and are not considered separate environmental controls. A stakeholder pointed out that there are not emissions costs for solar. Vectren stated that the IRP process incorporates all costs for various technologies. A stakeholder asked how moral (health) considerations are taken into account, and it was explained that the health considerations are among the primary factors considered when government standards, like ozone limits, are developed. Finally, a stakeholder asked how Vectren complies with the operating permit for Brown to make sure that Posey County remains in attainment for the revised One Hour SO₂ air quality standard. Vectren lowered averaging time which effectively lowers the compliance target.

Base Case/Modeling Inputs (slides 16-24)

Gary Vicinus, Pace Global – Managing Director of Consulting Practice

Mr. Vicinus explained that Vectren surveyed and incorporated a wide array of sources in developing its base assumptions for key drivers. He then showed the consensus forecasts for the following drivers: carbon price, natural gas, coal, on-peak and off-peak power prices, and capital costs. A question was asked about how climate change models were factored into the IRP analysis. Within the IRP analysis, the demand forecast includes average 10-year peak producing weather. Additionally, the risk analysis will consider a wide range of demand forecasts.

Busbar Analysis and Optimization Modeling (slides 25-40)

Matt Lind, Burns & McDonnell – Associate Project Manager

Mr. Lind explained the concept of busbar or Levelized Cost of Electricity (LCOE) screening which involves narrowing 36 new power supply choices from the technology assessment into a manageable data set that will then be modeled. Within the busbar screening, similar generation options are compared within expected operation ranges. Generally, the lowest cost resources within each category are then selected for modeling. Modeled options are representative of a class of generation.

Slide 38 describes the resource alternatives that will be modeled within the IRP analysis. The following alternatives were chosen in the busbar screening: 4 combined cycle gas turbine options, 2 simple cycle gas turbine options, Indiana wind, combined heat and power, and utility scale solar. Note that energy efficiency and demand response were not screened options and will be modeled as potential resources. In the base case all battery storage (lithium-ion) options were screened out due to high cost relative to other options. A stakeholder asked if other kinds of battery storage technologies besides lithium-ion were considered, and it was noted lithium ion batteries seem to be the most likely technology over the next twenty years.

To help stakeholders understand the relative capacity differences among various power supply resource alternatives, Mr. Lind discussed the amount of installed capacity needed to supply 100 MWs towards the planning reserve margin. Reserve margin is the amount of capacity above the peak demand forecast required by MISO, Vectren's regional transmission operator, to maintain

reliability. MISO's most recent Loss of Load Expectation Study Report¹ (Planning Year 2016-2017) requires that utilities have 7.6% capacity above expected demand. Vectren is able to count 11.25% of installed wind capacity towards the MISO planning reserve margin. In other words, only 11.25 MWs per 100 MWs of installed wind capacity is credited towards the planning reserve margin. The chart on slide 37 shows that it will take approximately 889 MWs of installed wind capacity to receive 100 MW credit towards the required reserve margin ($100/.1125 = 889$).

A stakeholder asked if Purchase Power Agreements (PPA) for solar would be considered. Solar will be modeled as a utility resource; however, PPAs will be considered at the time of a generation build.

Scenario Development (slides 41-61)

Gary Vicinus, Pace Global – Managing Director of Consulting Practice

Mr. Vicinus started by reviewing direct stakeholder input that was provided to Vectren on April 7th at the first 2016 Vectren IRP stakeholder meeting. Slide 43 shows stakeholder input that was considered in scenario development.

PACE has helped a variety of utilities across the country construct scenarios. Scenarios are possible future states that can aide in the IRP process of developing and evaluating portfolios. The process involves identifying key drivers (regulations, technology, and the economy) and constructing scenarios by varying key inputs such as gas, coal, CO₂, load, capital, and market power prices. Vectren worked with PACE to develop 5 internally consistent scenarios (each is described in slides 46-51):

1. High Regulatory
2. Low Regulatory
3. High Technology
4. High Economy
5. Low Economy

Mr. Vicinus then presented the range of key input prices for each scenario: carbon price, natural gas, coal, on-peak and off-peak power prices, and capital costs.

A stakeholder asked about the plausibility of the low regulatory scenario. It was explained that the low regulation scenario includes existing regulations and associated economic/social costs; however, this scenario assumes that there is no CO₂ price. Another stakeholder asked if wholesale sales will be considered in the scenarios, and the answer was that economic/efficient dispatch opportunities in the marketplace will be included.

A stakeholder asked if the risk analysis will include +/- 2 standard deviations in outcomes for key inputs, and the answer was yes.

¹ Source: <https://www.misoenergy.org/Library/Repository/Study/LOLE/2016%20LOLE%20Study%20Report.pdf>

A stakeholder asked if PPAs for renewables are better for customers because they do not include capital costs. It was explained that capital costs are included in pricing for both developers and utilities. Purchased power agreements embed those costs in the price of power.

Stakeholder Input to the Portfolio Selection (slides 64-69)

Gary Vicinus, Pace Global – Managing Director of Consulting Practice

Vectren held a portfolio development workshop to gain input from stakeholders on additional portfolios to be considered within the IRP analysis. A portfolio is a mix of future resources to meet expected future demand for electricity. Details of that workshop can be found in the 2016 Vectren Public IRP Stakeholder Portfolio Exercise Summary², posted on www.vectren.com/irp. The table below shows the summarized results of the stakeholder exercise. Note that Vectren did not receive any additional stakeholder input on the stakeholder portfolio summary after being posted.

Stakeholder Portfolio	Stakeholder Portfolio		
	2025	2030	2035
Coal	40%	15%	0%
Gas Combined Cycle	10%	15%	15%
Gas Combustion Turbine	0%	0%	0%
Gas Combined Heat and Power	10%	10%	10%
Wind	10%	10%	10%
Solar	10%	15%	25%
Storage	0%	10%	10%
Energy Efficiency/Demand Response	20%	25%	30%
Total	100%	100%	100%

During this session, representatives from Valley Watch and the Sierra Club presented their input to the group.

Valley Watch Comments

Valley Watch believes that Vectren should retire “uneconomic coal plants” instead of investing in additional pollution control equipment. They feel that this would address public health concerns and would prevent incremental spend, which drives up rates and increases stranded costs. Valley Watch supports renewable options and energy efficiency programs, and is willing to work with Vectren to satisfy both investors and customers to achieve this.

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<https://www.vectren.com/assets/cms/pdfs/2016%20Vectren%20Public%20IRP%20Stakeholder%20Portfolio%20Exercise%20Summary.pdf>

Sierra Club Comments

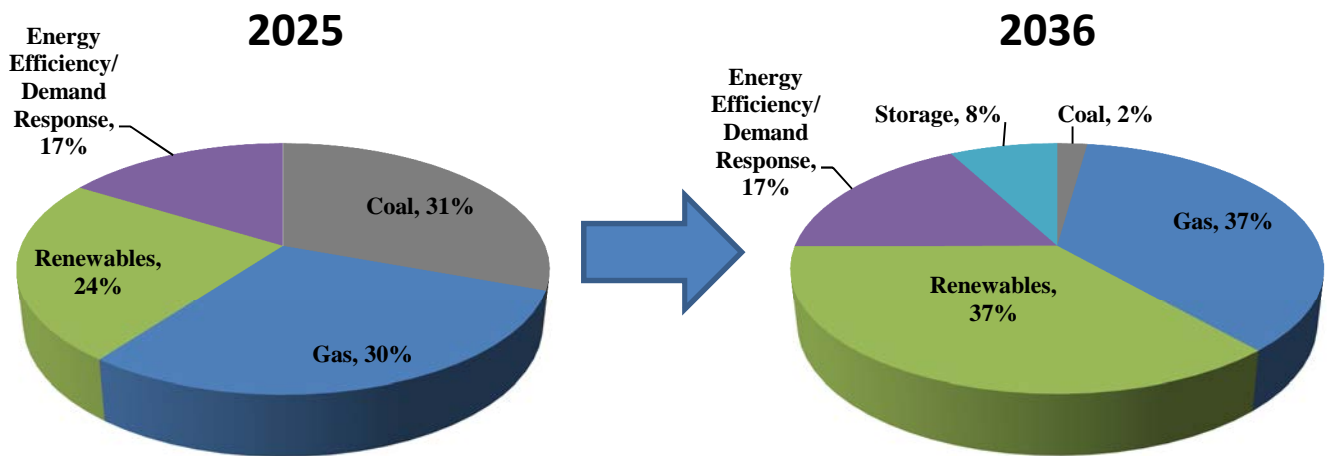
Sierra Club believes that now is the time to transition to clean energy. There is the moral case for public health and protecting the environment. They stated that Vectren’s coal plants are not competitive and are not needed based on surplus capacity in the region. The Sierra Club believes that there is no reason to invest in coal plants in an area with high rates. Renewable generation is increasing within MISO. Sierra Club feels that energy efficiency programs are most cost effective in reducing customer costs. Sierra Club noted that there are incentives for early adoption of renewables (as proposed by the Clean Power Plan). A number of companies are setting goals addressing their energy mix.

Stakeholder Portfolio

Vectren and Burns and McDonnell used stakeholder input received during this session to build a diversified stakeholder portfolio that is largely consistent with input received during the meeting.

Because current and future generation options have specific sizes, the stakeholder portfolio does not exactly match the percentages that were discussed in the stakeholder meeting. In this portfolio, nearly all coal is retired in the long term while renewables increase. Energy efficiency remains at approximately 17% in 2025 and 2036, which equates to 2% of eligible sales (non-industrial opt-out load) each year between 2017 and 2036, which is the highest level of energy efficiency included in Vectren’s modeling. Energy efficiency blocks are modeled using a ten year life.

The percentages below were developed by dividing unforced capacity (UCAP), the amount of capacity applied towards meeting MISO’s reserve margin requirement, by the expected demand plus the reserve margin requirement (totals are slightly higher than 100% due to surplus capacity). The chart below shows the stakeholder portfolio that will be modeled and evaluated along with other portfolios within the IRP analysis.



Stakeholder Questions, Feedback, and Comments (slide 70)
Gary Vicinus, Pace Global – Managing Director of Consulting Practice

The final portion of the meeting was dedicated to answering any additional questions and capturing stakeholder feedback.

A stakeholder asked how many technologies are available to help meet load. There are many vendors that have slightly different technologies within each resource category. The IRP analysis generally considers one or two resources within each category that are representative of what is available. When a company goes out for bid on new generation, they can consider multiple options, including PPAs.

A stakeholder asked about how Vectren incorporates the 1% cap on distributed solar generation, consistent with current regulations, into the IRP analysis. Within the load forecast used for the IRP, Vectren did not cap the forecast of customer owned solar at 1% and customer owned solar projection was netted out of the load forecast. Another stakeholder asked if feed-in-tariffs (FIT) were considered. Vectren has considered them in the past and will consider them again at the time of the next rate case. There is no rate case planned at this time.

A stakeholder asked what Vectren's plans are regarding solar. Vectren is constantly looking at solar in the near term, but over the last several years Vectren has not had a need for generation and wants to keep customer rates as low as possible. It was noted that the Vectren Foundation recently funded a solar lighting project in Evansville. The results of the IRP will inform next steps around solar. A stakeholder commented that customers would prefer that money be spent on solar and energy efficiency rather than on coal plants.

A stakeholder asked if we will be including all generation costs within Vectren's IRP analysis, including health costs. All costs are considered within the IRP. Governmental regulations include health costs, and anticipated regulations are included within the analysis.

A stakeholder noted that emission projections were not included in the presentation, and it was noted that it is included in the cost of generation. Emissions will be tracked for each portfolio as an output of the analysis.