

Vectren 2019 IRP
3rd Stakeholder Meeting Minutes Q&A
December 13, 2019, 9:00 a.m. – 3:00 p.m.

Lynnae Wilson (CenterPoint Energy Indiana Electric Chief Business Officer) – Welcome and Safety Message (holiday safety tips) and Vectren introductions.

Subject Matter Experts in the room: Matt Rice, Cas Swiz, Nick Kessler, Rina Harris, Jason Williams, Angie Casbon Scheller, Matt Lind, Kyle Combes, Jamie Bundren, Alyssia Oshodi, Natalie Hedde, Ryan Wilhelmus, Justin Joiner, Justin Hage, Bob Heidorn, Wayne Games, Christine Keck, Brad Ellsworth, Angie Bell, Tom Bailey, Steve Rawlinson, Ryan Abshier.

Stakeholders: Approximately 37 stakeholders attended in person. List of affiliations include the following:

Bowen Engineering
Citizens Action Coalition (CAC)
Earth Charter Indiana
Indiana Coal Council (ICC)
Indiana Utility Regulatory Commission (IURC)
Orion Renewable Energy Group LLC
Office of Utility Consumer Counselor (OUCC)
Sierra Club
Southwest Indiana Chamber of Commerce
State Utility Forecasting Group (SUGF)
Tri-State Creation Care
Valley Watch
Vermillion Rise Mega Park
Vote Solar

Approximately 38 registered to attend the webinar; several participated. Those registered included representatives from:

Advanced Energy Economy
AEP
Boardwalk Pipeline Partners
Development Partners Group
Earth Justice
Energy and Policy Institute
Energy Futures Group
EQ Research
First Solar
Hoosier Energy
ICC
Indiana Distributed Energy Alliance
Inovateus Solar LLC

IPL
IURC
Lewis & Kappes
Midwest Energy Efficiency Alliance (MEEA)
Morton Solar, LLC
NextEra
Orion Renewable Energy Group LLC
OUC
Sierra Club
Solarpack Development, Inc.
Whole Sun Designs Inc.

Matt Rice (Vectren Manager of Resource Planning) Reviewed Stakeholder Process and Presented Follow-up Information Since Our Last Stakeholder Meeting - Slides 4-17.

- Slide 4: Matt Rice noted that the date for the next stakeholder meeting has been moved to March 20, 2020.
- Slide 12 Stakeholder Feedback\Questions:
 - Request: In CO₂ life cycle analysis I want you to capture all greenhouse gas emissions associated with a process. Specifically, when burning coal, you should capture greenhouse gas emissions associated with coal hauling vehicles, as well as the emissions associated with manufacturing coal handling equipment.
 - Response: What you describe is the purpose of using a life cycle analysis. It considers mining the coal, transporting it, burning it, etc. but we would need to refer to the study to clarify [if manufacture of equipment is included].
 - Question: Regarding the size of the hydro resources available for selection in the model, if other hydro owners evaluate local dams and identify there is more potential than 50 MW's will you consider changing the size of hydro resources in the model?
 - Response: We plan to stick with 50 MW's for the size of hydro resources but keep in mind the IRP is a guide, and if hydro is selected as a resource [in the preferred portfolio] we would then initiate further evaluation of the potential of local dams and refine the projected output.
 - Question: You are going to model 50 MW's but will you perform an analysis to determine what size dam would work properly?
 - Response: Hydro would need to be selected first before further analysis is completed.
 - Statement: Modeling 50 MW's seems arbitrary and it seems that you want to dismiss it.
 - Response: Hydro will be evaluated within the model along with all other resources.
 - Statement: Regarding methane leakage I urge you to include the results from the Science Magazine article from 18 months ago. It is more current than the National Renewable Energy Laboratory (NREL) study being used.
 - Response: Life cycle analysis of carbon is one of many factors we are using to select a preferred portfolio. The NREL study is the best study we can find to show the relative differences among resources. When we spoke with NREL, we told them how we intended to use the study, and they agreed that their study was appropriate for our analysis. We can set up a separate meeting to discuss if needed.
- Slide 11 Stakeholder Feedback:

- Question: Can you tell me who you spoke with at MISO that indicated they are moving toward a seasonal construct?
 - Response: Based on conversations with MISO personnel and public presentations it is clear to us that MISO is planning to move to a seasonal construct [or other mechanisms to adapt to intermittent, renewable resources] in the coming years. We can schedule a group call to make sure we are all on the same page if needed.
- Question: Can you share the documents you are looking at that indicate MISO is moving toward a seasonal construct.
 - Response: Yes, we will provide them.
- Slide 13 Stakeholder Feedback:
 - Statement: I appreciate that you are willing to export inputs and assumptions from Aurora to share with stakeholders that don't want to pay \$5k for a read only license but I am concerned that the information exported will be difficult to interpret.
 - Response: There is a help function in the read only copy, and we will try to print as much of that information as we can to help provide a work around, but we cannot provide a read only copy [free of charge] of all the models we use to all stakeholders that want a copy. We will work to provide the transparency that is needed with this workaround.
- Slide 14 Stakeholder Question:
 - Questions: Can you explain the planning process between MISO and a utility? What does it mean that MISO is fuel source neutral? Isn't the planning reserve margin based on information you provide in your planning?
 - Response: Fuel source neutral means MISO doesn't care what fuel sources (coal, gas, solar, wind, hydro, etc.) we use to meet customer needs. They provide us with the planning reserve margin requirement.
 - Response: The planning reserve margin is the surplus power we need above expected customer peak demand. It is based on [load and performance] information of all resources in MISO.

Peter Hubbard (Manager of Energy Business Advisory, Pace Global) Presented Draft Reference Case Modeling Results - Slides 18-29.

- Slide 20 Stakeholder Questions:
 - Question: On slide 20 I don't see hydro. Is it included?
 - Response: This is not an all-inclusive list. It is included and is shown on slide 22.
 - Question: Can you explain what customer owned Distributed Generation (DG) capacity represents?
 - Response: It represents how much capacity is expected from solar installed by Vectren customers, over time in the reference case. These values can vary in different scenarios.
 - Question: Does this estimate include batteries?
 - Response: There could be a battery behind the customer owned solar, but this just represents the solar capacity.
- Slide 21 Stakeholder Question:
 - Question: Did House Bill 6 in Ohio have an impact on Vectren's ownership, operation, or cost of Ohio Valley Electric Corporation (OVEC) that would impact Vectren customers?
 - Response: No.
- Slide 22 Stakeholder Questions:
 - Question: Shouldn't hydro capacity be 100 MW's?
 - Response: It is 50 MW's for each resource, and 2 resources are available for selection (100 MW's total).
 - Question: How did you determine the solar and wind capacity limitations?
 - Response: It is based on what is a reasonable expectation for how many MW's can be constructed and brought on line in a year.
- Slide 24 Stakeholder Question:

- Question: Regarding CO₂ does your analysis include the potential use of the low sulfur diesel fuel that could be produced from the proposed coal to diesel facility in Spencer County?
 - Response: This analysis only includes natural gas as a fuel source [for resources that can be fired by natural gas or diesel].
- Statement: There is probably more carbon produced transforming coal to diesel than there is transforming oil to diesel.
 - Response: The Spencer County project is external to the IRP analysis.
- Slide 20 Stakeholder Questions:
 - Question: The amount of customer owned solar DG would depend upon net metering and how much customers are compensated. Are you putting caps on net metering and solar?
 - Response: The DG (solar) is looked at from a probabilistic point of view that determines what levels of DG could exist on the low end and on the high end. It captures a range of inputs for the model.
 - Response: We are also considering a low load forecast within scenarios that will produce a portfolio. We are considering a range. The assumptions in the reference case are based on existing law.
 - Question: So, you will only be as favorable to the homeowner as the law makes you be?
 - Response: We are modeling a wide range of load forecasts. Solar DG is accounted for as a reduction in load in the model. We've included existing law in the reference case but will also look at high and low bounds.
 - Question: When determining the cost of natural gas, do you assume the gas will come from CenterPoint Energy in Houston?
 - Response: There are several different sources for gas, so it would not necessarily come from CenterPoint. It would be on a low-cost basis and would come from one of the interstate gas pipelines.
 - Question: Does most of the gas come from the Texas area?
 - Response: It depends on the pipeline. Many pipelines that are in this area come from the Gulf Coast, but some come from other sources. The gas could come from other areas (i.e. Pennsylvania).
 - Response: We have a diverse mix of gas interstate pipelines in Indiana. The gas could come from Canada, Ohio, New York, Pennsylvania, Colorado, or the Gulf Coast.
 - Question: Since a lot [of gas] comes from the Gulf Coast, is it figured in that climate change is likely to create record floods. The Houston area has had two 500-year floods in recent years. I assume more frequent and drastic flooding will impact the ability of the pipelines to work (for people to get to their jobs to do it). I hope that when you figure the cost and reliability of natural gas is, you consider the factor in the impact of climate change.
 - Response: When you look at the 2 flooding events in Houston, Vectren customers did not have an interruption. When you look at the interstate pipeline and the planning involved the diversity really helps [maintain reliability].
- Stakeholder Question:
 - Question: In April 2019, the IURC denied your proposal for an 850 MW gas plant. If the request for proposal that comes to fruition as a result of this IRP also gets rejected by the IURC will you continue to recommend oversized gas plants that favor CenterPoint's interests?
 - Response: Today, we are laying out the portfolios that we are considering. A large gas plant is not included. When you look at the planning reserve margin requirement graph [for the reference case] there is not a build larger than the requirement.
 - Response: It is important to note that meeting the planning reserve margin requirement is a capacity issue. When we retire base load coal capacity, we need to replace capacity. The model is picking gas peaking units, not a combined cycle [gas plant], which runs a lot. [In the reference case] the peaking

units are only projected to run 7% of the time. 90+% of the time other MISO units are being selected to run (create energy). When we evaluate all 15 portfolios through the risk analysis, the reference case may be low cost for capacity, but it is not a great energy selection. This leads to exposure to volatility of the energy market. The reference case is an option, but there are [up to] 14 other portfolios with 200 iterations of each, and all will be run through the risk analysis. That will lead us to a preferred plan. The preferred plan will perform [well] across all scenarios and [potential] costs.

- Slide 25 Stakeholder Question:
 - Question: How did you come up with 697 MWs to replace 730 MWs of coal capacity?
 - Response: The three combustion turbines selected by the model are 230 MW's each. The balance is made up for by purchasing capacity from the market.
- Slide 22 Stakeholder Question:
 - Question: Why is there a single 200 MW capacity option for wind energy? Is that a realistic capacity option viewed relative to the capacity of Vectren's existing wind resources (i.e., 30 MW and 50 MW)?
 - Response: Many wind farms are much larger than the 30 and 50 MW's that Vectren currently has contracted. The 200 MW size is reasonable from a tech assessment point of view, but it could be smaller.
- Stakeholder Question:
 - Question: What pipeline costs were included in the reference case modeling?
 - Response: Pipeline costs were included. Costs are subject to refinement but were included in the reference case.
- Slide 22 Stakeholder Question:
 - Question: Why did you constrain the reference case? It seems like it makes the most sense to let the model do as much optimization as possible.
 - Response: There are operational and commercial constraints that need to be considered. The analysis is meant to be least cost but subject to reasonable considerations.
 - Comment: I've seen other utilities use a max reserve margin instead of resource specific constraints. For renewables it does matter because the cost changes by year pending tax credits. Rather than you telling us it is reasonable, it would be nice if we could evaluate if it is reasonable too.
 - Response: We are preparing to put Request for Proposals (RFP) information into the model so we can evaluate what projects are out there and see if we need to change the limitations.
- Slide 23 Stakeholder Question:
 - Question: Why are aeroderivatives excluded from the model? I've seen that they are modeled in Puerto Rico, so why isn't is an option to Vectren?
 - Response: The required pressure is 900 psi which is higher than other potential resources. They have a higher pipeline cost and they are smaller resources [expensive] so we decided to screen them out.
 - Question: Do you have any data on the pipeline cost differences?
 - Response: It is subject to non-disclosure agreement but we can discuss.
 - Question: CenterPoint could hold the contract to supply gas to any unit that Vectren may build. Is that something you intend to do an RFP for?
 - Response: Currently, our practice is to go out for bid for fuel source supply for our generating facilities.
- Tri-State Creation Care (along with the Sierra Club) presented a petition with approximately 600 signatures encouraging Vectren to take future risk of CO₂ emissions on future generations into consideration. Emphasis was added that this is a moral decision to stop CO₂ production; it is not just an economic decision.
- A residential customer presented a petition of approximately 600 people effected by a large [600 acre] solar project in Vanderburgh County, requesting that Vectren consider land use in portfolio development. Emphasis was added that solar plants are large, industrial facilities and should be

zoned as such. Vectren should maximize use of brownfield sites and not pursue large solar projects on productive farm land near residential homes.

Matt Lind (Resource Planning & Market Assessments Business Lead, Burns and McDonnell) Presented Final RFP Modeling Inputs - Slides 30-37.

- Slide 36 Stakeholder Question
 - Question: Is cost incorporated over the life of the asset including initial build cost and O&M?
 - Response: It includes initial build and O&M.
 - Question: Some resources, depending on the fuel source, will have an increase in price that will be difficult to model. I suspect that as some resources become more scarce their cost will increase exponentially. How are those types of variables accounted for?
 - Response: In the RFP we are focused on specific projects. To the extent that some of these resources are going to burn fuel, the IRP risk analysis will consider and evaluate that.
- Stakeholder Comment
 - Comment: Every day a river or aquifer is destroyed, and the cost can't be determined; it can't be replaced.
 - Response: Thank you for your comment. In the IRP, the assumption is that all resources meet existing regulations which include costs associated with avoiding instances that you described.
- Slide 34 Stakeholder Question
 - Question: Was there a particular duration in hours [for storage] that made it into Tier 1 where as others didn't?
 - Response: Duration did not go into categorizing resources into tier 1 or tier 2. It was based on [firm bids and] if the energy was settled at Vectren's load node or located on their system. There was not a distinction on duration to qualify for tier 1.
- Slide 36 Stakeholder Question
 - Question: How does the project shown in group 13 [Solar Purchase/PPA] compare to projects in group 14 [12-15 Year Solar PPA]? Is that where you are purchasing from homeowners?
 - Response: No. That project was a hybrid where some portion of it would be owned and some would be a PPA with the developer. There was only one bid in that category, so we didn't show cost to keep it confidential.
- Slide 36 Stakeholder Question
 - Question: Is solar+storage only charged by solar? How are you accounting for carbon footprint if charged by the grid?
 - Response: With solar+storage and how tax credits are structured, it is favorable to charge based on renewable energy. It is bid specific; they may have the ability to be grid charged and discharged to the grid.
 - Response: Carbon is accounted for in the energy price. We are still determining the best way to apply the life cycle of carbon analysis to storage.

Matt Rice (Vectren Manager of Resource Planning) Presented Portfolio Development - Slides 38-51.

- Slide 40 Stakeholder Question
 - Question: If the net metering cap were to be doubled, tripled, or quadrupled do you have a factor that incorporates the increase in the cap into different portfolios?
 - Response: Indirectly, yes. We will run a scenario that has a lower load than the reference case.
 - Comment: But the lower load would vary based on what the cap is.

- Response: If there is something that induces more solar on rooftops, that would result in a reduction to our load. We are considering reduction to load within the scenarios and probabilistic modeling.
 - Comment: But the lower load could be 5-20% lower so you don't know what that reduction is.
 - Response: Our bounds are very wide.
- Slide 41 Stakeholder Question
 - Question: How many portfolios do you think this will end up being?
 - Response: We are planning for up to 15.
- Slide 50 Stakeholder Comment:
 - Comment: Thank you for including the HB 763 but on the chart on slide 50 the cost should be \$45 in 2025 and \$205 by 2039.
 - Reply: Thank you, please see me at the end of the day.
- Slide 43 Stakeholder Question
 - Question: Why does it take so much solar ICAP (installed capacity) to meet 174 MW UCAP (accredited capacity of approximately 29%)? I thought MISO offered 50% accreditation starting off but could be even higher, particularly with tracking.
 - Response: As more solar penetrates the MISO footprint, the solar is netted out which shifts the [net] peak hour out into the evening hours. Then resources other than solar must serve that net peak load. The projection for UCAP declines over time as more solar penetrates the MISO footprint.
 - Question: In California the same thing has happened, but the simple solution is to add 4 hours of storage to get the solar back to a high capacity value. In your lists you include solar+storage but in these lists you didn't include solar+storage as a potential buildout.
 - Response: We are just showing these as reference points. We will evaluate solar+storage consistent with the bids received in our RFP.
- Stakeholder Feedback:
 - Comment: In Germany they put a lot of solar on rooftops and we should do that here. There are a lot of buildings here that don't have solar.
 - Response: That is an option, but it is more expensive and more complex. We have seen this with the Urban Living Research Center. We had to work with the developer on the design of the building to make sure it would support the amount of solar we wanted to install on it. We are modeling utility scale [universal solar] that is much more cost effective.
- Stakeholder Question
 - Question: Can you explain how peak load can shift to the evening?
 - Response: It is the net peak that shifts which is the peak load less the renewable generation (how MISO calculates). The remaining load must be served by something that is dispatchable.
- Stakeholder Question:
 - Question: When you are projecting into the future, do you extend today's values into the future or have other sources?
 - Response: It depends on the input. Some inputs we develop ourselves, some by others but we are diligent to have a basis for all assumptions that are fed into the models.
- Stakeholder Question:
 - Question: How does Vectren's profitability plan into the analysis?
 - Response: When each portfolio is analyzed, it will have a net present value [over the planning period]. The net present value includes a rate of return on resources that we own.
- Stakeholder Statement:
 - Statement: In the last IRP you chose a large CCGT which was going to be highly profitable because it was a large capital investment. It doesn't seem like there is an incentive to go to the lowest cost because profits would be lower.

- Response: In the last IRP each scenario produced a gas plant as the lowest cost option to serve customer load. In a few slides we will show that affordability is one of the objectives in this IRP to be balanced against other objectives.
- Stakeholder Question:
 - Question: You said that hydro is very expensive initially but it seemed like you said we can't carry that cost over the 50-100 years that it would operate?
 - Response: We will need to review the tech assessment and see what the life is expected to be and put it in the notes. [Upon review, 40 years is included in the tech. assessment. It would not necessarily lower cost by extending the life to 50-100 years as this would take further capital investment that is not included in our estimate.]

Peter Hubbard (Manager of Energy Business Advisory, Pace Global) Presented Scenario Testing and Probabilistic Modeling - Slides 52-60.

- Stakeholder Question:
 - Question: Are there any incremental solutions where you reassess every 2 years and add resources as needed?
 - Response: Every three years the IRP analysis is revisited and updated based on current assumptions.
- Slide 55 Stakeholder Question:
 - Question: In the high regulatory case how were the natural gas prices determined?
 - Response: It is based on a fracking ban. We used historical pricing (pre-shale gas boom) and sustained those high gas prices throughout the forecast (the 95th percentile every year of the forecast).
- Slide 58 Stakeholder Question:
 - Question: There is more to environmental risk minimization than greenhouse gas emissions. There is ecosystem destruction from coal mining and fracking as well as health issues from burning those fuels. How are you modeling those factors?
 - Response: It isn't just carbon; CO₂ equivalent considers emissions involved from cradle to grave for each technology. Additionally, we are also assuming compliance with EPA regulations. We are accounting for a lot of potential impacts.
- Slide 54-57 Stakeholder Question\Comment:
 - Question: Are you modeling variable O&M probabilistically?
 - Response: We are modeling fuel and CO₂ emissions probabilistically. We are not varying non-fuel variable O&M probabilistically.
 - Question: The list shows CO₂ prices and capital cost (will be varied). I am concerned because I don't think we have enough data to develop a stochastic distribution for CO₂ price. For capital costs, the RFP should provide certainty for those costs and you should be able to extrapolate those costs going forward.
 - Response: The RFP response will tighten up the short-range distribution of capital costs. There is less uncertainty in the short term. However, over 20 years we don't know where those costs will go. The capital cost could be higher or lower than the reference case in the long term.
 - Comment: I think the only thing that lends itself to stochastics are load and fuel prices. I don't think you should test capital costs and CO₂ prices.
 - Response: Thank you for your feedback.
- Stakeholder Question:
 - Question: In essence the IRP is a 3-year plan because you will have another IRP in 3 years. What is going to be done in the next three years that becomes irreversible?
 - Response: Long term there is a bit of uncertainty that goes into this but the IRP incorporates specific market feedback on what the short term might look like. In the very short term, it is based on real figures the market can provide. There is a wide range of technologies that came out of the RFP, and you want to look at

- how they perform in the long term. We will look at how they perform in a wide range of conditions.
- Feedback: I think this process is a short-term planning process but would prefer that it be a long-term planning process.
 - Response: We are looking at a wide range of portfolios, and in each case, we are looking at how those portfolios will perform over a 20-year horizon.
 - Stakeholder Question:
 - Question: Have you asked your rate payers if they would be willing to pay a higher rate for renewable energy?
 - Response: Yes. We do survey our customers to understand their needs. There is a segment of the population that is willing to pay more for renewables.
 - Stakeholder Question:
 - Question: Vectren ratepayers pay some of the highest rates in the state for a fleet primarily fueled by fossil fuels. I wonder why there is a high value on fossil fuels when utilities that are opting for renewables have lower rates.
 - Response: We are working on a long-term plan, and affordability will be on the scorecard.
 - Question: Has affordability not been on the scorecard in the past? Why do we pay higher rates than others in the state?
 - Response: Affordability is always on the scorecard for the IRP.
 - Stakeholder Question:
 - Question: Does Vectren have a renewable energy rider? If not, that could be a consideration and a benchmark to see how many customers are interested in renewable energy.
 - Response: We do not [currently have a renewable energy rider]. We performed an analysis on community solar in recent years to gauge the interest of our customers. At the time, there was slight interest, but we will look at this again as we move forward.
 - Stakeholder Comment:
 - Comment: The CAC disagrees that renewable energy riders can gauge customer interest in renewable energy. Buying into these programs does not change the energy portfolio of the utility serving that customer.
 - Response: Thank you for your feedback.
 - Slide 16 Stakeholder Question:
 - Question: There was a mention that there weren't any bids received for combined cycle units. I thought I had heard through press releases that you did receive bids for Combined Cycle Gas Turbine (CCGT) projects. Is purchasing power from independent sources woven into your analysis?
 - Response: On slide 32 it shows that we did have some bids for CCGT projects, but they did not qualify to be considered tier 1 projects based on the criteria to be a firm bid, be on our system, or have a delivered price. We are evaluating attractive tier 2 bids and are performing congestion analysis to determine the congestion cost to get the energy to our customers.
 - Slide 33 Stakeholder Question:
 - Question: Why are some of the values [in the table] on slide 33 shown on the screen different than the handouts?
 - Response: There was a typo on the slide that we originally posted/printed for this meeting. What is on the screen is accurate. We will post an update to the website.