



An AEP Company

BOUNDLESS ENERGY™

Indiana Michigan Power Company
2018 Integrated Resource Plan
Stakeholder Workshop #1

February 15, 2018
9:30 a.m. - 2:30 p.m.
Meeting Minutes

1. Meeting Objectives and Introductions - John Torpey, Managing Director, Resource Planning

John kicked off the meeting at 9:31 and covered slides 1-8.

John took a roll call for people who joined via the webcast. He introduced the role of his organization and purpose of the meeting. He stated that, the IRP will be developed over the course of the next several months and stakeholder input be solicited and considered throughout the process. He also discussed I&M's IRP webpage and noted that stakeholders are encouraged to submit comments and input using the comment form available on the IRP webpage. <https://www.indianamichiganpower.com/info/projects/IntegratedResourcePlan/>

Meeting Access Information: Wifi is available for participants in the room.
Introductions were made for those attending in person.

Ground Rules and Housekeeping were discussed.

John mentioned to be respectful of opinions and stick with allotted time windows.

I&M's Key Priorities for the 2018 IRP (slide 4)

John discussed I&M is looking for ways to improve the IRP and to be even more collaborative than it has in the past. I&M is looking to continue to deploy Demand Side Management/Energy Efficiency (DSM EE) measures and renewables. AEP and I&M have added solar and wind resources and are firmly behind renewables. Further, I&M is considering distributed generation opportunities as well. The Rockport plant is a 2600 MW coal plant, with 2200MW belonging to I&M. John recognizes that there are a lot of concerns with the future of the plant. Purpose of the plan is to put together something reasonable that balances multiple points – cost, risk, needs.

John mentioned the Michigan PSC was implementing new IRP requirements and welcomed the Michigan staff members in attendance. I&M plans to file its 2018 IRP with MI as well.

Q: Will the analysis show I&M total data or IN specific? A. John indicated that the data and analysis will be based on the total I&M company (MI and IN).

Meeting Goals (slide 5)

John indicated that the 1st stakeholder meeting will focus on key IRP inputs and the IRP process. The heavy modeling work will take place in the July time frame.

Preliminary Stakeholder Meeting Schedule (slide 6)

Four stakeholder meetings will be held. Next meeting in Indianapolis (April 11, 2018), and I&M will schedule another in July and likely in September. Outstanding issues may be addressed as needed with phone conference approximately two weeks after meetings.

Stakeholder comments (slide 7)

An input form link is provided on I&M's IRP web page. Comments can be submitted there.

Today's Agenda (slide 8)

John reviewed the meeting agenda and introduced I&M's CEO and President Toby Thomas.

2. Opening Remarks & Welcome - Toby Thomas, I&M President & Chief Operating Officer

Toby welcomed everyone to the meeting and reiterated the desire to get input for future resource needs. He discussed his expectations for I&M's upcoming IRP and his goal to work transparently with the stakeholders. He is interested in stakeholder input on resource options and assumptions needed for various technologies. He indicated that I&M will need insight on how people change their behaviors to support the new technologies. Energy storage is something I&M is watching, and EV's are receiving a lot focus. Also watching advances in Artificial Intelligence to analyze massive amounts of data. Toby covered the existing I&M assets/resources summarized on slide 10.

Toby introduced Marc Lewis, I&M's Vice President, Regulatory & External Affairs.

3. Introduction to I&M - Marc Lewis, I&M VP Regulatory & External Affairs

Marc discussed areas served and generation sources. Made investments in Cook Nuclear Plant (CNP) to keep it going through mid 2030's. EE program has been successful and continues to evolve based upon technology and load shifting. DSM pilot I&M did this summer – several mw's offloaded – involved HVAC and lighting. These technologies involve changing customer behaviors. Need customers input on what this looks like in future (customer acceptance and use of new technologies).

4. Stakeholder Presentations, facilitated by Marc Lewis

I&M allotted 30 minutes on the agenda for stakeholders to present IRP-related topics to the group.

Marc introduced group of students from Ball State University for a presentation on the solar potential of brownfields sites. Their project was completed under the direction of Sanglim Yoo, Ph.D., Assistant Professor of Urban Planning, Department of Urban Planning.

4a. Stakeholder group #1 – Ball State University Immersive Learning Project, Brownfields to Brightfields: analyzing solar potential of brownfields in Delaware County, Indiana

Several students presented the project overview:

-The Brownfields to Brightfields project was implemented in Fall 2017 as Ball State University's PLAN 203 Regional Analysis and Design Studio.

-A group of nine second-year urban planning students in the College of Architecture and Planning studied the brownfield redevelopment programs of the Environmental Protection Agency (EPA) and the Indiana Department of Environmental Management (IDEM) as well as analyzed the solar potential of nineteen Delaware County, Indiana, brownfields site, including the existing conditions at many sites.

Reviewed 19 sites using specific evaluation criteria. Two sites are utility scale and two sites are large scale.

-Results: Four brownfields sites suitable for solar PV installation in Delaware County

Two sites suitable for utility scale solar installation (over 40 Acre)

Two sites suitable for large-scale solar installation (over 2 Acre)

Total 16 MW capacity

The top site for solar facility was 101 acres owned by Delaware Advancement Corp.

A copy of the group's presentation will be provided to the 1st stakeholder meeting attendees.

There is a lot of potential with these sites to turn them from brownfield to brightfield sites.

Q. When will Borg Warner facility in Muncie, IN be demolished. A. The site is owned by single owner, but not sure of owner's intent.

Marc mentioned a lot of interest at another site in Muncie for a possible solar production project.

Marc requested other stakeholder input. No other stakeholder volunteered to address the group.

15 minute break

5. Resource Planning 101 Q&A, Scott Fisher, *Manager of Resource Planning* and Dylan Drugan, *Resource Planning Analyst, Sr.*

Stakeholders were asked to review slides 11-25 prior to the meeting. The material also included links to a recorded overview of the IRP process prepared by the Indiana IOUs in 2016. The link is posted on I&M's IRP webpage.

Scott began this section of the discussion by introducing Dylan Drugan who went through pre-read materials on Resource Planning 101. Dylan reviewed demand side and supply side resources. Dylan mentioned that the IRP analyses will cover a 30-year planning period but the report will address only a 20-year period as required. Dylan indicated that the report will show a 20-year present value of revenue requirements (PVRR). Plan is to get blue print for future, but it is a snapshot in time based upon current info. Four major steps on process –

1. Gather data, develop input assumptions and create scenarios

2. Portfolio development
3. Analyze portfolios
4. IRP report development

Dylan asked for questions:

Q – First slide – will results show 20 year or 30 year PVVR? A. Will show 20 year.

Q - Will it be in 5 year increments? A. Dylan indicated that I&M can provide a revenue requirement output for each year in the study period.

Comment – For the 2015 IRP, the commenter commended the team for willingness to answer questions and provide information during that process and after the IRP was filed. Her concern is not being able to see user manual and inputs into model. Would like to see transparency on user inputs. John indicated that AEP licenses this model and could not share at the time. I&M/AEP will revisit the concern with the model license holder. I&M's goal is to get this resolved prior to IRP being filed.

Comment – Transparency of model – if I&M cannot get approval, perhaps other approaches should be taken. Model inputs need to be transparent.

Q – How will EE be modeled in MI? A. We will model EE for total company. The specific EE programs are developed under the EE plan, not the IRP. Scott mentioned that the next stakeholder meeting will be dedicated almost exclusively to EE IRP issues. A related question was asked about how the IRP will ensure that I&M meets the mandated EE targets in Michigan. Mr. Fisher stated that if the amount of optimized EE selected during the modeling are insufficient to meet the mandates, additional EE resources may be added to certain portfolios to meet the mandates.

6. Key IRP Inputs & Assumptions (slide 26 and 27)

Scott introduced SME's who discussed key IRP inputs

6a. Commodity and Fuel Price Fundamentals, *Connie Trecuzzi, Staff Analyst, Fundamental Analysis Group, slides 28-34*

Connie discussed the forecasting process for fundamental pricing. The Aurora model is used for projecting long-term energy prices. It uses a wide range of information in developing forecast – internal and external. As shown on slide 29, the modeling is iterative, not a single pass, to reflect the impact of changes in power generation demand on underlying fuel prices and the subsequent impact on power prices. The process is repeated until an equilibrium has been reached.

The forecast is a baseline forecast covering the entire country. It is used for analysis across AEP's entire service territory. It is not developed for any single project or AEP operating company.

The LR forecast uses a 30 year normalized weather forecast, based on weather normal published by NOAA. The process considers relationships of commodity prices to each other, such as oil and natural gas. Considers how international demand is impacting fuel prices. I&M/AEP uses sensitivity analysis to understand how changes in input assumptions impact resulting prices and use scenario analysis to explore the impact of potential market states other than the base case.

AEP is in the research phase of the process used to update its fundamental forecast. At this point, AEP expects short-term gas prices to come down some in the next update, but it's too soon to tell how the long term gas forecast will change.

Q – Are data on slide 33 specific for all AEP? What are we seeing on graphs? A. This shows PJM AEP pricing / AEP PJM Off-peak pricing / Henry Hub gas pricing / PRB coal pricing. The different lines represent different scenarios.

Q – A stakeholder asked why the short-term gas forecast doesn't match the current market gas price? Connie explained that the short-term outlook reflected current market conditions, adjusted for normal weather, at the time the forecast was prepared.

Q – How does Plexos tie into Aurora? A. Connie responded stating that the Aurora model is used to develop the commodity price forecast (e.g., energy or gas prices) that feeds into the Plexus Plexos IRP model. Connie also noted that the companies that own Aurora (EPIS) and Plexos (Energy Exemplar) are merging. Q – Why is Aurora not used for entire process? A. We prefer using Plexos for IRP optimization (Scott). Connie indicated the level of detail is completely different between Aurora and Plexos. John Torpey stated about 6 years ago the IRP group went through review of available models. Looked for tool to streamline the number of data sets. At that time Aurora did not meet our needs as well as Plexos. AEP's experience and practice has been to use them together. AEP is open to looking at new models in the future. But it takes time to learn these very complex models. John discussed the complexity of the models and how difficult it is to switch from one to another; it is a very big deal. Stakeholders said that they were indifferent as long as there was transparency in the process.

Q – Are we running all AEP companies together? A. We run east companies together, since they are in PJM.

Q – How does forecasting process use both Plexos and Aurora? A. Connie – Aurora is used to determine long term national forecast. It does not rely on Plexos.

Q - A stakeholder asked about post-modeling processing. We do some post modeling processing to feed into the financial forecasts for budgeting and financial forecasting purposes.

Connie was asked how the fundamental forecasting process uses both Aurora and Plexos. She explained that it's all done in Aurora. There's no loop-back process between the two tools.

Q - IURC – On page 33 – do you use mid case as reference case? A. Connie – that is our reference case. We look at how market fluctuations impact it.

Q – How are high and low sensitives used? Are they the only ones used? A – No we use others. Look at multiple impacts on risk factors. We haven't identified all of the sensitivities yet for the next outlook, and stakeholders are invited to provide input into defining those sensitivities/scenarios.

Q – Commodity pricing forecasting – are fuel prices correlated or independent? A. When going through iterative runs, we look price elasticity to determine how increased/decreased demand impacts underlying fuel prices.

Q – Confirm if forecasts are integrated or correlated. A. It is integrated.

6b. Load Forecast, Chad Burnett, Director – Economic Forecasting (slides 35-41)

Chad indicated that this is the same approach used for base cases, financial forecasting and the IRP. I&M has one load forecast. Currently working on updating / developing the forecast but the new forecast is not expected to be dramatically different than the current forecast.

Load forecast Process (slide 35)

Chad stated that AEP looks at county level economics. Then develops customer forecast use as input into monthly sales forecast which flows into peak demand. Try to look at energy needs of those customers 30 years from now. Consider demographics, macroeconomics, and weather. Models used are SAE – Statistically Adjusted End use models. Look at efficiency and adoption of new technologies. Adjustments are made for DSM/EE programs. A lot of time will be spent on analyzing these programs. Also, the process will include input from economic development team.

Load Forecast Drivers (36)

Chad discussed many of the drivers of load shown on slide 36 that there are other drivers that aren't shown here.

Population growth is a key driver of the load forecast. Five percent of I&M's customers live in homes less than five years old, and forty percent of I&M's customers live in homes that are over forty years old. Chad also stated that I&M closely watches the auto and metal industry as they are critically important in I&M's service territory.

Economic Forecasts (37)

Population growth is a key indicator of economic growth. Population growth is lower now than in the past. This will result in slower future load growth. Employment outlook is also lower driven by a lower population.

Energy Sales (38)

The forecast into future is pretty flat. Residential and commercial sales will decline/stay flat into future. Industrial growth is expected to be flat.

Residential Load (39)

Chad discussed the impact of EE. Slide 39 shows impact of EE on future load growth. Residential usage is forecasted to decline. EE is a big driver in that forecast decline

Load Forecast Scenarios (40)

Chad talked about the load forecast scenarios with the base line sales forecast being flat. Other scenarios that are shown are based upon different technology or EE assumptions. This is good for testing models and getting at sensitivities.

Q – What is the green line on the load forecast scenarios shown on page 40? What is “extended efficiency”? A. Chad explained that this assumes customers legislators will continue to do what they have been doing in terms of EE efficiency standards. In other words, that additional efficiency standards (not known today) will be enacted in the future.

Peak demand (41)

Chad said I&M is not expecting a lot of growth and perhaps negative growth in peak demand.

Q – What are our thoughts on EV adoption? A. EV’s are becoming more common. The forecasting process has developed an EV scenario based on IEA data. Today 0.5% of vehicles on the road are EV. By 2030, this will grow to 5%. We are considering those scenarios in our forecasting. Chad again pointed out that EV vehicle growth will fall between the high and low cases, so it is covered.

Q – Do we have a new potential study for IN &MI? A. Scott indicated that a market potential study was completed in 2016. The market potential study included all of I&M.

Q – For the key drivers of load, how are regional variables handled? A. Regional variables are at the county level for I&M. On a national level, we use things like mortgage rates, industrial trends. However, most inputs are for I&M service territory.

Q – What is the source of forecast data for saturation studies? A. EIA looks at surveys to project saturation data. We get our data from EIA data.

Q – Does he (Chad) give three levels of forecasts (high/low/baseline) to IRP team for use? A. Yes. Q – Are economics the overall driver of load? A. Chad indicated that the economy has a bigger impact on load than any other driver. Comment regarding the use of Moody’s for data set – their trends are more optimistic over time. Should we use a different vendor? This causes concerns with the data and methodology used for modeling. A. Moody’s is used across the industry and PJM. We like them as they give county level data. They have been a good source of economic projections. Income is a valid driver for economics so we need to use that data. The stakeholder was still concerned. Chad said that he appreciated the comments but stated that the inputs were reasonable, with one cause of the increase being rising incomes which creates competition for labor. Chad explained that there are fundamental drivers that account for the increase; but, putting that fact aside, the high and low forecast address all reasonable growth scenarios.

Comment – Concerns with correlation vs. causation when looking at that data. Commenter would like to talk more about it. A. Sure.

Q – What are our projections of future weather? What is the assumption on precipitation? A. We use a 30 year normalized weather trend and project into future. No assumptions on water are considered.

Q – In the historical data on page 40, why would the baseline see a large drop in 2015? Is that due to data noise? A. Chad said though he doesn’t recall the exact driver, it doesn’t surprise him and appears reasonable. We would need to do further research on the specific causes. It could even be a specific customer impact. Over the break, Chad discussed the 2015 situation in more detail and explained that he believed it had to do with SDI having a full book of orders during the first half of 2015, but then

dropping off at the 2nd half due to the drop in metals prices caused by the surplus of Asian steel. Q – Will the model pick the high scenario? Are there probabilities associated with it? How does the model use high and low scenarios? A. We use for those stress testing model. If it gives same answer for both scenarios, we know we got it. Highs and lows are used for risk analysis. Chad explained that if the high and low cases are evaluated in the IRP modeling, then the extremes and everything in between are adequately addressed.

6c. Existing Resource Portfolios, Scott Fisher, Manager of Resource Planning (slide 42)

Scott discussed current I&M generating resources. ~4,600 MW available to the company. I&M will look at how existing assets meet future energy needs. Scott discussed the PJM capacity assumptions for intermittent resources (e.g. 38% for solar and 13% for wind).

Q – For OVEC (Clifty Creek/Kyger Creek), how are they reflected in the model? Are they treated differently than other owned assets? A. We choose a portfolio to have them either in or out. Toby Thomas then indicated that due to the multiple owners we can't unilaterally retire the OVEC resource. There are obligations associated with those units, so they cannot be simply removed from consideration. To clarify I&M's plan regarding the OVEC resource in this IRP, the OVEC resources will remain part of I&M's going forward resource plan for the duration of the IRP study period.

Q – Will the end of existing contracts for wind be shown? A. The model reflects available resources. If a contract goes away, the model will choose the next best generation option.

Q - Will Rockport scrubbers be part of the IRP evaluation. A. Scott indicated that John Torpey would address the question after lunch.

Lunch

7. Stakeholder Input, John Torpey, Managing Director – Resource Planning (slide 43)

John discussed planning the year for PJM is June 1 – May 31. UCAP forecast considers capacity obligation of plants.

Stakeholder Input Slide 44 – I&M's PJM Obligation –Preliminary

John stated that when it comes to portfolio discussion, the word "current" doesn't mean "today". This means the 2015 IRP filing is the current plan, it's not today's plan. The current plan, as defined by the 2015 IRP, is to continue to operate the Rockport units through the 2030's. Cook will operate through its current licensed period.

Stakeholder Input Slides 45 & 46 – current plans and capacity needs

John remarked that Rockport is a particularly interesting conversation at this time.

The chart shows net ICAP (installed capacity). For 2020, PJM has a new capacity performance requirement and penalties. If you commit to have a certain amount of MW's available and then they

are not available, you will be imposed stiff penalties. AEP currently assumes a 15% capacity performance for wind resources. AEP will lower it to 5% due to the new rules.

The chart on page 45 shows I&M position for reserve margin to meet load. Currently, I&M is trying to modify a consent decree to change the need to install scrubbers at Rockport. Scrubbers cost over \$1B per unit. John briefly discussed the company's proposed Consent Decree modifications and indicated that an answer is expected over the next few months. John indicated that his understanding was that the proposed modification would result in basically the same environmental benefit as the Rockport scrubbers required under the existing Consent Decree, but at a lower cost.

The Sierra Club indicated that they do not agree that the proposed solution will provide the same level of control. John indicated that it is up to the judge to decide.

John stated that a complicating factor at Rockport is that Unit 2 is not owned by I&M. It is leased from a group of investors with a lease that expires in 2022. For IRP purposes, I&M will assume the Rockport Unit 2 lease is not renewed. This will result in the removal of approximately 1100 MW from the net capacity position shown on slide 45, beginning in 2022/2023. So starting in the 2022/23 PJM planning year, I&M will be approximately 820 MW short. This is where the IRP modeling will come into play to help determine the preferred mix of resources (i.e., renewable, market solutions, capacity purchases from PJM, etc.) needed to fill the resource need. In summary, a portion of Rockport 2 will need to be replaced, and Rockport 1 is in the hands of a Federal Judge.

A stakeholder asked if Rockport unit 2 would be modeled in this IRP. John stated that I&M's IRP will not consider Rockport unit 2 as a viable resource option after 2021/22, and it will not be included as a resource in the IRP modeling. John stated that we are not making a resource decision; we are making an IRP modeling assumption. I&M does not know what the cost of a lease renewal would be and is not going to model it. Matt McKenzie, I&M's internal counsel, indicated that the most likely outcome is that the lease would not be renewed. And for now, all we are talking about is an IRP modeling assumption, nothing more.

John indicated that the license for the Cook Nuclear Plant expires in 2034/2037 timeframe. At this point, I&M is not assuming another license renewal for the purpose of this IRP.

Stakeholder Input Slide 47 – various portfolio options

John went over the various portfolio options that will be analyzed and considered. I&M welcomes comments on these portfolio options.

When current Purchased Power Agreements (PPA's) expire, they go away in the model.

Combined Heat and Power (CHP) is difficult to model due to it being site specific (at an industrial site) in most cases. There are also contractual implications to monitor. If stakeholders have CHP for I&M to consider as a resource, please provide information on the IRP website.

Wind can still take advantage of Production Tax Credit. AEP is monitoring the market for opportunities. We are open to future wind resources. Wind is a low cost resource, but we must consider PJM resource obligations associated with wind.

I&M is not averse to solar. I&M was the first AEP operating company to put solar in.

Q – When we talk about wind capacity and PJM capacity ratings, does that factor in energy storage? A. Energy storage is still highly priced, but we are watching it.

Q- Does energy storage help with riskiness of available resources such as wind and solar. A. It's still an expensive option. We expect prices will come down over time. There is a lot of work going on right now with batteries for PEV's. We are waiting for the next battery technology breakthrough.

John continued by discussing customer owned solar. We are watching the growth of it. We are factoring it in and looking to see how it grows. The more there is of it, the fewer resources we will need to meet our obligation.

Energy storage is for energy consumption but is also used to relieve distribution issues. It can alleviate the need to do major substation upgrades.

Market purchases are occurring for a lot of utilities that are in states where utilities do not own generation. They can buy capacity, but there is risk involved by going this path. Prices are low right now. To protect customers, it may be best to want something more long term. A 20 year deal for a power purchase agreement approximates the cost of building a NGCC plant.

For NGCC, gas prices are coming down. These plants are becoming very efficient and the costs are down to <\$1,000/kw. The last IRP used a cost of \$1250/kw.

John indicated that reciprocating engines are getting interesting. 90% of ocean going vessels uses them. They have a fast start and are a scalable technology. They can be as small as 9MW and can run on natural gas.

Comment - There is a future risk to customers by investing in company owned asset vs. risk of buying on market. Q – Does the model consider that? A. We watch the markets to see how they develop. There is risk in building new assets and with certain technologies. For example, there is a risk that a future administration could end fracking which could significantly escalate natural gas prices.

Q – AEP has presented its future energy plan. Can you tell us if the 2015 IRP was a basis for that? A. AEP files IRP's in a number of states. The future energy plan takes the most recent IRP's from each state and sums them up for the report.

Q - AEP's recently announced strategy to significantly cut carbon dioxide emissions and to focus on expanding renewables. Do the future gas plant additions included Rockport unit replacements. A. No.

Q – Will AEP impose annual constraints on roll out of wind/solar. A. Probably, depending on pricing. Further, we will need to look at tiers of wind resources. Those would be based upon proposals. We limit how much wind is in each tranche. For planning, we do limit what is reasonable on how much renewables we want to take on at one time.

Q – What's the price tier for wind? A. RFP's for wind will get many responses. Costs cover a range and we only accept lower tier pricing. We will have a work paper that shows average or proposed pricing.

Q – Can we see information from the most recent RFP? A. We will not provide the RFP results. We will have work papers that show how we came up with the numbers used in the IRP.

Q – Will I&M look at purchasing an existing asset vs building a new asset? A. For PJM, we're modeling capacity, not necessary where the asset comes from. That's more of an implementation issue vs. a planning issue.

Q – Do we consider traditional demand response? A. Yes. We will talk about supply side resources at our April meeting.

Stakeholder Input Slide 48

I&M has website set up and available for comments. We will read every comment. If more information is needed on an idea, we will communicate back.

Slides 49 & 50 – Next steps

Andrew Williamson discussed next steps. He stated that the IRP is very important to the Company. He invited everyone to continue participation as the process moves forward.

The next stakeholder meeting will focus on DSM/EE and be held on April 11 in Indianapolis.

The 3rd meeting will be held in July and the 4th meeting will be held in the Sept/Oct timeframe.

Q – What is I&M's consideration for pollution in our communities? What's our obligation to stop pollution? Andrew indicated that this is something that we can continue to discuss as we work through the process.

Q- Will I&M be providing pollution impacts with options going forward? A. If you would like input or have some data that you're interested in, we can look at it. Let us know.

Q – On website, will comments be in blog type? It would be good if others could see comments. A. Comments will be visible to the IRP team. We can compile comments and publish them.