Indianapolis Power & Light Company
2019 IRP Public Advisory Meeting #3
May 14, 2019

Meeting Summary

Welcome & Opening Remarks
Lisa Krueger, President AES US SBU
(Slide 3)

Lisa Krueger is the President of the AES US SBU, which includes IPL & DP&L, as well as AES Generation across the nation. Lisa addressed the meeting participants and thanked them for their collaboration and contribution to the IRP process and for attending today's meeting.

Meeting Objectives & Agenda
Stewart Ramsay, Meeting Facilitator
(Slide 4 – 5)

Mr. Stewart Ramsay introduced himself and emphasized the importance of converting dialogue into a conversation and encouraged participants of the meeting to ask questions. Mr. Ramsay's role is to ensure questions get answered and to keep track of time during the meeting to ensure a successful meeting outcome for all attendees.

Meeting 2 Recap
Patrick Maguire, Director of Resource Planning
(Slide 6 – 8)

Mr. Patrick Maguire, Director of Resource Planning, started with a quick review of Meeting 2 topics and reminded the IRP stakeholders of the 2019 Public Advisory Meeting process and IPL's approach to allow multiple opportunities for stakeholders to provide their feedback.

Electric Vehicle (EV) and Distributed Solar Forecast
Ed Schmidt, MCR
(Slide 11 – 36)

Mr. Ed Schmidt introduced himself and the firm MCR. Mr. Schmidt started by describing what is covered in the EV and Distributed Solar forecasts. For EV, the forecast is for electric charging vehicles. For Distributed Solar, the forecast is for customer owned, net-metered solar. Mr. Schmidt explained that at the end of his presentation there is a summary with numerical tables of the forecast. MCR spent time on overall research, literature review of ninety (90) resources and in the end completed what is presented today in this presentation. First, MCR put together and presented a workshop focuses on methodological for the EV and Distributed Solar forecast for IPL. The big research question was posed: How do we forecast EV and Distributed Solar out to 2040? Twenty years is a long time for technologies such as these.

MCR pursued the EV forecast with the approach of forecasting on a percent of fleet basis. Of

the registered vehicles in IPL's territory, how many of those in the study period will be electric vehicles? The methodological approach taken was to take a national forecast of EVs and scale it to the IPL service territory to get the number of projected number of vehicles for this area. In the next step of the process, MCR establishes the electricity usage by each type of EV. This establishes the baseline and is an important element of the analysis. Next, MCR applied a weighted average of miles driven per vehicle. Therefore, when you apply the kWh used per 100 miles to how many miles an average Indianapolis resident drives, you get the total kWh necessary to serve that number of electric vehicles.

Participants had the following questions/comments, with an answer provided after:

- Why not look at EV hybrid vehicles?
    - The MCR forecasts is just for battery electric vehicles (BEVs) and not plug-in hybrid vehicles (PHEVs).
    - MCR noted that hybrids are a bridge technology. Since the IRP intent is to look at 20 years, the focus is on fully electric vehicles.
- Stakeholder commented that he has a Nissan Leaf for two years. He noted that he most often drives twenty (20) to twenty-five (25) miles a day. Furthermore, he has had four (4) Prius vehicles which he and his family would drive twenty (20) to thirty (30) or forty (40) miles a day. His daughter still drives one of those Prius vehicles. Therefore, these cars run a long time and the early study projection needs to account for these cars because they are out there.
    - MCR notes this is an assumption for the IRP process, which is looking at what is plugged in.
- Another stakeholder then commented that it is the job of stakeholders to question assumptions. Therefore, I question not showing data for plug-in hybrids. Especially, given where Indiana is regarding charging stations roll out and would like to understand why IPL withdrew some of their plug-in stations. This does not make sense to me. Again, our job is to challenge assumptions and ask you to tell us how you arrived at your assumptions and ask how affects the modeling.
    - In response to these comments and questions, Mr. Maguire suggested that we pause and look at the forecast as we move through this presentation. IPL and MCR did make some assumptions that reflect an increase of EVs in 2021 and 2021. Nonetheless, the comments are noted and let's look at where we are in the forecast and then we can revisit, if necessary.

Mr. Schmidt noted that the miles per year number is a modest number. However, MCR strove to make sure there is reasonableness and publicly available data for this project. Mr. Schmidt on slide 18 notes the growth of EVs since 2010 in IPL's service territory. From an IRP perspective, the EV growth expected is important. Slide 19 shows actual IPL aggregated data from EVX charging rates from IPL customers. The BlueIndy vehicle charging is backed out and not included in this data.

Participants had the following questions/comments, with an answer provided after:

- Are these the cars charging under IPL's electric rate in their home?
    - This data is a subset of the 515 registered on the rate. Therefore, the data shown on this graph is for approximately 150 cars. Yes, this is only the IPL EVX rate data.
- I missed the comment about BlueIndy. Why is BlueIndy not in the data?

    - BlueIndy data is not included because those vehicles charge continuously twenty-four (24) hours a day. The IRP forecast is not interested in this charging behavior because the forecast is focused on BEVs. The data presented from the EVX vehicles is the charging profile for BEVs as we know it today.
    - Ed Schmidt noted that a major takeaway from this data is the 2.5% charging on peak.
- Stakeholder commented that Indianapolis has a lot of donut counties with EVs traveling into the IPL service territory. For example, Duke customers charging their cars during the day in the IPL service territory while at work.
    - Mr. Schmidt noted this is great question. As EVs become more of a percentage of the fleet, this is important. Specifically, this is not a question we could answer in this analysis. As we get further into the emergence of EV over time, this would be important to consider. In general, it is too soon to know.
- The inverted bell of this curve seems to be more typical for weekend usage. People's cars would be charging later in the evening. For a work schedule, you would have to turn this curve opposite and it would how charging behavior would be when people are charging at work. Don't you need to include the variable of the day of the week to be accurate?
    - Good point. This is EVX, non-holiday weekday. Dynamic changes for public charging was not modeled.
- It seems that you are saying for the weekday you are assuming most of the charging takes place overnight.
    - Stewart Ramsay, Meeting Facilitator, clarified that this is IPL customer data who are on a special EV charging rate. They come home from work and plug in their EV and the meter or EV knows to charge overnight when it is cheapest.
- How many people in this room have an EV? Also, how many people have solar at their home, your office, your church, your school, etc.? For the record, there is a correlation. Solar owners are more likely to early adopter of EVs. I think there is also an important point to note that these individuals are intentional about when they charge their cars. They want to use solar power to charge their EV. This is a potential factor going forward.
    - A good and fair point.

MCR presented on their research and review of the IndyGO Electric Buses. MCR conducted an interview with staff from IndyGO to get more information. Mr. Schmidt noted that IndyGO is committed to going to 100% electrification. This is a known datapoint. On slide 20, the data from the manufacturer of the charging load for the buses is presented. IndyGO is testing two (2) buses currently. The plan is to get to fifty-six (56) of the sixty (60) foot buses when the project is complete. The range of 275 miles is from the manufacturer and confirmed by IndyGO in the interview with MCR. The kWh charge time is what it is. This is important to note because this would mean that the charging time of 6 hours could be completely done off peak. IPL and MCR are aware of the discussion going on about range issues. If the charging assumptions change, then the data presented here would change. Overall, these assumptions for bus load into the future are a direct add to the forecast.

MCR noted that there is a lot going on with medium and heavy-duty electric trucks. As previously noted, it is too soon to include this in the forecast. Nonetheless, after MCR's literature review, MCR and IPL noted the approach was to use public forecasts and then scale to the IPL service territory. How this approach was executed, what sources were used, what and how the

economic adjustment was used is presented on slide 21 of the presentation. This gives us the number of vehicles in the forecast. Next, the growth of the fleet then used the scaled public forecast numbers. These numbers are depicted in the graph on slide 22.

Next, Mr. Schmidt notes how the number of vehicles impacts the energy sales forecast. The sales forecast is presented in slide 24. From an IRP perspective, the summer peak is what matters. From an electrification perspective, the load from EVs is presented as a percentage increase of sales.

Participants had the following questions/comments, with an answer provided after:

- Does this say in 2020, we expect 0.7% of cars in Marion County to be EVs?
    - Yes.
    - As previously mentioned, there was a recalibration. MCR noted that IPL and Marion County is a bit behind, so we rescaled here to make sure the forecast is not unrealistically low in 2040.
- Stakeholder responded that he believes these are low.

In summary, the EV growth is 5.5% incremental growth.

The MCR Distributed Solar forecast takes a similar approach as the EV forecast. MCR took the IPL net energy metering (NEM) count as reported to the Energy Information Administration (EIA) with some database clean-up. To start, MCR needs to know how many residential and C&I distributed solar NEM systems are in the IPL territory. Mr. Schmidt noted to the meeting participants that the size of solar system is listed as kW-DC. In the IRP world, it is the AC value of the solar production that is important, not the nameplate DC capacity. Therefore, output is discussed in AC-kWh/MWh. The average size of an IPL NEM Rider customer is approximately 6 kW. Some recent public data shows many systems are 10kW. Therefore, for the distributed solar forecast projection the assumption of size is 8 kW, between those two numbers. For commercial customers, the size is 125 kW-DC. As emphasized earlier, the importance of using publicly available data drew MRR to utilize the National Renewable Energy Laboratory (NREL) tool, PVWatts, to understand the production of these average size systems.

Participants had the following questions/comments, with an answer provided after:

- How is climate change factored into these projections?
    - Mr. Ed Schmidt shared that he did not know. Since this is from NREL and PVWatts data, that would be a question for NREL.
- How does this capacity factor compare to the existing distributed and net metered IPL solar?
    - If you compare 8760 interval data from the IPL installed NEM systems to PVWatts, the two numbers are extremely close. Therefore, MCR went with the PVWatts number because it is public.
- Are you incorporating improvements in panel efficiency?
    - Mr. Schmidt noted that he does not know if NREL incorporates future panel efficiency.
- In response, stakeholder noted that it would not because the PVWatts data provides a single data point. Will you extrapolate panel efficiency on top of that data?
    - No, MCR and IPL did not for this iteration.
- Jake Allen, IPL, spoke up to clarify to the stakeholder and the group that IPL does not

collect the meter data from NEM customers. IPL does have metered data for Rate REP projects, which IPL knows has a slightly higher capacity factor than the smaller NEM systems.

- When the 15-year Rate REP contracts expire, the 96MW of solar will still be on the IPL system. When and how will IPL include this solar? Since Rate REP customers are offsetting their load with their project and the 30MW accounted for through the reverse auction. Where does this solar appear in the forecast?
    - IPL is aggregating all the Rate REP contracts as a solar resource in the IRP modeling that will continue through the study period.
- How will I know where the solar is?
    - It will be in the model output. As a reminder, Mr. Maguire references that in the IPL IRP Meeting #1 slides, the solar is depicted as a supply side resource.

MCR presented the growth of distributed solar systems in the IPL service territory. On slide 28, the solar production is shown from PVWatts. Like the EV forecast, MCR did not build a model from the ground up. MCR wanted to start with known, reliable and public information. One source is the fourth quarter Greentech Media (GTM) solar energy outlook. Some discussion points Mr. Schmidt noted how policy impacts solar adoption and how the national number is helpful to use even if Indiana is middle of the pact as not to drag down the growth rates.

Slide 30 shows the lumpy-ness of the solar growth by sector. This depicts how the real world is dynamic. With that said, IPL applied the production from this analysis to get to the Distributed Solar sales forecast. The results are noted on slide 32.

In summary, the Distributed Solar is two tenths of a percent of sales in 2040.
Furthermore, MCR shares a tabulation of the forecast for both EV and Distributed Solar.

A participant had the following question:

- It looks like you did not do MW forecasts, rather you did MWh forecasts? How do these get converted to the capacity forecast?
    - The MWs are presented in the IPL forecast later in today's presentation.

Meeting Facilitator, Mr. Stewart Ramsay, noted that now we will go back to make Ingrid's presentation and then take the morning break.

Stakeholder Presentation: Advanced Energy Management (AEMA)
Ingrid Bjorklund, AEMA Consultant
(Slide 8)

Ms. Ingrid Bjorklund introduced herself and AEMA to kick off her presentation of "Leveraging Utility – Aggregator Partnership Models". AEMA is working to encourage cost effective demand response. Currently the price signals do not exist in MISO's "heavily" residual capacity market. Furthermore, AEMA is advocating for more utility tariffs to encourage Demand Response (DR). Ingrid notes the AEMA position and belief that regulatory constructs do not promote utility investment in DR.

Slide 6 presents an Overview of Benefits of Demand Response. One benefit of DR is that it helps integrate renewables. Furthermore, the Benefits of 3rd Party DR providers include the ability to provide significant capital investments in advanced technology, maximize customer flexibility and enable reliable performance while shielding customers from out of pocket penalties.

Slide 8 explains the AEMA recommendation and approach to facilitate DR participation. Ingrid noted that it is important for utilities to still maintain control and that the two models of either utility tariffs or bilateral contracts allows for this. The goal to increase participation should be about attracting more customers to participate and ensure reliability when called upon.

Some MISO States encourage this model. For example, in Missouri, the ARC model was included in a similar tariff proposal submittal. In Louisiana, they never acted on ARC. In that specific docket, an ARC ban provided 3rd party aggregators the opportunity to work with utilities. There are many current, still open, rule-makings going on right now, specifically regarding the development of demand response portfolios. For example, Michigan and Arkansas have proceedings going on right now as well.

Slide 10 shows the two models that utility could use third party providers while maintaining the utility planning control. One model is what AEMA calls the Indiana-style tariff (i.e. I&M DRS1 tariff) and the other is bilateral contracts. The appendix of the presentation gets into more detail about tariff and bilateral contracts.

BREAK
(Slide 37)

Detailed Load Forecast – Base, High & Low Peaks and Energy
Reap of Customer Class Breakout
Erik Miller, Senior Research Analyst
(Slide 38 – 43)

Mr. Erik Miller began his presentation with laying out the three (3) areas he will cover. First, how the EV and Distributed Solar data is incorporated into the IPL Load Forecast. Second, a presentation of the revised IPL Load Forecast, including the High and Low Load Forecasts. Third, a revised look at the customer class breakout for clarification.

Slide 39 is like the final MCR slide presented before the meeting break. The black line is the load forecast. The orange bar is the reduction of load from new Distributed Solar which lowers the black line and then the blue bar is an increase in load from EV growth and the moves the black line back up.

Participants had the following questions/comments, with an answer provided after:

- What if we convinced you that we want to put a lot of solar on the homes in the city? For example, if IPL was willing to put on bills notices of upcoming Solarize Indiana events. Could we drive the orange bars with this action? Also, how does this fit with the NEM caps in the state, which is a 1.5% cap?
    - Yes, it assumes the cap stays in place until 2039.
- Where does a customer owned energy storage facility with solar fit into this forecast? This is what the solar gurus are talking about as being total game changers as it relates

to distributed solar in the next five (5) years.
    - The forecast does not have assumptions about batteries.
- Well GTM and the other trade press for solar see this going off the charts. Other people are projecting it.
    - Mr. Miller notes that in the overall big picture, distributed solar does not have a lot of impact on the overall forecast. But nonetheless, something to consider.
    - Matt Fields, IPL, added to the conversation around solar + batteries as it relates to the rules of NEM. As IPL understands it, batteries are not an eligible technology under the NEM rules in the state. It would not be of benefit to add a battery to your NEM solar since you would lose the NEM benefit.
- The stakeholder responded with the question, who provided the legal memo at IPL/AES saying that energy storage is not eligible under net metering? We've had that conversation at the IURC. I believe that is not true.
    - That is the IPL interpretation. We can continue this conversation offline.
    - Mr. Erik Miller noted that the point that Matt Fields was making was around the fact that there is no incentive to add a battery with your NEM solar since that does not give the benefit like the NEM solar on its own does.
- Another stakeholder continues the discussion around storage. Is IPL or other utilities discussing the potential for grid defection? If customers see less value to stay connected to the grid then they may, unfortunately from my perspective, make that choice. Rocky Mountain Institute (RMI) has done some reports that note projections of the number of folks in California that may go off grid in the future. Therefore, since IPL is planning down the road for 20 years, is grid defection something that IPL and AES are talking about internally?
    - Patrick Maguire notes we have not seen this a lot in terms of where our rates are today.
    - Mr. Maguire continued to note that in terms of solar + storage, IPL is modeling storage either as a net decrease to demand or on the supply side. The economics should play out in the model.
    - Do note that there is uncertainty in all these forecasts. The variations between the high and low forecasts are meant to help capture that uncertainty to truly see how the portfolio performs in all the scenarios. For example, if there is less load than we think because there is more distributed solar, that should be incorporated on an overall level in the low load scenario.
- With electric scooters multiplying so extensively, is the resource needed to charge them expected to be enough?
    - Erik Miller responded that the electric scooters do not have an overall impact that is significant.
- One stakeholder shared his perspective on net metering. He noted his dislike how that when the grid goes down, his NEM solar inverters shut off. No power, no solar. Therefore, this stakeholder has been thinking about adding batteries. For example, he has friends who may have necessary medical emergency equipment. I consider a generator, or a battery, a form of insurance. It has nothing to do with NEM. It is both. Not an either/or situation. It is consumer choice to have a battery with their solar.
    - Mr. Miller noted this is something IPL will consider.
- IPL already has off-grid solar customers. If you are not aware of them, I know where at least one of them is. I have a member of IndianaDG who will install a battery when this off-grid solar customer asks for it. These are not necessarily high-end customers with big

mega structures. This is something to take into consideration. There is enough information in the trade press about customer owned energy storage. Many people believe that is the alternative to crappy net metering. As we approach the time when true net metering ends, this will take off.

In the last IRP Meeting, Mr. Miller presented the Base Forecast. This Base Forecast is now adjusted for the EV and Distributed Solar. Slide 41 presents the High and Low Load Forecast for the 2019 IPL IRP. The grey line represents IPL actual sales that includes weather. For instance, 2017 was mild while 2018 had more extreme summer and winter weather. The green line shows what sales would have been had we had normal weather. The blue line shows the forecast prior to the EV and PV forecast.

The high and low forecasts come from the Moody's economic high and low growth scenarios. IPL also worked with Itron's models and calculated standard deviations. One standard deviation above and below the mean forecast were began the targets for 2039, then we added the growth rates from Moody's to get to the standard deviations.

Mr. Miller notes that the orange line is close to the low load forecast. One reason to think about this, if the EVs don't take off like we forecasted, then we would likely see the low load forecast.

Participants had the following questions/comments, with an answer provided after:

- On Slide 41, how is IPL treating embedded energy efficiency? I assume you are looking historical sales matching up with the drivers from the explanatory variables on why those sales manifested. To project that same relationship forward. Are you treating those EE impacts in the forecast?
    - Recent IPL sponsored demand side management (DSM) stays in the forecast. This EE is now in the load. 2021 to 2039 EE has been added back into the forecast. IPL does this because DSM is being added a resource that will then be selected in the IRP modeling.
- I look at this graph and see a potential issue of the construction of the load forecast. In other jurisdictions, Moody's data shows a very high rate of growth. For whatever reason Moody's tends to assume that economic drivers explain electric sales dramatically from what they have been historically. I think I am also seeing this because you see inflection points in the presented high and low load forecasts. For example, in 2022 you see it jump up and keeps going. Overall, this aggressiveness in the load forecast may be of concern.
    - Mr. Maguire noted that it is important to note that this graph does not start at zero (0). The growth is less than one (1) percent. So yes, visually it shows a more aggressive growth, but it really is not.
    - The next slide (slide 42) shows the percent changes. The load growth is less than one percent.
    - Mr. Miller notes Moody's is using an average annual growth rate of about 2%.
- Part of what also makes sense here is what is assumed in the short term versus the long term. The growth rate is higher in the shorter term. Is this driven by the economic forecast you are using? It matters if you get more growth now or growth later.
    - Mr. Miller noted that IPL can review this with the stakeholder outside of today's meeting.

Slide 42 is what was presented in the last meeting. It created some confusion. Therefore, IPL

created Slide 43 that shows the disaggregation of IPL customers by sector and not by small C&I and large C&I categories. Slide 42 categories are used for internally IPL accounting purposes and Slide 43 better depicts what are truly the IPL industrial customers by putting SL customers (grocers, big box retail stores, etc.) into the commercial sector category.

Participants had the following questions/comments, with an answer provided after:

- 1.7% is about three times 0.5%. What is driving the growth in residential?
    - A lot of what is driving the residential growth is the number of residential customers forecasted from the Moody's data. That data shows that it is expected to grow. Also, a lot of the residential growth is in the multifamily sector.
- The grey bar is the annual average rate of growth of the industrial sector and it is clearly going up, why is that when there is the negative growth rate presented?
    - It appears to be growing, but the width of the grey bar is shrinking, hence the negative growth rate.
- Why do you see the industrial rate growth negative?
    - We see this decline in the trends in our historical sales data. Additionally, economics is likely driving this as well.

DSM Bundles in IRP Modeling
Erik Miller, Senior Research Analyst
(Slide 44 – 50)

Mr. Miller starts by reviewing the Demand Side Management (DSM) roadmap on Slide 45. IPL is starting with the MPS and the Realistic Achievable Potential (RAP), which is used to create inputs into the IRP model. This input provides an hourly load adjustment and levelized cost. This makes the DSM look like generation in the model, so it can be selected alongside other supply side resource options. Next, IPL will run the resource selection planning model which will select DSM. After that, this level of DSM will be included in a Request for Proposal (RFP) and then IPL will file a three-year plan for program implementation.

This presentation describes how the DSM bundles were created. Slide 46 describes how the DSM bundles work. Each bundle is a 0.25% decrement. Each decrement bundle has an associated load shape and cost/ MWh that serve as inputs into the IRP model. Also, the residential and C&I are combined in each bundle. Ultimately, IPL ended with ten (10) bundles. If all bundles are selected that is 2% of the IPL load.

Slide 47 depicts a supply curve of the RAP of DSM. The x axis is the quantity of DSM. The costs are on the y axis. This curve represents all DSM measures in the RAP of their contribution in MWh by cost. The eight (8) decrements are broken out with the dotted line sections. The first section represents very cost-effective energy efficiency measures. As you move towards the right on the graph, the measures are more and more costly to implement. There is one of these graphs for every year. This graph is for 2026. Currently, IPL is doing approximately 140,000 MWh at a 4 cents per lifetime kWh cost. The model will show the avoided cost where it intersects this curve.

A participant had the following question:

- The third section is flatter than the other sections, why is it not steeper?

- The black line is built up by individual measures. For example, at this cost there is the potential to incentivize this many AC units, etc. This is built-up of measures. The potential for how many AC units we can incentivize. Furthermore, this is a depiction of a group of measures. The slope of the line may be high, but the cost to implement is low.

Mr. Miller presented an illustrative way to describe the same information. The black dotted line is the Base Load Forecast with EV and Distributed Solar included. This is the incremental view of DSM as a reduction to the IPL Load. However, when considering DSM, it is also important to present savings on a cumulative basis. Therefore, on Slide 49, Mr. Miller shows that when IPL incentivizes EE measures in the DSM programs those measures have a useful life and then will eventually retire off. Out in 2039, if we were to operate at 2% every year, then that would be a 16% reduction of load if we did EE/DSM at that pace. The model will select the DSM somewhere in the range of decrement bundles shown on the chart.

Mr. Ramsay described that each color represents one of the bundles from the previous chart. If all the bundles were selected, the load forecast would flatten out.

The next step is to evaluate DSM in the IRP modeling. At the next IRP meeting, the team will present preliminary results from the decrement DSM modeling approach.

Participants had the following questions/comments, with an answer provided after:

- So far what you've shown is energy, what about demand?
  - Mr. Miller responded that IPL is building up 8760s and it therefore will have the demand impacts in it also. The peak demand impacts are within the data
  - Mr. Ramsay notes that the load forecast is identifying how much energy is in every hour of the 8760 hours in the year.
  - Mr. Miller further explains that the forecast is every hour for every year of the IRP study period and the DSM is in the model every hour also and is a reduction of that load forecast each hour.
- One participant shared her appreciation for IPL's efforts in working with the stakeholders who have an NDA. She expressed her gratitude for this day-to-day collaboration. Another participant seconded.
- Is this assumption that each decrement must be selected for the entire modeling period? (i.e. if 1.5% is selected in 2021, does it stay at 1.5% through 2040? Or could it select 1% in 2021 and go up to 1.5% in 2030, for example?)
  - The bundles are for the entire period. If the model selects 1%, it is selected for the entire period.

Mr. Maguire clarified that the 8760 load shapes will be created from the simulations in the PowerSimm model. DSM 8760 data will be fed into the model. This is a key distinction when you think about the peak and energy forecast.

A participant had the following question:

- How much production are you expecting from the Petersburg plant?
  - Mr. Maguire notes that how much the units run depends on the simulations in the model. That will change by day by month by year, and by scenario based on each scenarios' assumptions.

Stewart stated that the topic just mentioned will be covered further after the lunch break.

LUNCH
(Slide 51)

Modeling and Scenario Recap
Patrick Maguire, Director of Resource Planning
(Slide 52 – 60)

As a follow-up from the questions about plug-in hybrids, IPL and MCR did some review during the lunch break. In the database of car registrations for Marion County, the total of PHEVs and BEVs is 1,200 vehicles – approximately 500 EV cars and 700 PHEV cars. The mix of growth in registrations between PHEVs and BEVs is uncertain going forward. IPL approached the forecast with the assumption that BEVs will dominate the future vehicle stock. By 2020, the total number of vehicles is up to 5,000. As previously noted, this increase was used in the forecast as the baseline to ensure that the forecast did not miss anything and covered all the possibilities of EV growth for IPL to consider in long-term planning.

Mr. Maguire shared that one of the objectives of this meeting is to help recap what was covered in the last meeting. Also, this presentation provides a few updates on commodity prices from the last meeting and this discussion is open to allow stakeholders to provide any feedback they have on IPL modeling assumptions. Patrick noted that a lot was covered in the last meeting, so IPL wants to pause and allow another opportunity for stakeholders to give feedback on modeling assumptions.

Slide 54 shows the scenarios presented and that went through in the last meeting. The reference case and four (4) additional scenarios. Those are the primary drivers and have the highest impact variables on the resource mix.

IPL is using Wood Mackenzie forward curves. Wood Mackenzie provides forecasts for EVs, PVs and has a heavy commodity forecasting presence. Wood Mackenzie provided cases in their Long-Term Outlook.

- Federal Carbon Case (Carbon tax starting 2028).
- Federal Carbon Case + High Gas Sensitivity.
- No Carbon Case.
- No Carbon + Low Gas Sensitivity.

IPL wanted to see more sensitivities. IPL contracted with Wood Mackenzie further to create the following additional cases:

- No Carbon Case + High Gas Sensitivity
- Federal Carbon Case + Low Gas Sensitivity

IPL wants to have the full range of possible outcomes. These additional sensitivities and forecasts allow us to run our scenarios, particularly Scenario C & D. On April 12, 2019, IPL uploaded the first four (4) scenarios to those stakeholders with an NDA. An update to the commodity prices files will be available later to NDA stakeholders.

Mr. Maguire notes the types of forward curves on Slide 55. These were presented also in the last meeting. Power prices are an outcome of the other variables listed on the slide. IPL is looking at prices for natural gas, coal, fuels and emissions. Also, IPL will use stochastics for MISO capacity prices by indexing to the price of new entry.

A participant had the following question:

- Has IPL considered how to better represent other pollution sources beyond just air pollution?
    - The IPL IRP team is working with the IPL/AES Environmental team to assess. In terms of the modeling, it would have to be outside the model. IPL is limited to what we can do in the model when there is no pricing, so this would need to be addressed qualitatively outside the dispatch model.

Slide 56 shows the blended curves for power and natural gas. The chart shows the blending into fundamental curves starting in 2021 for the base case, 2020 for the high and low gas sensitivity cases. IPL uses this blending approach because the forward curves are liquid in the 1 to 3-year range and then those values are less meaningful. At that point, IPL utilizes the Wood Mackenzie fundamental curve to serve as the assumption for the later time range.

Slide 57 shows how the coal price is modelled. The IPL coal curve is based on RFP prices and market intelligence on the southern Indiana inland coal market. Stochastic volatility is applied only to the open/unhedged portion.

On Slide 58, Mr. Maguire recaps how the scenarios impact the evaluation and analysis of our existing fleet versus alternatives. This table was presented in the second meeting. As you read this table, when you go down the left column, there are different retirement dates assumed for the Petersburg units. Each of these will be compared to the first portfolio of age-based retirements of those units. IPL is reviewing various resource portfolios and then will have the model fill in the capacity need moving forward, when or if there is a shortfall. Each of these portfolios will be run through each of those scenarios. This provides twenty-five (25) different Present Value of Revenue Requirements (PVRRs) to compare. This approach allows you to test how does Portfolio 1 compare and perform in all five (5) scenarios.

The modeling is underway. The IPL IRP team has a lot a work ahead of us. Hence the gap between now and the next meeting. The intention is to continue with collaboration and transparency as we host technical workshops with IURC, OUCC and CAC staff prior to Meeting #4.

Participants had the following questions and comments, with answers provided after:

- What is the output going to look like? I am trying to picture what you would compare between each different portfolio.
    - Mr. Maguire noted that one output is PVRR. A PVRR comparison is the measure of lowest cost for all portfolios. Other metrics will be reported and can be used to compare portfolios in addition to cost.
- The same stakeholder then asked, are we going to see all of that?
    - Yes, the IPL team intends to present as much detail as we can in the meeting.
- Are you going to help those employees who will be let go if IPL chooses to close

operations at Petersburg?
    - Obviously, there is a big impact on all people. IPL is considering all stakeholders and all factors. IPL has not made any final decisions yet.
- Is it possible to see the inputs and not just the outputs? And by inputs, I mean the model settings and the optimization constraints, etc. These are the embedded settings that are selected to execute the model.
    - Mr. Maguire referred to Slide 60 which depicts the IPL 2019 IRP assumptions and their release dates. These constraints will be available with these data releases.
- What is your take on using different input assumptions for wind and solar prices, for example? Is there a disconnect when using different sets of input assumptions. Or is this not an issue?
    - Mr. Maguire acknowledged that IPL has thought a lot about modeling assumptions and described the modeling approach in detail to respond to the question.
- The Indianapolis THRIVE plan calls for a 50% reduction in carbon emissions by 2030. Nothing in this presentation shows how we are going to meet that. What are we going to do?
    - IPL is modeling a no coal scenario by 2030. This allows IPL to evaluate with is the cost and risk impact to our customers compared.
- Can you report something about the cumulative impacts of your actions on CO_2?
    - Carbon emissions will be an output of the model that IPL will report on.
- Are you considering healthcare costs for the people who live near power plants, are these costs being factored into the model?
    - This is a tough one. There are constraints on how you can quantitatively assess. It is about pricing the externality. When you cannot assign a price, IPL layers on the qualitative assessment.
- NIPSCO in a previous IRP looked at the impact on employees and stakeholders due to retirements of coal-fired power plants. I don't see IPL presenting this type of economic impact study analysis. Why? Are you going to do this analysis?
    - Mr. Maguire noted that IPL is still early in the process. IPL is looking and considering this as we are evaluating the internal and external stakeholder impacts.
    - The stakeholder responded that analysis will help address these concerns.
- Stakeholders dialogued back and forth on the Indiana process for public input on utility filings.

Mr. Maguire discusses what the pieces are in the model and how they are put together on Slide 59. These inputs are the majority of what is needed to execute the modeling process. IPL will present on what drives the analysis to stakeholders.

At the last meeting, the data release schedule was presented and per that discussion and schedule there will be additional data made available to those with an NDA prior to the next public advisory meeting.

A participant had the following question:

- What are the currently projected retirement dates for the Petersburg units?
    - These dates are presented in the Meeting #1 materials. Mr. Maguire answered

the stakeholder in the meeting as well.

Q&A, Concluding Remarks & Next Steps
Stewart Ramsay, Meeting Facilitator
Patrick Maguire, Director of Resource Planning
(Slide 61)

Mr. Stewart Ramsay addressed the meeting attendees with a request for any final questions or comments. He asked how was the meeting today? Was it a useful day? Anything IPL and team can do differently in the next meeting? Stakeholders asked about the next meeting. Mr. Maguire noted IPL is targeting late July or early August.

Meeting adjourned.