MI POWER GRID

Making the Most of Michigan's Energy Future

Integration of Resource, Distribution, and Transmission Planning

Advanced Planning Stakeholder Meeting
September 24, 2020

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Agenda Items		
9:00 AM	Welcome and Introductions	Jesse Harlow
9:10 AM	Opening Remarks	Chair Scripps
9:25 AM	MI Power Grid Phase II Summary and Timeline	Jesse Harlow
9:40 AM	Resource, Distribution and Transmission Planning Alignment Overview	Pat Hudson
9:55 AM	Forecasting Overview	Roger Doherty
10:10 AM	Transmission Planning Overview	Naomi Simpson
10:25 AM	Value of Generation Diversity	Zachary Heidemann
10:40 AM	Break	
10:45 AM	Utility Perspectives on Resource Distribution and Transmission Planning Coordination	Consumers Energy, DTE Energy, Indiana Michigan Power
12:00pm	Closing Remarks	Jesse Harlow
12:10pm	Adjourn	

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MI Power Grid Phase II

Advanced Planning Kick-off Meeting

September 24, 2020

Primary Lead - Naomi Simpson

Assisted by:

Pat Hudson

Roger Doherty

Jesse Harlow

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Workgroup Instructions

1. This meeting is being recorded
2. Please be sure to mute your lines
3. There will be opportunities for question/comments after each of the sections identified in the agenda
   - Please type questions into the chat function or use the “raise hand” function during this time
   - We will open it up to those on the phone after those using the chat function
   - We will be requesting comments after all of the meetings which will be posted to the webpage
4. The presentations for all the meetings are posted to the Advanced Planning webpage.

Sneak Peek at Presenters!

MI Power Grid Initiatives Summary

- Focused, multi-year stakeholder initiative to maximize the benefits of the transition to clean, distributed energy resources for Michigan residents and businesses

- Engages utility customers and other stakeholders to help integrate new clean energy technologies and optimize grid investments for reliable, affordable electricity service

- Includes outreach, education, and regulatory reforms

Key Drivers

- Declining prices of distributed energy resources
- Changing resource mix
- Customer preferences for clean energy
- Electrification of transportation and buildings
- Environmental and sustainability goals

Core Areas of Emphasis

- **Customer Engagement**
- **Integrating Emerging Technologies**
- **Optimizing Grid Performance and Investments**

Customer Engagement

- Customer Education and Participation
- Innovative Rate Offerings
  - Time-Based Pricing
  - Distributed Generation Pricing
  - Voluntary Green Pricing
- Demand Response
- Energy Programs and Technology Pilots

Integrating Emerging Technologies

- Interconnection Standards and Worker Safety
- Data Access and Privacy
  - Distribution System Data Access
  - Customer Data Access and Privacy
- Competitive Procurement
- New Technologies and Business Models

Optimizing Grid Performance and Investments

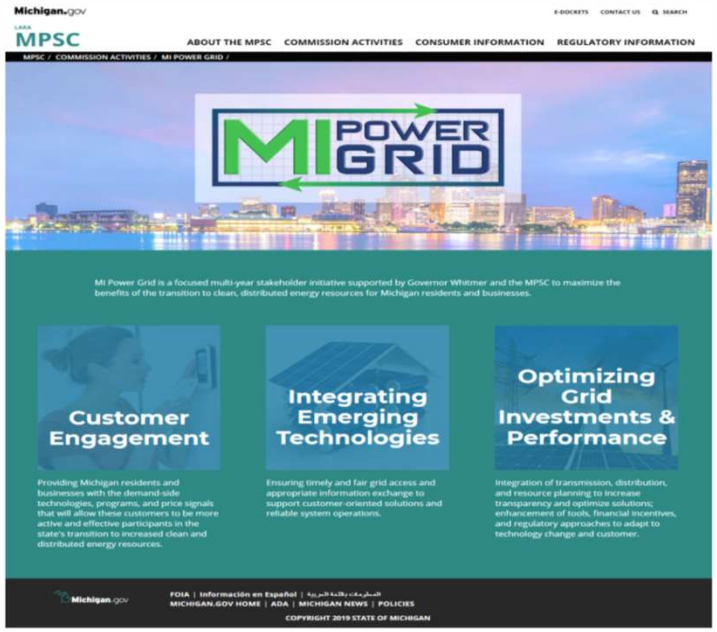
- Financial Incentives/Disincentives
- Grid Security and Reliability Metrics
  - Service Quality & Reliability Metrics
  - Grid Security
- Advanced Planning Processes
  - Integrated Resource Plan
  - Distribution Planning
  - Integration of Resource/Transmission/Distribution Planning

Phase I Activity Overview

- Interconnection Rules
- Distribution Planning
- Energy Programs and Technology Pilots
- Demand Response
- Grid Security and Reliability

How to Get Involved In Other MPG Initiatives

www.Michigan.gov/mipowergrid



- Email: mipowergrid@Michigan.gov
- Contact team leads
- Follow @MichiganPSC on Twitter
- Sign up for listservs

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Questions?

Please type questions into chat box

Overview of U-20633 Advanced Planning Order and Specific Tasks

Environmental Justice, ED 2020-10 and EO-2020-182

- Public Health and the Impact of Utility Plans have been addressed in several recent cases before the Commission
  - The Commission acts in an advisory role to the Michigan Inter-Agency Environmental Justice Response Team created by Governor Whitmer
  - The Commission expects to continue its coordination with EGLE on the inclusion of public health and EJ in future IRP proceedings
- Executive Directive 2020-10
  - Carbon neutral by 2050 with interim goal of 28% by 2025 compared to 1999 levels
  - Staff will develop a Straw Proposal to guide discussions in this Workgroup going forward
- Executive Order 2020-182
  - Creates an advisory council within EGLE to guide MI Healthy Climate Plan

Advanced Planning Workgroup
Purpose

- September 11, 2019 in Case No. U-20464, the Commission approved the Michigan Statewide Energy Assessment (SEA) Final Report dated September 11, 2019

- On August 20, 2020, the Commission opened the U-20633 docket with an order commencing the start of the Advanced Planning Workgroup

  - This Workgroup will develop recommendations for changes and updates to the Michigan IRP Planning Parameters that are scheduled to be updated in 2022.

  - The Commission directs Staff to file a report in the U-20633 Docket by May 27, 2021 based on the discussions and findings in these Workgroup sessions.

Advanced Planning Workgroup Tasks

1. Potential ways to align distribution plans with IRPs and examination of methodologies, frameworks, and best practices from other jurisdictions, on the following topics:
   a. Development of distributed energy resource forecasts over a five and ten-year period;
   b. Forecasting electric vehicle (EV) penetration over a five and ten-year period;
   c. Forecasting the impact of the expected EV penetration on the load forecast over a five and ten-year period; and
   d. Evaluation of non-wires alternatives (NWAs) such as targeted energy waste reduction and demand response in distribution plans and IRPs.

2. Identifying potential revisions to the Commission-approved IRP modeling parameters or the filing requirements to better accommodate transmission alternatives in IRPs in preparation for the next formal review of the Michigan IRP Planning Parameters expected to take place in 2022; and

3. Methodologies to quantify and value generation diversity in IRPs.

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Resource, Distribution and Transmission Planning Alignment

Pat Hudson

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Resource, Distribution & Transmission Planning Alignment Overview

- Currently, separate processes
  - Integrated Resource Plans (IRP's)
  - Electric Distribution Planning
  - Transmission Planning
- Many synergistic elements that connect the 3 processes
- This workgroup was formed on the premise that better alignment needs to occur with the 3 planning processes

Cliché as it may be……

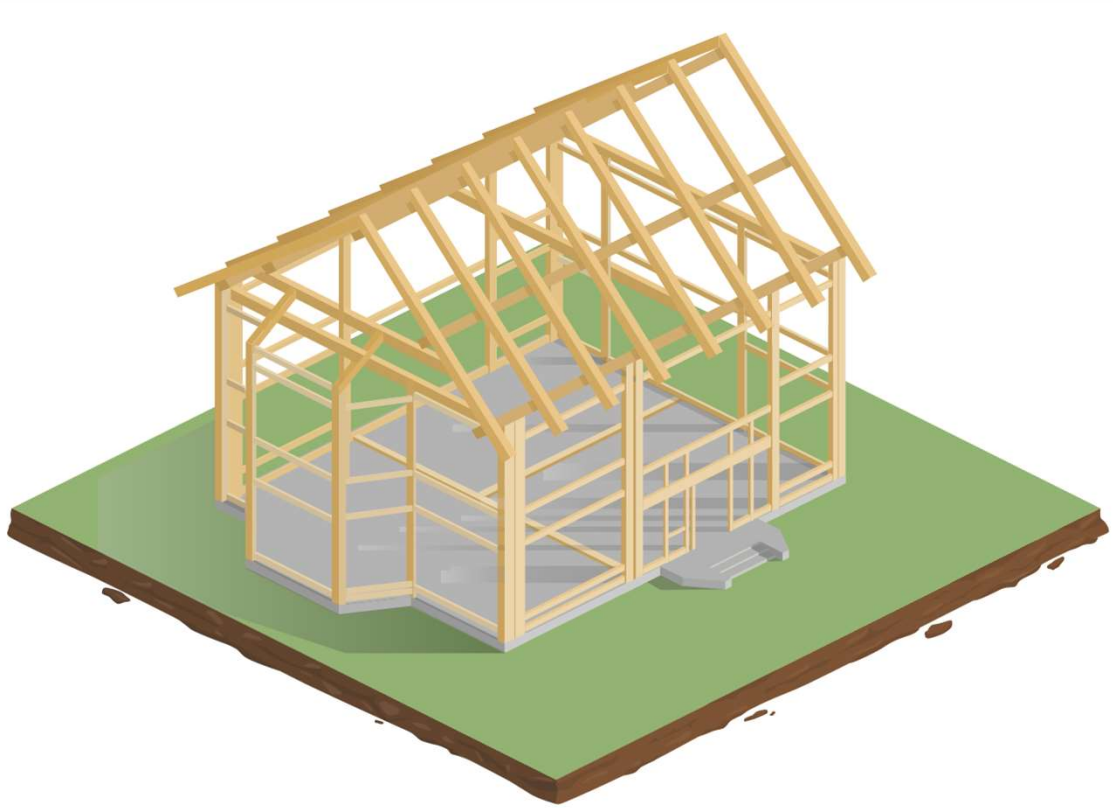
Time to Break Down the Silos

We Have Good Incentives

- Customer affordability
- Long-term utility cost reductions
- Safety
- Improved system reliability
- Enhanced systemwide emergency response
- Environmental responsibility (clean energy goals)
- Expanded stakeholder interest

We Have Good Resources and Frameworks

- Utility Companies
- Transmission Companies
- Regional Transmission Organizations
- Regulatory Body (MI Power Grid Initiative)
- Trade Groups and Professional Associations
- State and National Subject Matter Experts
- Other Stakeholders



We Have Good Tools

- Energy Resource Mix
  - Power plants
  - Renewables
  - Demand response
  - Energy waste reduction
  - Customer-owned resources
- Statute
  - Section 6t(1) of Public Act 341 of 2016 (Act 341)
- IRP
  - U-18418
  - U-18461

We Have Good Tools

- Electric Distribution Planning
  - U-20147
- Transmission Planning
  - MCL 460.6t(5)(h) and (5)(j)
- Statewide Energy Assessment
  - U-20464
  - Recommendation E-5
  - Recommendation E-8.1
  - Recommendation E-6

The Challenge: Coordination, Alignment & Vision

- How do we envision the interplay of IRP, electric distribution and transmission planning for a better served State of MI?
- How do we leverage and improve MI's integrated resource planning parameters?
- How do we value source diversity throughout planning processes?

Meeting the Challenge

- With an over-arching theme of integrating planning processes, we will explore four separate but related topics:
  - Alignment of Resource/Distribution/Transmission Planning
  - Forecasting
  - Transmission Planning
  - Valuing Source Diversity

Meeting the Challenge

"The critical overarching challenge is to develop power system resource plans that will continue to guide investments that provide safe, affordable, reliable, and environmentally responsible electricity supply. These plans also need to be resilient and flexible as well as support the unprecedented pace of change occurring in the production, delivery, and use of electricity—and in the policies that govern energy use."

Developing a Framework for Integrated Energy Network Planning (IEN-P): 10 Key Challenges for Future Electric System Resource Planning, Electric Power Research Institute (EPRI), 2018

Integration Planning Topic

- Today's focus: provide a broad overview of the entire workgroup goals, objectives, and desired accomplishments
- At our October 21 session, we will focus on the Integration topic – how best to align & coordinate resource, distribution and transmission planning processes
- Featured presentations from EPRI, Regulatory Assistance Project (RAP), and Pacific Northwest National Laboratory (PNNL)

Integration of Planning Efforts

- Coordinate and better align integrated resource plans with electric distribution & transmission plans to develop cohesive, holistic strategies and procedures - while optimizing investments considering cost, reliability and risk.
- In other words, a smooth flow……

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Advanced Planning Processes Forecasting

Roger Doherty

Forecasting in Utility Planning

Critical.

A good plan based on a bad forecast is probably a bad plan.

Complicated.

“It’s tough to make predictions, especially about the future.”
– Yogi Berra

Forecasting in U-20633

- Methodologies to develop distributed energy resource forecasts over a five- and ten-year period
- Potential sources or methodologies to forecast electric vehicle (EV) penetration over a five- and ten-year period
- Methodologies or frameworks to forecast the impact of the expected EV penetration on the load forecast over a five- and ten-year period

U-20633 references SEA Recommendation

E-5: "…With increased adoption of electric vehicles and distributed energy resources such as solar and energy storage, the Commission recommends utilities better align electric distribution plans with integrated resource plans to develop a cohesive, holistic plan and optimize investments considering cost, reliability, resiliency, and risk. As part of this effort, Staff, utilities, and other stakeholders should identify refinements to IRP modeling parameters related to forecasts of distributed energy resources (e.g., electric vehicles, on-site solar) reliability needs with increased adoption of intermittent resources…"

Commission Guidance in U-20147

- November 21, 2018 order Utility Distribution Plans, p. 32
  - “The Commission emphasizes the importance of accurate forecasting in planning and investment decisions and the need to ensure best practices in forecasting methods as technologies and customer behavior evolve with the adoption of DERs and PEV charging, which may include scenario-based forecasting to account for uncertainties and identify least regret solutions. Whether it is at the bulk transmission system or the individual distribution circuit level, the Commission believes prudent planning and investments will require more sophisticated forecasting approaches to develop best practices and mitigate risks...”

More Commission Guidance on Forecasting

- U-18419 DTE CON
  - demand-side management, environmental limitations, planning reserve margin and system reliability requirements, or other legislative or societal developments
- U-18322 CE Rate Case & U-18255 DTE Rate Case
  - EWR
- U-20165 CE IRP
  - Customer-initiated DG
  - Transportation & Building Electrification

Goals of the Forecasting Discussion

- U-20633 Order
  - DER and EV Forecasting, methodologies and/or sources
  - How DER and EV adoption affects load forecasts
- Forecasting alignment across planning parameters
  - Should there be a relationship between forecasts used in transmission, distribution, and resource planning? What should that relationship be?
  - Modeling techniques

- Michigan Integrated Resource Planning Parameters (U-18418) & IRP Filing Requirements (U-18461)
  - Load Forecast for Various Scenarios and Sensitivities

How are we going to do that?

- Go to school. Presentations from subject matter experts.
- Build some consensus. Stakeholder participation and feedback.
- MPSC Staff report next spring.
- Inform MIRPP and IRP Filing Requirements revisions (MPG Phase 3).

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Transmission Planning for IRP

Naomi Simpson

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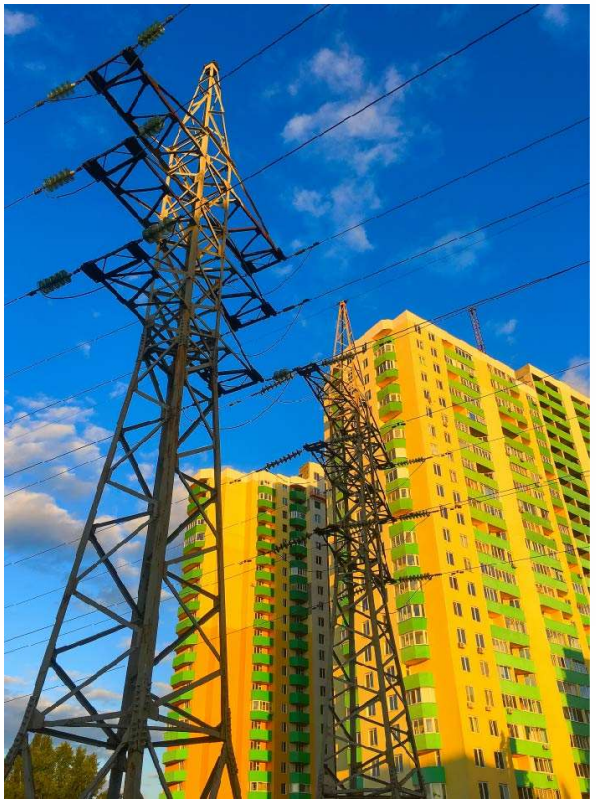
Transmission Planning in IRPs

Transmission analysis has been contemplated in Certificate of Need filings for many years.

PA 341 of 2016 expanded the transmission analysis requirements to the IRP.

Transmission Analysis in an IRP is complex.



Transmission Planning in U-20633

Through a series of stakeholder sessions directed by Staff, identify “potential revisions to the Commission–approved IRP modeling parameters or the filing requirements to better accommodate transmission alternatives in IRPs in preparation for the next formal review of the Michigan IRP Parameters expected to take place in 2022.”

Goal #1 of the Transmission Planning Discussion

- Build on existing initiatives, requirements, reports, and orders
  - IRP Statutory Language
  - IRP Filing Requirements
  - SEA recommendations
  - Previous IRP Orders

Electric Transmission Analysis in IRP Statutory Language

- PA 341, Section 6t.5, “An integrated resource plan shall include all of the following:
  - (h) An analysis of potential new or upgraded electric transmission options for the electric utility.
  - (j) Plans for meeting current and future capacity needs with the cost estimates for all proposed construction and major investments, including any transmission or distribution infrastructure that would be required to support the proposed construction or investment, and power purchase agreements.

U-20633 references SEA Recommendation

SEA p. 196

Transmission planning takes place separately from generation and distribution planning making the consideration of transmission options in integrated resource plans limited.

The Commission Recommends:

E-8.1: MPSC Staff should work with Michigan utilities and stakeholders to propose revisions to the Commission-approved IRP modeling parameters and filing requirements to better accommodate the consideration of transmission alternatives in IRPs.

Commission Guidance in U-18419

- April 27, 2018 order in DTE CON, p. 112, 115-116
  - Pg. 112: DTE Electric could have conducted a more in-depth investigation of transmission system constraints as well as transmission options to enable delivery of energy resources from outside of the MISO region by further engaging transmission owners and other entities in a stakeholder process.
  - Pg. 115-116: Commission expects a far more robust analysis of transmission opportunities that might defer, displace, or optimize the amount, type, and location of additional generation based on up-to-date information about current and expected transmission system conditions and import/export capabilities.
  - Pg. 116: To ensure alternatives are fully considered in future IRP proceedings, and the system is optimized from a cost and reliability standpoint, the Commission also expects DTE to work closely and collaboratively with ITC and other transmission owners to explore transmission solutions and to work toward integrating the company's distribution planning efforts with resource planning.

Commission Guidance in U-20165

- June 7, 2019 order in CE IRP
  - Pg. 90: Looking ahead to Consumers' filing of its next IRP in 2021, the Commission expects that Consumers will work in close collaboration with METC and will provide METC a thorough and timely retirement analysis of its aging generation units and new resource plans to allow for a more accurate and in-depth analysis of transmission issues in the next IRP.

Commission Guidance in U-20350

- December 6, 2019 order in UPPCo IRP
  - Pg. 41:To approve a new unit, the Commission expects a more robust consideration of generation alternatives and associated transmission and operational reliability impacts.
  - Pg. 42: The Commission stresses the importance of examining near-term operational impacts associated with these longer-term resource planning decisions in IRPs, especially in the Upper Peninsula, and to have the transmission owner weigh in on these issues.

Commission Guidance in U-20471

- February 20, 2020 order in DTE IRP
  - Pg. 82: Failure to consider all resource options, including those that exist outside Zone 7, violates the dictates of Section 6t(5)(h), (j), and (k).
  - Pg. 83: The Commission further finds that information included in the record herein indicates that, in the very near future, an examination of potential ways to increase the CIL will become a necessary component of any IRP, and the Commission directs DTE Electric to include such an examination in its next IRP filing.

IRP Filing Requirements Related to Transmission

- December 20, 2017 Order in U-15896 & U-18461
  - a) The utility shall assess the need to construct new, or modify existing transmission facilities to interconnect any new generation and shall reflect the estimated costs of those transmission facilities in the analyses of the resource options;
  - b) A detailed description of the utility's efforts to engage local transmission owners in the utility's IRP process in an effort to inform the IRP process and assumptions, including a summary of meetings that have taken place;
  - c) Current transmission system import and export limits as most recently documented by the RTO and any local area constraints or congestion concerns.

IRP Filing Requirements Related to Transmission

- December 20, 2017 Order in U-15896 & U-18461
  - d) Any information provided by the transmission owner(s) indicating the anticipated effects of fleet changes proposed in the IRP on the transmission system, including both generation retirements and new generation, subject to confidentiality provisions;
  - e) Any information provided by the transmission owner(s), including cost and timing, indicating potential transmission options that could impact the utility's IRP by:
    - (1) increasing import or export capability;
    - (2) facilitating power purchase agreements or sales of energy and capacity both within or outside the planning zone or from neighboring RTOs;
    - (3) transmission upgrades resulting in increasing system efficiency and reducing line loss allowing for greater energy delivery and reduced capacity need; and
    - (4) advanced transmission and distribution network technologies affecting supply-side resources or demand-side resources.

Goal #2 of the Transmission Planning Discussion

- Provide recommendations that identify how an IRP filing should reasonably include transmission alternatives.
  - Need your input on:
    - What are the expectations regarding information that should be included in an IRP filing?
    - How should transmission analysis be conducted for an IRP?
    - What changes should be made to the MIRPP and Filing Requirements?

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Value of Generation Diversity

Zachary Heidemann

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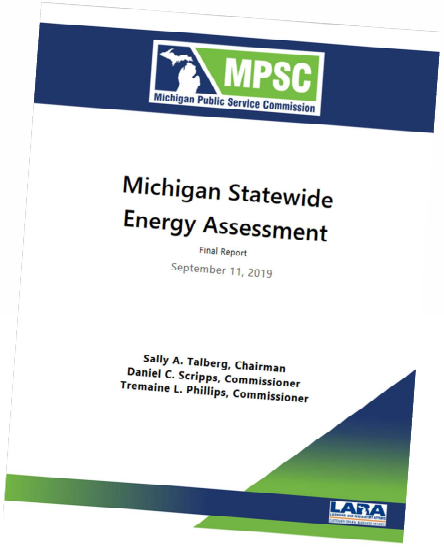
Case No. U-20633 Order

- Directs the Staff to begin outreach aimed at holding a series of stakeholder sessions, and to research best practices in… Methodologies to quantify and value generation diversity in IRPs.
- The order refers to the Statewide Energy Assessment recommendations



Recommendations from the SEA

The Commission recommends utilities work with Staff and stakeholders to propose a methodology to quantify the value of generation diversity in integrated resource plans.

The changing electric generation fleet in Michigan and the Midwest due to increasing retirements of coal and nuclear plants could lead to reliability and resiliency problems especially if new replacement resources such as energy waste reduction, demand response, and wind and solar energy projects are delayed. Understanding the value of resource diversity could also better inform power plant retrofitting and retirement decisions beyond traditional net present value and market price comparisons.

- The word diversity is used frequently in vernacular
- Is there a more formal analysis that is more conducive to quantification?

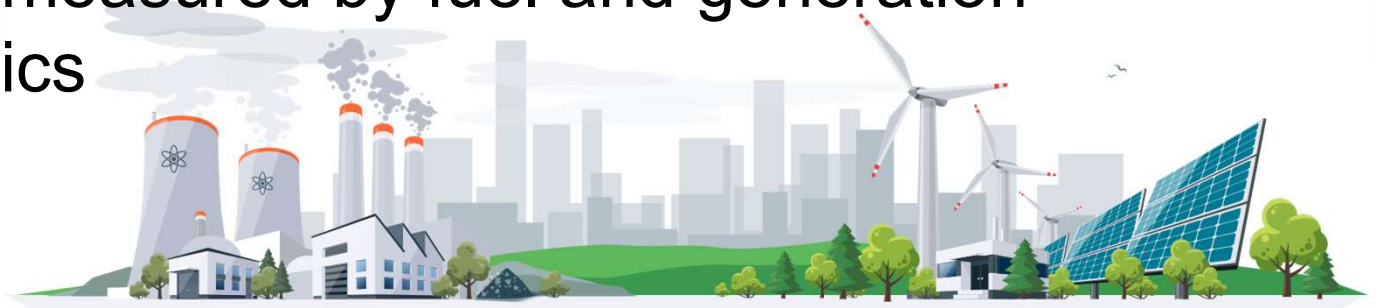
Diversity from an Academic View

- Diversity as a concept appears in many fields
- Diversity has three components[1]
  - Variety[1]
    - The number of different categories (species, investment type, fuel)
  - Balance[1]
    - How evenly spread are the category populations
  - Disparity[1]
    - How different are the different categories form one another

Stirling, A. (2007) A General Framework for Analyzing Diversity in Science, Technology and Society. Journal of the Royal Society 707-719.
https://royalsocietypublishing.org/doi/10.1098/rsif.2007.0213

Diversity in Generation

- Academic studies usually categorized by fuel
  - Sometimes sub types are considered
- Categorization by fuel allows both the variety and balance of generation to be considered
  - Energy
  - Capacity
- Disparity is measured by fuel and generation characteristics



Diversity Indices

- There are three common indices that are used for electrical generation
- Shannon Wiener Index
  - Considers variety and balance[(1)]
  - Variety more emphasized[(1)]
- Simpson Index
  - Considers variety and balance[(1)]
  - Balance more emphasized[(1)]
- Stirling Index
  - Considers variety, balance and disparity[(1)]
  - More complicated and more open to interoperation[(1)]
- There are other indexes that consider only one component or are more complicated[(2)]

(1) Wu T, Rai V. (2017). Quantifying Diversity of Electricity Generation in the U.S. https://energy.utexas.edu/sites/default/files/UTAustin_FCe_Quantifying_Diversity_2018_Feb.pdf
(2) Stirling, A. (2007) A General Framework for Analyzing Diversity in Science, Technology and Society. Journal of the Royal Society 707-719 https://royalsocietypublishing.org/doi/10.1098/rsif.2007.0213

Shannon-Weiner Index

- Originally developed to look at information entropy[1]
- $H = -\sum_{i=1}^{n}(p_i ln\, p_i)$[2]
- p_i is the proportion of category i (balance)[2]
  - In this case the category would be fuel/generation type
- Diversity is e^H[1]
- Increases with increasing diversity[1]
- Can be sensitive to category definition[2]

(1) Cooke H, Keppo I, Wolf S, (2013) Diversity in theory and practice: A review with application to the evolution of renewable energy generation in the UK
(2) Stirling, A. (2007) A General Framework for Analyzing Diversity in Science, Technology and Society. Journal of the Royal Society 707-719. https://royalsocietypublishing.org/doi/10.1098/rsif.2007.0213

Simpson Index

- Developed looking at biodiversity(1)
- Same equation as Herfindahl-Hirschman Index (HHI)(1)
  - Used to measure market share concentration
- $\sum_{i=1}^{n}(p_i{}^2)$(1)
- Grows smaller with increased diversity(1)
- Modified version that increases with increased diversity(1)
  - $\frac{1}{\sum_{i=1}^{n}(p_i{}^2)}$(1)

(1) Cooke H, Keppo I, Wolf S, (2013) Diversity in theory and practice: A review with application to the evolution of renewable energy generation in the UK

Stirling Index

- Developed for policy[1] used by the same author for energy policy[2]
- Only index of the three presented to consider disparity
  - Disparity is important in generation technology
- $\sum_{i,j=1,i\neq j}^{N}\left(d_{ij}p_i p_j\right)$[1]
- Disparity between two options is captured in d_{ij}
- Disparity can be subjective[1]
- Usually calculated as distance on a normalized scale[1]

(1) Stirling, A. (2007) A General Framework for Analyzing Diversity in Science, Technology and Society. Journal of the Royal Society 707-719. https://royalsocietypublishing.org/doi/10.1098/rsif.2007.0213
(2) Stirling, A., Yoshizawa, G. Suzuki, T. (2009) Electricity System Diversity in the UK and Japan – a Multicriteria Diversity Analysis http://www.sussex.ac.uk/spru/documents/sewp176

Example of Disparity Coefficients

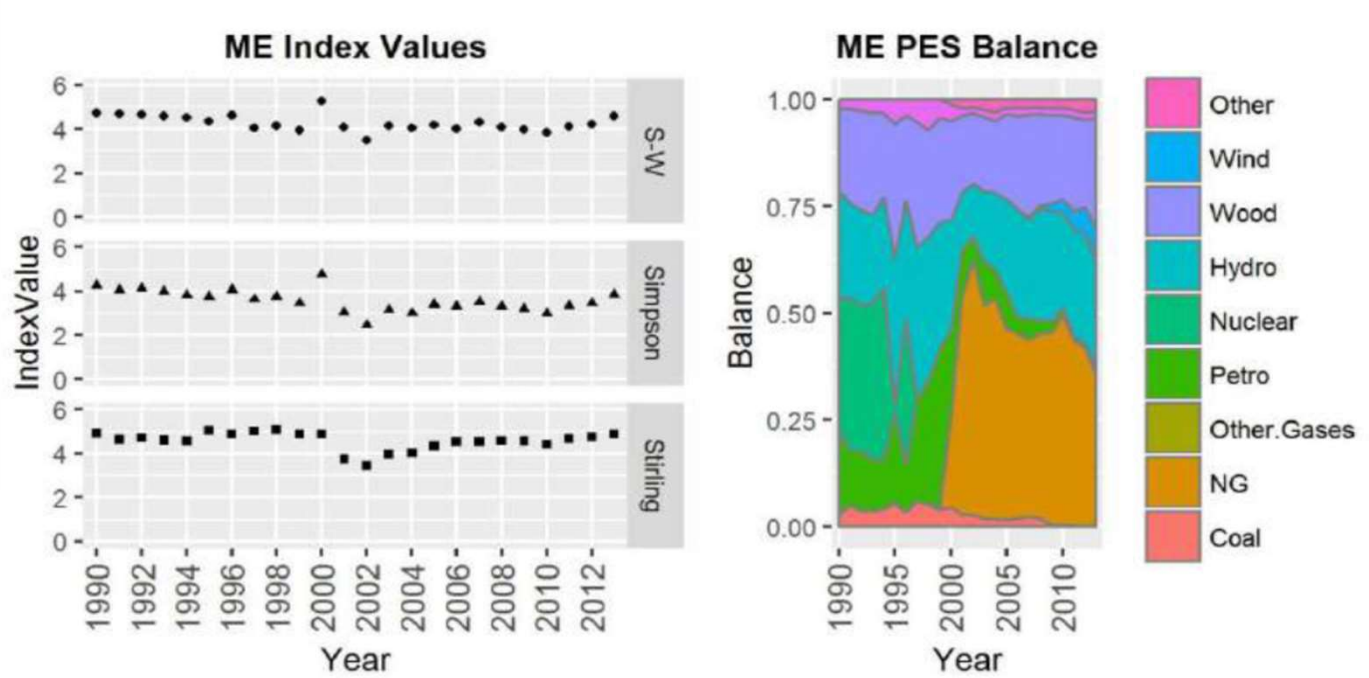
- It should be noted that this is a single person's opinion
- Higher the disparity coefficient, the higher the dissimilarity

	Coal	NG	Petro	Nuclear	Hydro	Geothermal	Solar/PV	Wind	Biomass	Muni/Ind Waste	Other
Coal	NA	0.171	0.171	0.126	0.271	0.271	0.271	0.271	0.088	0.271	0.1355
NG	0.171	NA	0.059	0.171	0.271	0.271	0.271	0.271	0.171	0.271	0.1355
Petro	0.171	0.059	NA	0.171	0.271	0.271	0.271	0.271	0.171	0.271	0.1355
Nuclear	0.126	0.171	0.171	NA	0.271	0.271	0.271	0.271	0.126	0.271	0.1355
Hydro	0.271	0.271	0.271	0.271	NA	0.199	0.199	0.077	0.271	0.128	0.1355
Geothermal	0.271	0.271	0.271	0.271	0.199	NA	0.123	0.199	0.271	0.199	0.1355
Solar/PV	0.271	0.271	0.271	0.271	0.199	0.123	NA	0.199	0.271	0.199	0.1355
Wind	0.271	0.271	0.271	0.271	0.077	0.199	0.199	NA	0.271	0.128	0.1355
Biomass	0.088	0.171	0.171	0.126	0.271	0.271	0.271	0.271	NA	0.271	0.1355
Muni/Ind Waste	0.271	0.271	0.271	0.271	0.128	0.199	0.199	0.128	0.271	NA	0.1355
Other	0.1355	0.1355	0.1355	0.1355	0.1355	0.1355	0.1355	0.1355	0.1355	0.1355	NA

(1) Wu T, Rai V. (2017). Quantifying Diversity of Electricity Generation in the U.S. https://energy.utexas.edu/sites/default/files/UTAustin_FCe_Quantifying_Diversity_2018_Feb.pdf

The Math Doesn't Care

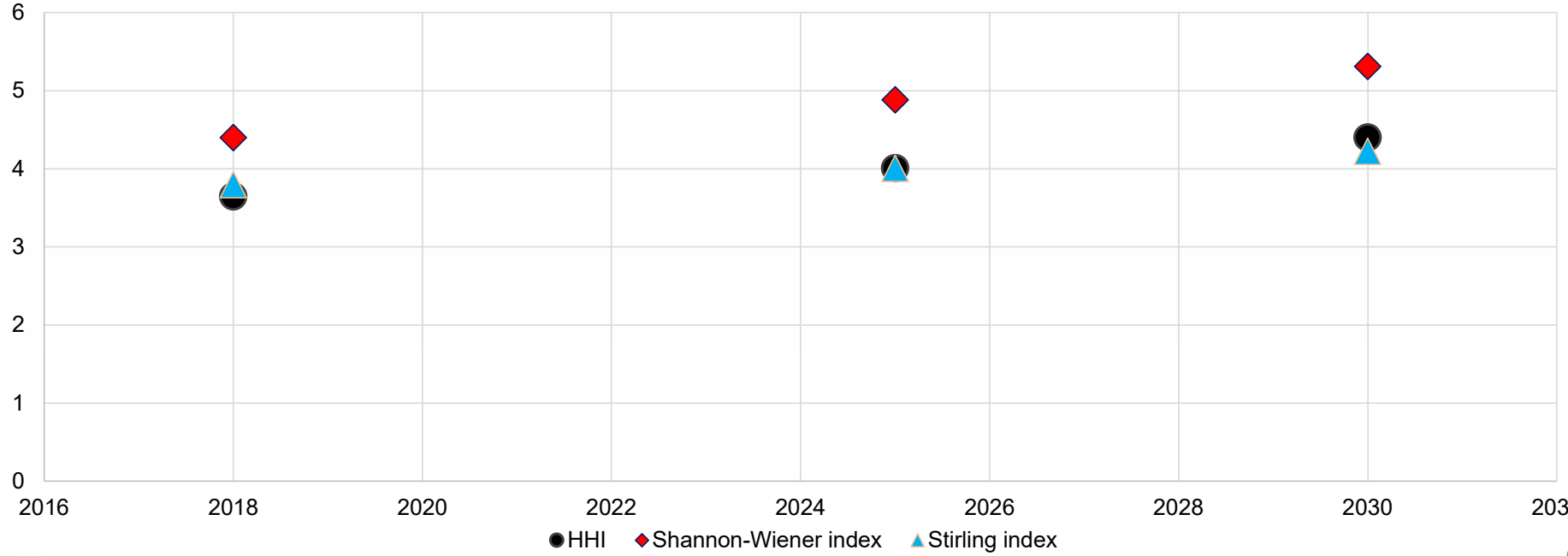
- The diversity indices treats all generation types equally
- Maine is a good example



(1) Wu T, Rai V. (2017). Quantifying Diversity of Electricity Generation in the U.S. https://energy.utexas.edu/sites/default/files/UTAustin_FCe_Quantifying_Diversity_2018_Feb.pdf

Staff's Preliminary Calculations

- Staff applied equations to Michigan as first look
- Using Stirling X30 to have it be of similar scale to other indices[1]
- Data taken from IRP's and capacity demonstrations



Diversity ≠ Resilience

- For the Stirling index the disparity coefficient (D_{ij}) for utility scale and distributed solar would be small
- They will have different effects on resilience
- Diversity may have effects on resilience
- Resilience has components related to distribution which generation diversity does not contemplate

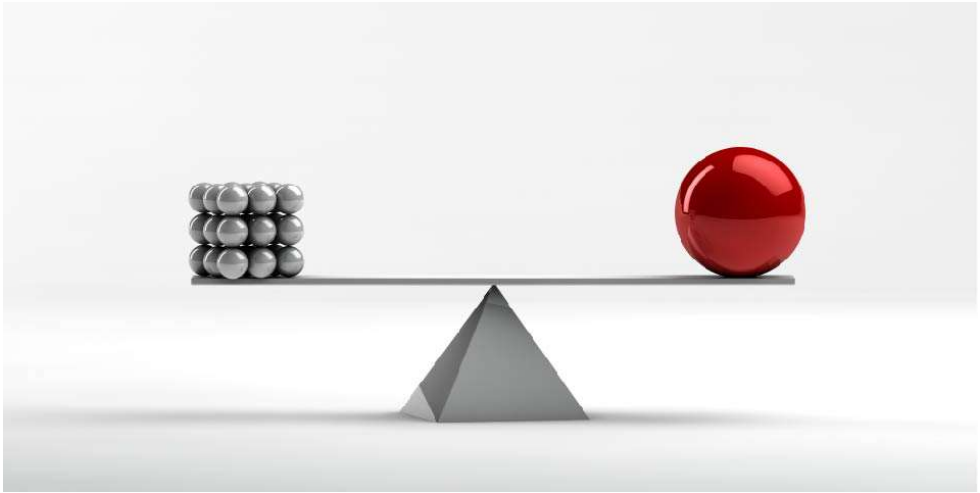
(1) Scripps D, Talberg S, Phillips T. (2020) Order in Case U-20147 August 20,2020 p 48 https://mi-psc.force.com/sfc/servlet.shepherd/version/download/068t000000DcfWRAAZ

Considerations in Valuing Diversity

- Diversity reduces risk
  - Diverse ecologies are more robust
- Placing monetary value on associated risk may be difficult
  - Some variables in indices are subjective
  - Options are often prioritized based on desirable traits
    - Coal vs Coal with carbon capture
  - May result in buildout that is not economically optimal
    - May be more societally acceptable

Valuing Generation Diversity

- We have seen some ways to measure diversity
- How do we value the diversity?
- Additional speakers to come
  - EPRI, LBNL, GridLab



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Questions?

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5 Minute Break

Please mute your microphone and turn off your camera during break.

MPSC

Michigan Public Service Commission

MI Power Grid
Advanced Planning Processes
Working Group

September 24, 2020

Consumers Energy
Count on Us

Integrated Planning Overview

EGI Roadmap

01	Energy Waste Reduction & Demand Response
02	Battery Storage & Non-Solar DER
03	Beneficial Electrification
04	Load Forecasting
05	Existing Assets
06	Solar
07	Wind
08	Power Plan Agreements
09	Grid Modernization
10	Distributed Energy Resources Integration
11	Integrated Planning
12	Capabilities & Tools
13	Talent
14	Strategic Partnerships
15	Regulatory
16	Governance
17	Communication Integration

Strategic Structure
- 3 Strategic Choice Categories
- 4 Strategic Pillars
- Enables direction for Detailed Asset Planning Development

Integrated Resource Plan

IRP Summary
- 20-year View, based on PCA-Proposed Course of Action through 2040.
- 18-month Development Cycle
- File every 3 years
- IRP Steering Committee

Electric Distribution Infrastructure Investment Plan

EDIIP Summary
- 5-year View
- Goals – (Safety & Security/Reliability/Sustainability/Control/System Cost
  - 14 Metrics Tracked
  - CE System Performance (SAIDI/SAIFI/CAIDI)
  - Grid Capabilities (
- 18-month Development Cycle
- File every 3 years
- EDIIP Steering Committee

Electric Rate Case and IRP Development

Long Term Financial Plan Process

Consumers Energy
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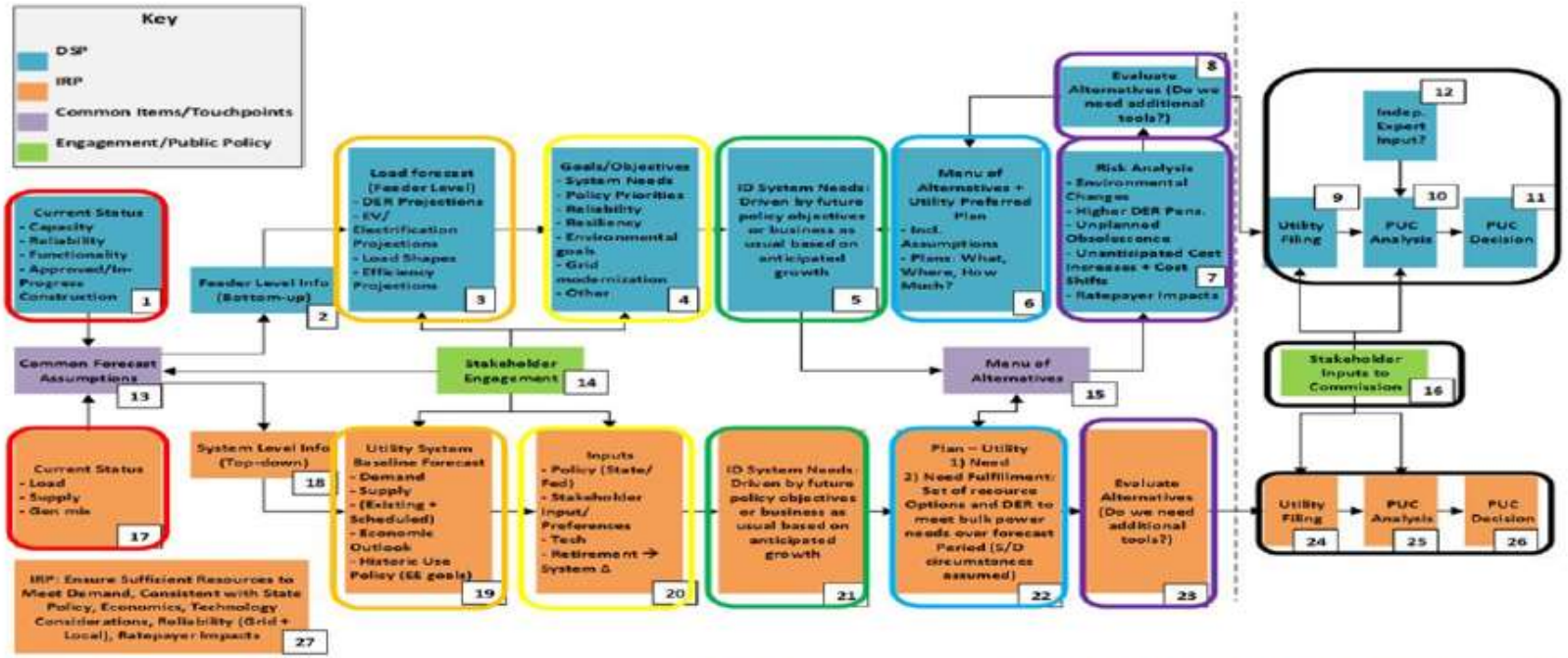
2

NARUC Integrated Planning Process



NARUC National Association of Regulatory Utility Commissioners

NARUC-NASEO TASK FORCE ON COMPREHENSIVE ELECTRICITY PLANNING

NASEO National Association of State Energy Officials

3

MI POWER GRID

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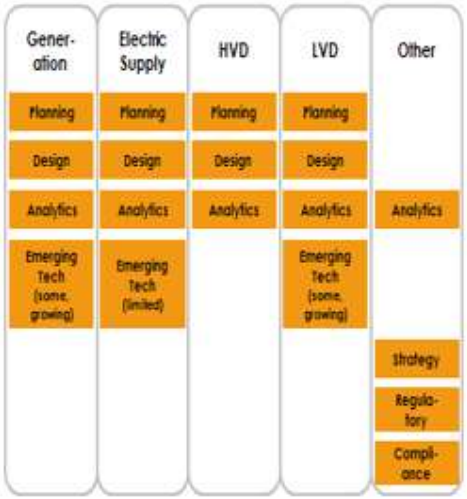
Integrated Planning Structure and Governance

PRIOR TO Q3 2019

Developing capabilities **by asset** for the **traditional grid**



AFTER Q3 2019

Developing capabilities **by function** to build a fully **integrated and modernized energy system**

- **Steering Committees** for regulatory policy, IRP, EDIIP connect senior leadership with planning organization
- **Cross-functional Operating Reviews** - daily, weekly, monthly – bring awareness and visibility into planning activities
- **Business Plan Deployment** – metrics, financial planning, performance management – ensures common goals and financial direction

Evolution of Integrated Planning – IRP and EDIIP

2018

- Fully separate IRP and EDIIP, filed 3 months apart
- Plans developed by different organizations within Company
- Little/no attempted alignment between filings

2021

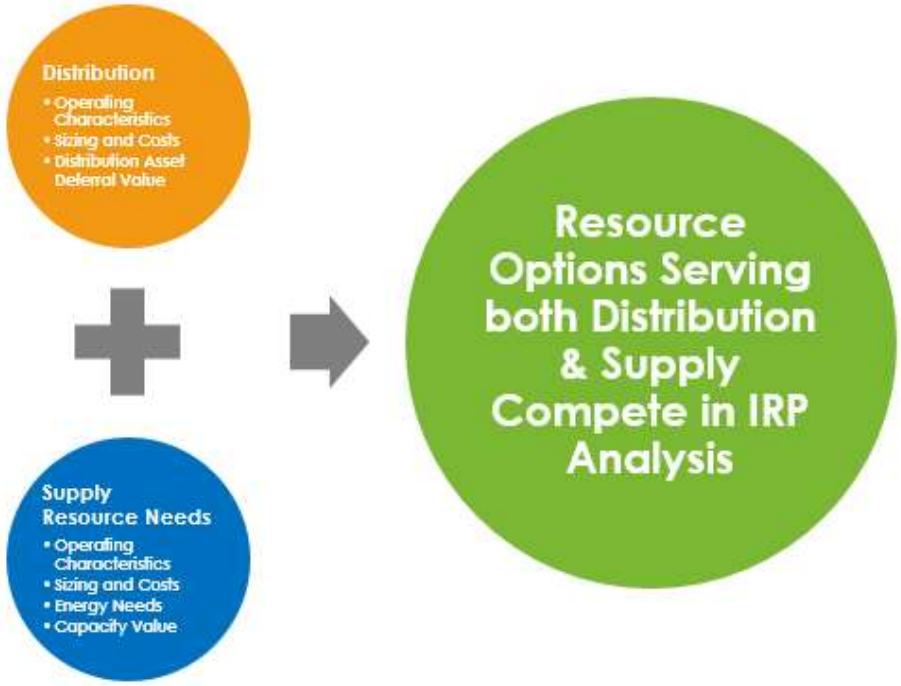
- Separate IRP and EDIIP dockets, filed at same time and reinforcing each other
- Both plans developed within single Electric Planning organization
- Clearer alignment in areas including:
  - Load forecasting
  - EWR and DR forecasting
  - DER and EV forecasting
  - Grid storage

2024+

- Further integration
- Path of integration will be informed by this workgroup

Example of Integration: Battery Storage

- Resources include primary and secondary services to satisfy distribution **and** supply needs
- Example
  Distribution Asset Deferral Battery
  - Primary Services
    - Available to Distribution to reduce local load
    - Operates on weekdays, certain times, certain months
  - Secondary Services
    - Available to provide energy and capacity for supply
    - Operates when lower energy costs can be achieved



*IRP is Integrated Resource Plan

This example is being used in the Company's 2021 IRP analysis

Integration Challenges

- Translating high-level assumptions used in transmission planning and integrated resource planning down to the distribution planning level
- Integrating stakeholder input to distribution plans
- Maturing emerging areas such as EVs or DERs from conception, to pilot, to actual deployment and use in planning analysis
- Aligning analytical tools used in respective planning analyses

DTE

MI Power Grid Stakeholder Session: Integration of Resource/Distribution/Transmission Planning

September 24, 2020

DTE Electric has filed both an integrated resource plan and a distribution investment and maintenance plan in recent years

Integrated Resource Plan (IRP)

- 2019 IRP Filing (Case No. 20471)
  - Filed in March 2019
- Next filing by September 2023
- Fundamental planning approach
  - Evaluates and compares potential resource portfolios to meet **system** peak demand and reserve margins under various futures
  - Forecasts size and time of capacity need based on current resource planning assumptions
  - Long term generation view (15 – 20 years)

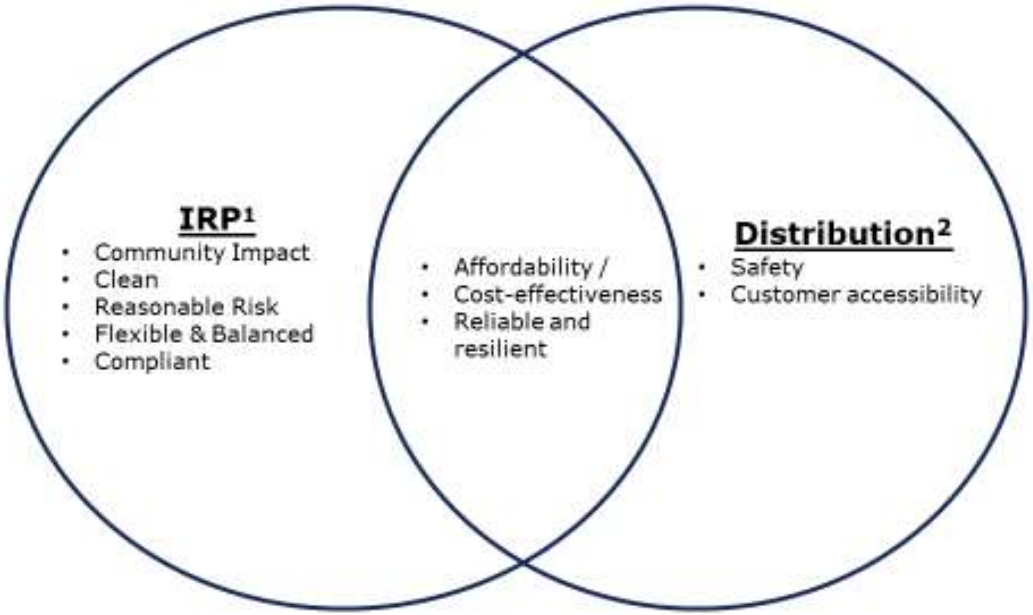
Distribution Investment and Maintenance (DO) Plan

- 2018 DO Plan Filing (Case No. 20147)
  - Filed in January 2018 as Case No. 18014
- Next filing by September 2021
- Fundamental planning approach
  - Evaluates investments with a global prioritization approach (GPM model) with each project or program addressing area/regional-level issues or specific asset classes
  - Performs area load analysis based on substation/circuit-level **peak** load forecasts for the next five years
  - Detailed views in the next five years and high-level grid vision and plan in the next 10-15 years

- The plans filed are developed by core teams that reside within different business organizations in DTE Electric
- The 2019 IRP included collaboration with Distribution regarding Conservation Voltage Reduction/Volt Var Optimization (CVR/VVO) which was ultimately a resource included in the Company's proposed course of action
- The 2019 IRP coordinated with the Transmission Operations team and ITC to analyze, at a high level, the transmission system impacts across several build scenarios

DTE

There are planning objective/principles that intersect between both the IRP and DO planning processes



DTE

1. 2019 IRP, MPSC Case No. 20471
2. Distribution Planning Order, MPSC Case No. 20147

Corporate load forecasting and distribution planning have some differences

IRP Load Forecasting (Current State)

- Purpose: Sales and Peak forecast (8760's) are produced at the system-level (20-year outlook)
- Source data: Historical sales data at the class, market and customer-level utilizing hourly interval data for the most recent 5-year period
- DER include only customer sited energy resources in the forecast including EWR, Distributed Generation (Solar) and EV at the system-level. Demand response is considered a supply-side resource
- Growth projections are made based on econometric modeling (historical and forecasted) supplemented with specific customer market intelligence
- Scenario planning: The current forecasting process includes various levels of economic scenario planning as well as adoption scenarios of various DER technologies
- Weather normalization process is a robust calculation based off a rolling 15-year normal
- Planning requirements include meeting Planning Reserve Requirements in accordance with MISO

Distribution Planning (Current State)

- Purpose: Peak planning (max peak) is performed at the circuit-level with an emphasis on the next five years, focusing on the next year
- Source data: Most recent summer peak load data at the circuit-level utilizing available SCADA and older analog meters. Customer-level interval data is not utilized
- Loading analysis incorporates both customer site (behind the meter) and utility-scale DER. Emerging technologies are not realized at the circuit level until after implementation and are not material at the present time
- Actual loads are determined annually after the summer and adjusted for temperature, then used to forecast the following years' peak loads based on known and committed customer requests. Generic load growth factors are not built into planning forecasts
- Planning requirements include preventing overloaded equipment, providing distribution system capacity to accommodate customer connections, improving customer reliability, and addressing aging, at risk electric infrastructure

DTE

A transition to alignment of IRP and Distribution planning processes will focus on common forecast and scenario assumptions in the near term, while continued advancements in load forecasting may provide greater integration in the long-term

Current State of Planning Processes

- IRP and Distribution Plan developed independently and on different cycles
- Minimal alignment in Planning Principles/Objectives
- Limited collaboration regarding planning processes
  - IRP relies on DO subject matter expert(s) for inputs on specific resource opportunities (e.g. Conservation Voltage Reduction)
  - Distributed Energy Resource (DER) forecast and source varies
- DTE Transmission Operations provides scenarios to transmission owner for evaluation. Limited iterative process and visibility to models

Future State

- Consistent/aligned Planning Principles/Objectives
- Increased coordination and alignment
  - Collaborate on assumptions such that consistent base and sensitivity forecasts are utilized by both planning processes such as load, electric vehicle (EV), and DER
- Planning processes inform one another, examples include
  - An IRP proposed course of action could influence distribution system planning and investments
  - DER and non-wire alternatives (NWA) pilots that are scalable could be included as a resource alternative in IRP modelling

Journey to Future State

Integrated Resource Planning

- Transitioning to new capacity expansion model (Encompass)
- Modeling of storage technologies and hybrid generation-storage options (e.g. solar-battery)
- Evaluating DER base and sensitivity forecasts
- Distribution solutions to address peak demand

Load Forecasting

- Begin to enhance modeling capabilities that could allow for integration at the circuit/feeder level
- Explore opportunities to incorporate DER and EV adoption at the market and building type level
- Begin to lay the groundwork for a system wide forecast reconciled to various aggregation points

Distribution Operation Planning

- Propose grid modernization vision
- Incorporate EV's, PV and storage in addition to traditional customer load
- Collaboration on scenario planning and assumptions
- Build in-house knowledge and experience with emerging technology through pilots and demonstration projects

DTE

The integration of planning processes presents a host of challenges across the areas of process, technology, and people

Challenges
Process
– Information flow between planning processes
– Consideration of resources as they transition from baseload to intermittent and/or behind-the-meter
– Language / terminology
Technology
– Size, scope, and availability of data
– IT infrastructure requirements
– Data analytics
– New software modeling solutions
People
– Evolving skill sets and core competencies
– Resourcing and training

2020 MPSC Integration of Resource, Distribution and Transmission Planning Overview for IM Power

Workgroup Meeting 1

September 24, 2020

Web Conference

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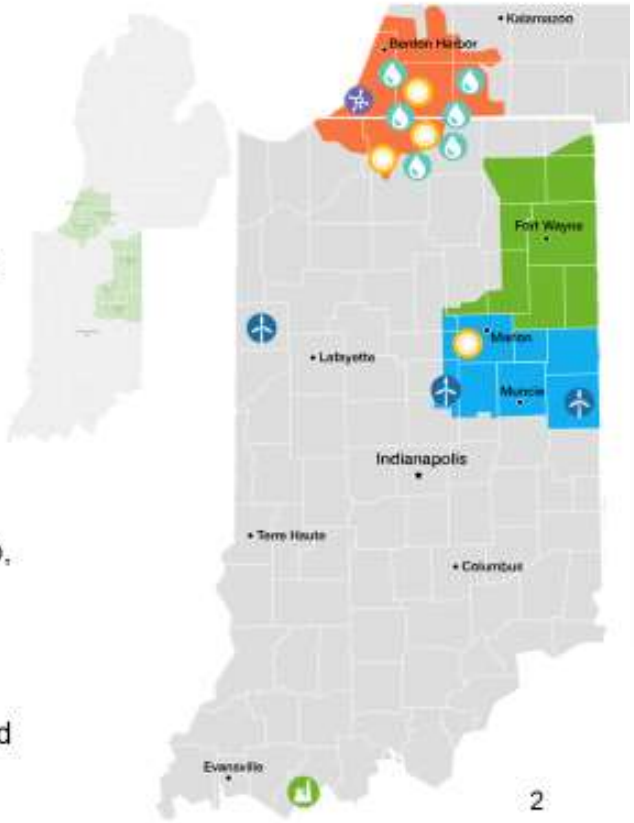
INTRODUCTION TO I&M

- Multi-jurisdictional utility with ~ 600,000 retail customers in Michigan and Indiana.
  - Indiana: 471,537
  - Michigan: 130,060
- Located in southwest Michigan, serving communities located in the counties of Berrien, Cass, St. Joseph, Van Buren, Kalamazoo, and Allegan
- ~390 MW of firm full requirements wholesale generation customers, mainly located in Indiana.
- Fully Integrated:
  - Generation: ~5,400 MW of Nuclear, Wind, Hydro, Solar Coal Resources
  - Transmission: ~5,300 line miles, ~900 (MI)
  - Distribution: ~20,500 line miles, ~5,300 (MI)
- I&M is part of the American Electric Power system and a member of PJM Interconnection, LLC (PJM)



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RESOURCE / DISTRIBUTION / TRANSMISSION PLANNING

Large and Diverse Stakeholder Group

- Customers, Communities, State Commissions, Shareholders, State Policy Makers, State Agencies, Industry Advocacy Groups, PJM, FERC, etc.
- Many Interests and Needs to Balance, Rapidly Changing
- Importance of Stakeholder Engagement
  - Distribution – customer to transmission interface
  - Transmission – landowners and customers to PJM and FERC
  - Generation – IRP refresh and review every 3 years

Robust and Continuously Improving G, T and D Planning Process

- Well Coordinated and Adapting to Change
- Varying Timelines and Needs
- Varying Inputs – Macro Economic to Customer and Circuit Specific
- Includes DER, EV and NWA
- Load Forecast is the Hub or Common Denominator

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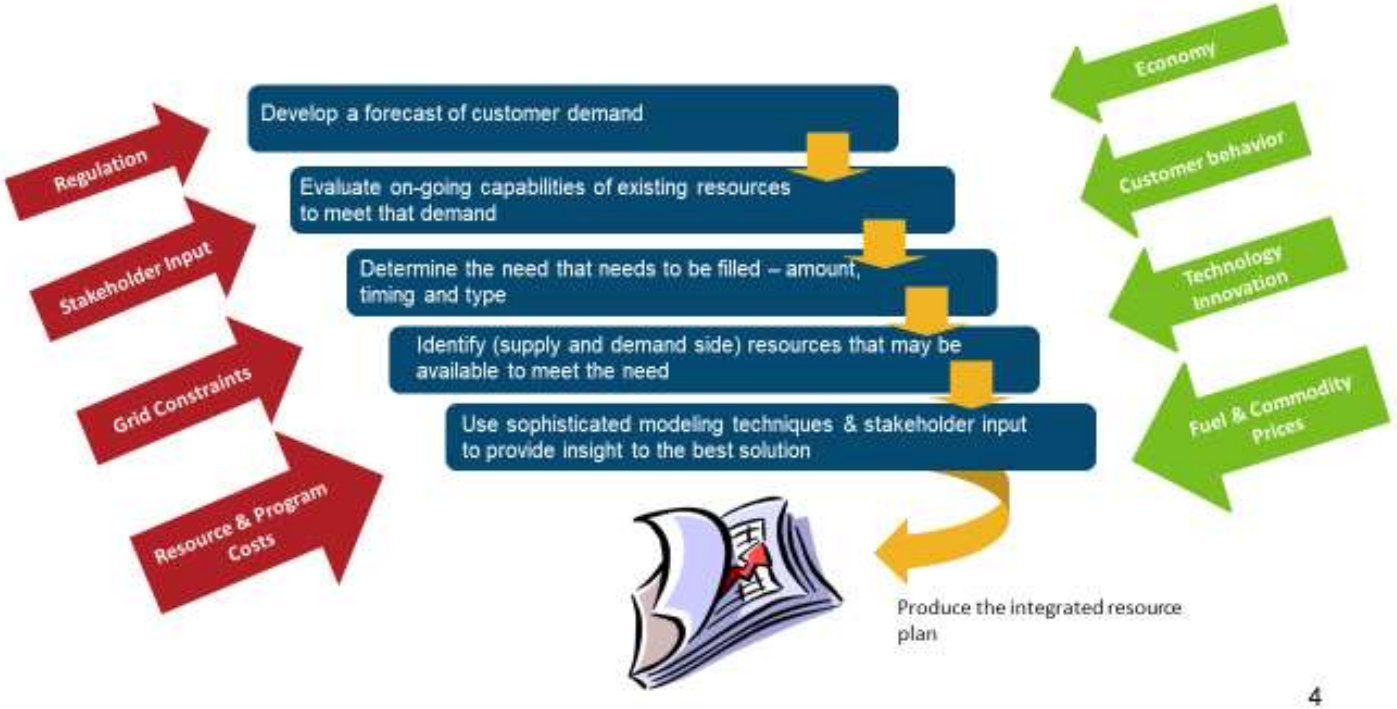
THE INTEGRATED RESOURCE PLAN DEVELOPMENT

An IRP describes how a utility will meet the future peak demand and energy requirements of its customers at a reasonable cost.



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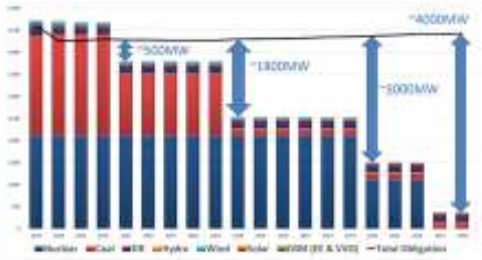
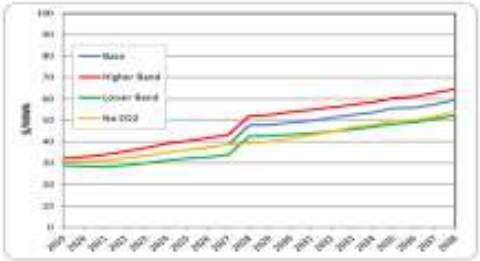
BUILDING BLOCKS OF THE RESOURCE PLAN



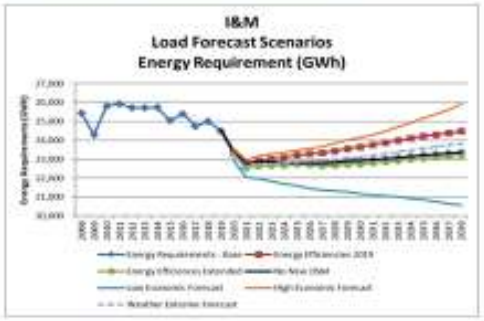
Fundamental Forecasts



Current Supply and Demand Resources and their Performance and Variable Cost Characteristics

RESOURCE PLAN

Cost, Performance, Limiting Parameters of possible incremental and/or Replacement Assets



Demand/Load Forecasts

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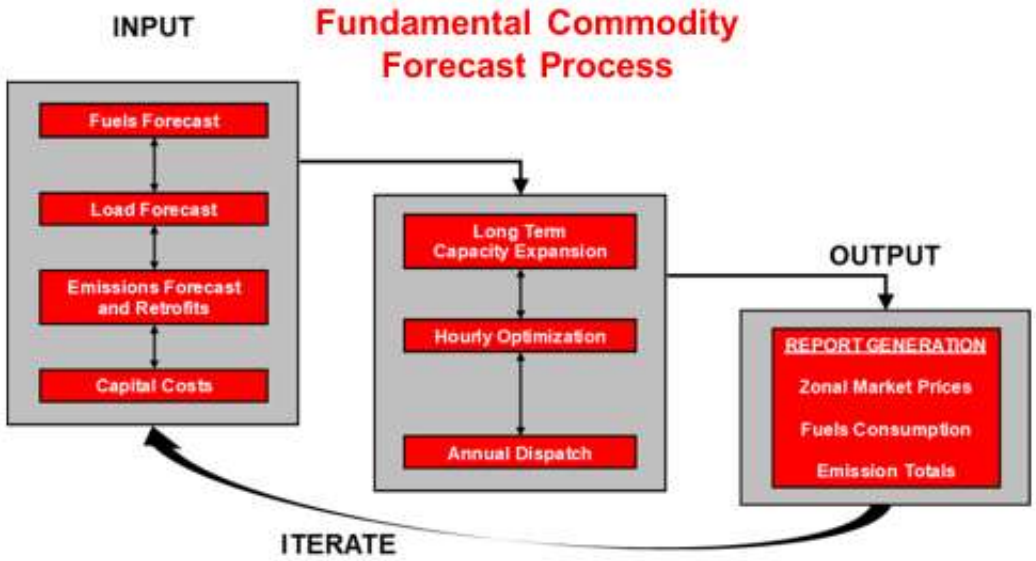
FUNDAMENTAL COMMODITY FORECASTS



This process includes the entire North American grid and develops commodity forecasts based on various views of the future. These forecast are then utilized as an input to various cases/scenarios considered within the IRP. Development of these "macro" forecast or differing views of the future, allows for improved understanding of cases or scenarios consider within the IRP. Further description of this process is included in the Company's IRP.

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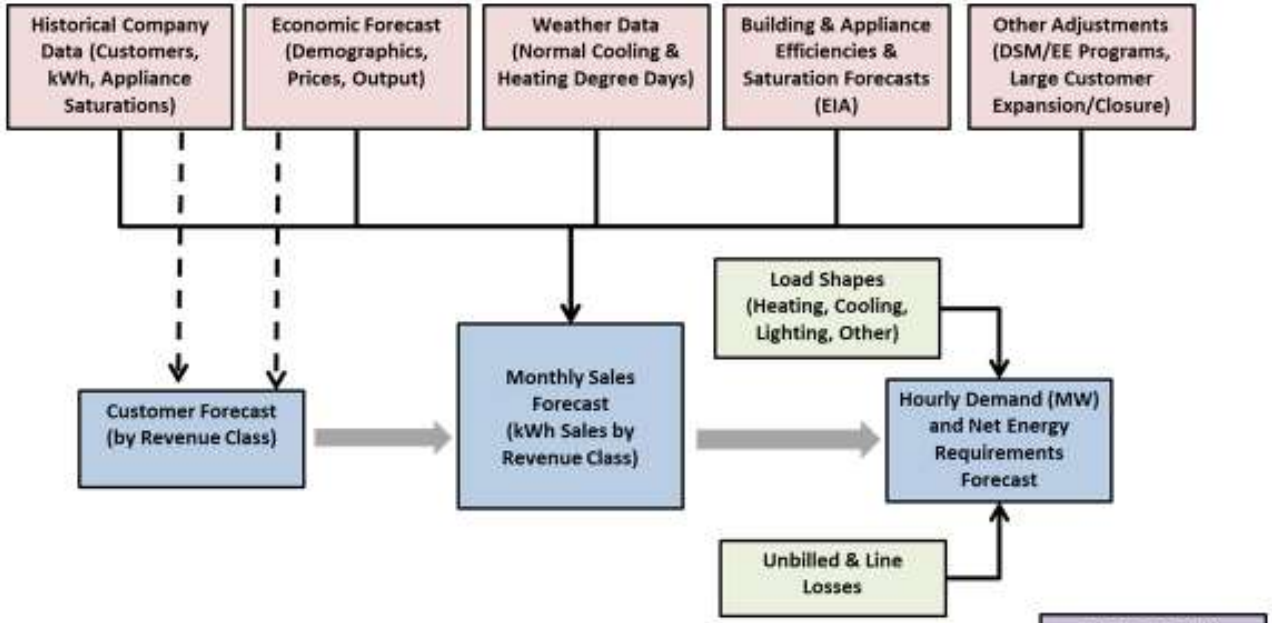
DEMAND/LOAD FORECASTS

Load Forecast Process



The Load Forecasting process includes the development of a range of potential outcomes that consider customer adoption of electric vehicles, distributed generation, demand-side management solutions, varying levels of economic activity, etc., which are discussed in the Company's IRP and reflected in the IRP modeling.

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INDIANA MICHIGAN RESOURCE OPTIONS

The Integrated Resource Planning (IRP) Process requires the selection of a mix of resources to meet the future energy & capacity needs. The Resources are generally categorized into traditional *supply-side and demand-side resources*.

Supply-Side Resources

- Nuclear, Coal, Biomass
- Natural Gas Combined Cycle (including CHP)
- Natural Gas Combustion Turbine & Reciprocating Engines
- Wind
- Solar
- Hydro
- Energy Storage

Demand-Side Resources

- Energy Efficiency
- Demand Response
- Distributed Generation (includes PJM Forecasted DG Growth)
- Grid Improvements (including CVR)

- The Company is in the process of updating a Market Potential Study for both Michigan and Indiana customers, with a completion date of spring 2021.
- A further description of all of these resources costs and performance expectations can be found in the Company's IRP.

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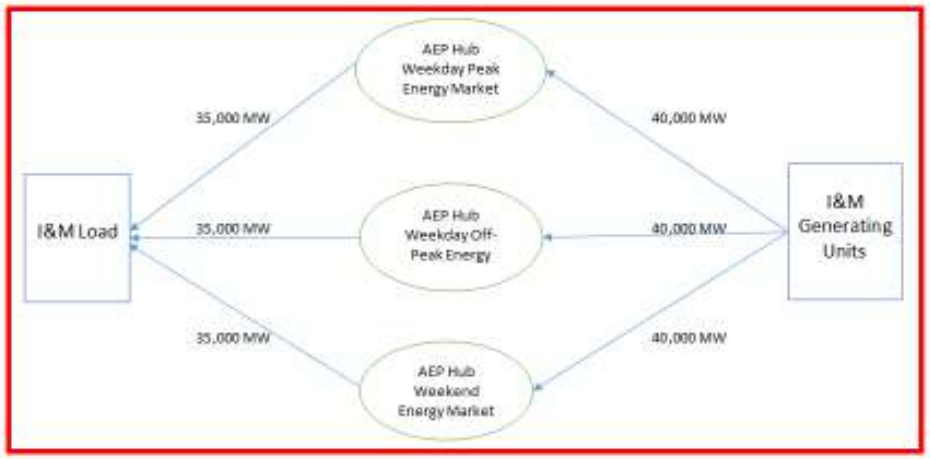
RESOURCE PLANNING SPECIFIC TO I&M

- I&M evaluates the resources need to meet all of I&M's load
- I&M is a member of the PJM Regional Transmission Organization (RTO) & is able to transact capacity & energy within PJM
- All resources modeled are considered deliverable to I&M and are not location specific, specific transmission considerations will be analyzed during a resources acquisition process
- Currently within the IRP Model, there are no modeled transmission constraints



- A further description of the Transmission Planning Process and Projects is included in the Company's IRP.

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DISTRIBUTION DISCUSSION

- System Overview
- Distribution System Planning
- Planning Challenges
- Distributed Energy Resources (DER)

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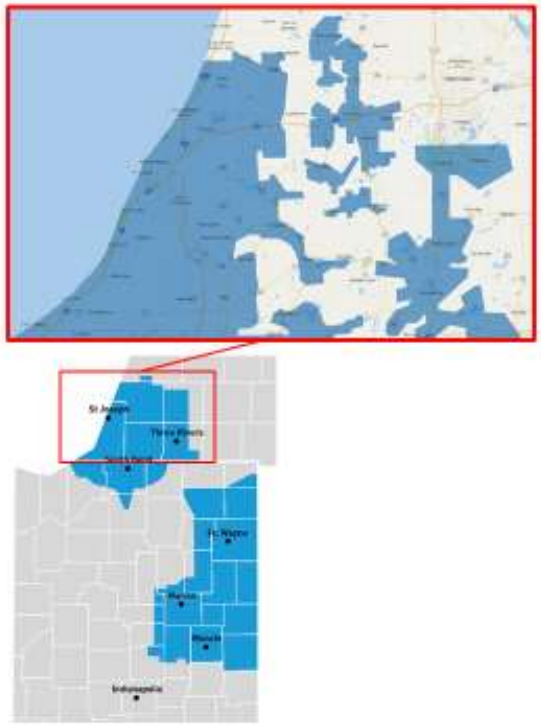
SYSTEM OVERVIEW



- Total customers: ~600,000
  - Michigan: 130,060
- Service area: 4,573 sq. miles
  - Michigan: 1,375 sq. miles
- Communities served: 164 in 30 counties
  - Michigan: 46 in 6 counties
- Service Centers: 12
  - Michigan: 3
- Distribution Lines: 20,565 miles
  - Michigan: 5,380 miles
- Distribution Circuits: 700
  - Michigan: 134

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DISTRIBUTION PLANNING

- I&M has a well established Annual Distribution System Planning Cycle utilizing Multi-Year Load and Project Forecasts.
- The Planning Process includes interaction with Transmission Planning, Distribution Customer Services, Distribution Operations, EE/DSM/EWR Group and I&M Management.
- The Planning process considers NWA, DER, Energy Storage, Smart Circuits and Grid Modernization.

MICHIGAN DISTRIBUTED ENERGY RESOURCES

I&M-Michigan DERs	Customers	kW
Solar PV - Residential	106	811
Solar PV - Non-Residential	17	302
Wind - Residential	8	26
Wind - Non-Residential	3	12
Internal Combustion	0	0
Steam Turbine	0	0
Battery	2	14
TOTALS	136	1,165

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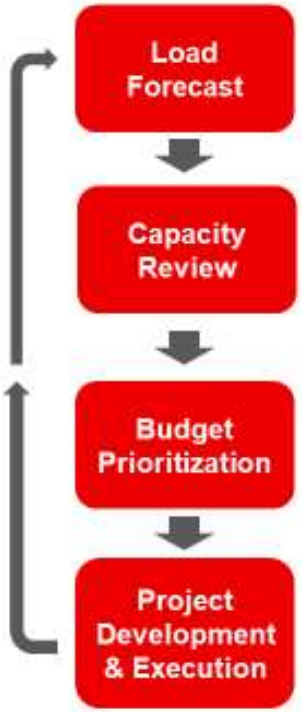
ANNUAL PLANNING CYCLE / PLANNING PROCESS OVERVIEW



1. Planning populates load forecast with the latest seasonal metering data.
2. Planning hosts load forecast meetings with I&M operations personnel to incorporate new development information.
3. Planning reviews load and reliability impacts for each station and circuit and develops high level solutions, including traditional, non-wires, and Grid Modernization alternatives.
4. Planning reviews and coordinates with new and existing Smart Grid deployments/plans to ensure the capacity upgrade plan is designed efficiently and proactively to accommodate new technologies.
5. Planning develops high level budget forecasts for I&M funding allocation discussions.
6. Planning hosts annual meeting to discuss upcoming T&D project work plans to determine any crossover opportunities and longer range planning.
7. Planning hosts a meeting with T&D personnel to discuss the ten-year distribution capacity plan and solicit feedback.
8. Planning develops projects for submission and internal authorization by I&M.

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PLANNING CHALLENGES AND OPPORTUNITIES

- Large block load increases with short notice
- Load "Masked" by DERs
  - Planning engineers only have circuit level loading information and have to estimate how much DERs are offsetting the load at the time of the peak.
- Production forecast of DERs
- Forecast of additional DERs sizes and locations in future years
- Forecast of EV Charging load sizes and locations in future years
- Value of Pilots
- Benefits of AMI

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QUESTIONS?

MI POWER GRID

Making the Most of Michigan's Energy Future

Next Steps

Feedback Request Responses Due October 6

Next Meeting Scheduled for October 21 from 1pm-4:00pm EST

MPSC

Michigan Public Service Commission

Feedback for today

- We have introduced 4 main topics today, are there additional areas within these four topics that need clarification or that should be elaborated on?
- Are there questions about the direction provided in the order that needs clarification?

Next Steps

- Staff will send out the slides and recording from today's meeting and post them to the Advanced Planning Phase 2 website.
- Staff will include the feedback request in its listserv message.
- Staff will finalize October 21st agenda and send out to listserv
- Staff will work to collect, compile and summarize comments received by October 9th for review with stakeholders during the October 21st meeting
  - Feedback collected through this feedback request will not be posted, simply summarized in aggregate.

Please send Feedback Requests to:

Danielle Rogers RogersD8@michigan.gov

Please direct general comments or questions to:

Naomi Simpson SimpsonN3@michigan.gov

Presentation materials for today's meeting can be found on the MI Power Grid website.