REINHOLD ENVIRONMENTAL Ltd.

2016 APC-Wastewater Round Table & Expo Presentation

July 18 & 19, 2016 in Dearborn, MI / Hosted by DTE Energy

Michigan Public Power Agency

"Delivering Value Added Energy Solutions and Services to its Members"

Regional, Local and Municipal Perspective

Transformation challenges & opportunity

Michigan Municipal Electric Utility

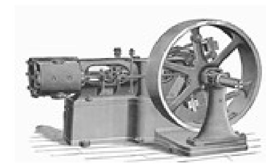
positioned for the challenge ahead

Diverse and complex set of environmental regulations affecting power generation – new permit ratcheting

Abundant domestic natural gas expediting phase out of coal & some nuclear (decarbonize)

Technology driving gen efficiency and controls, communication and visibility into the distribution network

X < 1930



- The transformation is altering the economics of the business
- Municipal Electric Utilities are challenged near term but positive aspects of the transformation - growing Distributed Energy Resources fit profile;
  - Dampening large electric gen efficiency advantage
  - Capital deployment / financing size aligned
  - Distribution network operation workforce fit
  - Local Control & Decision Model

2016 & beyond

Large scale gen & high voltage transmission replaced small local generation…the industry is now looking at a future similar to its past

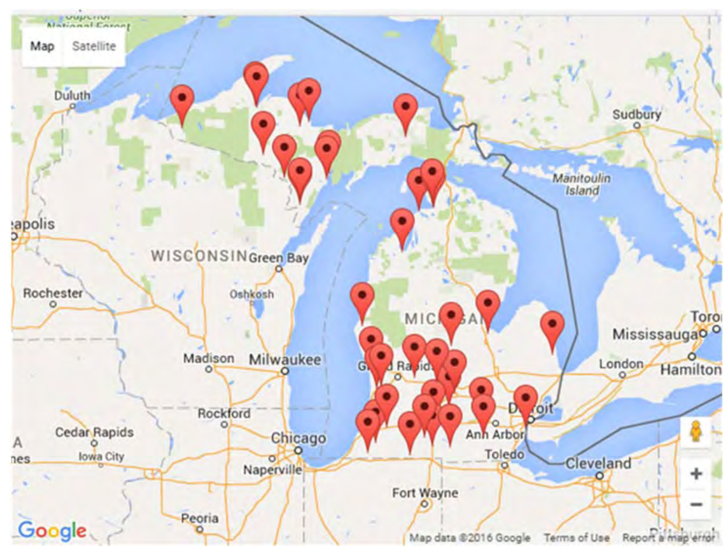
Michigan Municipal Electric Utilities

Profile at a glance

- 40 Municipal Electric Utilities in the State of Michigan (approx 2 GW)
- Vast majority created in the 1890 to 1920's period (100 + Years)
- Joint Action Agencies ("JAA's") formed in the late 1970's
- Michigan has 3 JAA's – MPPA (18 members), MSCPA (5 members) and WPPI (6 Members)
- Impetus of JAA creation was the unprecedented rise in wholesale electricity pricing in the 60's & 70's

MISO Market

- Rationale for the creation of the JAA was economies of scale of large central station power
- JAA could pool need of its members, finance (bond) and own a % of large central station power (mostly coal)
- Member participants under JAA obligated through Municipal Resolution



Michigan Public Power Agency

Created 1978, Act 448
18 Full Members
3 Associate Members

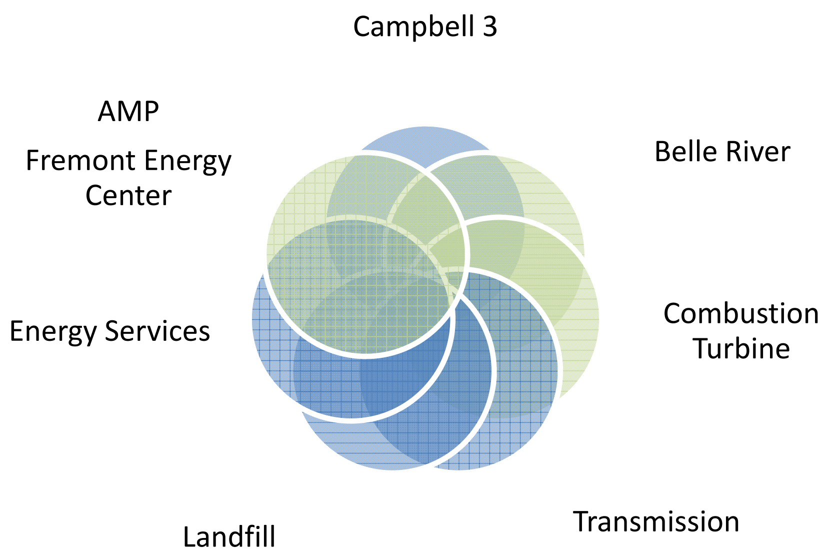
Power Supply Resources

Agency & Member Owned
- Coal
- Natural Gas
- Wind
- Solar
- Landfill Gas
- Transmission

Project Based Agency

Project Based Agency means each Member chooses which Resources or Services it wants to participate in. Members have the benefits of independence while leveraging expertise, resource sharing and economies of scale.

Project Committees



Service Committees

- Base Resources
- Combined-cycle
- NERC Compliance
- Peaking Capacity
- Renewable Resources
- Energy Efficiency
- Renewable Portfolio
- MIREC's
- GADS

Joint Action Principles

Trust, Mutual Understanding and Shared Values

Scale

Collective Efficiency

Asset Investment
- Power Supply Resources
- Power Delivery Resources

Human Capital
- Industry Expertise
- Focus

Systems
- Information Processing
- Resource Management
- Financing

Value Platform

Economic Principles translate to Value

Economic Principles

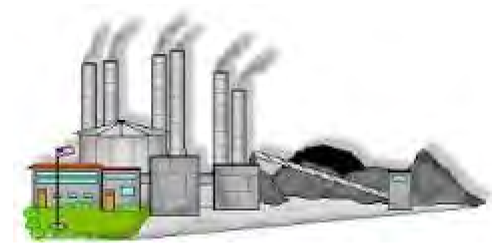
- Economies of Scale
- Resource Diversity
- Resource Sharing
- Centralized Financing Platform
- Specialization

Value

- More Efficient Resources
- Economic Portfolio Building
- Lower Reserve Margins
- Reduced Risk & Costs
- Expertise & Knowledge

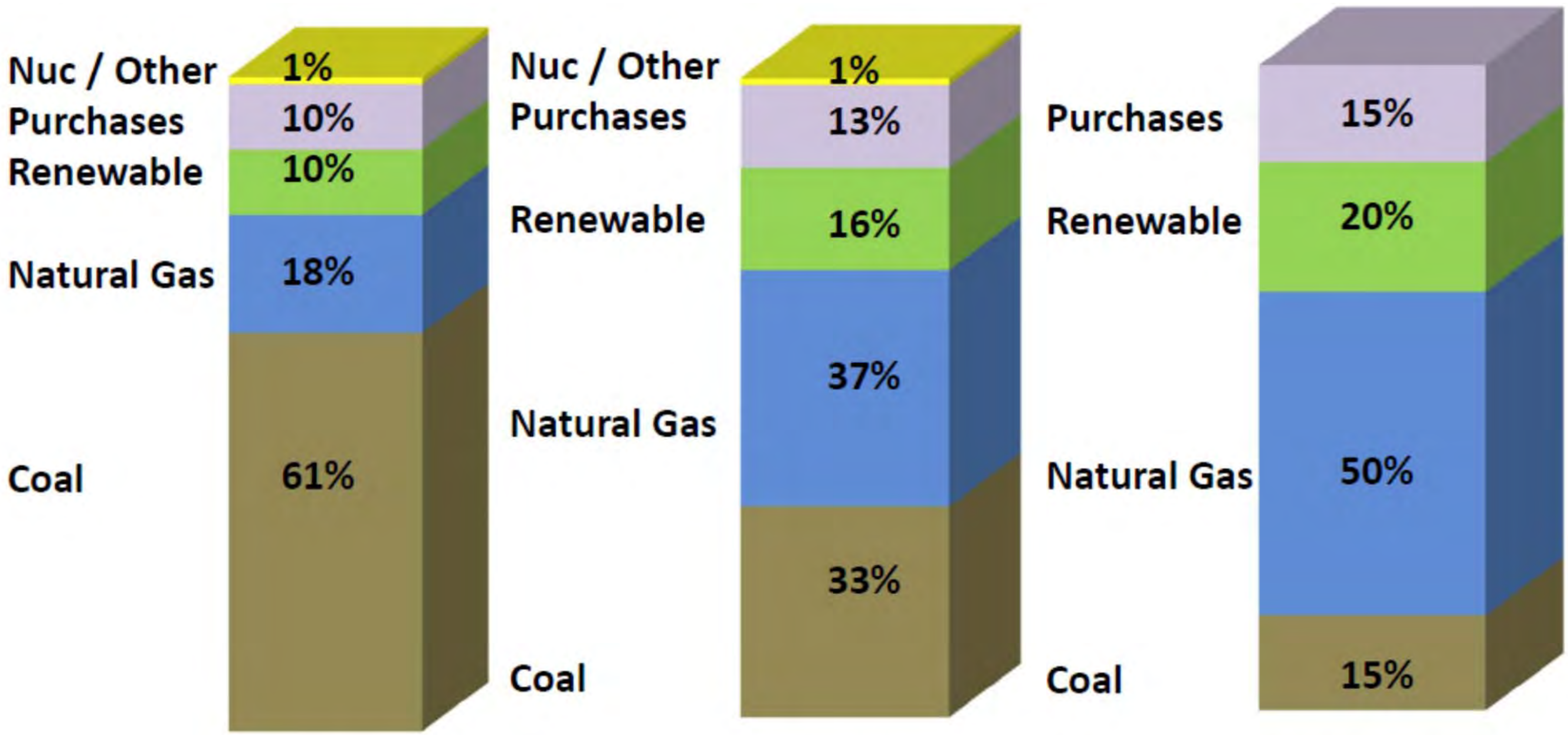
Evolution of Agency

Entity created as power gen asset investment platform (owner)



Entity that commercializes energy assets, interfaces wholesale energy markets and integrates & delivers energy supply and related services (servicer)

Power Supply Transformation



Represent average at Agency level as individual muni may have higher or lower %'s

Year	2013-2017	2018-2023 Planned	2024-2028 Forecasted
	1.6 GW	**1.6 GW**	**1.6 GW**

Agency Power Portfolio Drivers

Age & Size of Coal Fleet

Portfolio

- 1,050 MW of Coal in portfolio
- 775 MW Member Owned
- 275 MW Agency Owned (joint with IOU's)
- 4 independent stand-alone facilities with average size 65 MW's
- Largest 2 facilities in portfolio (500 MW) oldest at 50 + years of age
- Agency-Owned youngest in fleet at 33 years of age

Economics

- Natural end of life as O&M costs rise
- Efficiency of smaller facilities not competitive go forward
- Staffing costs not supportive going forward (of small facilities)
- Debt extinguished
- Investment in facilities does not support quality credit profile

Fuel diversity value through 2030 (forecast)

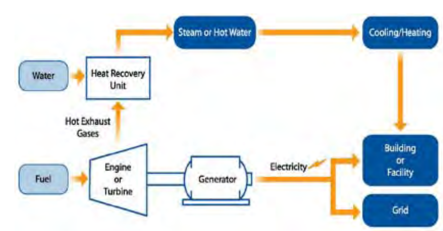
How are we responding?

- MPPA members (like Michigan as a whole) are naturally retiring "old" coal units
  - Replacing with market purchases (capacity & energy)
  - Natural Gas Power Gen Investment and
  - Renewables via PPA

- MPPA is carefully leveraging the cost advantages of market purchases & contracted assets (PPA's) with investment & ownership

- MPPA Member competitive cost advantage originates from prudent investment strategy favoring projects with multiple revenue streams or cost offsets paired with electricity production

CHP



- Resisted large grid gen investment over the last decade

- Invest / contract energy resources close to load

Strategic Investment & Ownership

Local Projects with Strategic Value favored over Grid Projects

Lansing Board of Water & Light (2013)

- 110 MW Reo Town Cogeneration Plant
- Replacement of Aging Coal Steam plant
- Dual Steam & electricity production
- Maintain transmission cost efficiency

Marquette Board of Light & Power (2017)

- 50 MW Marquette Energy Center
- Reciprocating Internal Combustion Engines
- System reliability due to transmission constraints
- Phase out of Aging Generation
- Capacity & Demand Response Resources
- Maintain transmission cost efficiency

❖ Clean Power Plan Compliant
❖ Unique efficiency (Electricity & Thermal use)
❖ Solve Reliability Challenges
❖ Transmission Cost Efficient
❖ Partner with stakeholders (customers & City**)**

Holland Board of Public Works (2017)

- 115 MW Holland Energy Park
- Combined Cycle Natural Gas Plant
- Waste Heat used in City snow melt system
- Replaces retiring coal
- Maintain transmission cost efficiency

Sebewaing Light & Power (2018)

- Evaluating 10 MW Cogeneration Facility
- Combined Heat & Power with largest customer
- Reduces cost for end-user and Utility customers
- 2017 Project

Note: *Not part of MPPA but MSCPA 13 MW unique greenhouse cogen application 2015*

Transformation Challenges

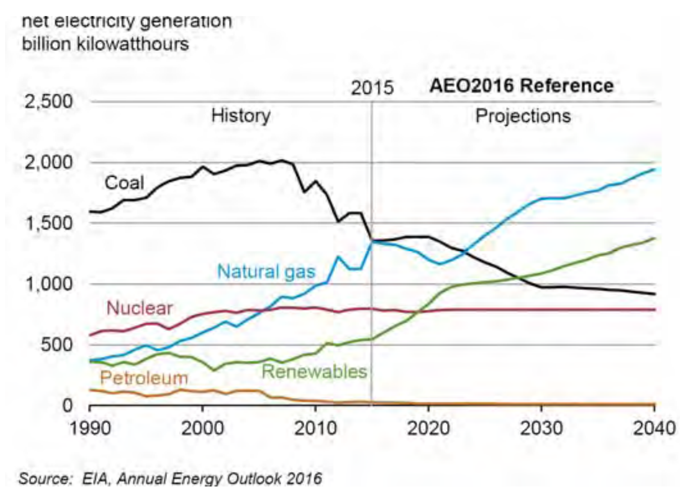
Diminishing Fuel Diversity

Financial Crisis in Coal

- April 13, 2016 - Peabody Energy Corp. – world’s largest private sector coal producer - filed for U.S. Bankruptcy Protection
- Jan 11, 2016 – Arch Coal Inc., 2nd largest U.S. Coal producer filed for U.S. Bankruptcy Protection
- Aug 3, 2015 – Alpha Natural Resources Inc., 3rd largest supplier filed for U.S. Bankruptcy Protection
- 2015 – Walter Energy, Patriot Coal, Xinergy, etc., etc. all filed for Bankruptcy protection in the last 24 months

Natural Gas overtakes Coal

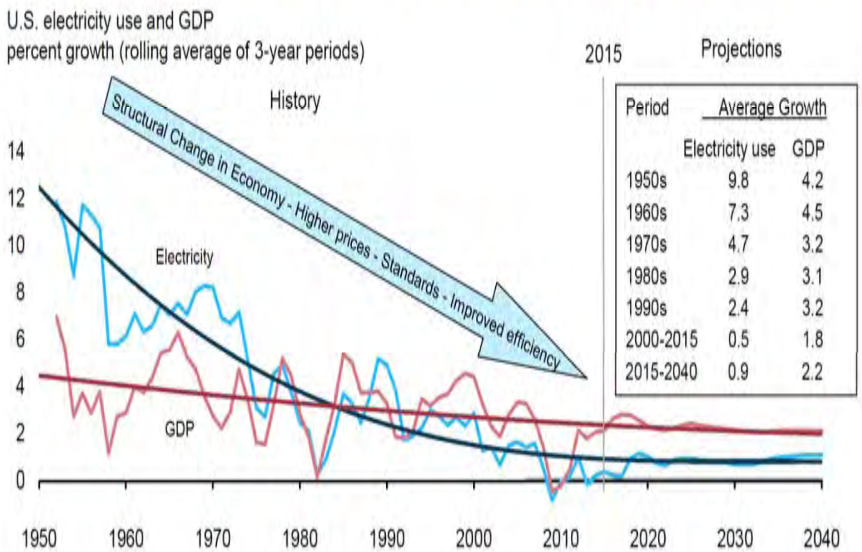
- EIA publishes that natural gas overtook coal as the top fuel for U.S. Power generators for 1st time ever over the 12 months ending January 2016
- 2016 on pace for record setting year for natural gas burn…34% of electricity production



Transformation Challenges

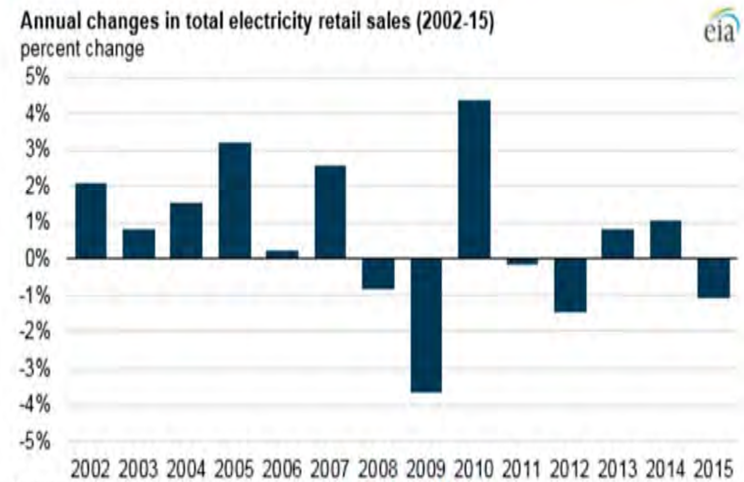
Declining load growth

Electricity use (including direct use) continues to grow, but the rate of growth slows as it has almost continuously over the past 60 years



Source: *EIA, Annual Energy Outlook 2016*

Total electricity sales fell in 2015 for 5th time in past 8 years



Source: U.S. Energy Information Administration, *Electric Power Monthly*

Transformation Challenges

Who pays when you can't retire?

Reliability Must Run PJM

System Support Resource - MISO

- Electric Delivery Systems were built to integrate **<u>large</u>** central station power plants
- The size of these power plants mean that when they retire local voltage or thermal problems on the electric grid can occur (even if no resource adequacy issue)
- The RTO may require the unit to remain operating until a solution to upgrade the delivery system or strategically encourage new generation
- These Agreements are "out of market" contracts and costs allocated to market participants

Reliability Support Service - NYISO

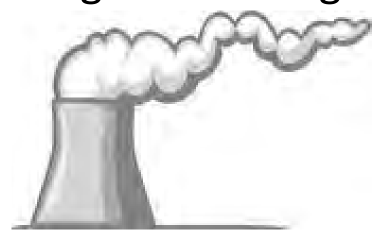
Cost of Service-ISONE

Transformation Challenges

Legacy Coal and Nuclear financial challenges

Illinois

- Next Generation Energy Plan – supporting zero emissions nuclear facilities
- Energy and Environmental Security Act - incentivizing clean coal generation



Ohio

- FirstEnergy (coal / nuc) and AEP Ohio (coal) PPA's designed to recover current above market costs in exchange for long-term hedge against natural gas
- FERC rejected waiver of review of the Affiliate PPA's in late April
  - FirstEnergy refiled Rate Stability Rider using a financial fixed for floating swap concept
  - AEP trimmed down original request opting for sale of plants or re-regulation bill via legislature

How to value / compensate Fuel Diversity?

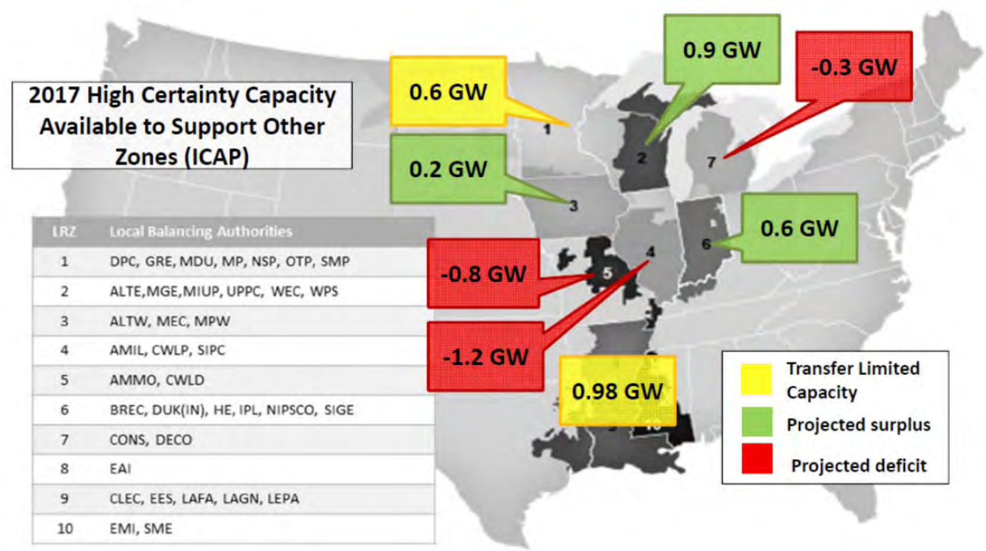
How about the competitive transition $'s paid ?

Competitive markets segmented to achieve source mix?

Transformation Challenges

MISO Resource Adequacy

- Problem Statement: Merchant Gen will disappear under current MISO market rules & competitive retail load not participating in or contributing to planning capacity
  - *Traditional Utility* design system for 1 day in 10 year LOLE reliability standard
  - *Merchant's* will build when they forecast capacity prices equivalent to Net CONE
  - MISO footprint largely comprised of traditional utilities (retail deregulation and Merchant generators in Z4 & to lesser extent Z7)
  - MISO current Resource Adequacy construct relies upon local or state jurisdictional long-term planning processes
  - MISO conducts a prompt (2 month forward) single year auction
- Proposed Competitive Retail Solution – 3 Year Forward Auction with administratively set sloped demand curve



LRZ	Local Balancing Authorities
1	DPC, GRE, MDU, MP, NSP, OTP, SMP
2	ALTE,MGE,MIUP, UPPC, WEC, WPS
3	ALTW, MEC, MPW
4	AMIL, CWLP, SIPC
5	AMMO, CWLD
6	BREC, DUK(IN), HE, IPL, NIPSCO, SIGE
7	CONS, DECO
8	EAI
9	CLEC, EES, LAFA, LAGN, LEPA
10	EMI, SME

2016 OMS Survey

Transformation Challenges

Wind Energy – important to achieve clean energy goals

- Clean, Renewable and Efficient Energy Act (Public Act 295) of 2008
- $500 million invested in 345 kV transmission as platform for wind development
- Capable of 5000 MW integration
- Approx ..30% integration

Challenges:

- Zoning Ordinance challenges
- Generator Interconnection timing
- PTC phase out

Transformation Challenges

Distributed Generation

Distributed Generation (utility owned)

- Permitting Fossil Fuel Based (diesel, natural gas, turbines and recips)
  - What is considered aggregation verse individual projects
  - Emission dispersion challenges (size & height)
  - Proximity to load – Local Ambient issues

Distributed Generation (customer)

- Metering & Tariff requirements
  - Fair Metering rules for all customers
  - Tariff design for proper cost recovery of delivery network and other support services used by or needed to support DG operation

Distributed Generation (Clean sources) – Storage, CHP, Distributed Solar, Fuel Cells

- True operating behavior, life cycle costs and benefits understood

What is the path forward ?

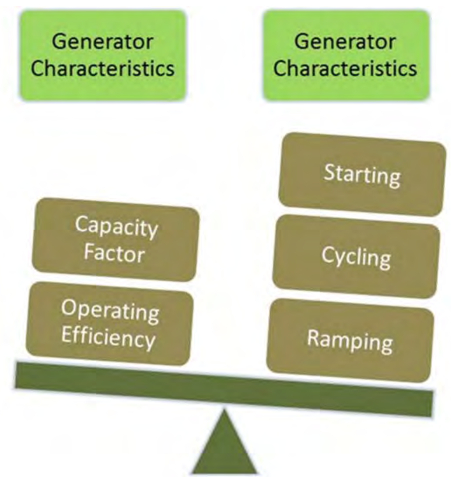
Future energy supply considerations

External Factors

- Growth in variable "weather dependent" electric generation (wind & solar)
- FERC Order 825 (June 16, 2016)
  - settling energy & op reserve transactions 5 minute intervals
  - shortage pricing alignment
- Large Base Load – Coal Retirement
- Information & Control Technology providing greater visibility into *downstream* network
- Proposed (tax credits for energy storage)…Energy Storage Tax Credit and Deployment Act of 2016 (Dem Senator out of New Mexico)
- Ancillary Service Markets

Action Plan

- Fast, responsive, smart electric generation



- Load Management
- Prescriptive energy efficiency
- Higher Cap Factor Energy still CCGT
- Build Natural Gas expertise

What is the path forward ?

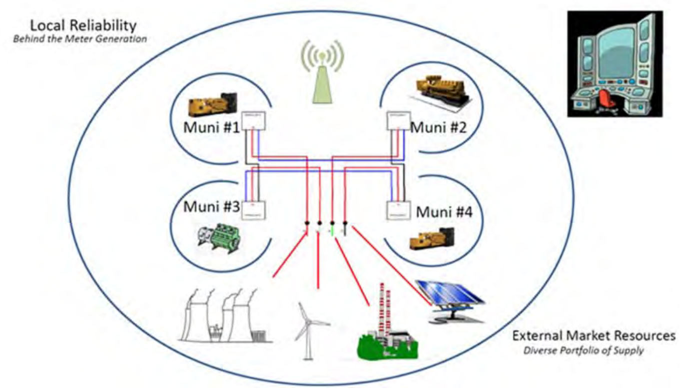
Future energy supply considerations

Internal Factors

- End-use customers want more renewable (2015 corporate PPA's for wind / solar in USA over 50% PPA market)
- Large current portfolio of behind the meter generation – centrally managed
- Local Control & Community Based Strategy
- Workforce skill alignment on distribution network side

Action Plan

- Solar – within Member Systems – scale and aggregate participation by all members
- Wind – Wholesale grid connected – scale matters
- Leverage Behind the Meter experience into more DER aligned infrastructure



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Final Perspective

- A power industry with increasing focus & investment in the Distributed Network is aligned with the **Municipal Utility** business model & financial profile (right sized)

- Electric Utilities as a group are best positioned to source, finance and optimize a growing Distributed Energy Resource future

- Economic efficiency is still currently favored by larger grid connected projects – JAA principles of pooling required (natural gas & wind)

- Transformation causing economic dislocation & resource constraints (market participants & regulatory bodies will need to find balanced solution)

- Environmental regulators need to educate on & harmonize with markets and technology

Questions?

Thank You for Your Time Today

Michigan Public Power Agency

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