DTE Energy®

Integrated Resource Planning Stakeholder Engagement Workshop

Workshop #2

September 27, 2018

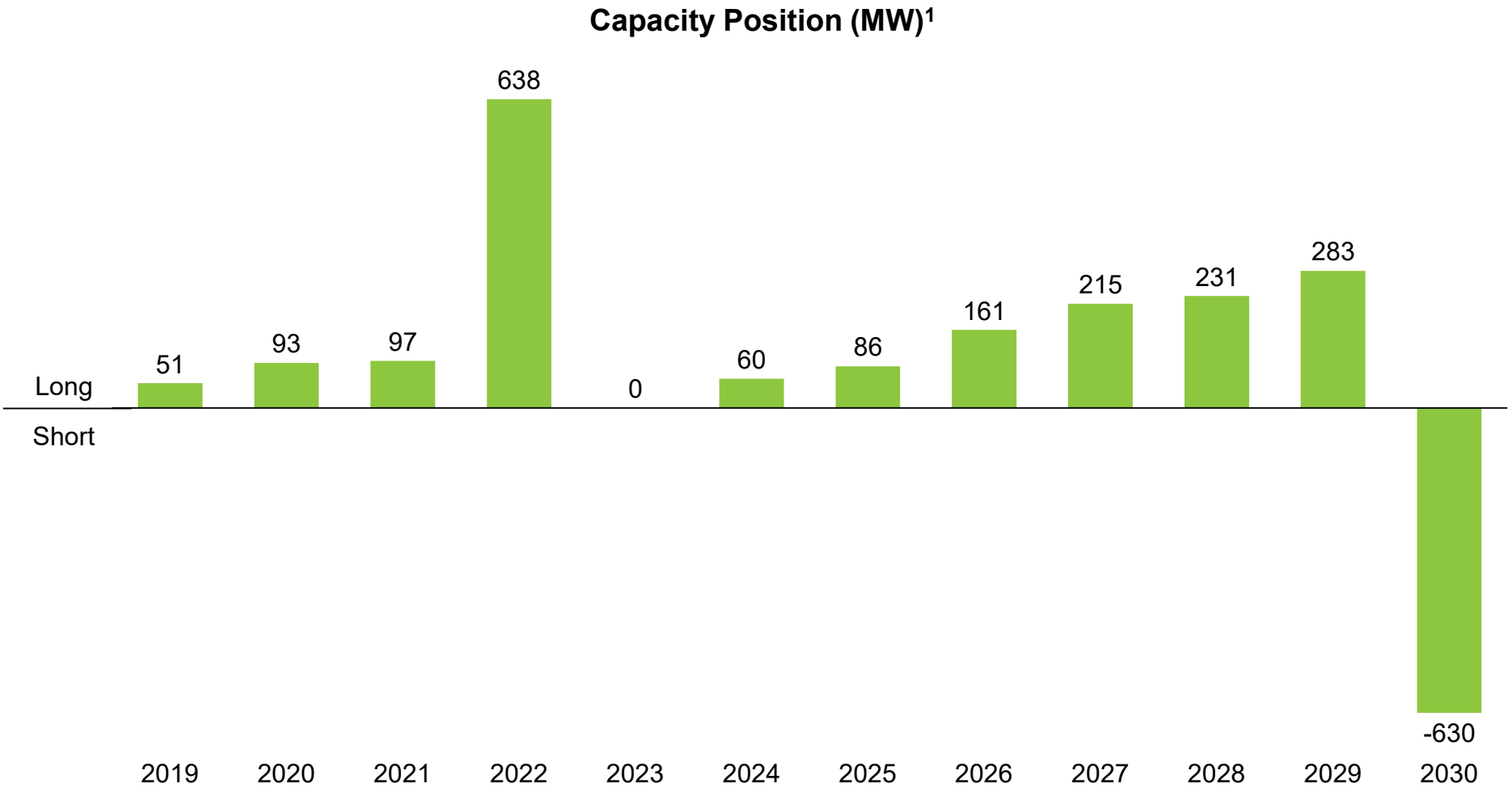
DTE Energy®

Welcome Remarks

Executive Summary

- The Michigan Public Service Commission (MPSC) integrated resource planning (IRP) filing requirements have outlined recommendations for performing public outreach prior to filing an IRP. As part of the MPSC IRP filing requirement in Public Act 341, participant engagement in the development of the IRP is strongly encouraged
- In the 12 months prior to an IRP filing, electric utilities are encouraged to host workshops with interested participants for input and to stay informed regarding:
  - The assumptions, scenarios, and sensitivities
  - The progress of the utility's IRP process
- This is the second of three Technical workshops for IRP stakeholders.
  - The first was held on June 11th; the third is planned for November 12th
  - There have also been two open houses to educate the public on the Company's planning process as well as provide an opportunity for public comments; a third open house is planned for October 23rd at the Wayne County Community College Detroit campus
- DTE will be filing an IRP on March 29, 2019

The starting point capacity position for the IRP shows that the DTE capacity position is long until 2030



1. Capacity position consistent with 2017 capacity demonstration. We plan to refresh the capacity positon prior to the March 2019 filing which will be consistent with the 2019 PSCR filing

Workshop agenda

- Introductions
  - Facilitators
  - Presenters

- The workshop will be broken into three parts:
  1. Presentation
  2. Questions
  3. Comments

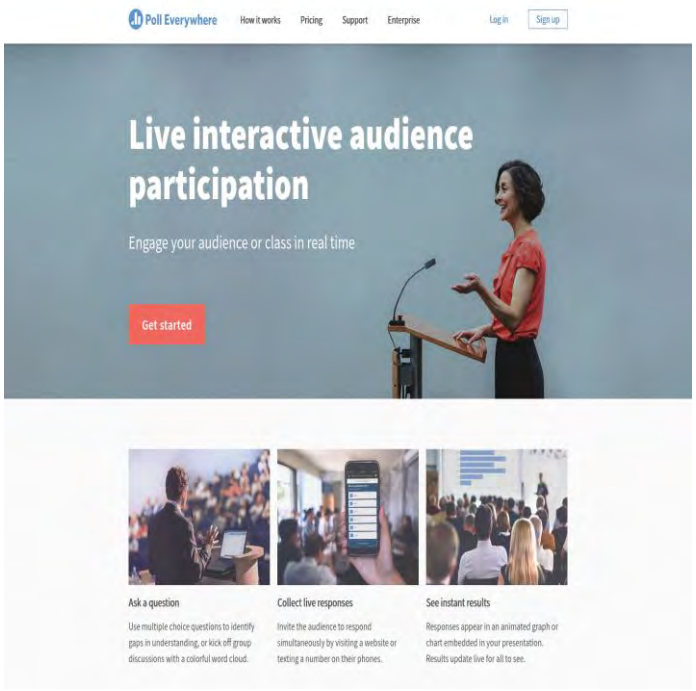
Safety

- Evacuations – Beacon Park / Navitas
- Call 313-235-9113 – Volunteer?
- CPR/First Aid - Volunteer?

Note: If you need to leave early, please notify one of the DTE Personnel so you can be checked out at the security

A new process for questions and comments will be utilized

- Text **DTEQC to 22333** for questions or comments as they arise during the presentation. (**Please limit questions and comments to 1 per text)**
- If using laptop or tablet respond using **pollev.com/dteqc** (**Please limit questions and comments to 1 at a time)**
- A DTE subject matter expert (SME) may answer the questions as we work through the topics, or we will address them at the end
- At the end of the formal presentation we will take a break where additional questions can be asked
- The moderator will read the questions and a DTE SME will provide a response; comments will also be read
- This process allows us to document the questions asked, and maintain the flow of the formal presentation



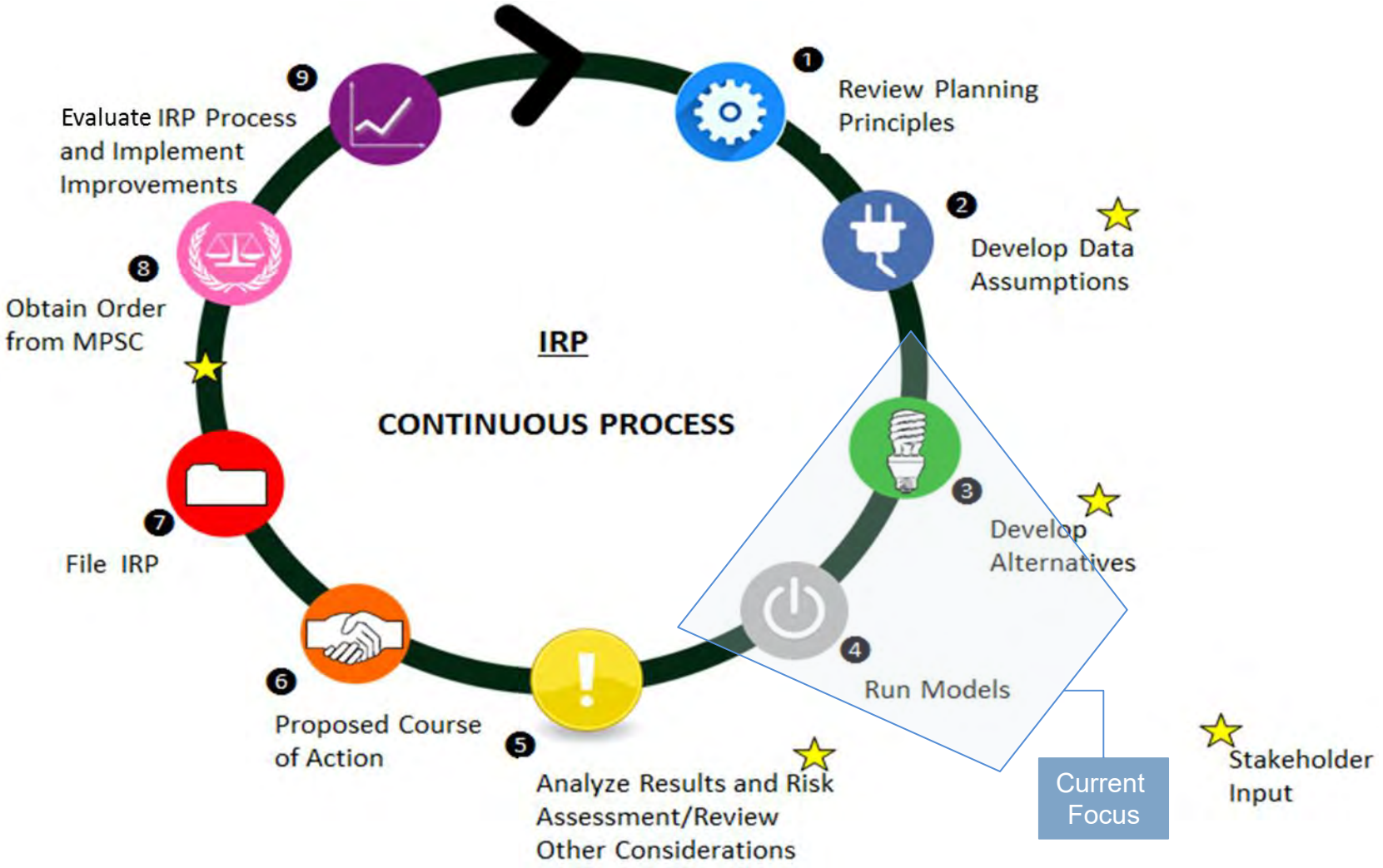
Presentation agenda

- **Technical Conference 1 Recap**
- Technology Screening Process
- Load Forecast
- Retirement Analysis Approach
- PACE Forecasts
- Next Steps

First stakeholder technical conference highlights

- Hosted on June 11, 2018 in Bad Axe, MI
- Topics included:
  - Objectives of the 2019 Integrated Resource Plan (IRP)
  - Process improvements from the IRP filed in 2017
  - Highlight resource alternatives cost assumptions and public sources
  - Scenarios and sensitivities to be considered
  - Process for stakeholders to submit sensitivities

The IRP process contains nine key steps to ensure the completion of a comprehensive plan



Four scenarios are currently planned; three specified scenarios from the MPSC modeling requirements as well as the DTE Reference Scenario

Scenario	Description
Business as Usual	• Existing generation fleet largely unchanged • Units granted regulatory approval are modeled • Demand and energy remain at low loads • Thermal and nuclear generation retirements in the modeling footprint are driven by max age, public announcements, or economics
Emerging Technology	• Technological advancement and economies of scale result in a 35% reduction in cost for demand response (DR), EWR, storage, and solar • Retirements of all coal units except the most efficient should be considered
Environmental Policy	• Carbon regulations targeting a 30% reduction in 2030 • Coal units primarily will retire based on carbon emissions, then economics • Lower renewable costs by 35%
DTE Reference	• Utilize DTE gas forecast • Incorporate DTE CO_2 targets • Current retirement plan as starting point

The Business As Usual (BAU) scenario is one of the required scenarios

DTE Energy

As of 9/27/18

	BAU	
	Starting point of parameters	**Sensitivities**
Load Growth	DTE forecast	High, 50% Choice return
Energy Waste Reduction	1.5% per year – 2018 potential study	2.5% per year
Capital Cost	Public sources	
Renewable	35% Clean Energy Goal (Renewable & EWR)	
Gas Price	EIA forecast	200% of EIA forecast
Retirement	DTE announced	Adjust tier 2 early (TBD)
Demand Response	2017 State of MI Potential Study	
Available Replacement	All technologies	Combustion Turbine (CT) only
IRP Footprint Modeled[1]	DTE service area	Zone 7

1. Scenario markets will be optimized across the entire US with PACE. IRP footprint refers to DTE IRP modeling process

The second required scenario is the Emerging Technology (ET) scenario

DTE Energy

As of 9/27/18

	ET	
	Starting point of parameters	**Sensitivities**
Load Growth	DTE forecast	High
Energy Waste Reduction	1.5% per year – 2018 potential study	2.5% per year
Capital Cost	Public Sources; Decrease solar / battery / EWR / DR / CHP costs by 35%, decrease wind by 17.5%	
Renewable	35% Clean Energy Goal (renewable & EWR)	25% renewable by 2030
Gas Price	EIA forecast	200%
Retirement	DTE announced	Adjust tier 2 early
Demand Response	2017 State of MI Potential Study	
Available Replacement		Defer second CCGT with EWR, DR, and renewables
IRP Footprint Modeled[1]	DTE service area	Zone 7

1. Scenario markets will be optimized across the entire US with PACE. IRP footprint refers to DTE IRP modeling process

The last required scenario is the Environmental Policy (EP) scenario

DTE Energy

As of 9/27/18

	EP	
	Starting point of parameters	**Sensitivities**
Load Growth	DTE forecast	High
Energy Waste Reduction	1.5% per year – 2018 potential study	2.5% per year
Capital Cost	Public Sources; Decrease solar / battery / EWR / wind costs by 35%	
Renewable	35% Clean Energy Goal (Renewable & EWR)	50% carbon reduction by 2030
Gas Price	EIA forecast	200%
Retirement	DTE announced	Adjust tier 2 early (TBD)
Demand Response	2017 State of MI Potential Study	
Carbon Price	Price determined by modeling to achieve 30% carbon reduction by 2030 ($0/Ton, all years)	Price determined by modeling to achieve 50% carbon reduction by 2030 ($20/Ton in 2030)
IRP Footprint Modeled[1]	DTE service area	Zone 7

1. Scenario markets will be optimized across the entire US with PACE. IRP footprint refers to DTE IRP modeling process

Planned DTE Reference (DTE Ref) Scenario and Sensitivities

As of 9/27/18

	DTE Ref[1]	
	Starting point of parameters	**Sensitivities**
Load Growth	DTE forecast	High, High Electric Vehicle Penetration
Energy Waste Reduction	1.5% per year – 2018 potential study	1.75%, 2.0%, 2.25%, 2.5%
Capital Cost	Public sources	DTE CCGT cost
Renewable	50% Clean Energy Goal (renewable & EWR)	
Gas Price	DTE Reference case	
Retirement	DTE announced	BR retire 2025, 2026
Demand Response	DTE Current Plan	Full amount available from 2017 State of MI Potential Study (low case)
Distributed Renewables	PURPA Renewed	+300 MW
Carbon Price	$5/ton in 2025 up to $10/ton in 2040 (real)	
IRP Footprint Modeled[2]	DTE Service area	Zone 7

1. The DTE Reference Case is subject to change
2. Scenario Markets will be optimized across the entire US with PACE. IRP footprint refers to DTE IRP modeling process

The following sensitivities are proposed by external stakeholders on the DTE Reference and the Business as Usual scenarios

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	Starting point (parameter in regular scenario)	Sensitivity 1	Sensitivity 2	Sensitivity 4
Scenario to run Sensitivity on		DTE Reference		BAU
Load Growth	DTE forecast			Increase retail open access from 10% of eligible customers to 25%
CO2 price	$5/ton in 2025 up to $10/ton in 2040 (real)	Increased CO2 Price[1]: $30/ton in 2023 and escalate out years		
Retirement Plan	DTE announced plan		Retire Belle River unit 1 on Dec 31, 2025 and Belle River unit 2 on Dec 31, 2026	

1. This sensitivity was requested by three different stakeholders

Another sensitivity was proposed by an external stakeholder that includes multiple changes on DTE Reference Scenario

DTE Energy

As of 9/27/18

	Starting point (parameter in regular scenario)	Sensitivity 3
Load Growth	DTE forecast	24% electric vehicles sales by 2030
Energy Waste Reduction	1.5% per year – 2018 potential study	2%
Capital Cost	Public sources	DTE CCGT cost
Renewable	50% Clean Energy Goal (renewable & EWR)	50% Clean Energy Goal with 35% renewable by 2030
DR	DTE Current Plan	Full amount from 2017 state of MI Potential Study
Distributed Renewables	PURPA renewed	450 MW
VVO-CVR[1]		150 MW of CVR by 2028

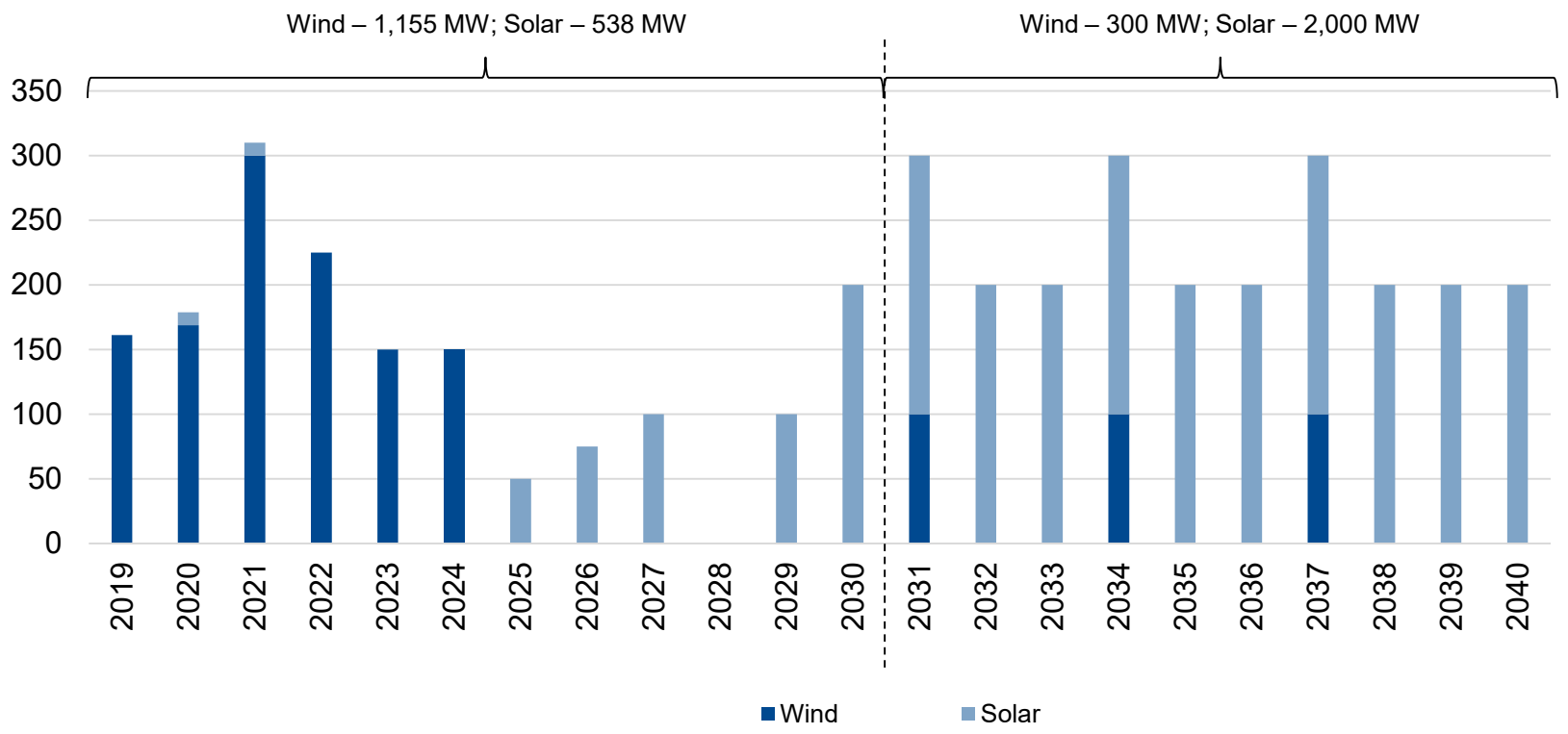
1. VVO-CVR = Volt Var Optimization-Conservation Voltage Reduction

The starting point for renewable energy, in all cases, is consistent with the filed renewable energy plan, 50% Clean Energy goal and 80% CO_2 reduction by 2050

DTE Energy

As of 9/27/18

Assumed Renewable Energy Build Plan[1] (MW)



1. Assumes all purchased power agreements and PURPA contracts are extended

The starting point for Energy Waste Reduction in all cases will be 1.50% annually throughout the study period

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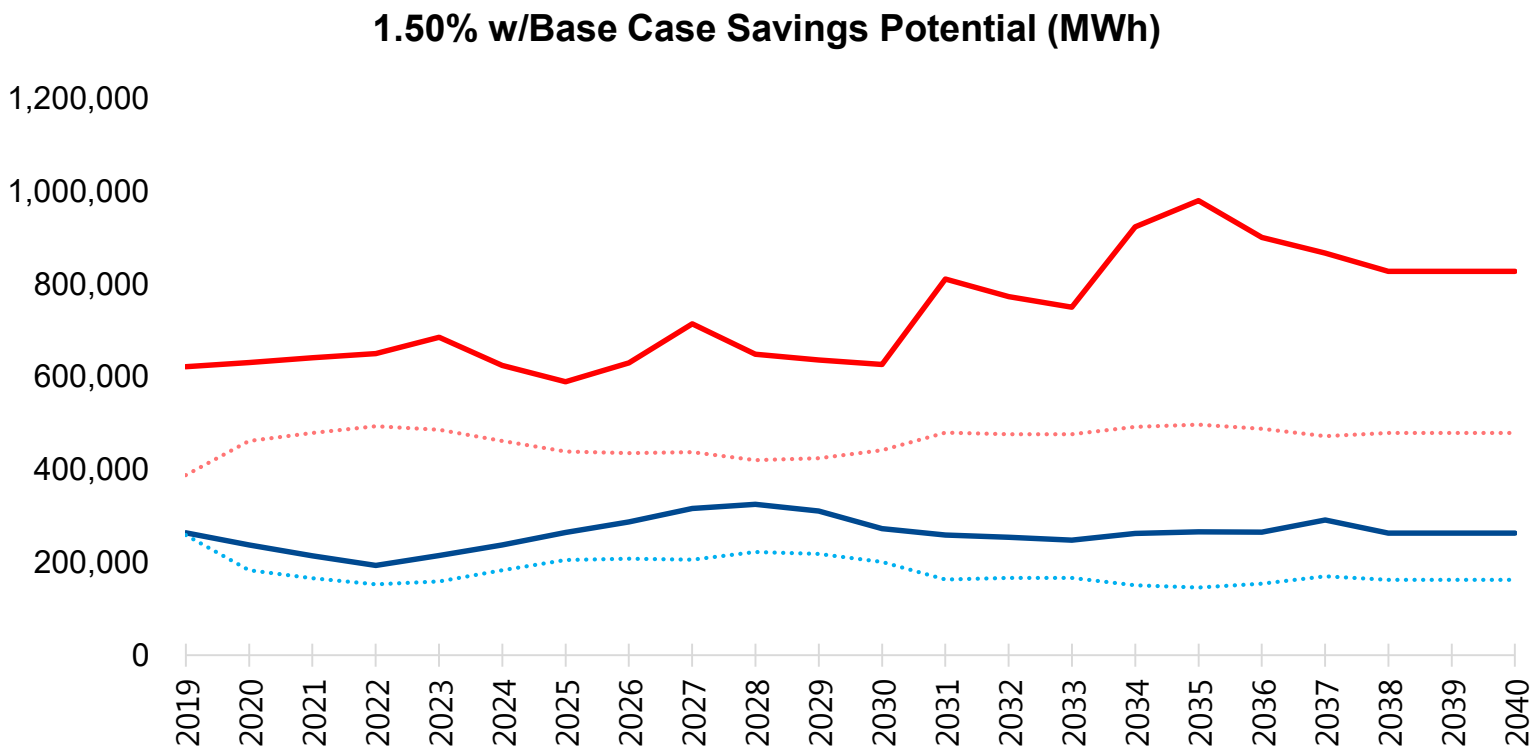

The updated potential study shows that a 1.5% EWR level can be maintained annually throughout the study period

The starting point for demand response in all cases is consistent with the forecast included in the 2017 capacity demonstration filing

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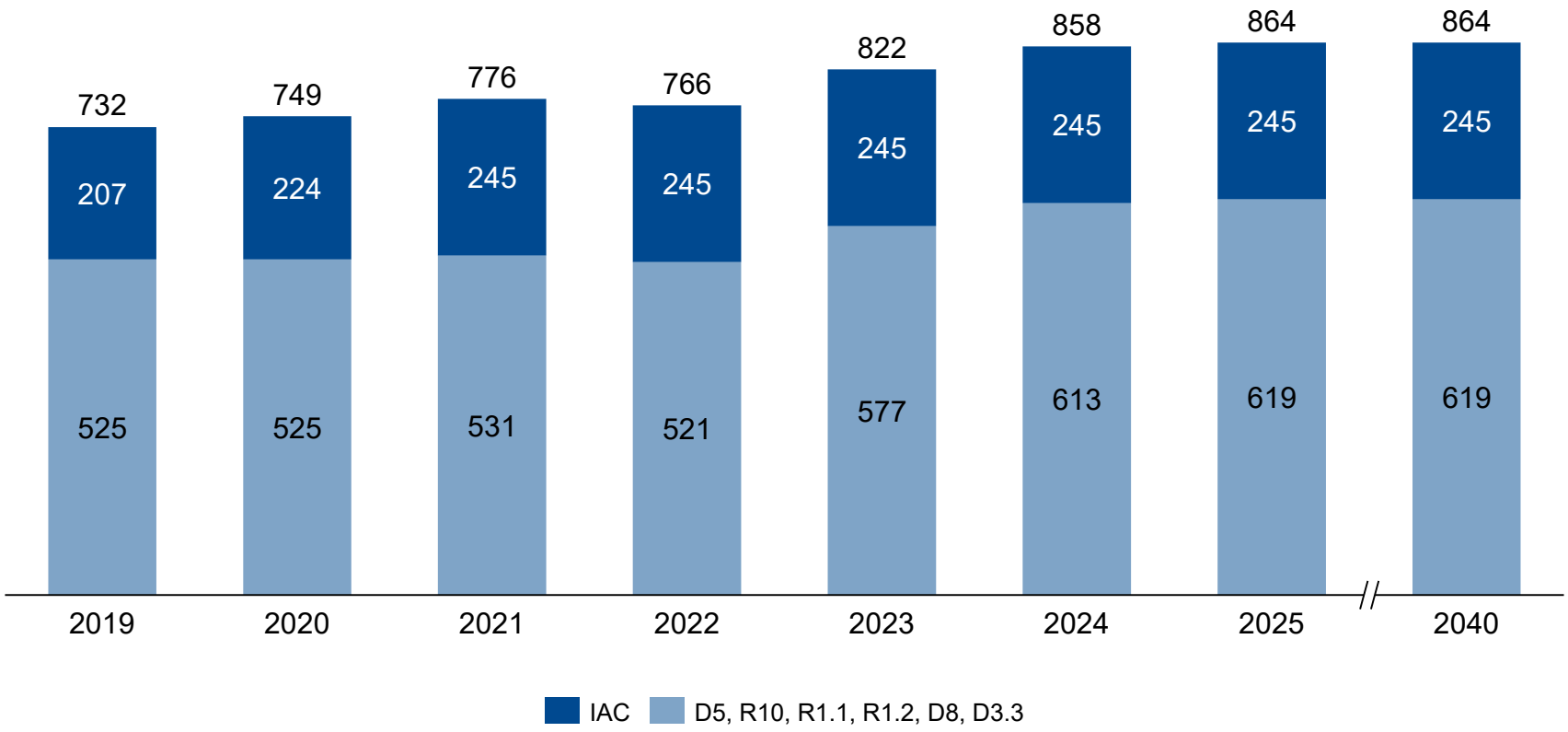
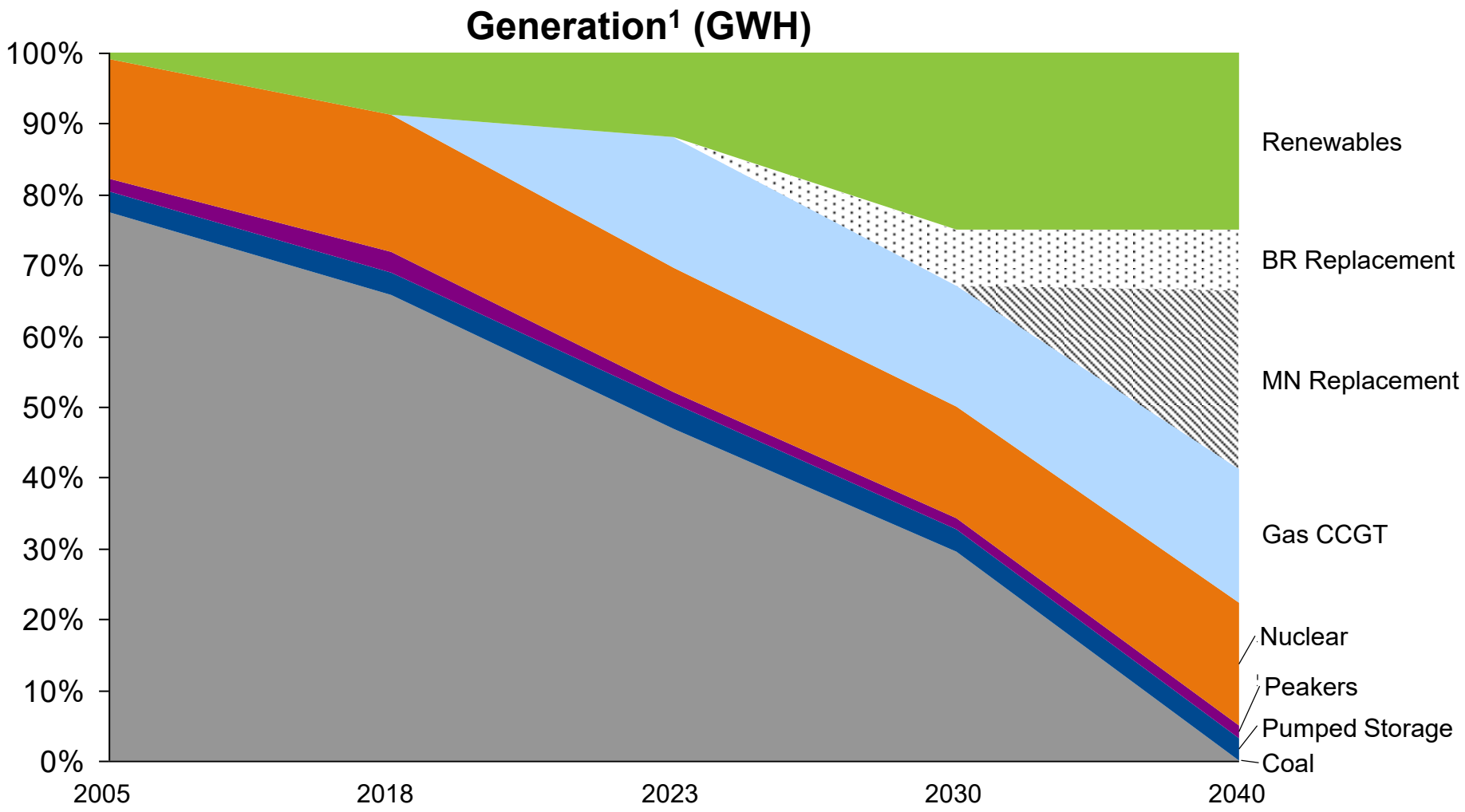
Total Demand Response Programs
(MW Adjusted for UCAP)



1. DR levels consistent with 2017 capacity demonstration. We plan to refresh the DR levels prior to the March 2019 filing which will be consistent with the 2019 PSCR filing

Fleet Fuel Mix for the IRP Starting point



1. Includes RECs; total GWH adjusted for RECs

Presentation agenda

- Technical Conference 1 Recap
- **Technology Screening Process**
- Load Forecast
- Retirement Analysis Approach
- PACE Forecasts
- Next Steps

Overview of IRP Screening Process

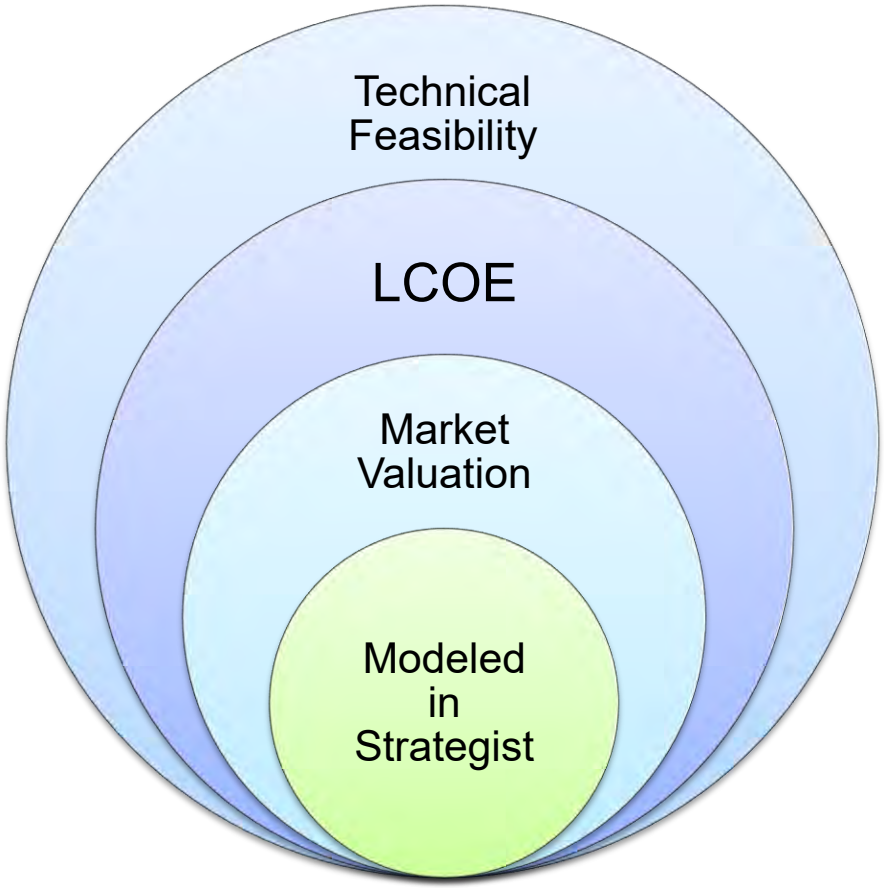
- Screening process will reduce the number of alternative technologies that will be modeled
- Reduce time spent on building models and running them
  - The Strategist program will create a decision tree that grows exponentially over time
  - Too many alternatives can lead to longer modeling run times and elimination of different options

	Unconstrained	Reduce # of Alternatives
# of Alternatives	50	10
Year 1	50	10
Year 2	2,500	100
Year 3	125,000	1,000
Year 4	6,250,000	10,000
Year 5	312,500,000	100,000

- Focus time on feasible options
- Currently modeling blocks of 50 MW solar and 150 MW wind

The Screening Process used by DTE Electric consists of four steps

- Step 1: Screen out technologies based on technical feasibility
- Step 2: Screen out based on high levelized cost of energy (LCOE); not all technologies use LCOE
- Step 3: Run technologies through a market valuation in Strategist. Compute a benefit-cost ratio
- Step 4: Run Strategist optimization model with the remaining technologies



Technology Alternatives considered in step 1: Technical Feasibility

				Scenarios		
				DTE Reference and BAU	ET	EP
Unit Type	**Abv.**	**Technology Source**	**Source Year**	**Overnight Costs ($/kW)[1]**		
Combined Cycles						
Advanced Combined Cycle	AdvCC	EIA	2018	1133	No Change	
Combined Cycle with Carbon Capture Sequestration	CCwCCS	EIA	2018	1981	No Change	
DTE Combined Cycle	DTECC	DTE		860	No Change	
Combustion Turbines						
Advanced Combustion Turbine	AdvCT	EIA	2018	663	No Change	
Combined Heat and Power	CHP	EPA	2017	1686	1096	
Micro Turbine	MT	EPA	2017	2776	No Change	
RICE (5 units at 17MW ea.)	RICE	EIA	2016	1400	No Change	
Renewables						
Wind	Wind	NREL	2018	1712	1412	1113
Solar PV-1 axis tracking	SolarTr	NREL	2018	1434	932	932
Solar PV-fixed tilt	SolarFix	NREL	2018	1325	861	861
Biogas	Bio	NREL	2017	3700	No Change	3700
Base Load						
Coal with 90% CCS	PCwCCS	EIA	2018	5250	No Change	
Advanced Nuclear	AdvNuc	EIA	2018	5266	No Change	
IGCC with Carbon Capture Sequestration	IGCCwCCS	EPRI	2017	5214	No Change	
Screened out on Feasibility						
Hydropower		NREL	2017	6040		
Geothermal		NREL	2017	4648		
Solar - Thermal		NREL	2017	6893		
Separate Screening Process						
EWR						
DR						
Storage Options						

To be Screened in step #2: LCOE

Screened out on feasibility

Different screening process

1. All cost are converted to 2018$, Solar cost represented in $/kW$_{AC}$

There was a wide range of large-scale energy storage technologies screened in Step 1: Technical feasibility screen

	Description	Selected Advantages	Selected Disadvantages
Battery Storage	• Uses electricity to store chemical energy through redox reactions. Electricity is generated when the reaction is reversed.	• *See following pages*	• *See following pages*
Pumped Hydro	• Uses electricity to pump water to a higher elevation. When required, water is released to drive a hydroelectric turbine.	• Mature technology • High efficiency (75%-85%) • Large potential for nameplate capacity (~GW scale)	• Limited by geography • Long lead-time for siting and approval
Compressed Air	• Uses electricity to compress air into confined spaces. When required, air is released to drive the compressor of a natural gas turbine.	• Mature technology • Large potential for nameplate capacity (~100 MW scale)	• Limited by geology • Limited US deployments • Low efficiency (25%-55%)
Other Storage	• Flywheel, thermal storage, other emerging storage technologies	• Niche applications	• Short duration, unproven technologies

The geographical and geological constraints of pumped hydro and compressed air raise questions around their feasibility in Michigan, so the analysis for this integrated resource plan will focus on battery storage technologies

There is also a wide range of battery storage technologies either deployed or under development

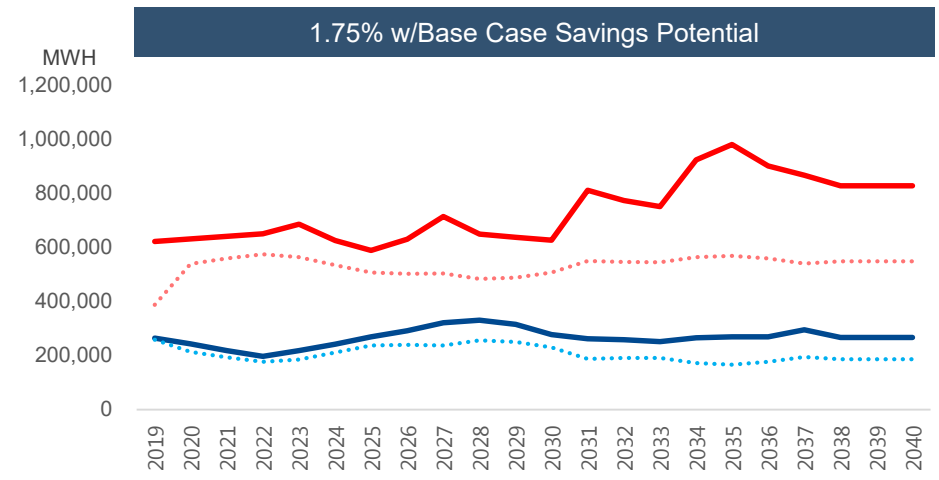
	Cycle Life[2]	Size Range[1]	Maturity[1]	Cost[3]	Comments
Lead Acid	~2000-~4500 cycles	5kW – 2MW	Mature	$500/kWh	• Mature technology, but low power and energy density limits system size • Poor cycling performance also reduces attractiveness for many grid applications
Sodium	~2500-~4500 cycles	1MW – 100MW+	Mature	$400-500/kWh	• Commercially available technology • Poor cycling capability and potential flammability issues reduce attractiveness
Flow Batteries	~10,000-~13,000 cycles	25kW – 100MW+	Emerging	$350/kWh	• Potentially promising technology, particularly for longer-duration applications • Limited level of deployments and operating experience to-date
Lithium Ion	~6,000 cycles	5kW – 100MW+	Mature	$200/kWh	• Current market leader in battery storage deployments • Applications in automotive and electronics industries have driven continued technology improvements

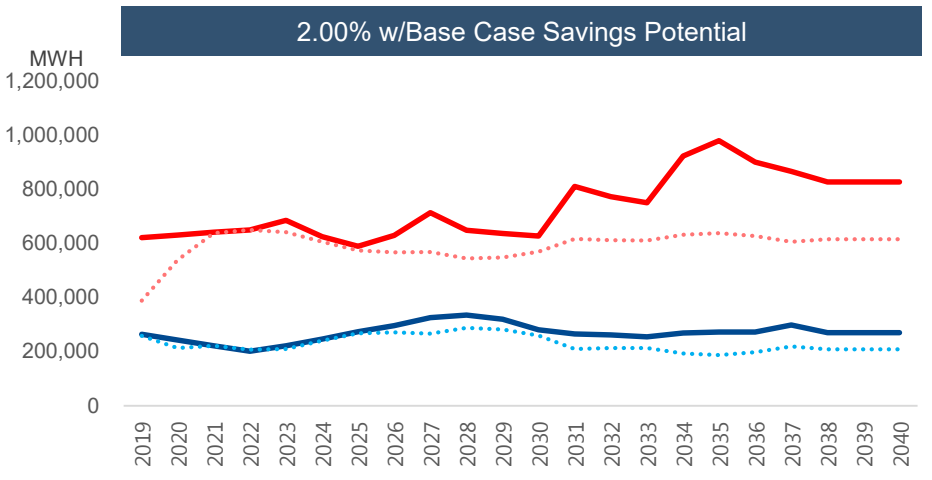
Most Preferable | Moderately Preferable | Least Preferable

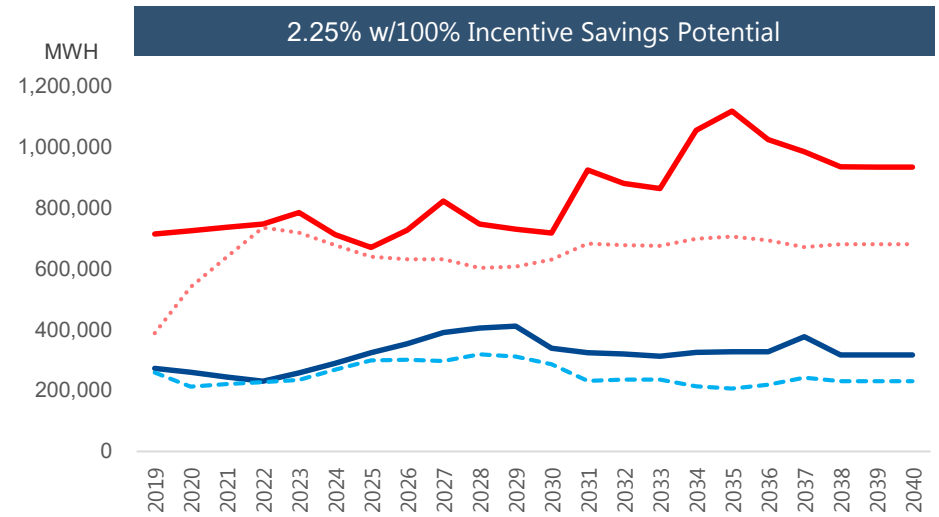
For the purposes of this integrated resource plan, we have chosen to evaluate lithium-ion as our battery storage technology

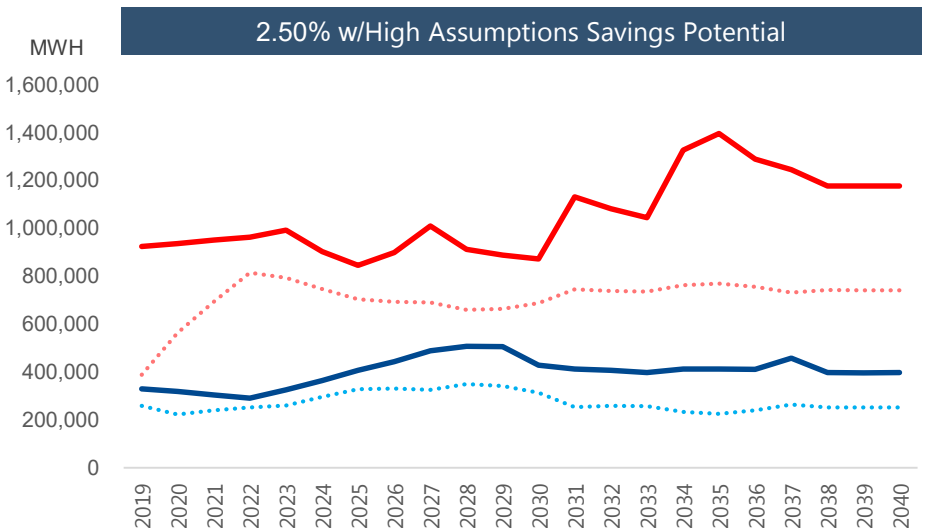
1. Source: Lazard *Levelized Cost of Storage 3.0* (size range and maturity);
2. B. Zakeri & S. Syri *Electrical energy storage systems: A comparative life cycle cost analysis* (non-lithium-ion cycle life); OEM brochures (lithium-ion cycle life)
3. Source for cost: Navigant Research (via International Renewable Energy Association via EPRI), Lazard *Levelized Cost of Storage 3.0*

EWR programs are screened by the EWR group and then grouped into levels from 1.5% up to 2.5% annually to be modeled as IRP sensitivities



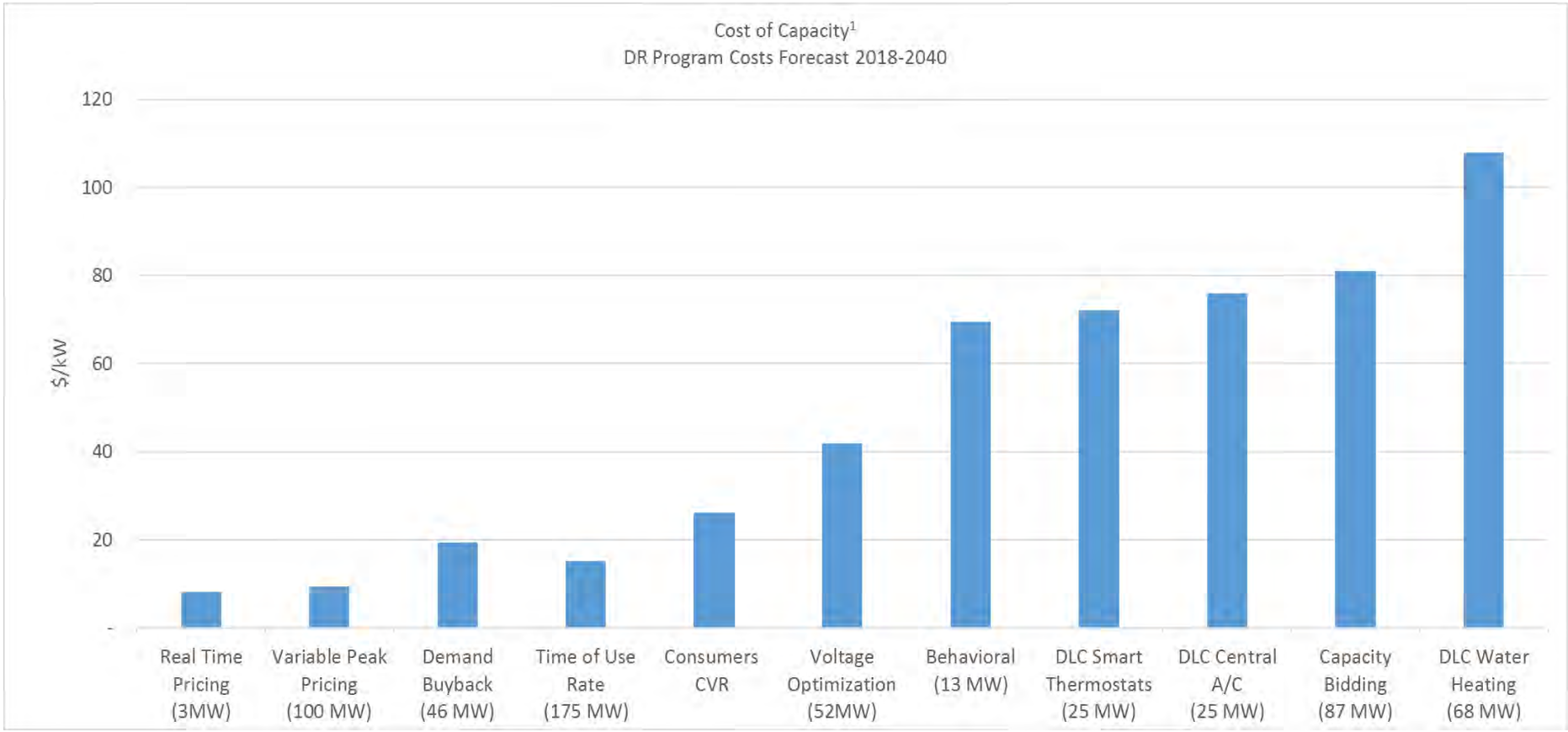






C&I Savings Potential
Residential Savings Potential
C&I Savings Target
Residential Savings Target

DR programs from the Statewide Study are screened in terms of capacity cost ($/kW)



1. DR Programs potential and estimated levelized cost of capacity are based on the 2017 Statewide Potential Study

The second screening step is the LCOE

- Compares different methods of electricity generation on a consistent basis
- Average total cost to build and operate a power-generating asset over its lifetime divided by the total energy output of the asset over that lifetime

Shortcomings of LCOE as standalone screening tool

- Useful to compare like technologies to each other i.e. baseload, non-dispatchable, peaking etc. to settle on the best alternative in a category but not useful to compare peaking to baseload etc.
- Capacity factor is an input and has a large impact on LCOE – may not be known
- LCOE calculation does not include ramping, start up costs, dispatchability, and capacity values
- The LCOE is a cost based value only. There is no accounting for hourly market impacts in the energy or capacity markets, which are captured in the third screening step
- Inaccurate to compare EWR, DR and storage technologies using LCOE because of inherent differences in characteristics of those technologies. They are much better suited for a cost/benefit approach

Step 3: Market Valuation of Alternatives:
Captures the costs of each alternative as well as the benefits; the results are expressed as a ratio

LCOE Assumptions

- Scenario Changes from DTE Reference
  - Gas prices (EIA and 200% EIA)
  - CO2 prices (Currently none for BAU, ET and EP)
  - 35% reduction of solar capital cost reduction in EP and ET
  - 17.5% reduction of wind capital cost in ET and 35% in EP
- All technologies are in service starting in 2024 for LCOE
- Assumed Wind Production Tax Credit is $10.6/MWh (40% PTC)[1]
- Assumed Solar Investment Tax Credit is 30% (amortized over life of the asset)[1]

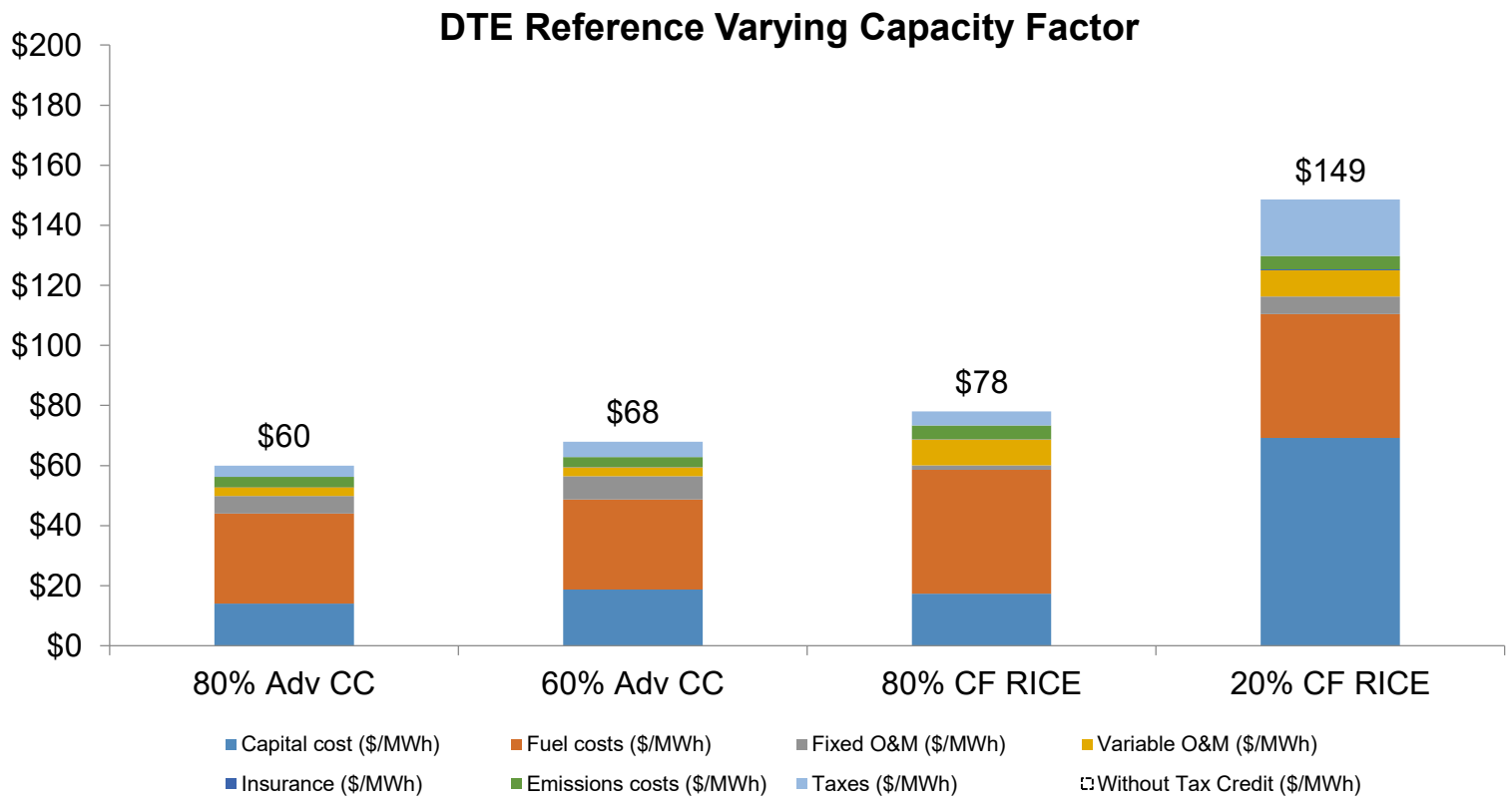
- Technology Assumptions

Technology	Capacity Factor % (CF)	Economic/Useful Life year
AdvCC	80%	30
CCwCCS	80%	30
DTECC	80%	30
AdvCT	17%	30
CHP	93%	30
MT	95%	20
RICE	80% / 17%	30
Wind	33%	30
SolarTr	23%	30
SolarFix	19%	30
Bio	83%	25
PCwCCS	80%	40
AdvNuc	90%	40
IGCCwCCS	80%	30

1. The LCOE model assumes the resource is generating on 1/1/24; therefore, we assumed wind and solar would technically be in service by 12/31/23 to capture the federal tax credits

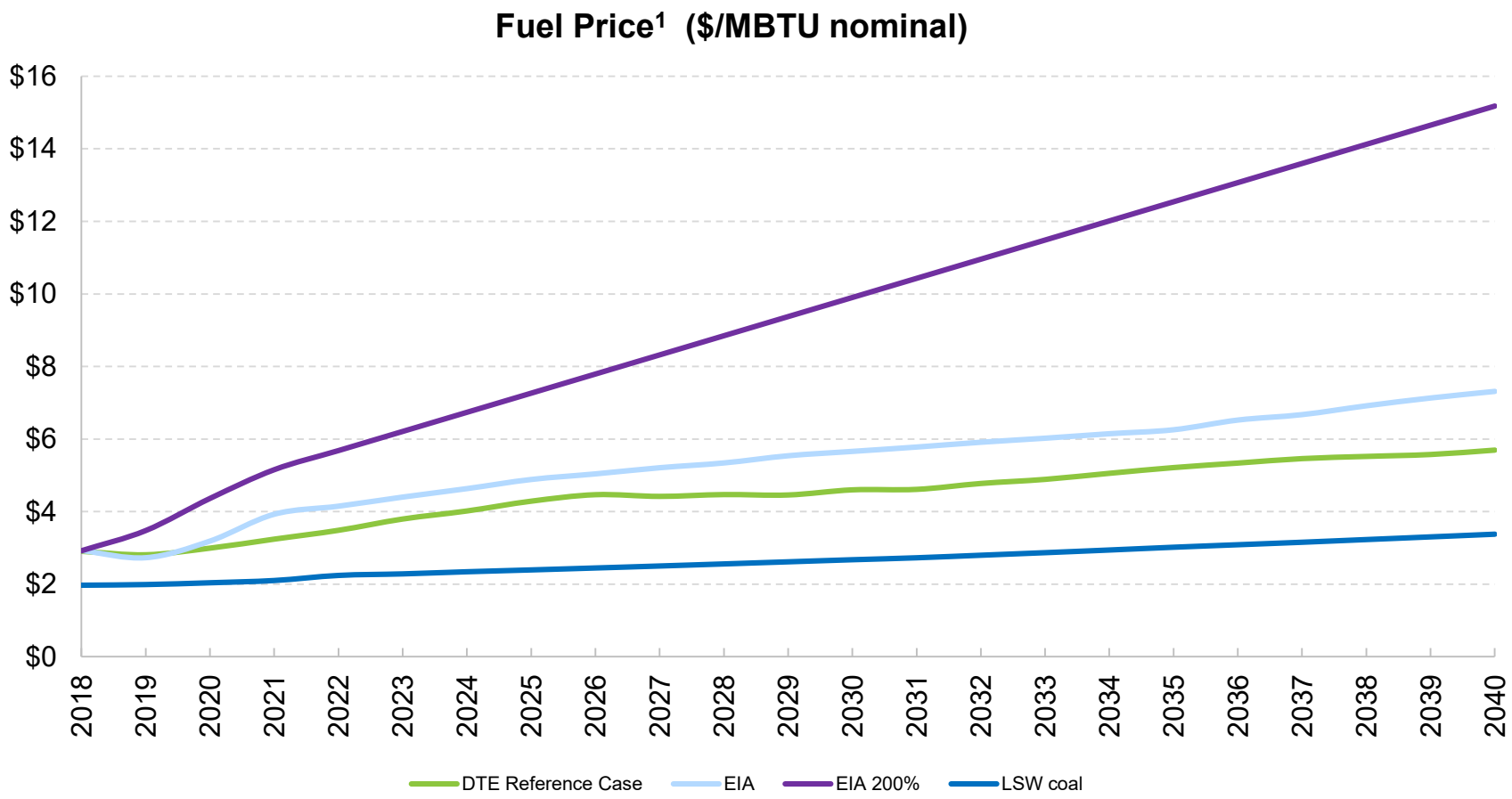
LCOE – Varying Capacity Factors (CF) Example

As of 9/27/18



Values expressed in terms of dollars per MWh. As the size of the plant or its ability to run decrease, the LCOE increases

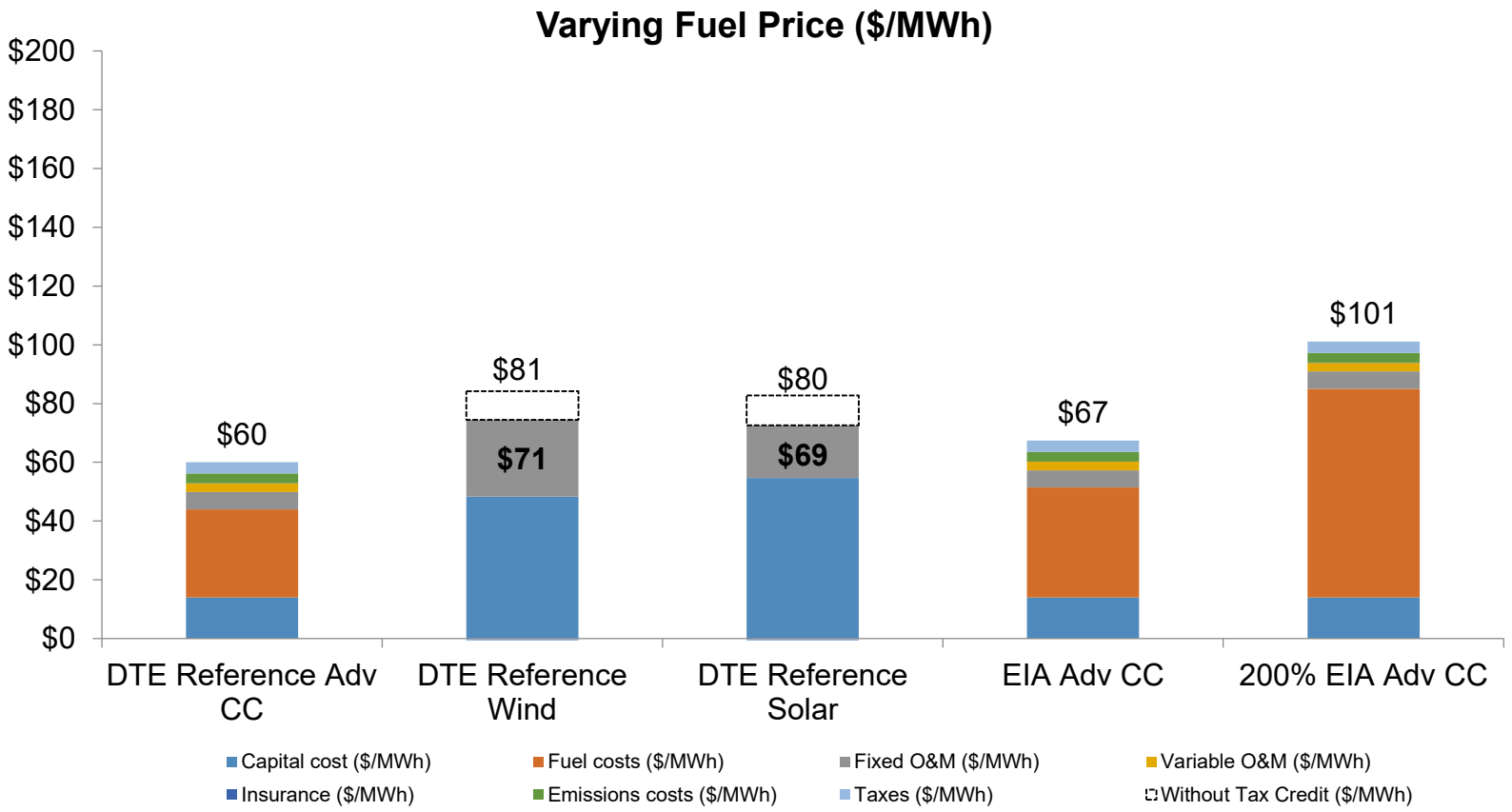
A large gas price range has been modeled as specified by the IRP Requirements



1. Gas at Henry Hub, coal at Monroe PP

LCOE – Varying Fuel Price Example

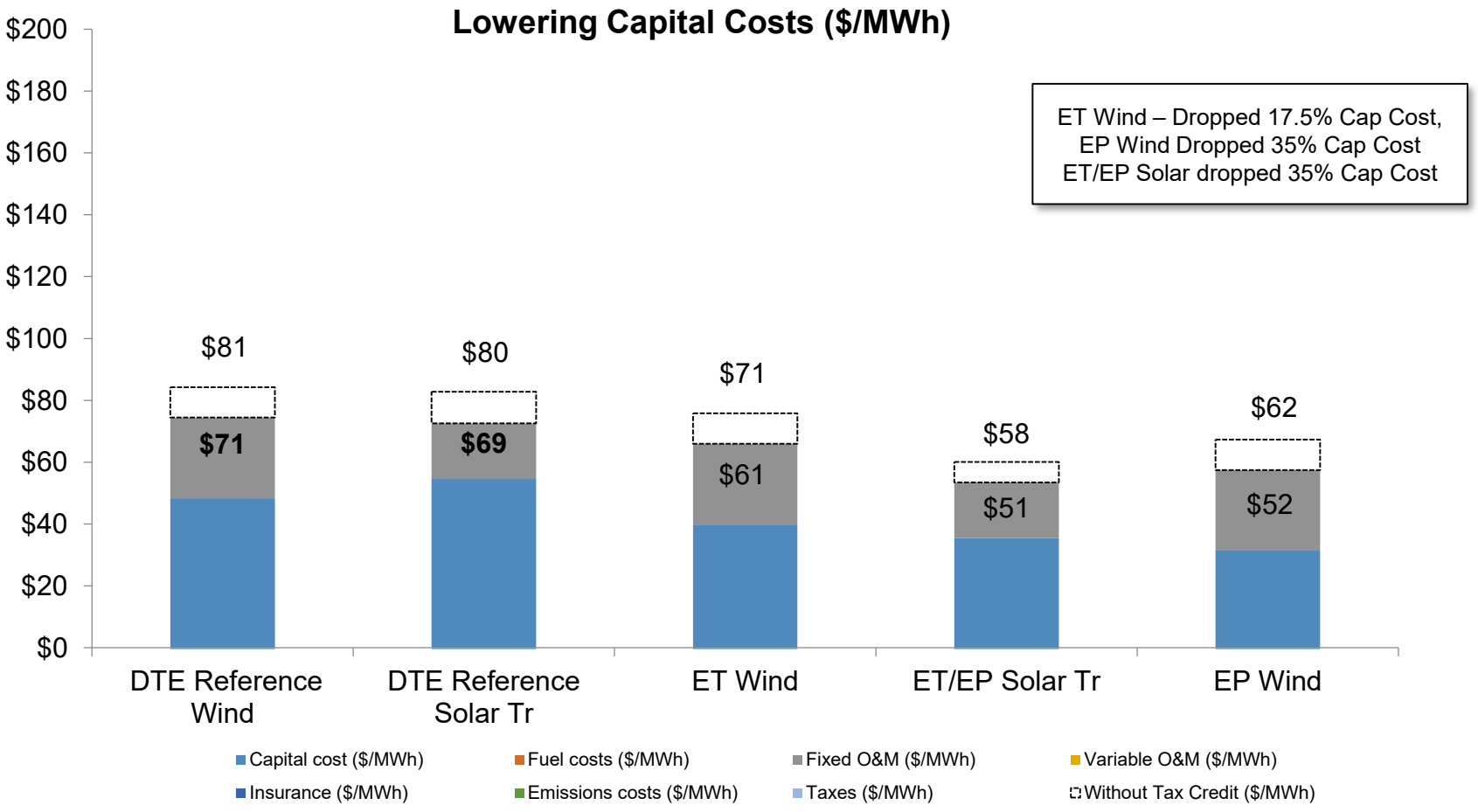
As of 9/27/18



Adv CC all have the same CO_2 price for comparison purposes

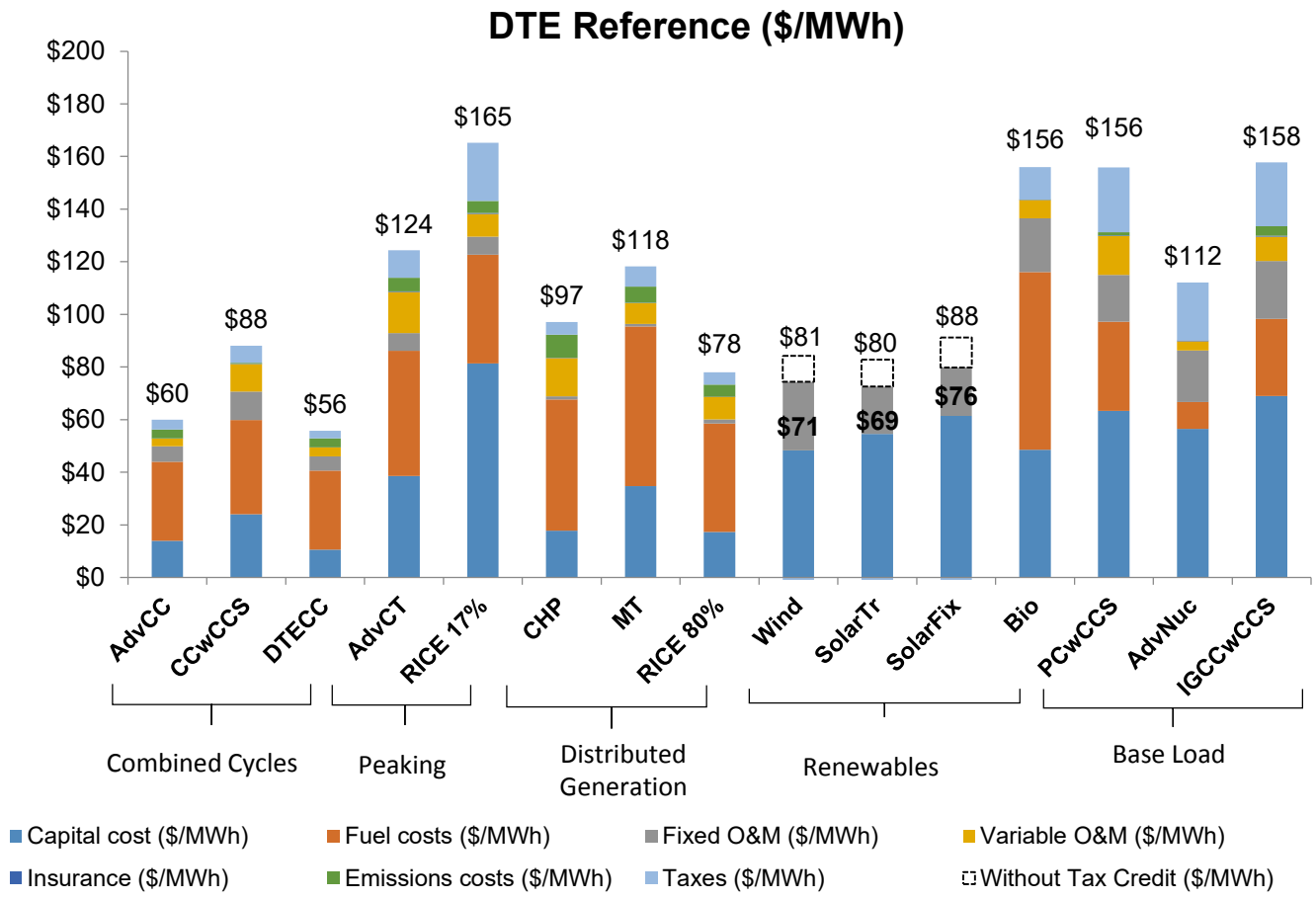
LCOE – Lowering Capital Costs Example

As of 9/27/18



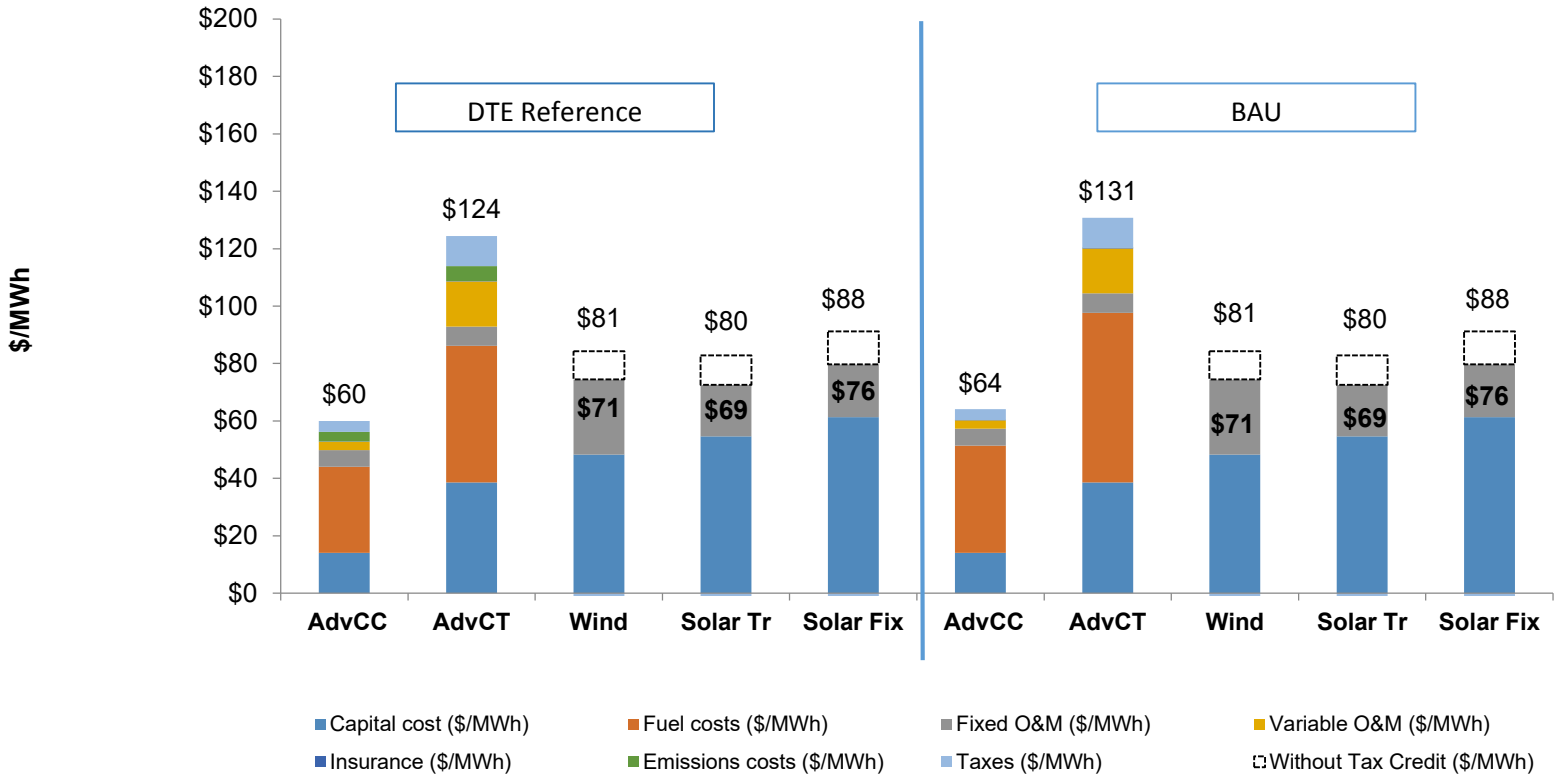
LCOE – DTE Reference

As of 9/27/18



LCOE – BAU: 100% EIA Fuel

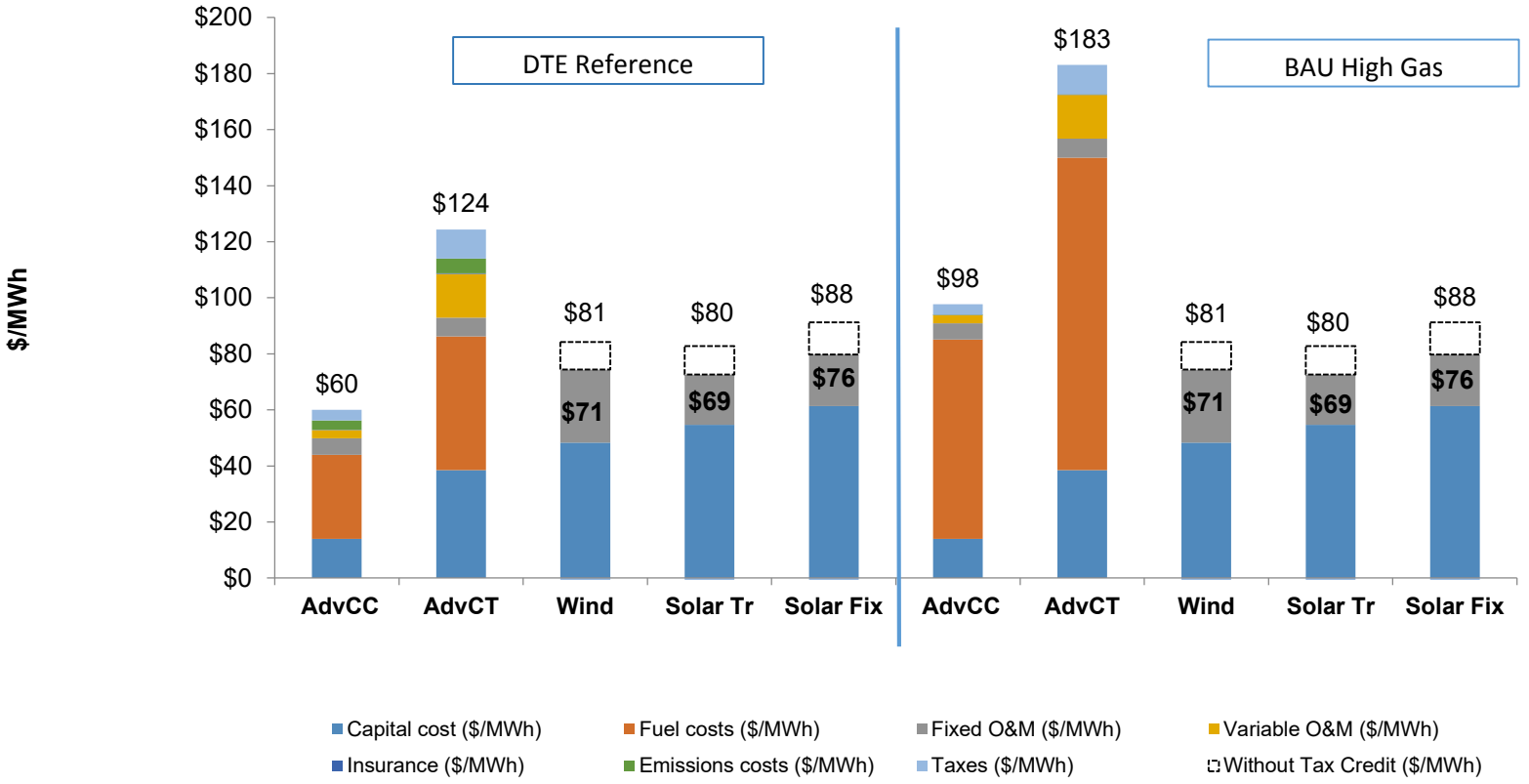
As of 9/27/18



1. Slight difference in gas technology due to gas prices from DTE vs EIA, and no CO_2 price in BAU
2. No change in Renewables

LCOE – BAU High Gas: 200% EIA Fuel

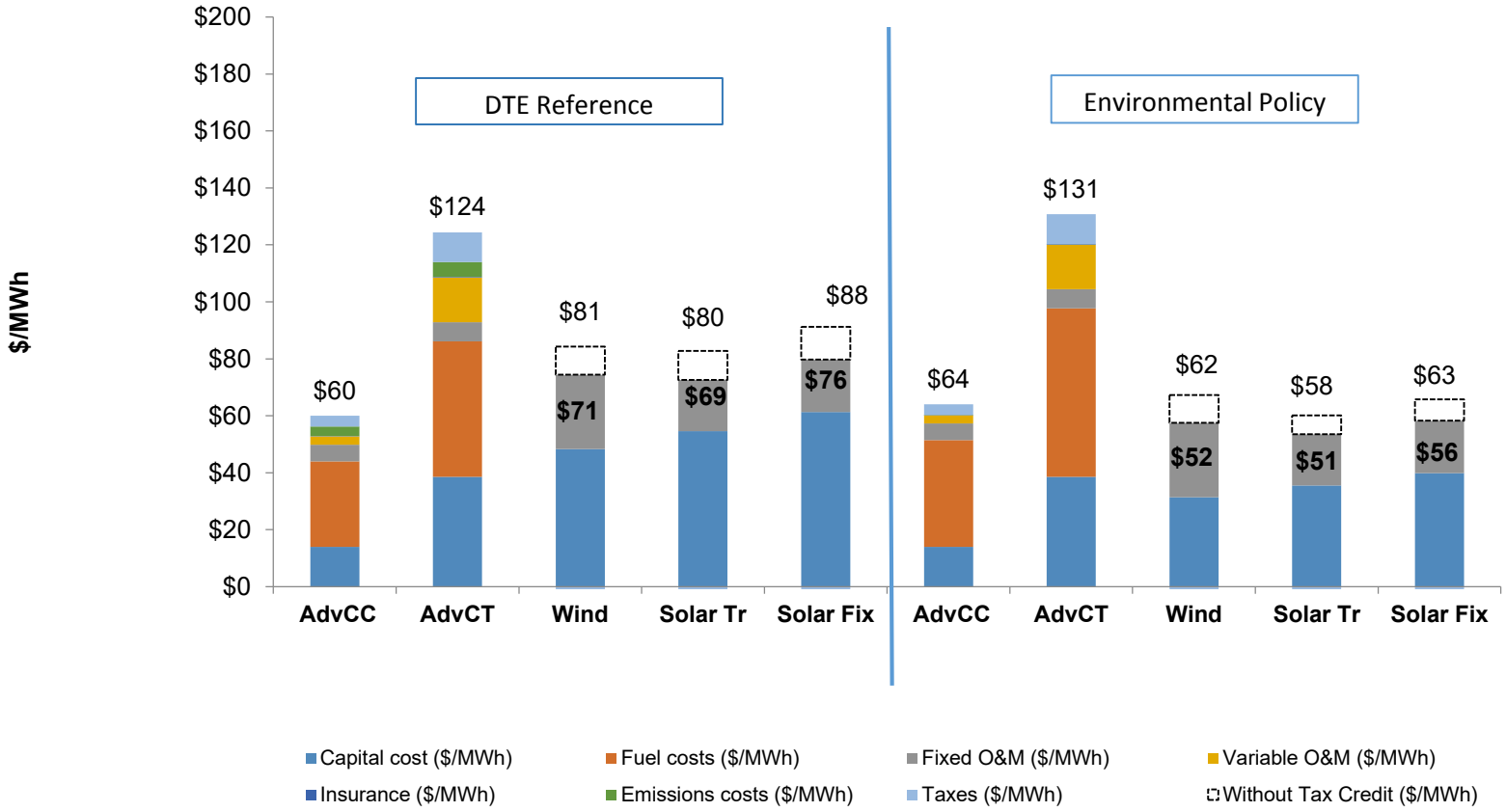
As of 9/27/18



1. Increase in fuel costs between DTE vs 200% EIA
2. No change in Renewables

LCOE – Environmental Policy: 100% EIA Fuel

As of 9/27/18

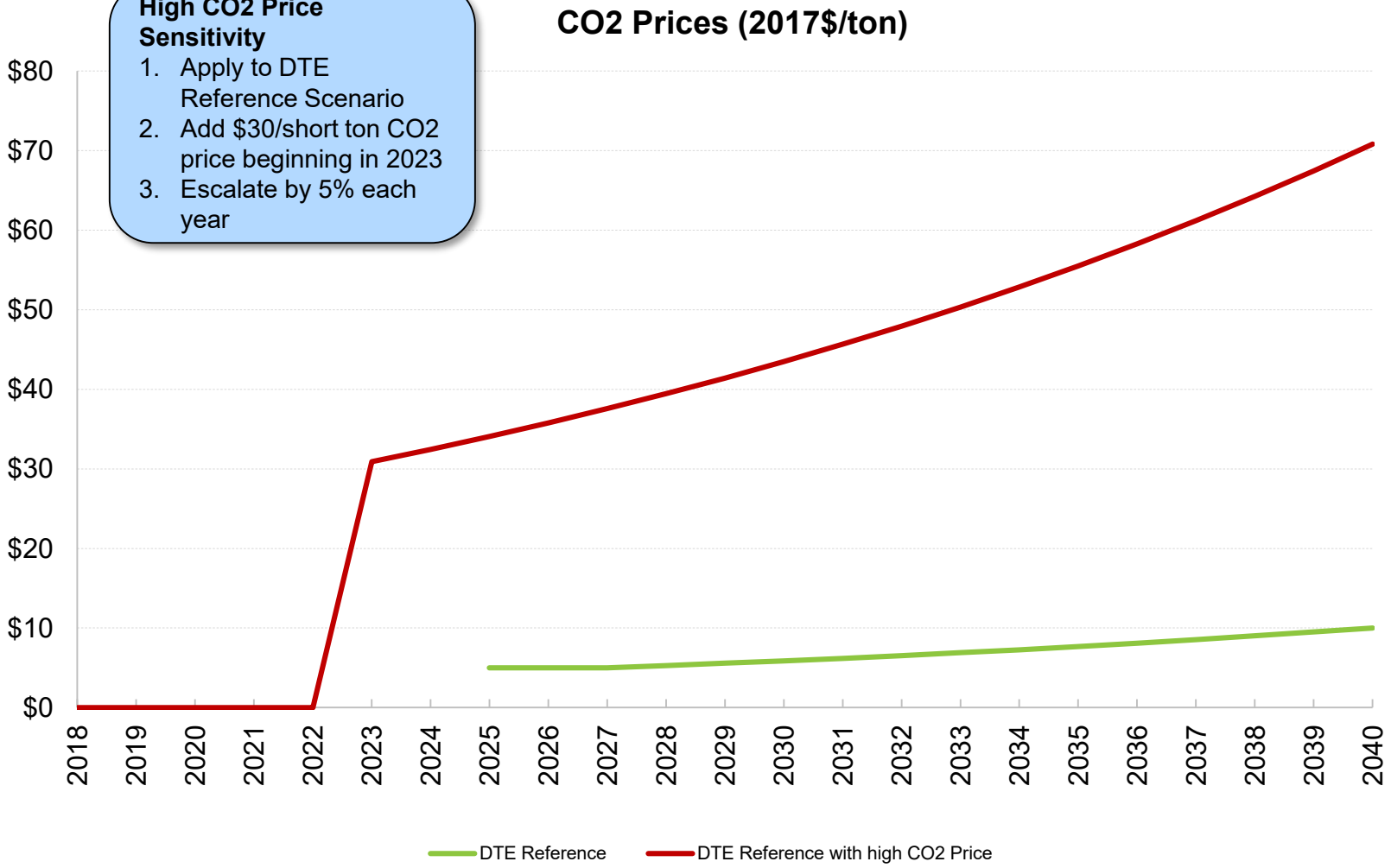


1. The cost for renewables have dropped by 35%
2. Slight differences in gas technology due to gas prices from EIA vs DTE, and no CO2 price in Emerging Tech

PACE Modeling: CO2 Price

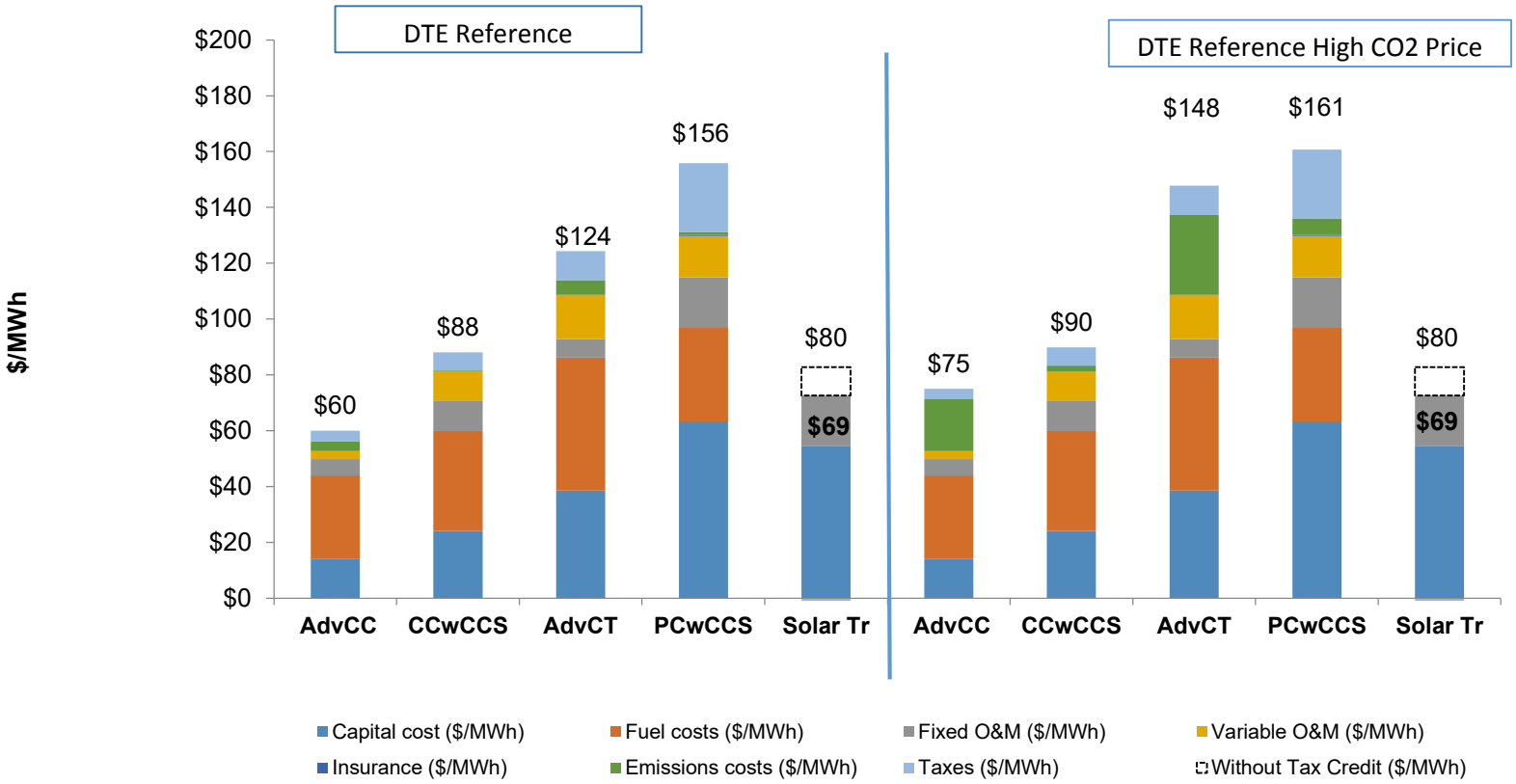
High CO2 Price Sensitivity

1. Apply to DTE Reference Scenario
2. Add $30/short ton CO2 price beginning in 2023
3. Escalate by 5% each year



LCOE - DTE Reference and Stakeholder Sensitivity with High CO_2 price

As of 9/27/18



1. Renewables stay the same
2. Emissions cost increase significantly for gas technology and increases slightly for carbon capture technology.

Presentation Agenda

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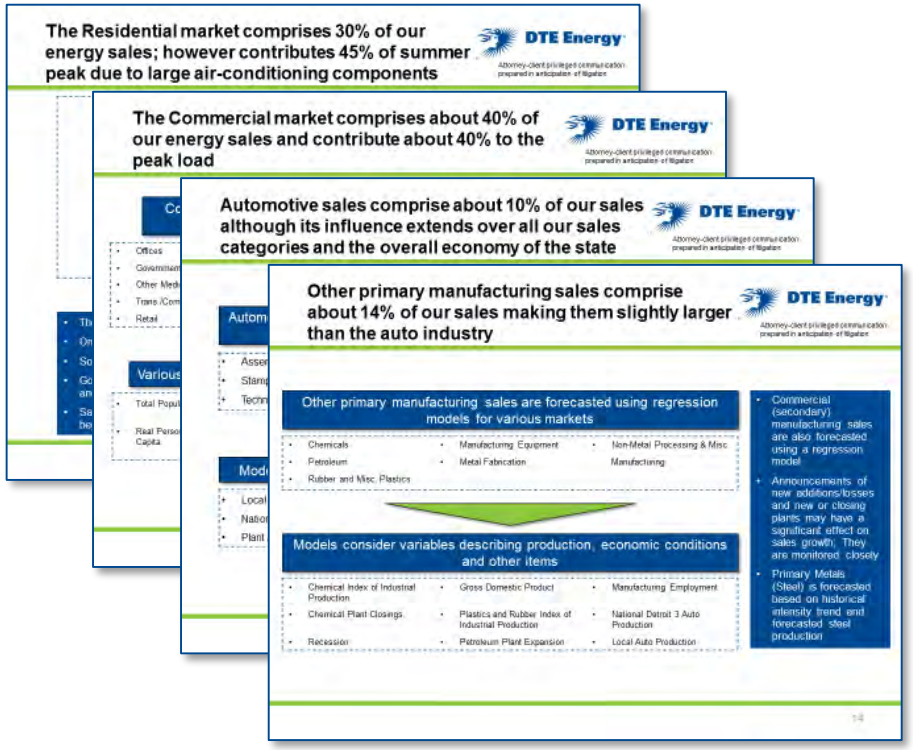
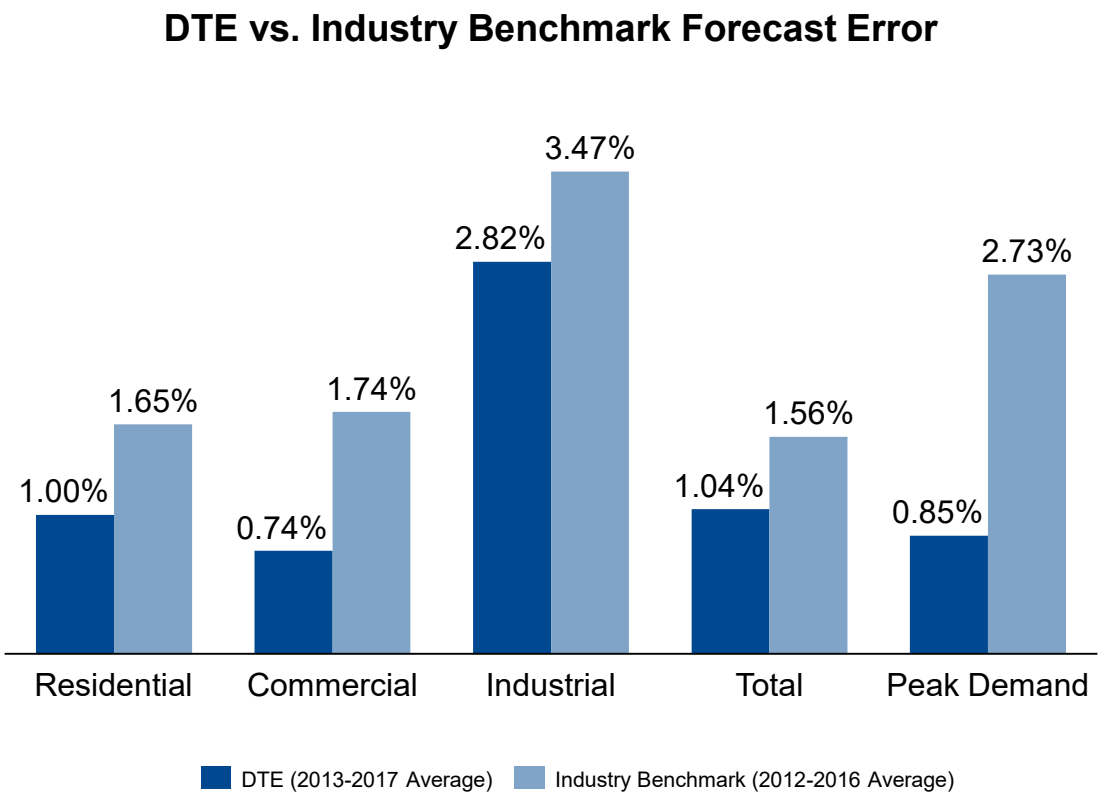
The load forecast is created from the aggregation of four distinct market sales forecasts

- The sales forecast is comprised of Residential, Commercial, Industrial and Other customer classes
- The residential market accounts for approximately 30% of our energy sales and contributes approximately 45% to our peak load
- The commercial market represents approximately 40% of our energy sales and contributes approximately 40% to our peak load
- The industrial market, to which the automotive industry is a key driver, comprises approximately 24% of our energy sales
- The other market, which includes lighting represents approximately 6% of our energy sales



DTE sales and peak forecast accuracy has exceeded industry benchmarks for all classes of customers



- DTE sales forecast has averaged 99.0% accuracy between 2013-2017 vs an industry benchmark of 98.4%
- DTE peak forecast has averaged 99.2% accuracy vs an industry benchmark of 97.3%
- In 2016 and 2017, DTE has achieved 99.6% and 99.8% forecast accuracy for total sales

Source: ITRON Forecast Industry Benchmarking Survey 2017

One of the key components of the sales forecast is the economic outlook

- The economy of S.E. Michigan is influenced by local, national and international factors, so it is critical to have a perspective on all these influences
- For example, global oil market prices can influence local vehicle production and steel tariffs can have a significant impact on local steel production
- The health of the national economy influences vehicle sales and local production
- Michigan household formation and electrification are primary driver of residential growth

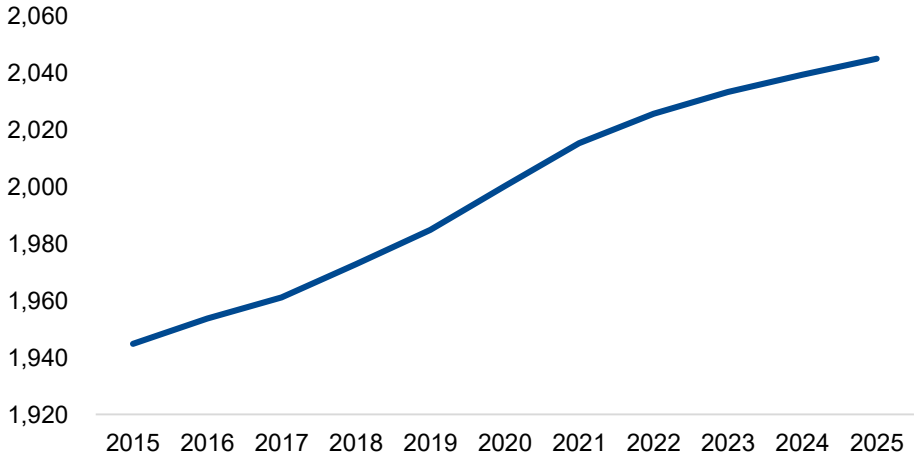
Source : IHS Global Insight

The 2019 IRP sales forecast takes into account the various economic factors

Key Economic Drivers

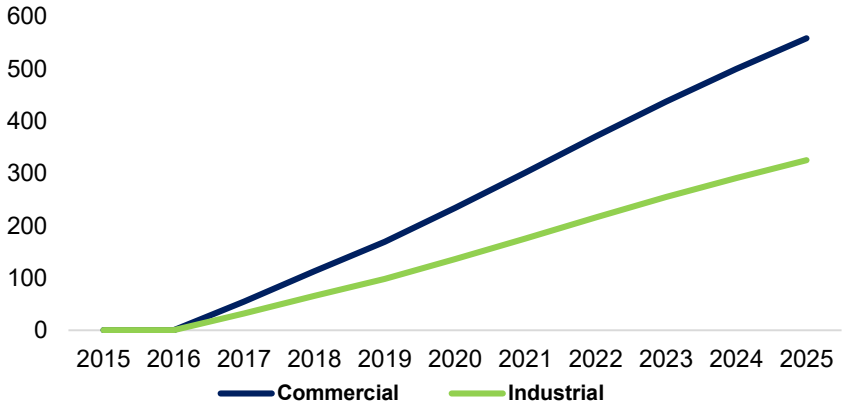
- Household/Customer Growth ↑
- Population ↑
- Detroit Motor Vehicle Production ↓
- US Vehicle Production ↓
- Michigan Manufacturing Employment ↑
- Steel Production Tonnage ↓
- Energy Efficiency ↑

Households ('000's)

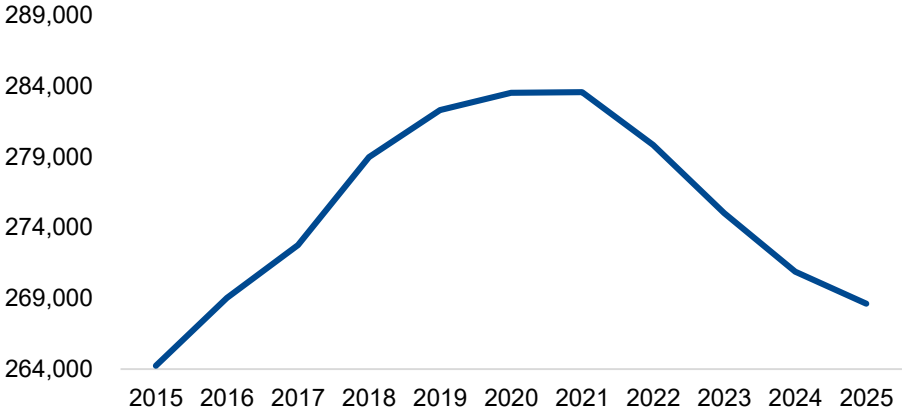


Commercial & Industrial EWR (GWh)

(Incremental EWR from 1.15% to 1.5% savings)



Manufacturing Employment ('000's)



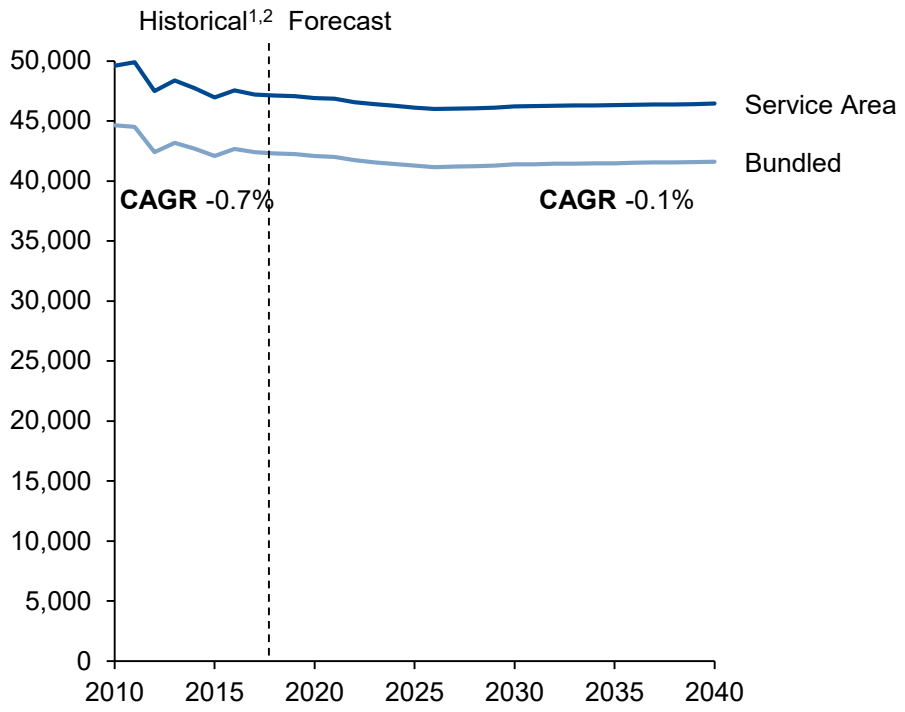
Source : IHS Global Insight

The sales forecast methodology addresses energy waste reduction programs, plug-in electric vehicles, and customer owned generation explicitly

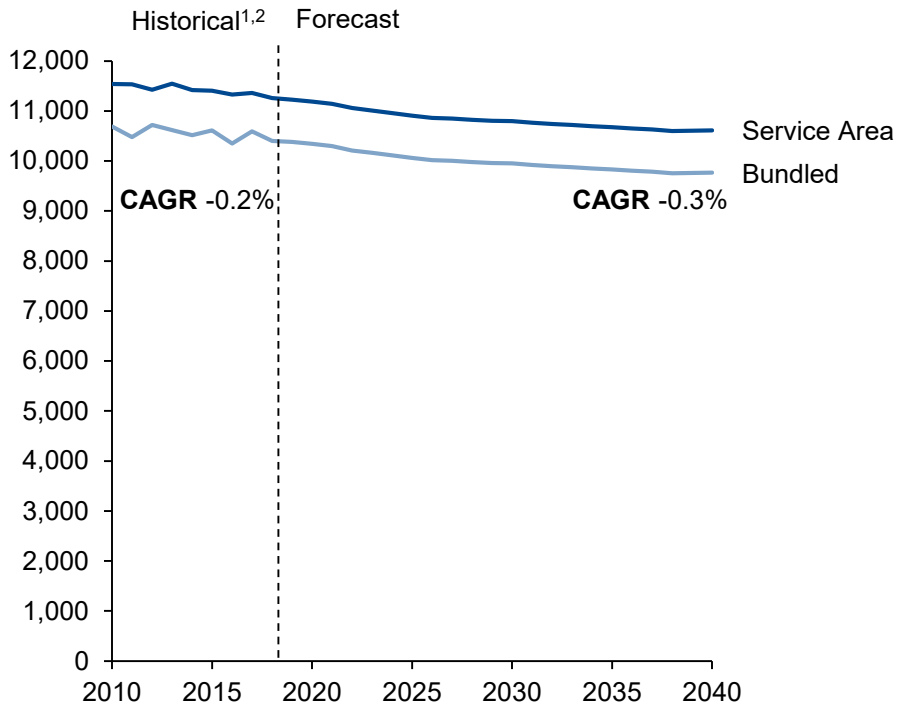
	2019 IRP Forecast
Energy Waste Reduction	• Residential EWR programs are identified in the end use forecast model • For the commercial and industrial models, the incremental difference between historical savings levels and future EWR program levels of savings is explicitly modeled
Electric Vehicles	• Electric vehicles are included in the residential, commercial, and industrial forecast models
Customer Owned Generation	• Existing customer owned generation is assumed as an implicit input • Incremental customer owned generation is included at PACE Global and EIA forecasts growth rates

The Service Area sales and peak demand forecasts are expected to decline annually an average of 0.1% and .03% percent, respectively

Annual Sales Forecast (GWh)



Annual Peak Demand Forecast (MW)

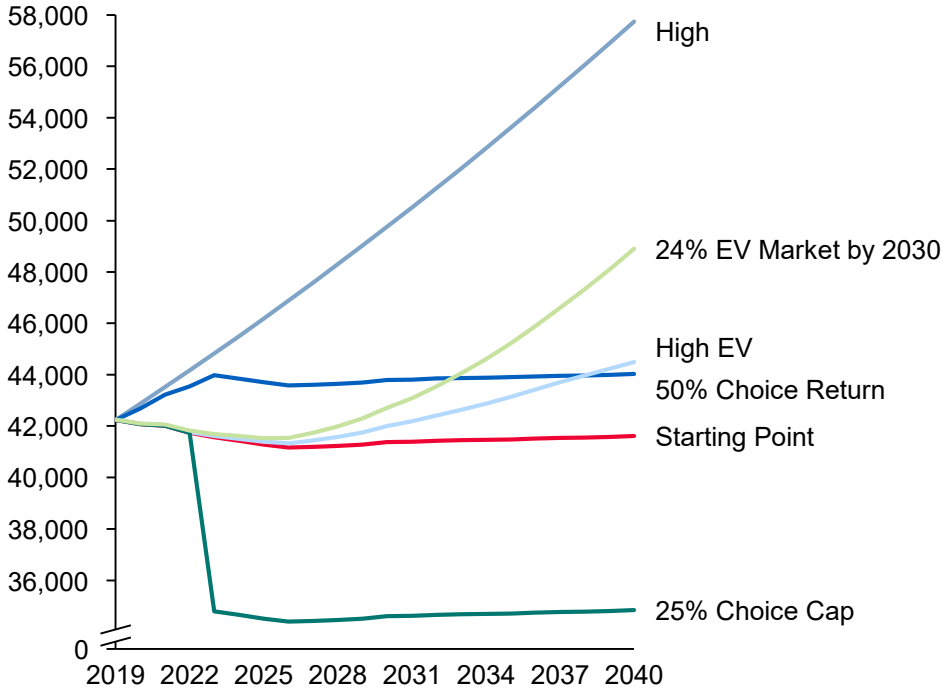


- Over the past several years sales and demand have been trending downward
- Energy waste reduction and emerging technologies, such as various forms of distributed generation, contribute to the decline in sales and peak

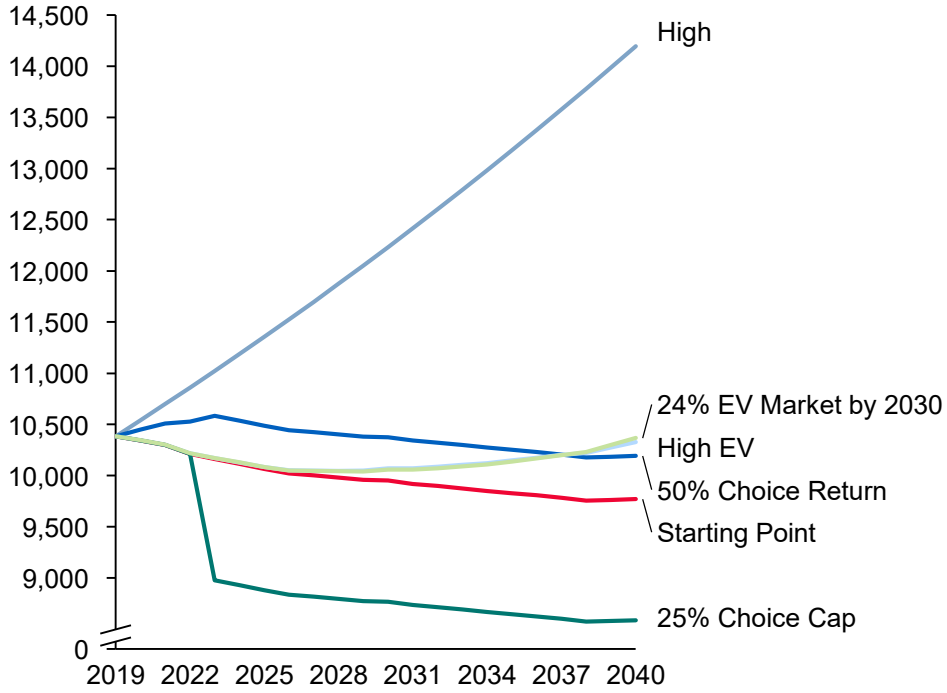
1. The data for 2010-2017 is temperature normalized actuals
2. The drop in sales and peak in the historical time frame is due to the loss of wholesale contracts (Wolverine, Thumb and PLD)

For the IRP, a number of sensitivities will be conducted, varying the sales and peak forecast

Annual Bundled Sales Forecast (GWh)



Annual Bundled Peak Demand Forecast (MW)



The sensitivities are based on IRP requirements, stakeholder feedback and internal interest

Presentation Agenda

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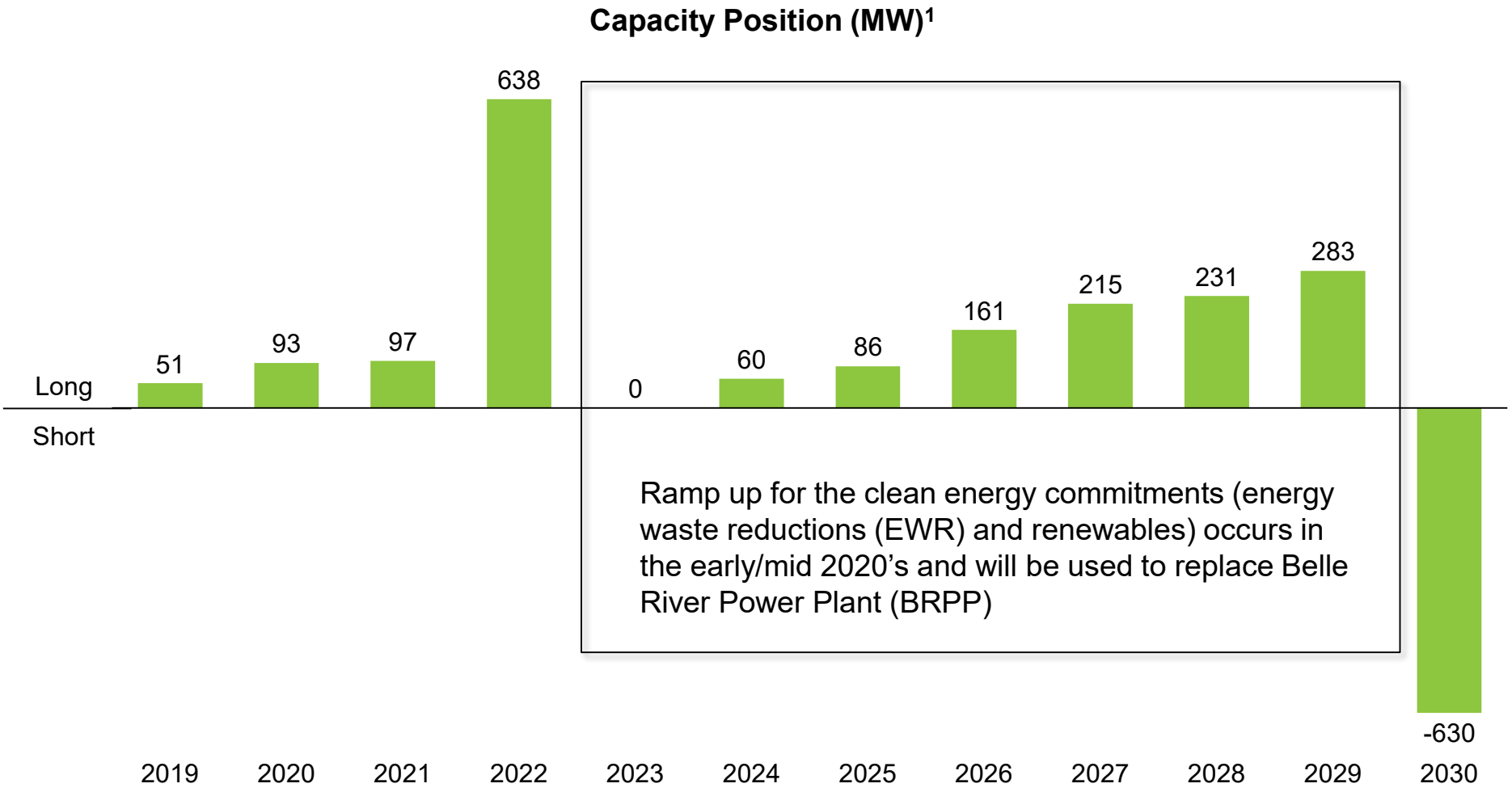
DTE Electric utilizes Planning Principles in our IRP Process

RELIABILITY	Each plan analyzed is required to meet the reliability planning requirements established by MISO and to encompass our desire to maintain a reliable fleet in the face of aging coal units.
AFFORDABILITY	Affordability is measured by the yearly impacts to the revenue requirement
CLEAN	Environmental sustainability, low carbon aspirations, and clean energy goals are major factors in the determination of the recommended resource portfolio
FLEXIBLE AND BALANCED	The resource plan needs to be flexible, having the ability to adapt to unforeseen changes in the market. Additionally, it must have a well balanced mix of resources so that it is not heavily reliant on the market or one source of generation
COMPLIANT	All resource plans are modeled to be compliant with the IRP filing requirements as well as environmental regulations
REASONABLE RISK	The Company desires a portfolio that minimizes risks related to commodity and market pricing, fuel availability, grid reliability, capacity constraints, operations and evolving regulations
COMMUNITY IMPACT	Considerations of the aspects of employment, tax base, and other community impacts

PA 341, Section 6t describes retirement considerations in an IRP

- **Business as Usual**
  - Maximum age assumption, public announcements, or economics
- **Emerging Technology**
  - Meaningful analysis of whether coal units should retire ahead of business as usual dates should be performed
- **Environmental Policy**
  - Coal units will primarily be retired based upon carbon emissions and secondarily based upon economics

The starting point capacity position for the IRP shows that the DTE capacity position is long until 2030



1. Capacity position consistent with 2017 Capacity demonstration, we plan to refresh the capacity positon prior to the March filing which will be consistent with the 2019 PSCR filing

Several retirement sensitivities will be performed to evaluate the impacts of an early retirement of both "Tier-2 units" and Belle River Power Plant

	Unit	UCAP (MW)	Announced Retirement	Sensitivity 1	Sensitivity 2	Sensitivity 3
Tier 2	River Rouge 3	230	2020	2020	2020	2020
	St. Clair 1	140	2022	2022	2021	2022
	St. Clair 2	140	2022	2022	2021	2022
	St. Clair 3	140	2022	2022	2021	2022
	St. Clair 6	240	2022	2022	2021	2022
	St. Clair 7	360	2023	2022	2022	2023
	Trenton 9	400	2023	2022	2022	2023
Tier 1	Belle River 1	500	2029	2029	2029	2025
	Belle River 2	500	2030	2030	2030	2026
				Capacity Purchase	**Capacity Purchase**	**Optimization**

Sensitivity 1[1,3]: Pull ahead Trenton 9 and St. Clair 7 from 2023 to 2022

Sensitivity 2[1,3]: Pull ahead Tier-2 unit retirements by one year

Sensitivity 3[2,3]: Retire Belle River in 2025, 2026 - *This aligns with sensitivity submitted through technical stakeholder process.*

Sensitivities 4+: DTE is still contemplating other retirement sensitivities

Changes from Announced Retirements

1. Sensitivities 1 and 2 will be performed on the Emerging Technology Scenario.
2. Sensitivity 3 will be performed on the DTE Reference Case Scenario.
3. Capacity purchases are based on the 2017 reverse auction results.

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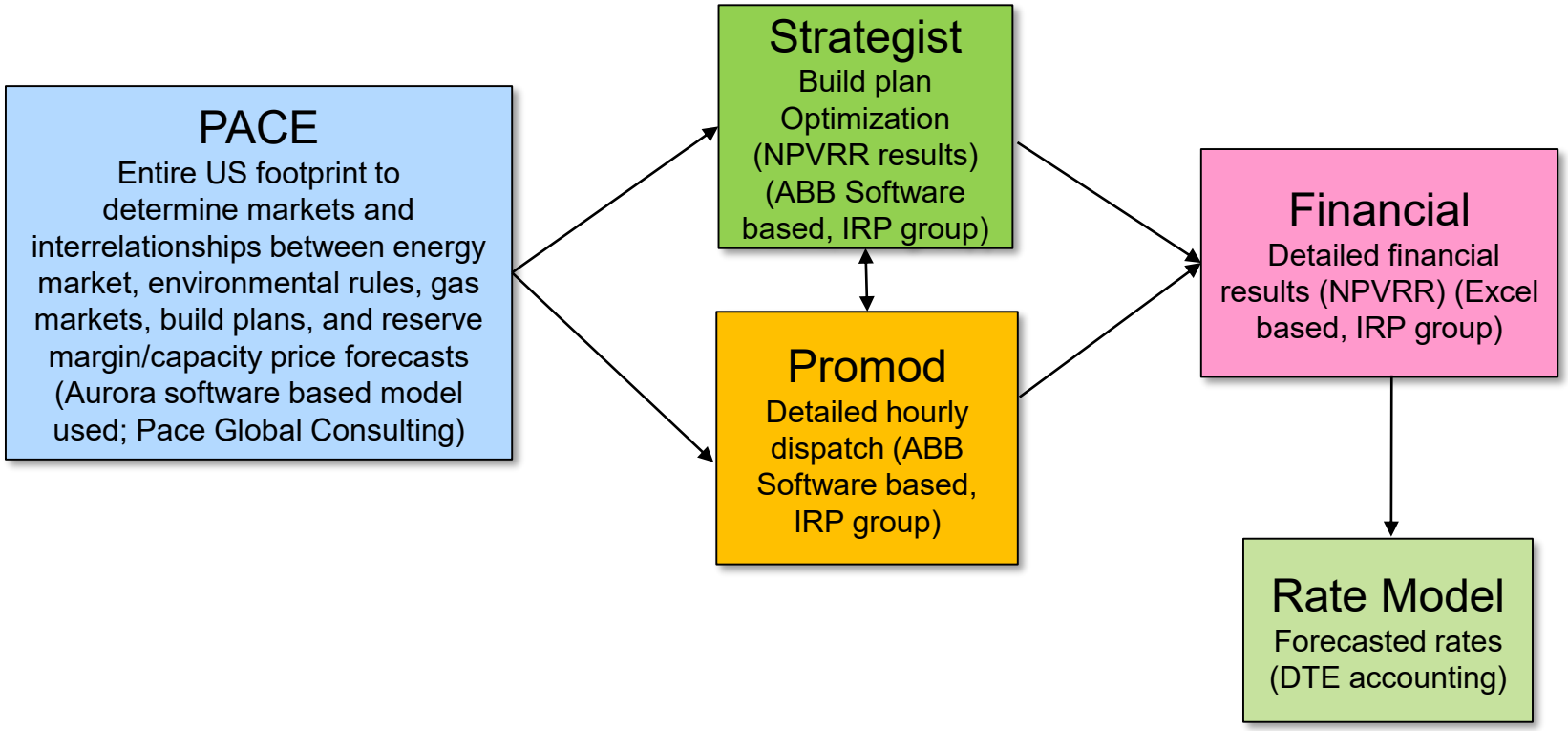
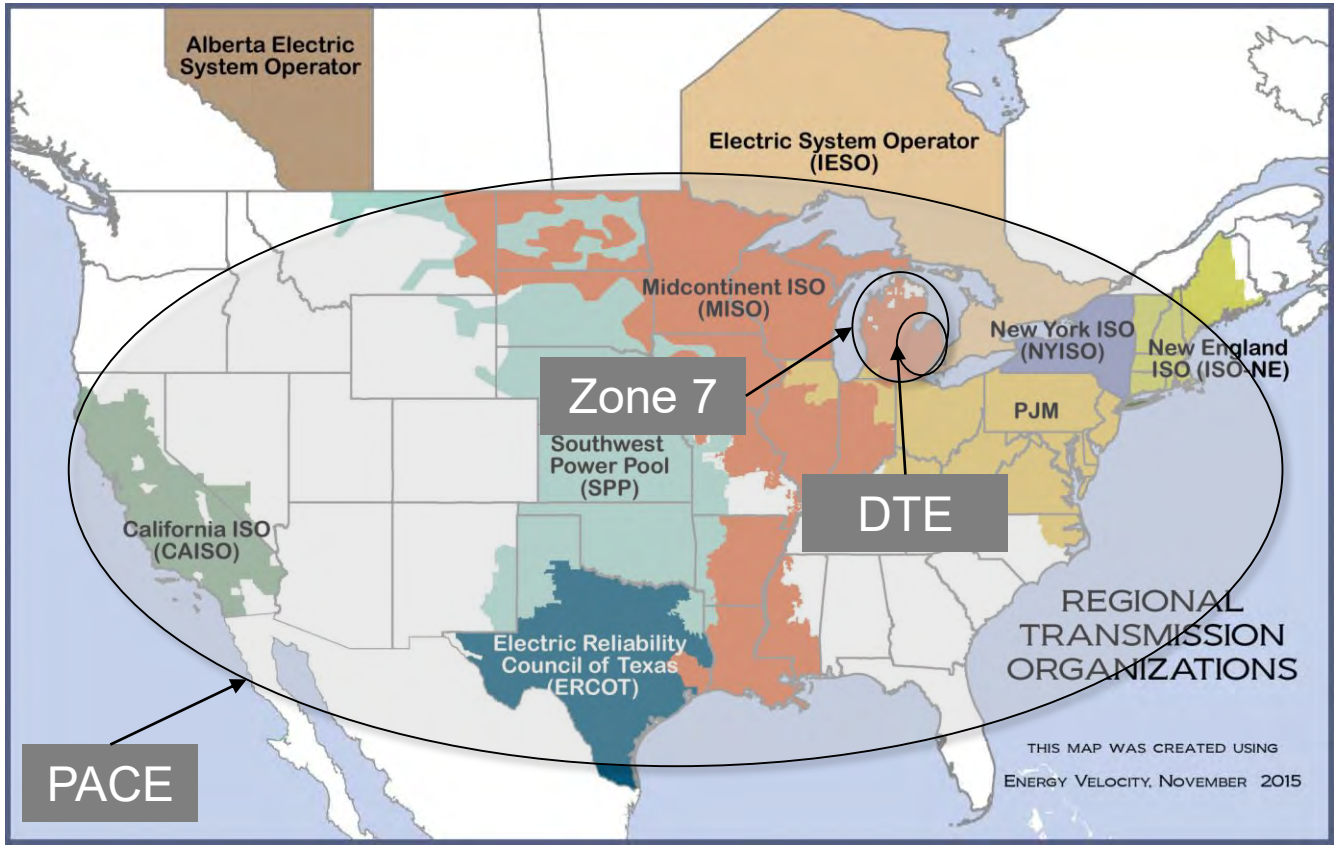
The DTE IRP modeling process uses four different models, which then feed into a rate model for some sensitivities



All models are not required for each IRP sensitivity

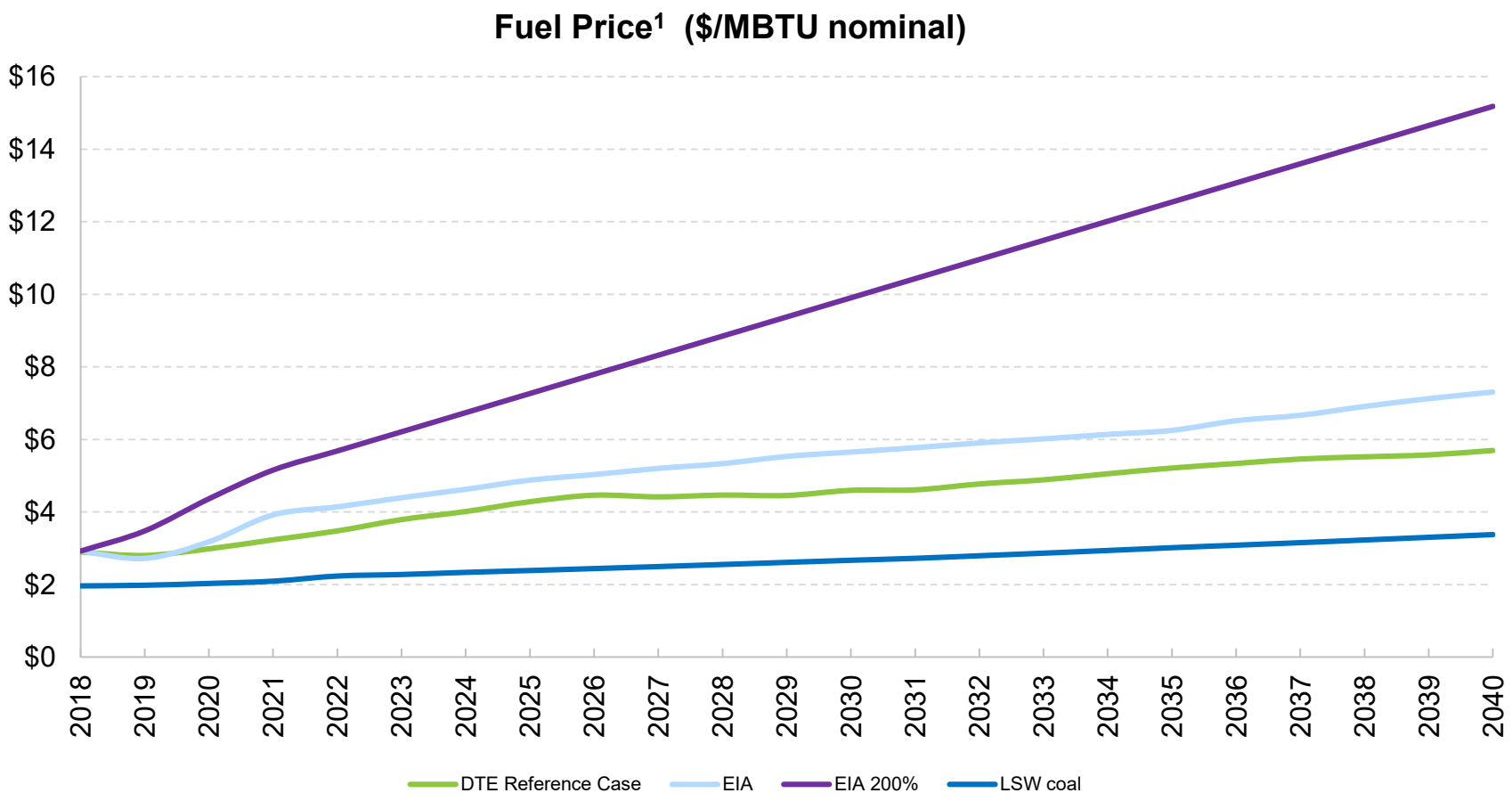
PACE will model a national footprint, while DTE will model both Zone 7 and DTE's service territory



DTE will model Zone 7 as a sensitivity to better understand the preferred energy mix within the state of Michigan

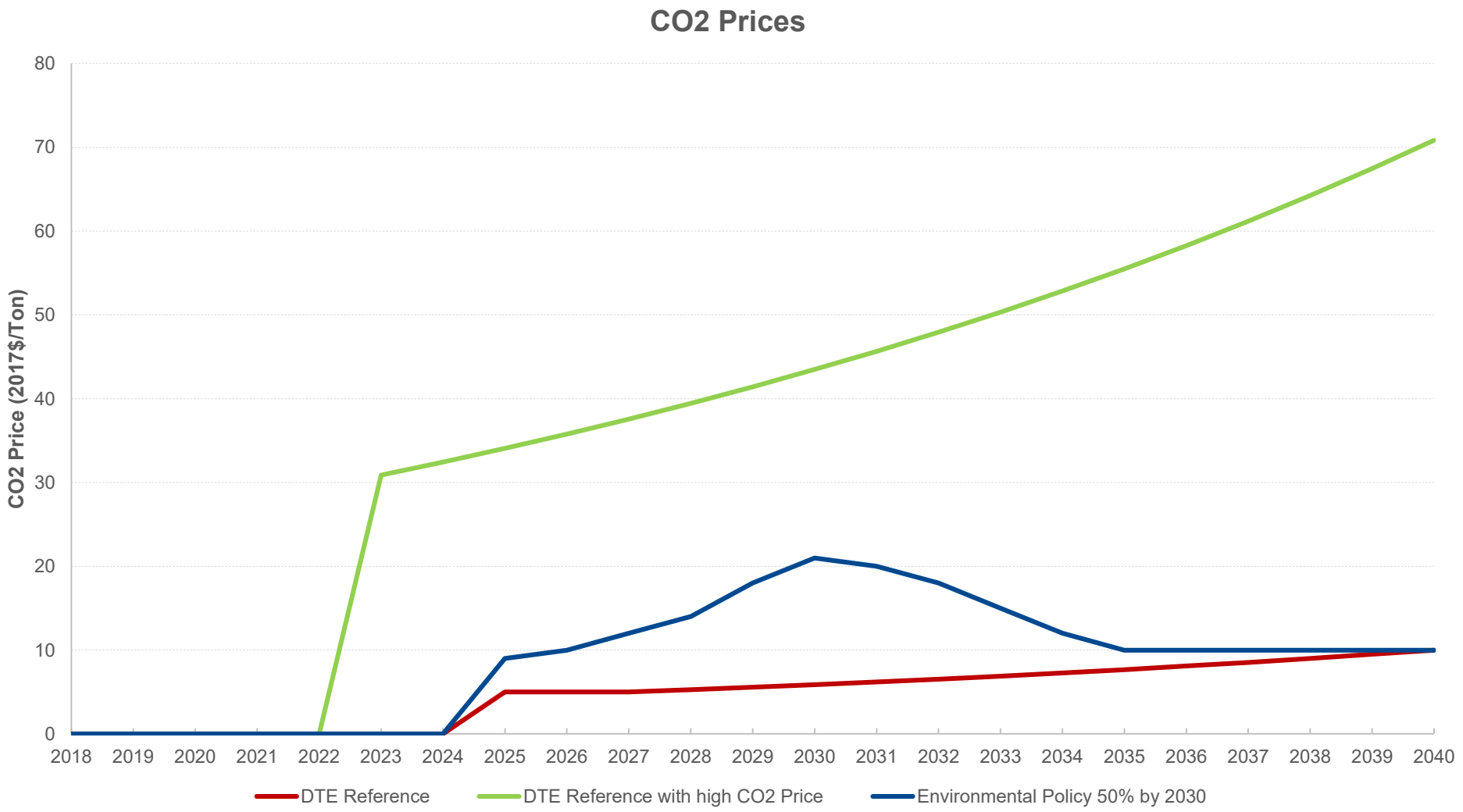
1. https://www.ferc.gov/industries/electric/indus-act/rto/elec-ovr-rto-map.pdf

PACE Modeling: Gas and Coal Prices

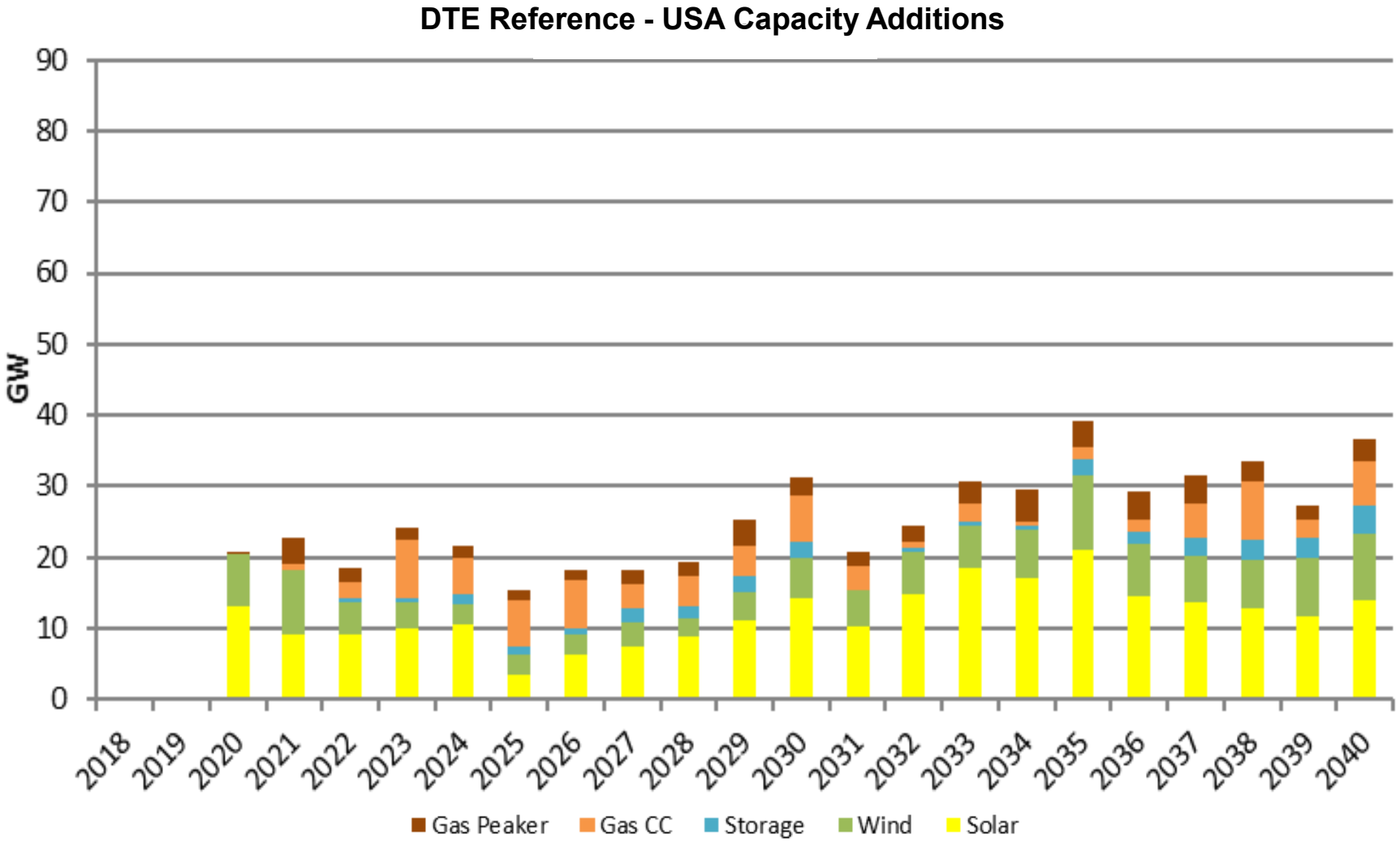


1. Gas at Henry Hub, coal at Monroe PP

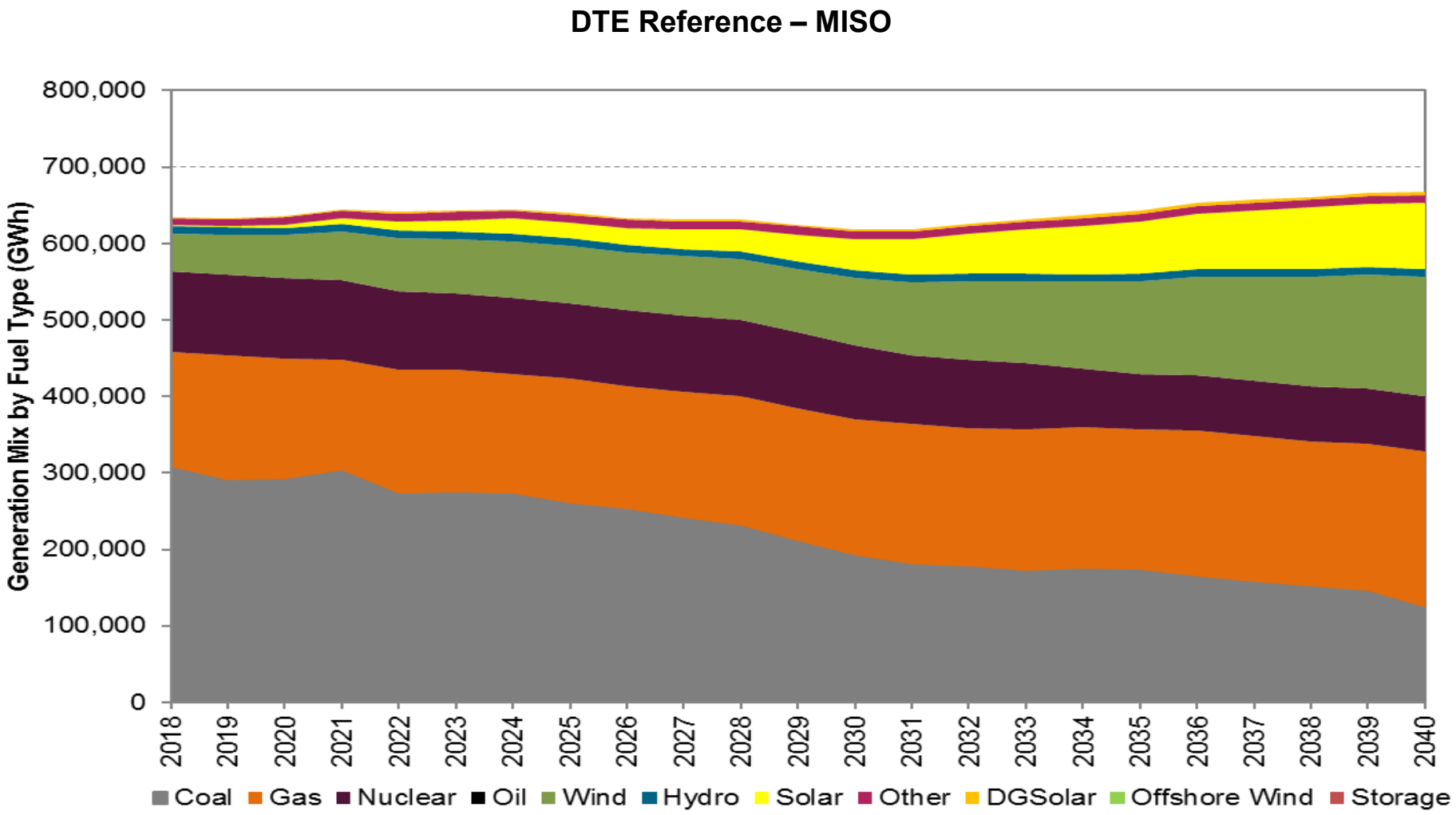
PACE Modeling: CO2 Price



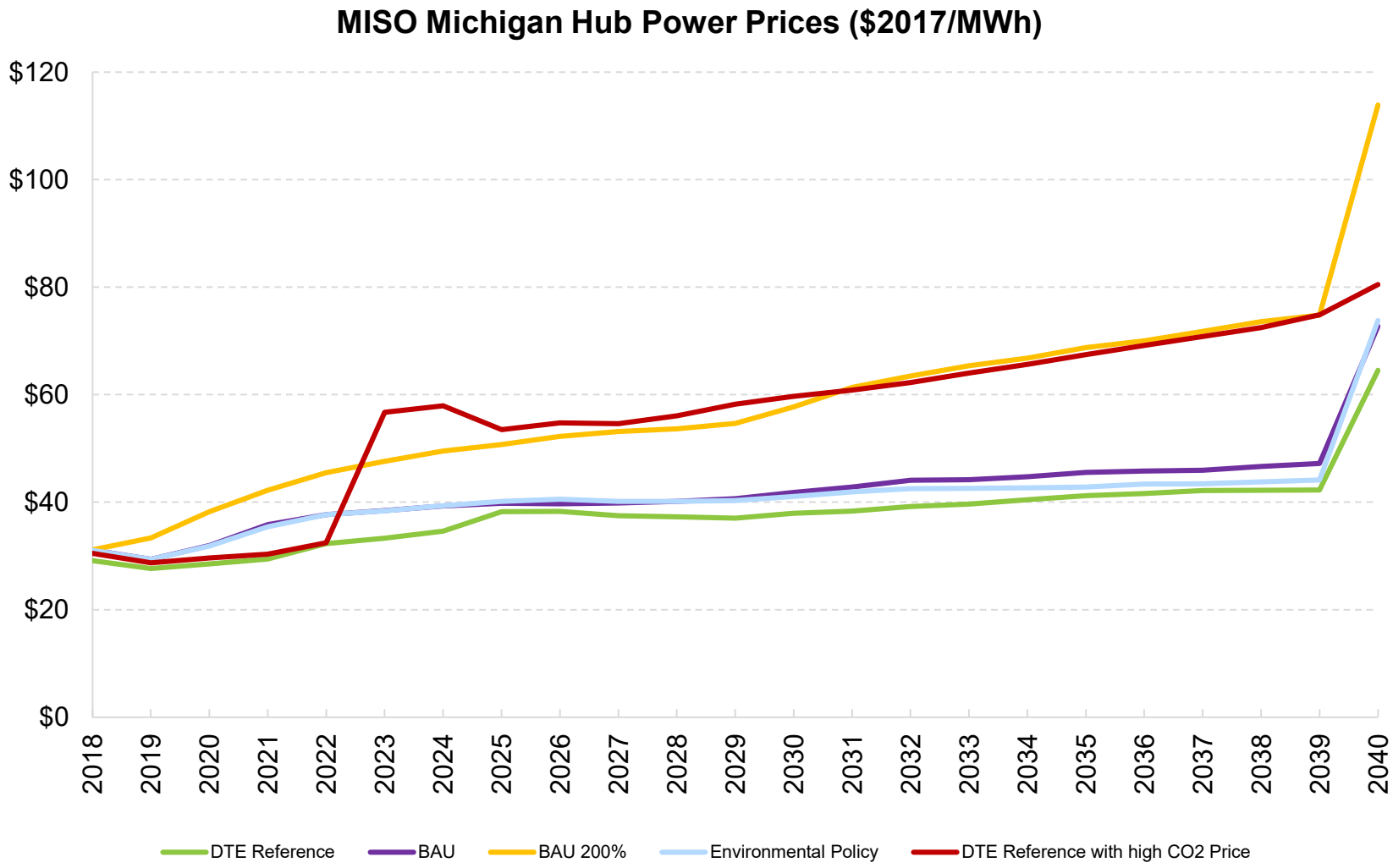
PACE Modeling: Capacity Additions



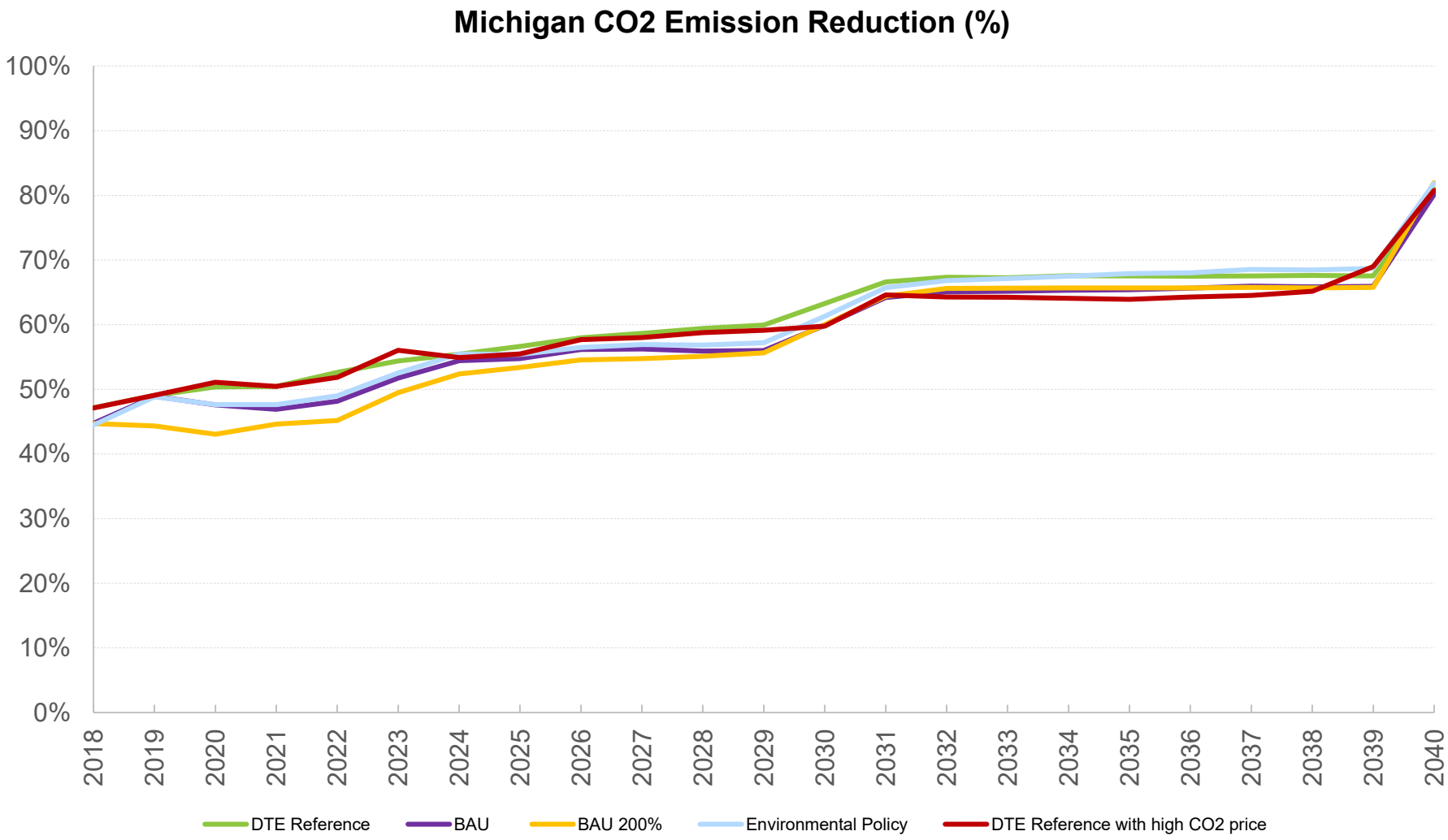
PACE Modeling: Generation Mix



PACE Modeling: Annual Power Prices



PACE Modeling: CO2 Emission Reduction



Presentation Agenda

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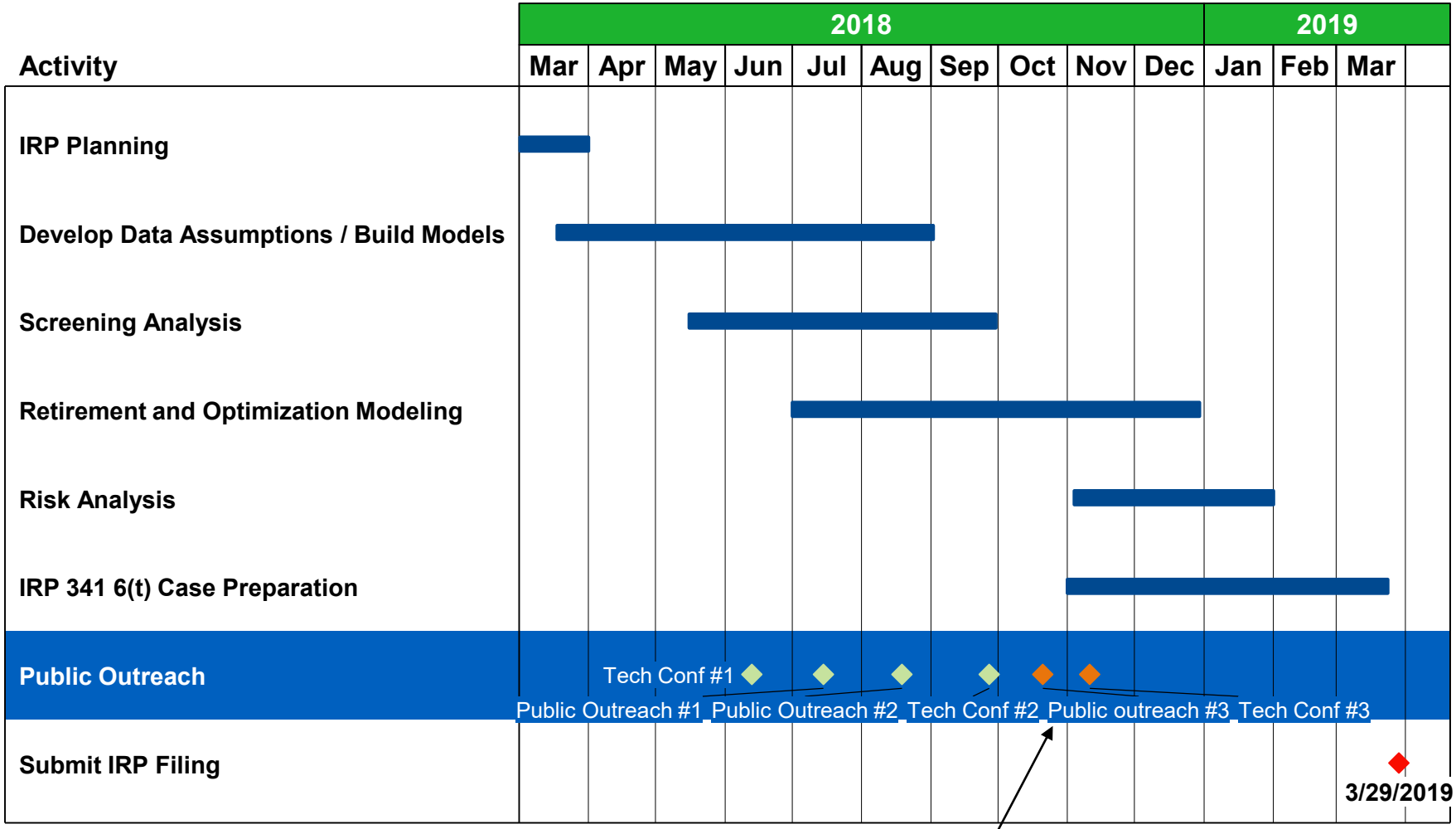
There are various activities scheduled that require completion before filing the IRP on March 29, 2019



A third public outreach open house has been added October 23 and a third technical conference added November 12

Break

Text **DTEQC to 22333** for questions or comments as they arise during the presentation. You will get a text confirming that you have joined the session. (**Please limit questions and comments to 1 per text)**

If using laptop or tablet respond using **pollev.com/dteqc** (**Please limit questions and comments to 1 at a time)**

Questions on Presentation

Stakeholder Comments on IRP Process

DTE Energy®

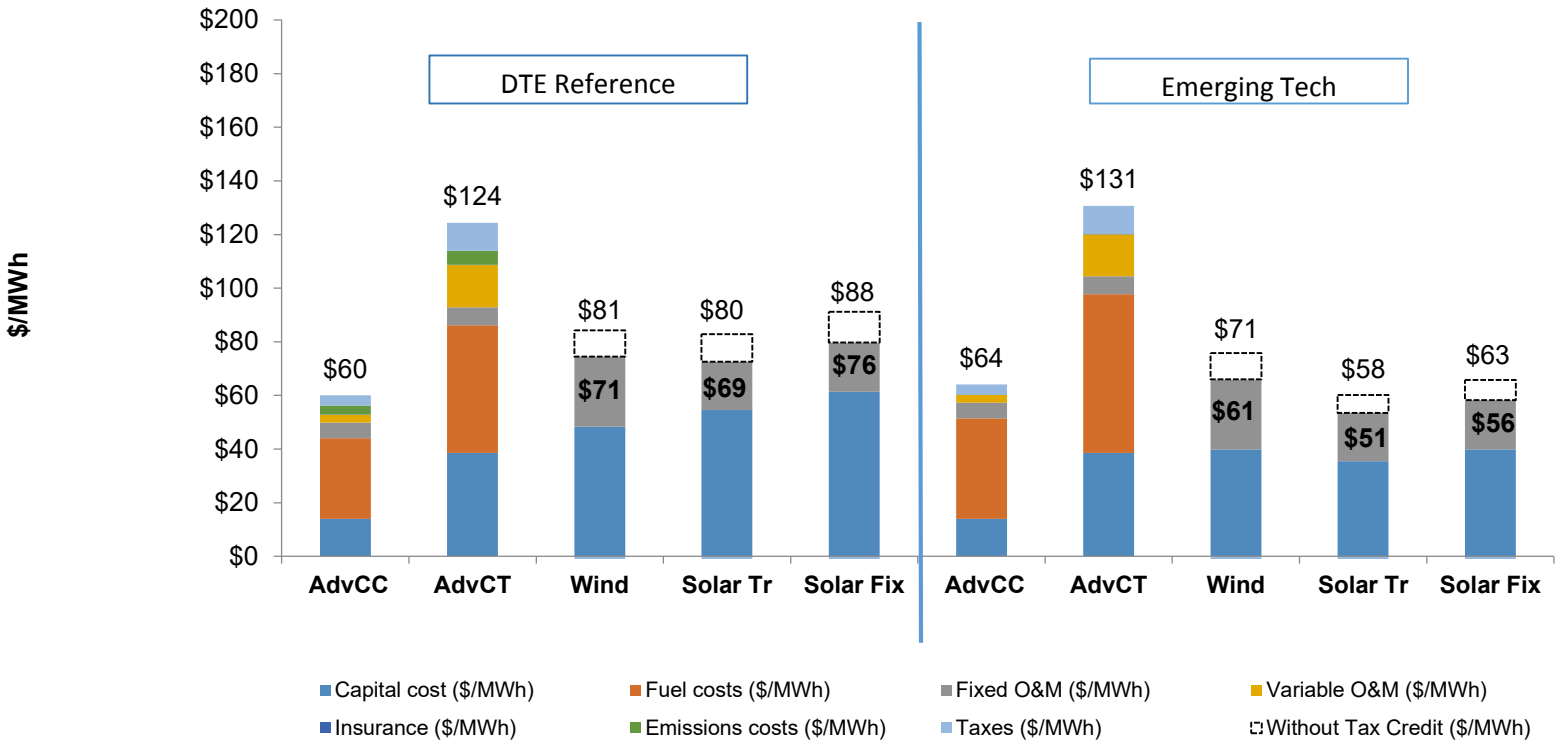
Closing Remarks

DTE Energy®

Supplementary Data

LCOE – Emerging Tech: 100% EIA Fuel

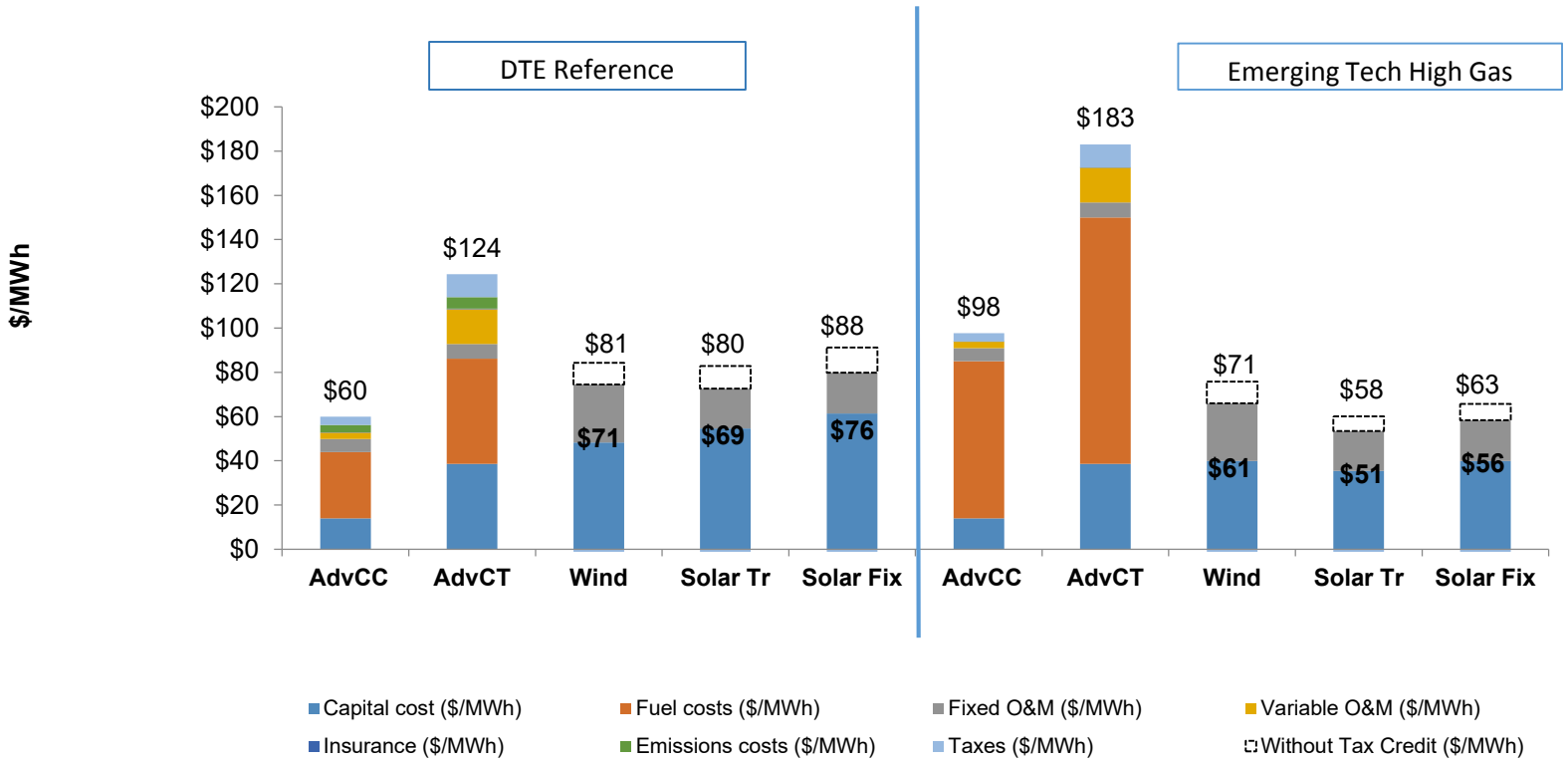
As of 9/27/18



1. The cost for solar has dropped by 35% and the cost for wind has dropped 17.5%
2. Slight differences in gas technology due to gas prices from EIA vs DTE, and no CO2 price in Emerging Tech

LCOE – Emerging Tech High Gas: 200% EIA Fuel

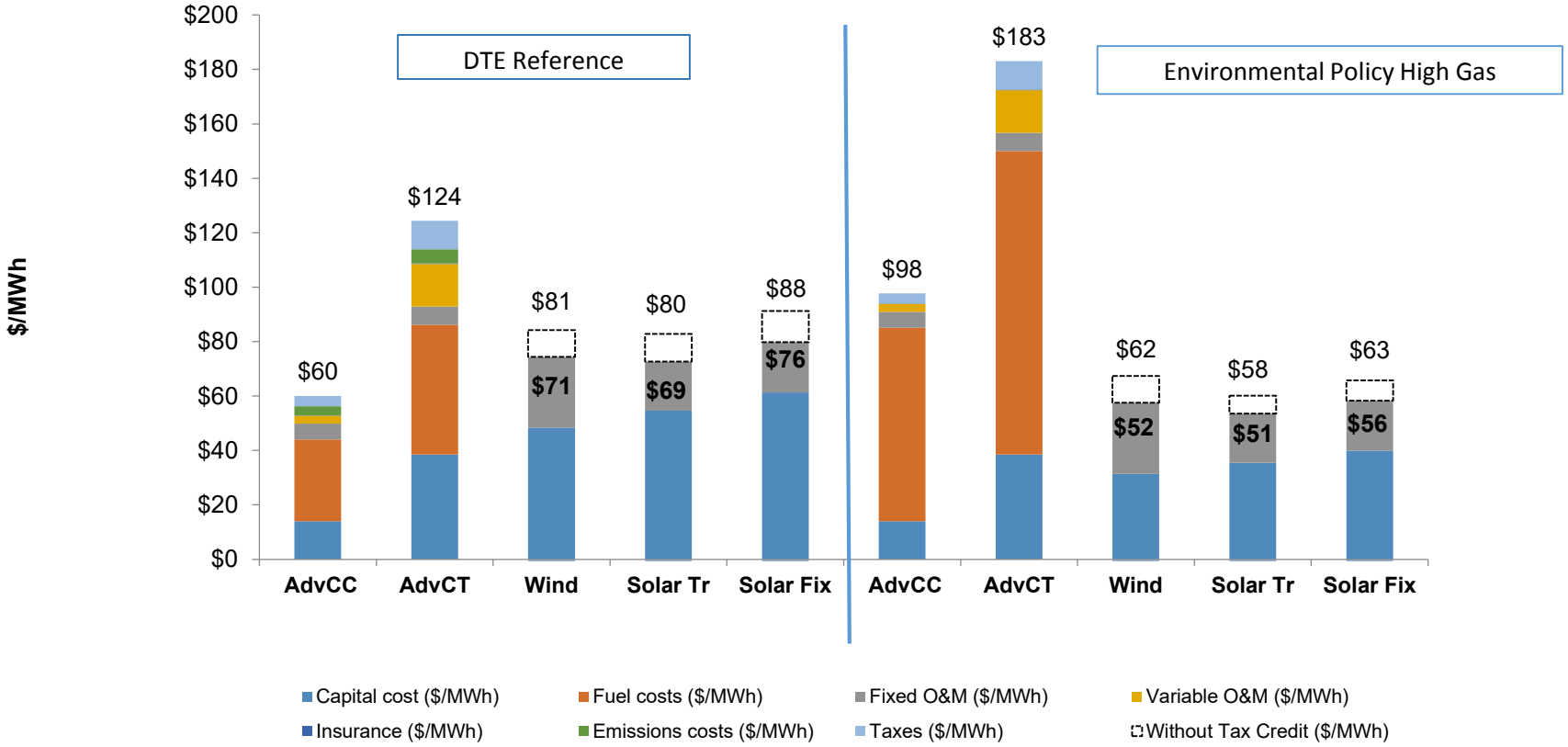
As of 9/27/18



1. The cost for solar has dropped by 35% and the cost for wind has dropped 17.5%
2. Increase in fuel costs between DTE vs 200% EIA

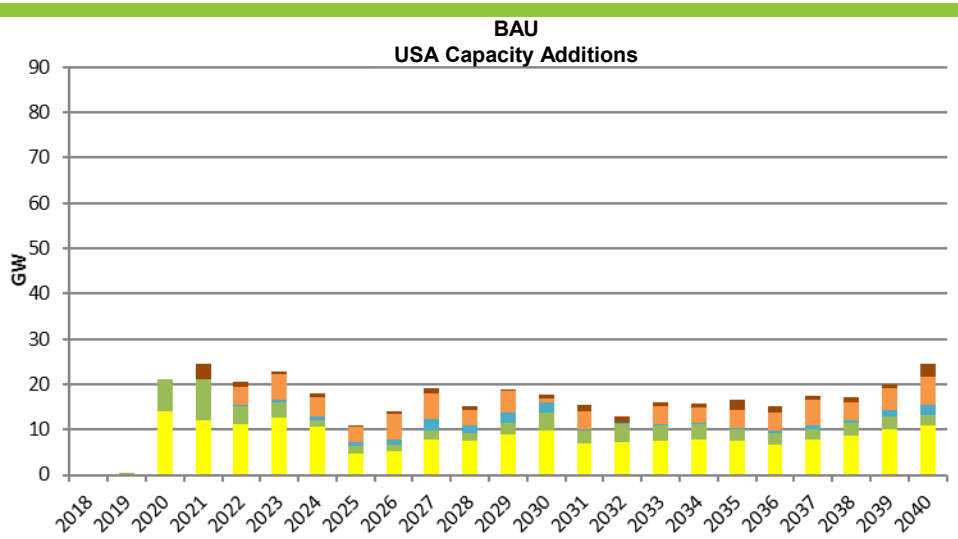
LCOE – Environmental Policy High Gas: 200% EIA Fuel

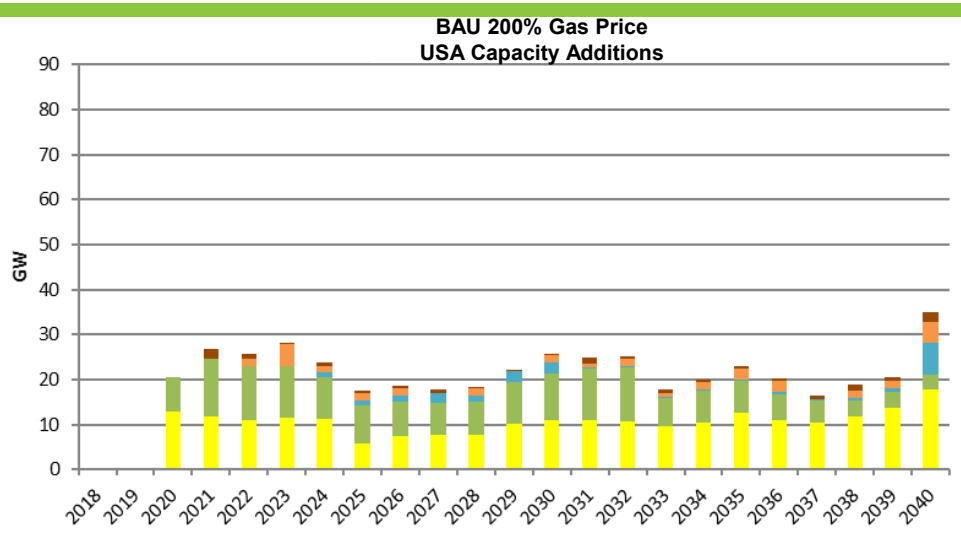
As of 9/27/18

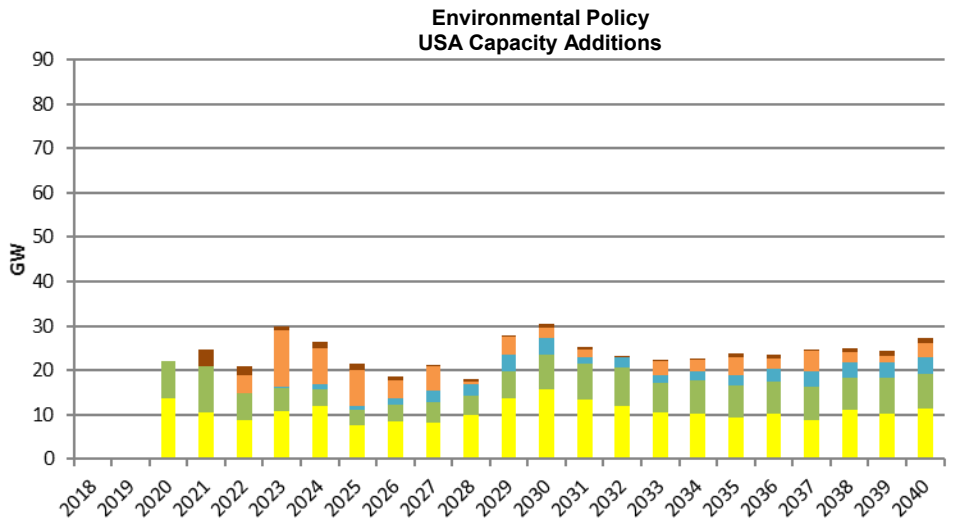


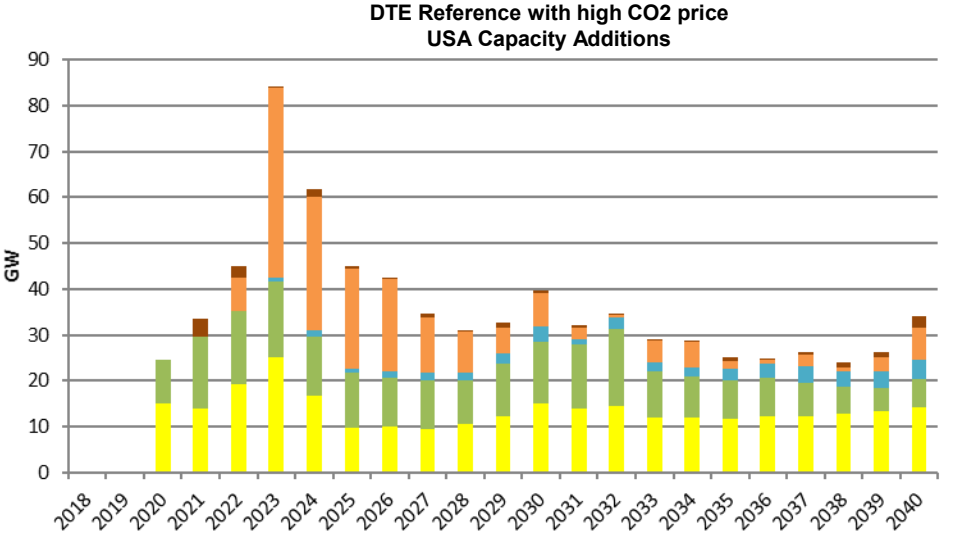
1. The cost for renewables have dropped by 35%
2. Increase in fuel costs between DTE vs 200% EIA

PACE Modeling: Capacity Additions



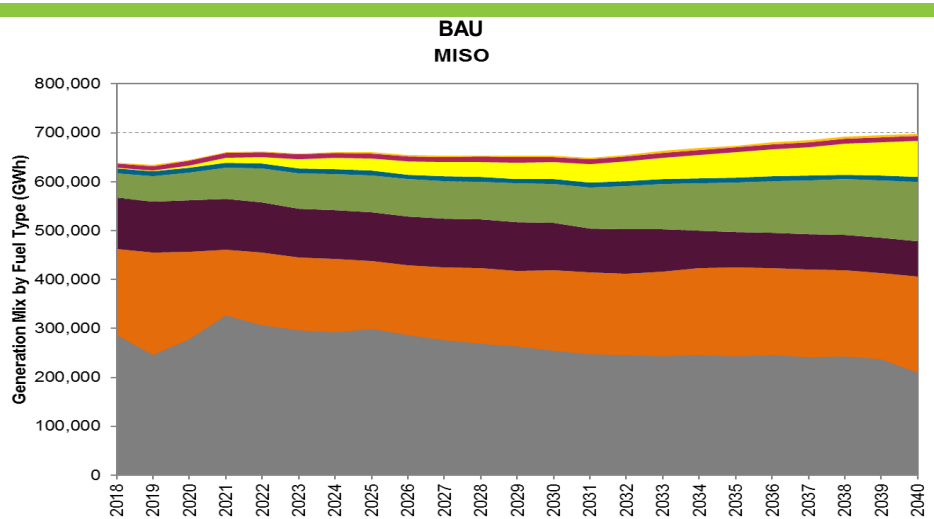


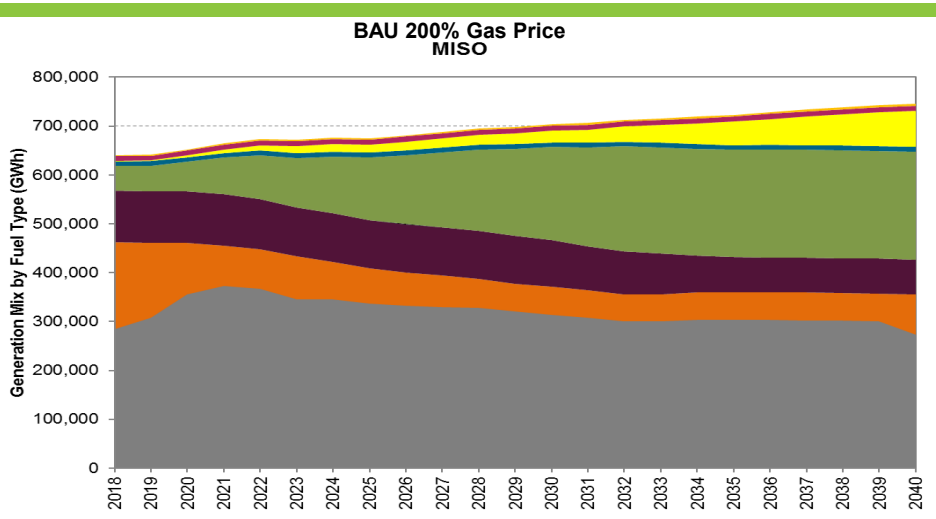


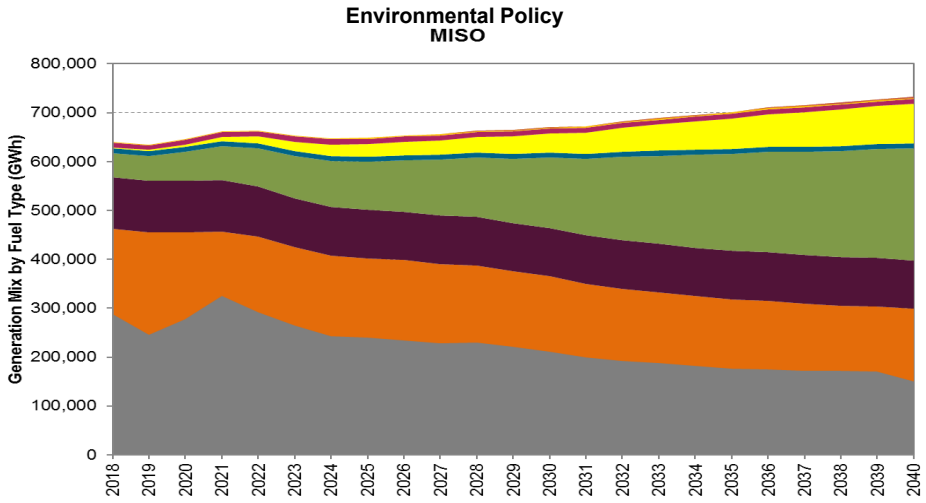


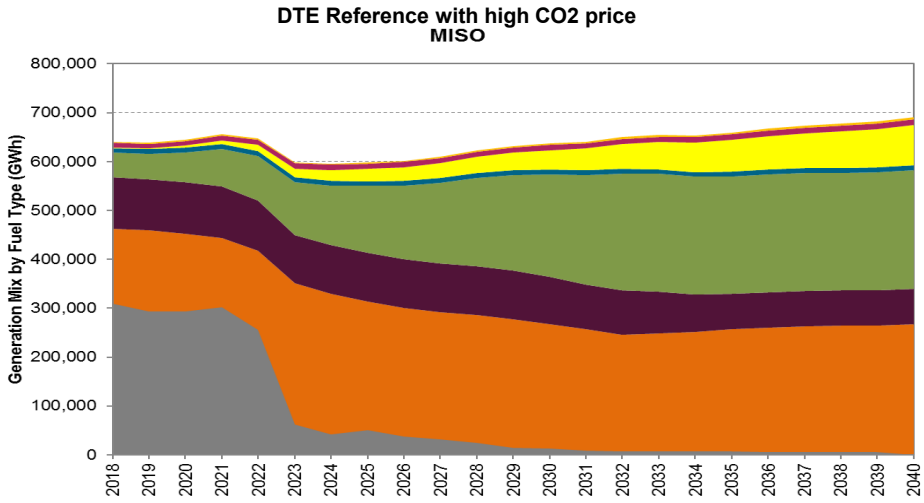
Gas Peaker Gas CC Storage Wind Solar

PACE Modeling: Generation Mix









Coal Gas Nuclear Oil Wind Hydro Solar Other DGSolar Offshore Wind Storage