

Resource Generation Plan Update

Path to Carbon Free by 2035

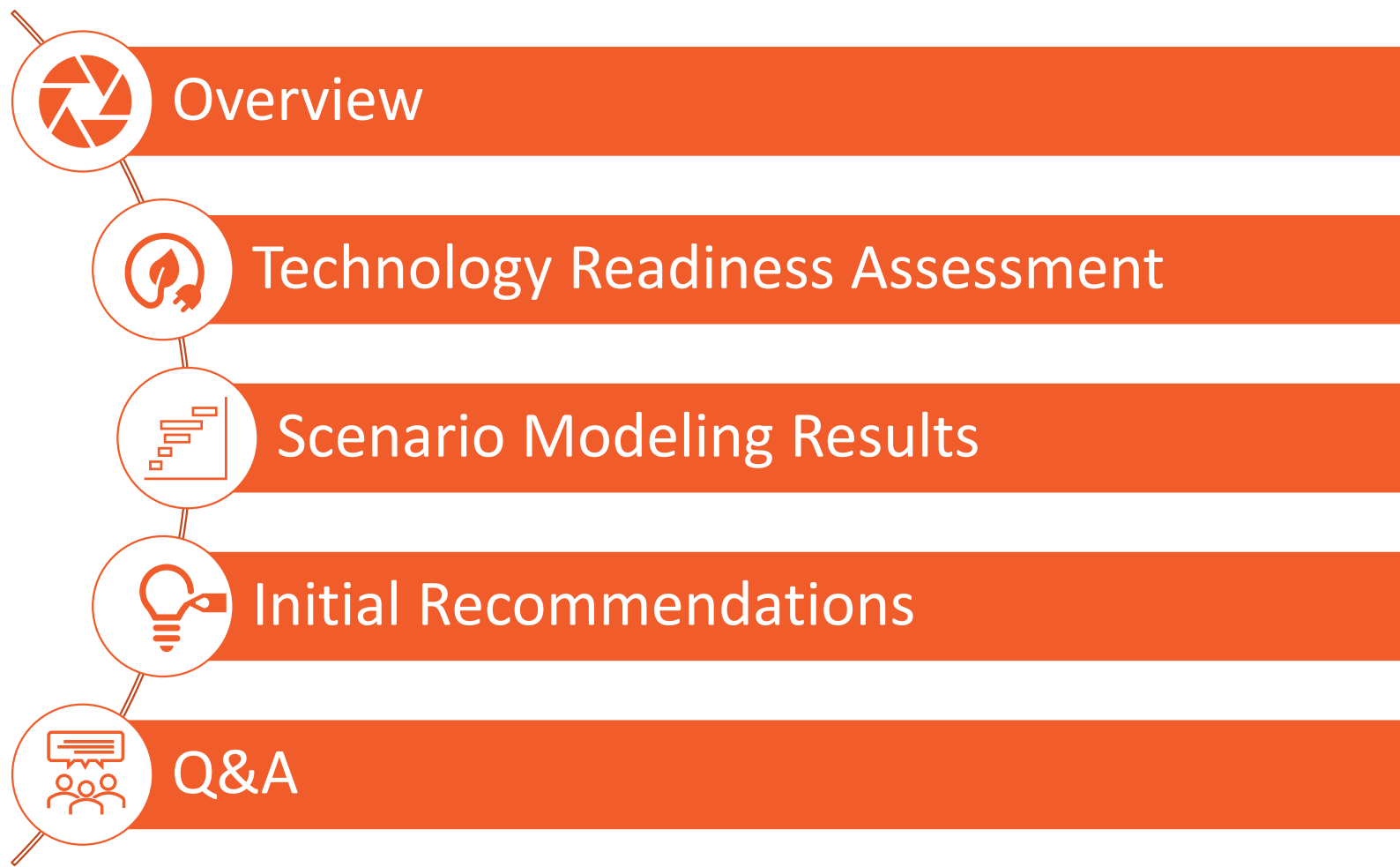


November 13, 2023

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Order of Presentation

EUC Generation Resource Plan Update



Overview

Lisa Martin

Deputy General Manager
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Michael Enger

Interim Vice President,
Energy Market Operations
& Resource Planning



Current Challenges

Retiring Fayette
Power Project

Regulatory /
ERCOT Market
Changes

Stronger Load
Growth

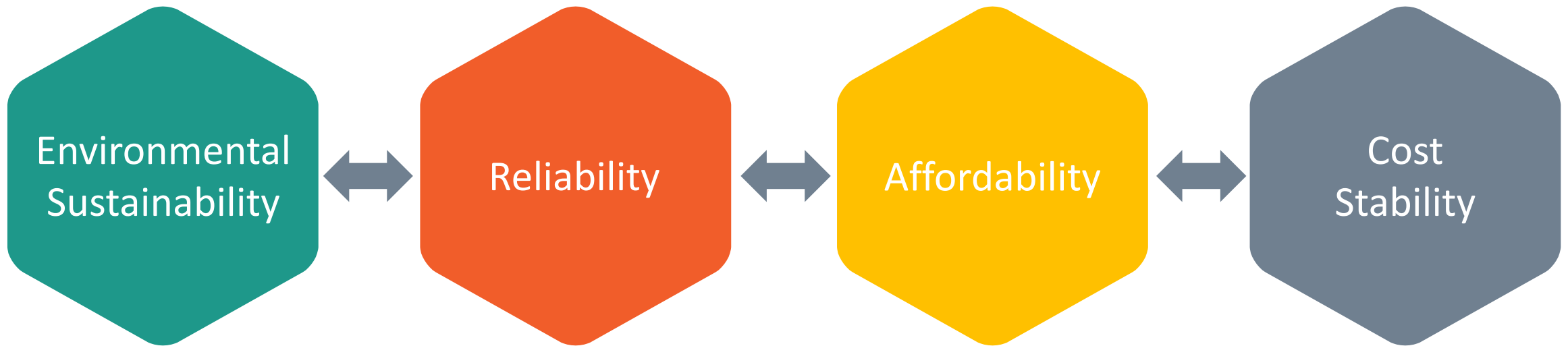
Extreme
Weather
Events

Increased
Market Volatility &
Congestion Costs



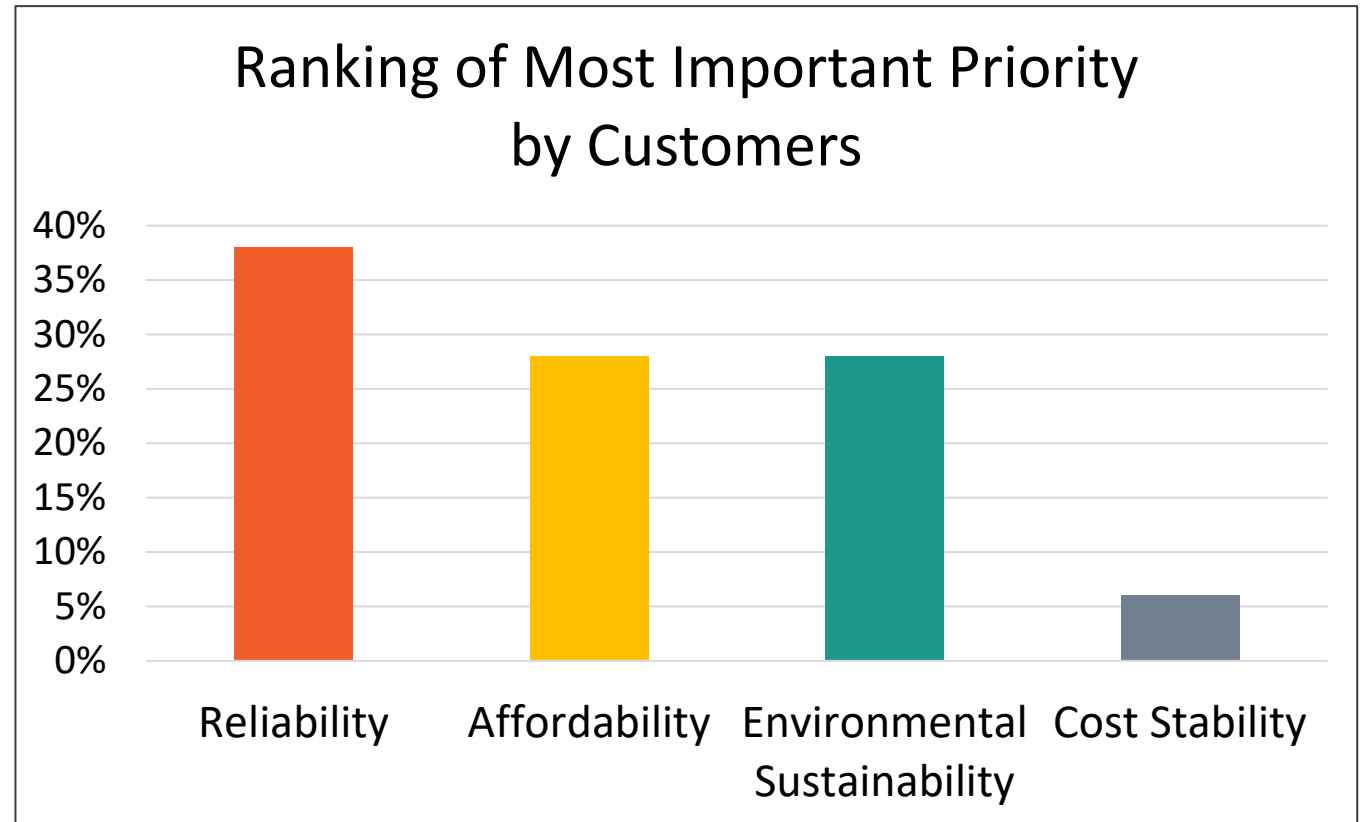
The 2030 Plan

A Quick Overview of the Balance



Customer Survey Results

- 7,512 respondents
- Reliability ranked #1 priority by 38% of respondents
- Open feedback responses echoed customer importance of reliability



Path to Carbon Free by 2035



Austin Energy remains committed to the 2030 Plan's goal of carbon-free generation by 2035



Austin Energy will continue discussions with LCRA to achieve a viable exit to Austin Energy's share of Fayette Power Project



Austin Energy will implement transmission upgrades to increase import capacity



Austin Energy recommends adjusting the goals framework for demand side management to enable expansion and capture full value of programs



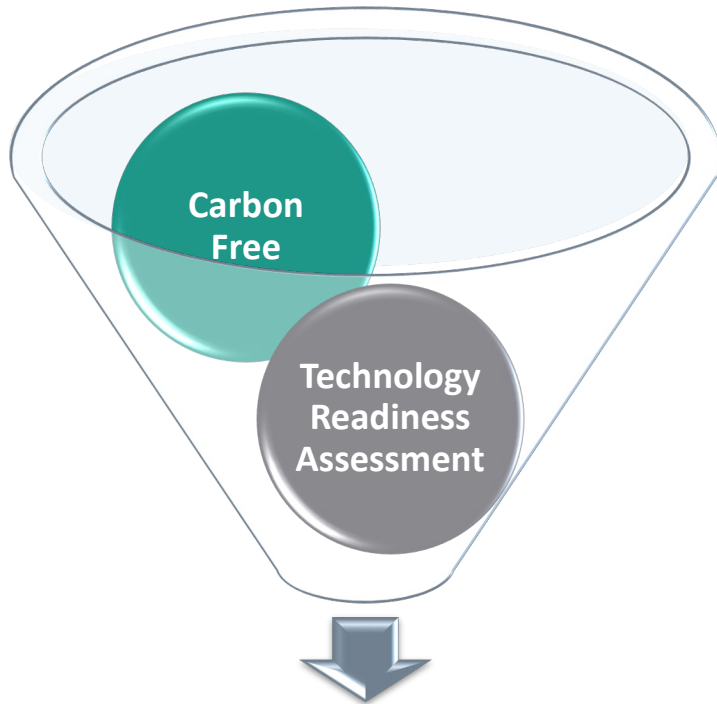
Initial assessment indicates a need to add local, dispatchable, hydrogen-capable generation — using natural gas as a near-term bridging solution — to address reliability and affordability risks, and to meet renewable generation goals



Framework for 2030 Plan Update

How we get to the proposed generation changes

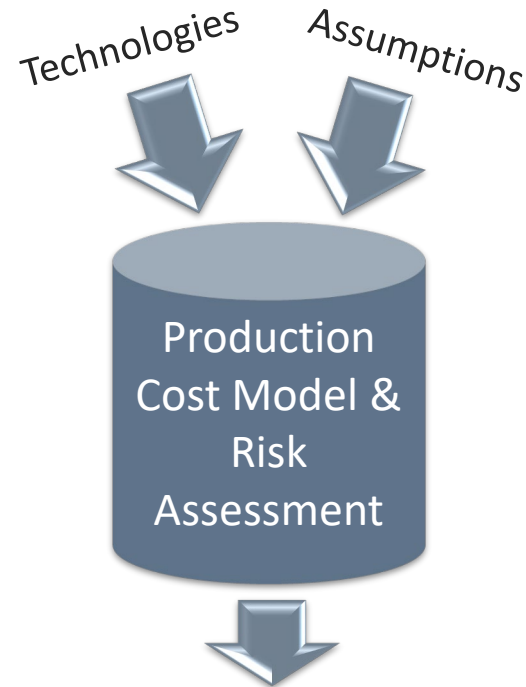
STEP 1



Technologies to include in
Production Cost Modeling &
Risk Assessment



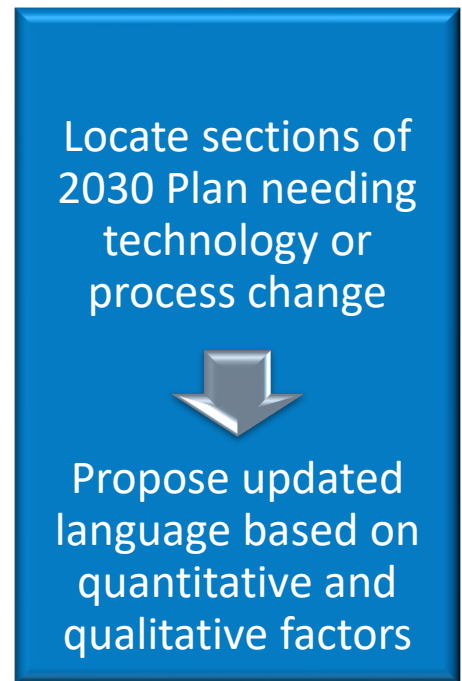
STEP 2



Costs for Comparison Purposes

Technologies to include in
Resource Gen Plan

STEP 3



Plan should maintain
flexibility as technologies
mature and not include
specific quantities

Technology Readiness Assessment



Technology Assessments

Expertise

Assessments were based upon technology write-ups by subject matter experts within Austin Energy.

Consultation

Academics/journal articles, research firms and vendors provided outside consultation.

Criteria

Standards were based off the current Resource Generation Plan.

Scoring

Qualitative scoring for each criteria was assessed:

■ Flawed ■ Challenged ■ Meets Criteria

Summaries

One-pagers with descriptions, breakthrough value/ innovation, market readiness, relative cost and challenges will be provided to the EUC/ Working Group.

Overview

A chart with an overview of the technology assessment scores will show comparative results.



Criteria

Readiness

Will the technology be able to serve as a resource within the 2030 Plan timeframe?

Affordability

Does using the solution at scale allow a high likelihood for meeting affordability goals?

Address Local Congestion

Can it be deployed inside Austin Energy's Load Zone?

Available 24/7

Beyond maintenance outages, can the resource reasonably be expected to meet a call to respond at any time?

Dispatchable

Can the resource respond on-demand to price and load requirements?



■ Flawed ■ Challenged ■ Meets Criteria

Technology Assessment

Technology groups covered correspond to portfolios of technologies used in scenario modeling



Supply-Side Technologies

Technologies that are on the utility side of the meter and Local Solar



Demand-Side Technologies

Manageable technologies on the customer side of the meter



Other Technologies

Technologies that extend beyond the supply or demand side categories

Portfolio Technologies

Supply Side



- Advanced Nuclear
small modular reactors
- Geothermal
production from old oil & gas wells
- Local Distribution Battery Energy Storage Systems
short duration <4 hrs.
- Local Distribution Battery Energy Storage Systems
long duration >4 hrs.
- Hydrogen Capable Combined Cycle Generators
- Remote Transmission Battery Energy Storage Systems
- Local Solar

Portfolio Technologies

Demand-Side Management

- Demand Response
- Customer-Sited Battery Energy Storage Systems
- Managed Charging of Electric Vehicles
- Distributed Energy Resource Management Systems (DERMS), including Virtual Power Plants



Portfolio Technologies

Other

- Carbon Capture & Sequestration
- Energy Efficiency
- High Efficiency Appliances
 - Induction Cooking
 - Heat Pump Systems
 - Water Heaters
 - Heating, Ventilation and Air Conditioning (HVAC)
 - Clothes Dryers
- Composite Conductor Transmission Lines



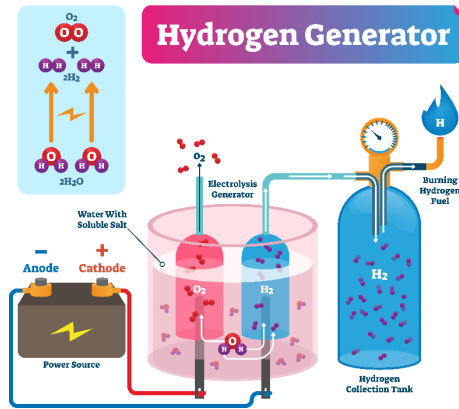
Path to Carbon Zero

Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Supply-Side					
Advanced Nuclear	Flawed	Flawed	Challenged	Meets Criteria	Challenged
Geothermal	Challenged	Challenged	Flawed	Meets Criteria	Challenged
Local Dist. BESS- short duration	Meets Criteria	Challenged	Meets Criteria	Challenged	Meets Criteria
Local Dist. BESS- Long duration	Meets Criteria	Challenged	Meets Criteria	Challenged	Meets Criteria
Hydrogen Capable Gen.	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria	Meets Criteria
Remote transmission-scale BESS	Meets Criteria	Challenged	Flawed	Challenged	Meets Criteria
Local Solar	Meets Criteria	Meets Criteria	Meets Criteria	Flawed	Flawed
Demand-Side Management					
Demand Response	Meets Criteria	Meets Criteria	Meets Criteria	Challenged	Meets Criteria
Customer-sited BESS	Meets Criteria	Challenged	Meets Criteria	Challenged	Meets Criteria
Managed charging	Challenged	Meets Criteria	Meets Criteria	Challenged	Meets Criteria
DERMS	Challenged	Challenged	Meets Criteria	Challenged	Meets Criteria
Other					
Carbon Sequestration	Challenged	Flawed	n/a	n/a	n/a
Energy Efficiency	Meets Criteria	Meets Criteria	Meets Criteria	n/a	n/a
High Efficiency Appliances	Meets Criteria	Challenged	Meets Criteria	n/a	n/a
Transmission-composite conductors	Meets Criteria	Challenged	Meets Criteria	n/a	n/a



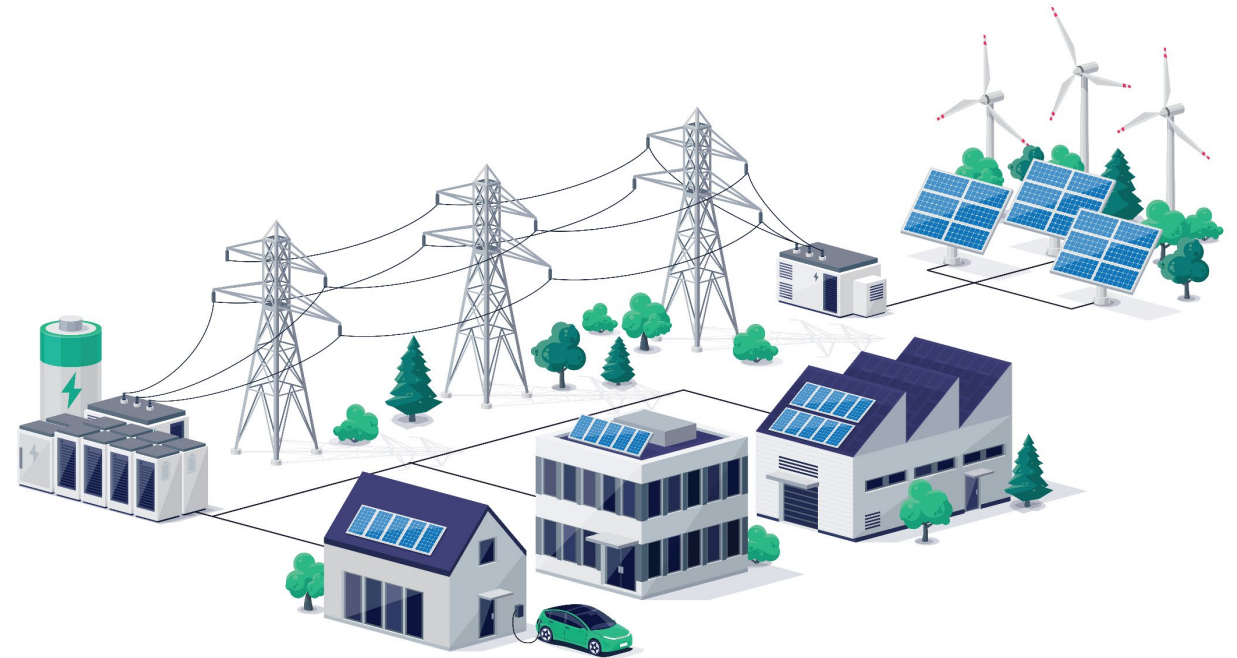
■ Flawed
 ■ Challenged
 ■ Meets Criteria

Key Takeaways



Only one technology satisfies all criteria –
Hydrogen Capable Generation

No one technology can be looked
at to solve all our resource needs



All technologies that meet the readiness criteria
(in green) were included in the scenario modeling

Resource Generation Plan Update

Production Cost Modeling Key Results

S. Babu Chakka

Manager, Energy Market Analysis & Resource Planning



Modeling Approach – Key Terms

Scenarios “Environments”

- Describe various environments or future states Austin Energy will need to navigate
- Help develop a broad understanding of impacts of generation transitions and load changes inside Austin Energy and across ERCOT

Technologies “Portfolios”

- Various types of supply and demand resources used to meet the goals and objectives of the plan
- Technologies in various combinations are called portfolios

Sensitivities “Risk Analysis”

Help broaden understanding of risks as they relate to Austin Energy’s power supply cost and system performance

OBJECTIVE: identify the least cost, carbon free, reliable, affordable, optimal path forward for Austin Energy considering risks and uncertainties that might unfold in the future



Modeling Approach – Scenario Environments

To maintain reliability and affordability while still driving toward carbon free, Austin Energy must course correct to navigate several risky environments (scenarios)

Extreme Weather

Weather events comparable to Winter Storm Uri, hot summer and extremely low wind or solar power production

Local Congestion

Conditions that cause local bottlenecks due to import limitations or changes in system conditions

Regulatory Changes

Focuses more on reliability in the face of market design changes such as Performance Credit Mechanism or load serving obligations or creating requirements on generation (cost causation)



Modeling Approach – Technologies

Austin Energy has studied a variety of technologies in various combinations (portfolios) to assess how they perform against the scenario environments

- Local Solar **LSOL**
- Distributed Storage **DST**
- Carbon Free Generation **HCCC**
- Direct Air Capture **DAC**
- Long Duration Storage **LDST**
- Local Long Duration Storage **LLDST**
- Demand Side Management **DSM**



Technology Portfolio Options

	Portfolio*	Description	Notes
①	CF_2035	Carbon Free by 2035 and meeting renewable goals Includes REACH dispatch	Base Case / Current 2030 Plan
②	CF_2035 without REACH	Carbon Free by 2035 while meeting renewable goals Does not include REACH dispatch	For comparison to Base Case
③	CF_2035 + LSOL	Carbon Free by 2035 with Local Solar	50% behind-the-meter 50% community solar
④	CF_2035 + LDST	Carbon Free by 2035 with Long Duration Storage	8-hour Lithium-ion batteries
⑤	CF_2035 + HCCC	Carbon Free by 2035 with Hydrogen-Capable Combined Cycle	Green hydrogen-capable combined cycle dispatchable
⑥	CF_2035 + LSOL + HCCC	Carbon Free by 2035 with Local Solar and Hydrogen-Capable Combined Cycle	A combination of technologies
⑦	CF_2035 + LDST + HCCC	Carbon Free by 2035 with Long Duration Storage and Hydrogen-Capable Combined Cycle	A combination of technologies



**All Portfolios include Carbon Free by 2035 while meeting renewable goals*

Technology Portfolio Options (cont.)

	Portfolio*	Description	Notes
8	CF_2035 + LSOL + LLDST + DST	Carbon Free by 2035 with Local Solar, Local Long Duration Storage and Distributed Storage	<ul style="list-style-type: none"> Distributed storage is targeted specifically to peak load reduction (4CP) and price spikes
9	CF_2035 + LLDST + DST + HCCC	Carbon Free by 2035 with Local Long Duration Storage, Distributed Storage, and Hydrogen-Capable Combined Cycle	<ul style="list-style-type: none"> Local long duration storage is 8-hr, sited within Austin Energy's load zone
10	CF_2035 + LSOL + LLDST + DST + DSM	Carbon Free by 2035 with Local Solar, Local Long Duration Storage, Distributed Storage and Demand Side Management	Considered heavier DSM as all runs already include demand side mgmt in the load forecast
11	CF_2035 + LSOL + LLDST + DST + HCCC	Carbon Free by 2035 with Local Solar, Local Long Duration Storage, Distributed Storage and Hydrogen-Capable Combined Cycle	A combination of technologies



**All Portfolios include Carbon Free by 2035 while meeting renewable goals*

Key Assumptions

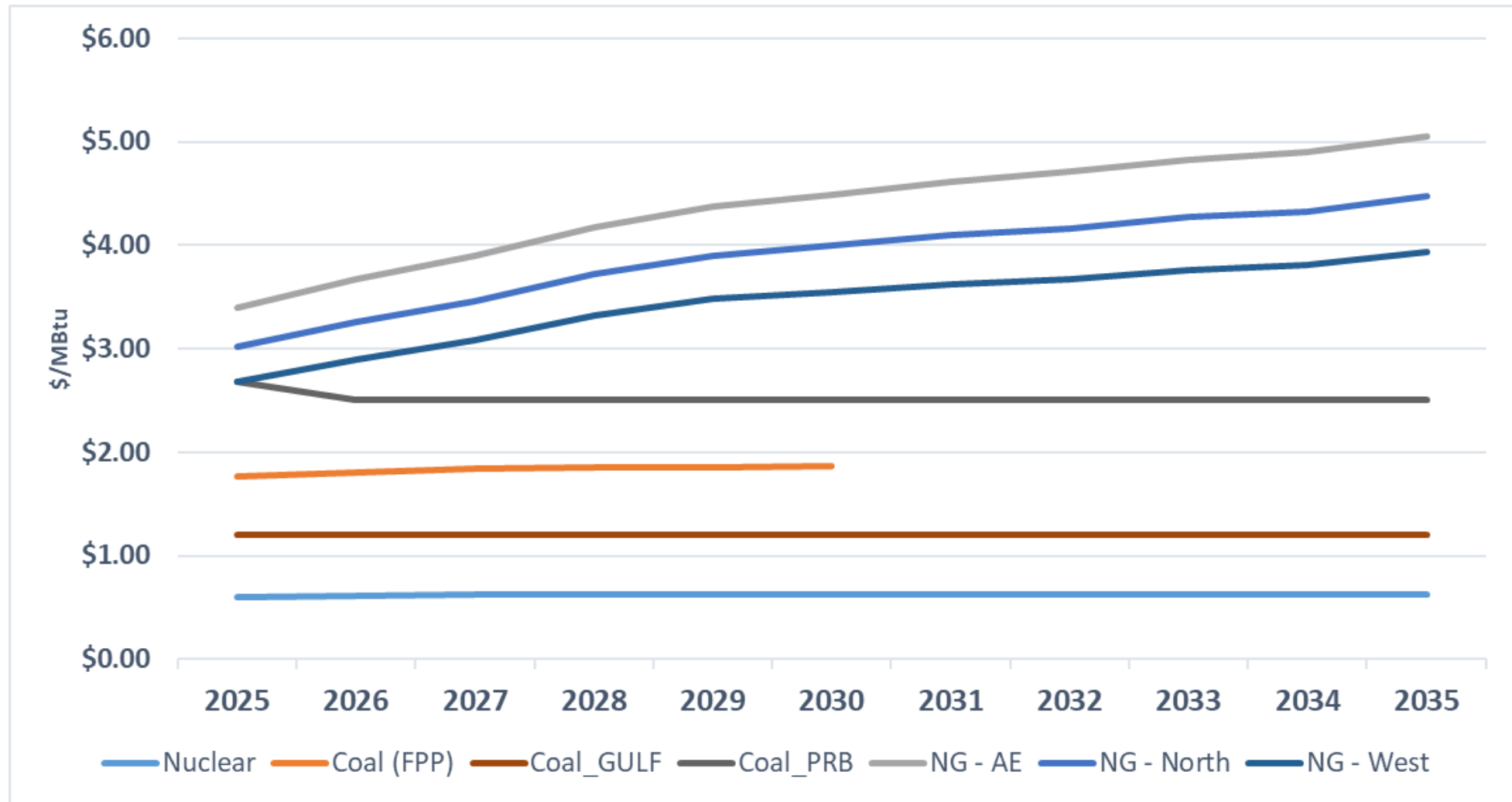


Key Assumptions: Technology Costs

Technology	Capital Cost (\$/kW)	Variable O&M (\$/MWh)	Fixed O&M (\$/kW-yr)	First Year Available
Utility Solar	1,097	0	8	2025
Local Solar - Residential	0	99	0	2026
Local Solar - Community	0	92	0	2026
Hydrogen Capable Combined Cycle	1,000 - 1,100	4	11	2026
Battery Storage (2-4 hour duration)	1,099	0	15	2026
Battery Storage (8 hour duration)	2,352	0	15	2026
Demand Response	100 - 200	0	0	2026



Key Assumptions: Fuel Price Projections



**Model assumes Fayette Power Project retirement in 2030*



Key Assumptions

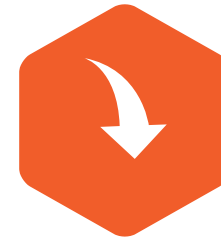
For comparison purposes, the total megawatts (MW) of additions and retirements are the same across all technology portfolio runs



1,000 MW added*

Model includes resource additions to

- Accommodate local generation retirements in model
- Meet future load growth
- Avoid load zone price separation



1,400 MW retired

Model includes retirement of

- 800 MW of local generation by 2035
- 600 MW Fayette Power Project by 2030



**The base case (current 2030 Plan) does not include any additional supply resources*

Key Assumptions: New Resource Additions/Retirements

ID	Portfolio	Total Supply Additions Modeled
①	Carbon Free by 2035 (CF_2035, base case for current 2030 Plan)	0%
②	CF_2035 without REACH	0%
③	CF_2035 + Local Solar (LSOL)	100%
④	CF_2035 + Long Duration Storage (LDST)	100%
⑤	CF_2035 + Hydrogen-Capable Combined Cycle (HCCC)	100%
⑥	CF_2035 + LSOL + HCCC	20% + 80%
⑦	CF_2035 + LDST + HCCC	20% + 80%
⑧	CF_2035 + LSOL + Local LDST (LLDST) + Distributed Storage (DST)	80% + 10% + 10%
⑨	CF_2035 + LLDST + DST + HCCC	10% + 10% + 80%
⑩	CF_2035 + LSOL + LLDST + DST + Demand Side Mgmt (DSM)	60% + 10% + 10% + 20%
⑪	CF_2035 + LSOL + LLDST + DST + HCCC	20% + 10% + 10% + 60%

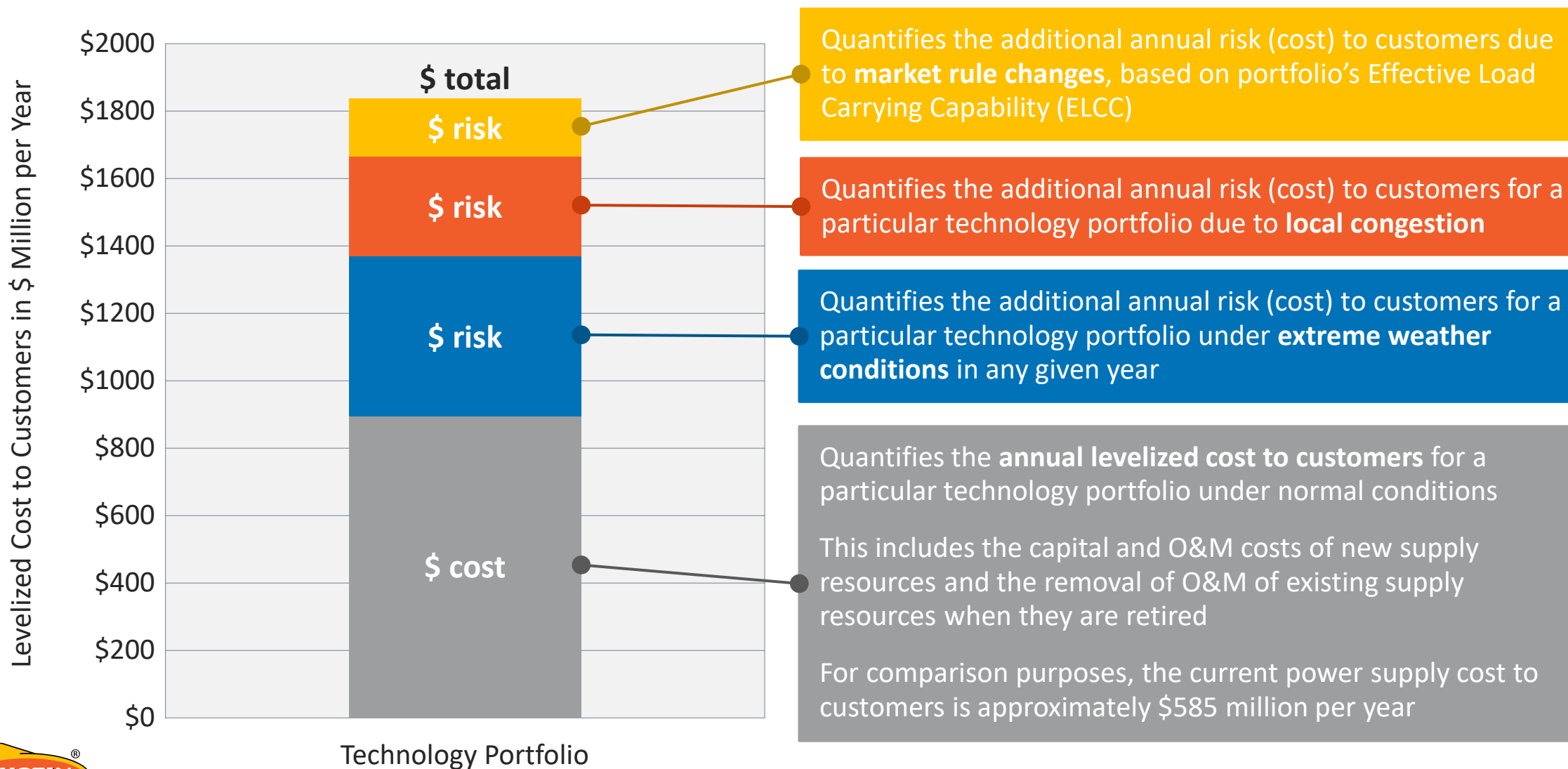


**All portfolios, except the base cases (1 & 2), include 1000 MW of supply additions and 1400 MW of retired generation resources*

Result Summaries



Results Summary – The Framework



Results Summary – The Current 2030 Plan (Base Case)

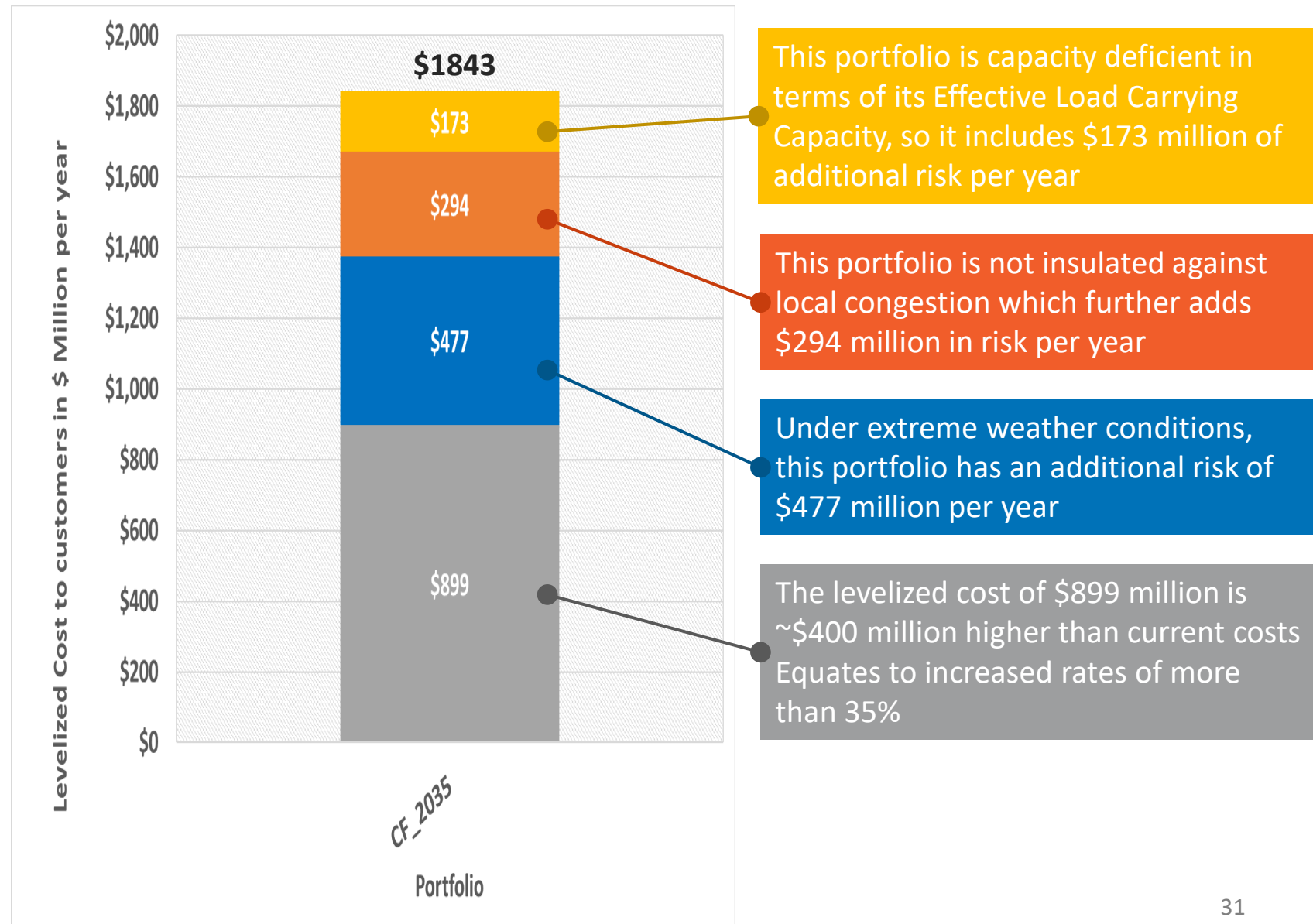
1

Key Assumptions

- No new thermal supply additions
- All 1400 MW of fossil generation retired
- Meets renewable generation goals in existing 2030 Plan
- Includes REACH dispatch

Key Takeaways

- The Current 2030 Plan has a high cost for customers
- It does not mitigate risks associated with extreme weather, local congestion or ERCOT market rule changes



Results Summary – Current 2030 Plan without REACH

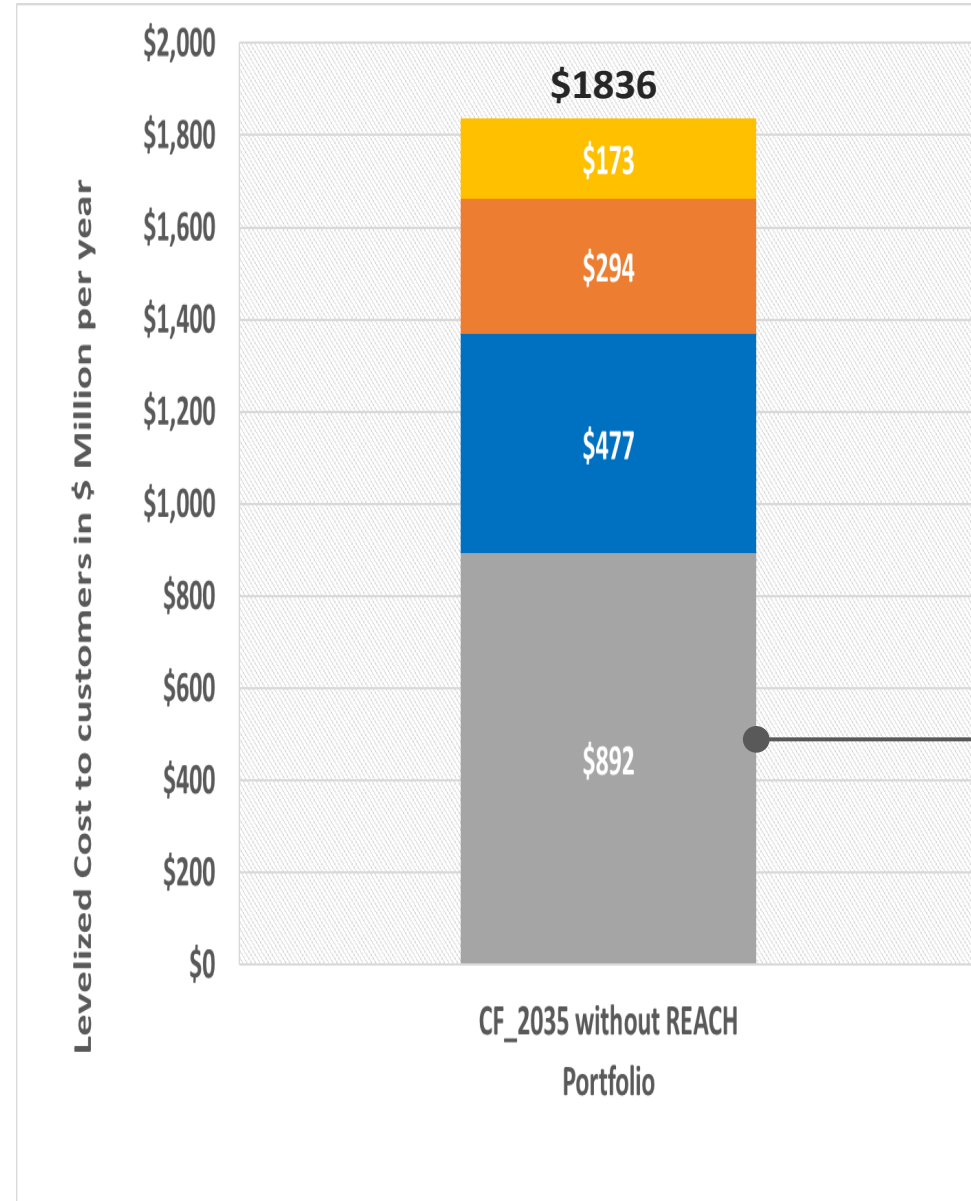
2

Key Assumptions

- Same as Current 2030 Plan (base case)
- Except this portfolio does not include REACH

Key Takeaway

The costs and risks of this portfolio are the same as the Base Case except for a decrease in the levelized cost due to not including the REACH adder



The levelized cost of \$892 million is \$7 million lower than the Base Case, but still ~\$400 million higher than current costs



Results Summary – Carbon Free by 2035

Local Solar

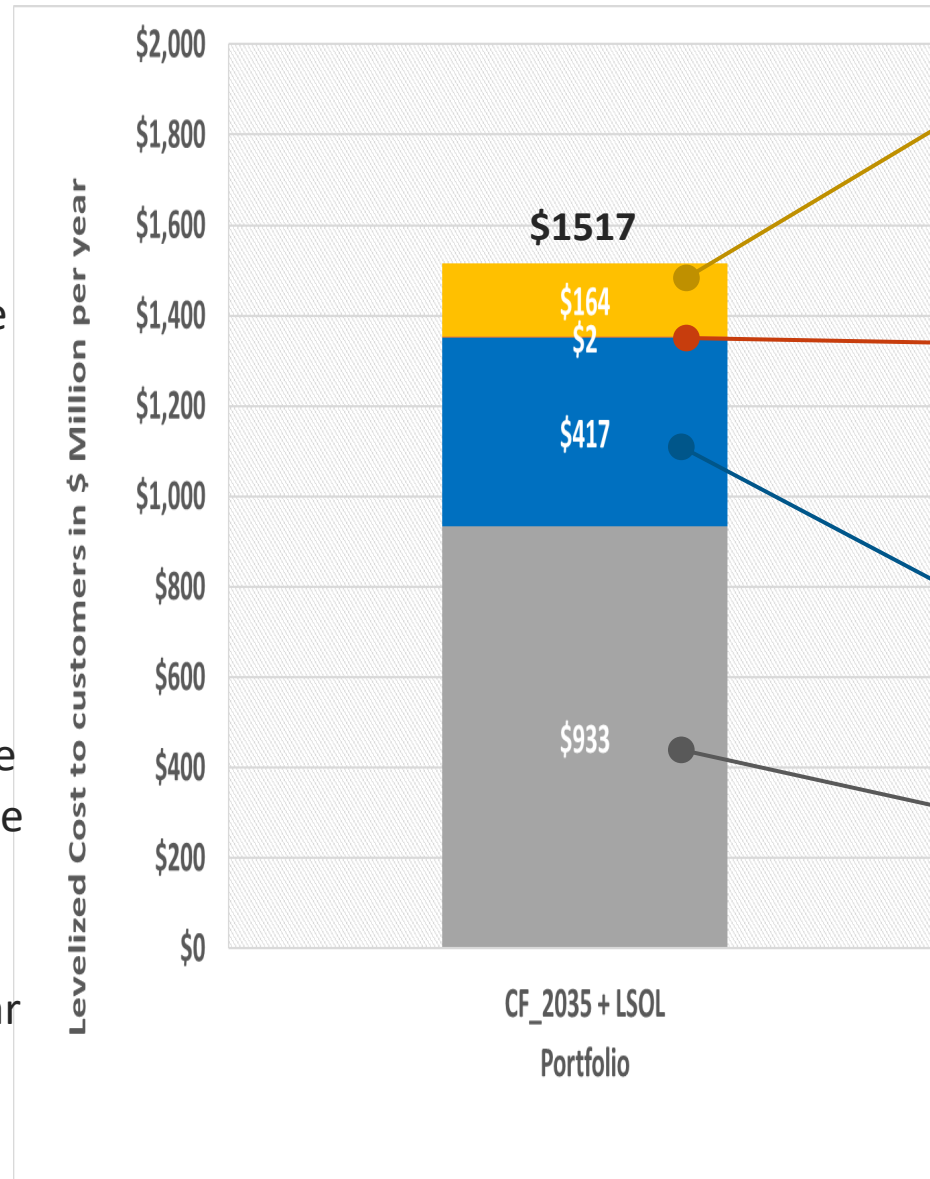
3

Key Assumptions

- Added supply is 100% local solar with
 - 50% MW behind-the-meter solar
 - 50% MW community solar
- Note: Quantities may not be feasible
- Does not include the cost of real estate

Key Takeaways

- This portfolio is costly for customers, but less costly than the base case
- It reduces congestion costs when solar performs as forecasted
- It does not mitigate risk during extreme weather even assuming the solar is able to produce
- It may not be feasible to obtain and host these large quantities of local solar



Results Summary – Carbon Free by 2035

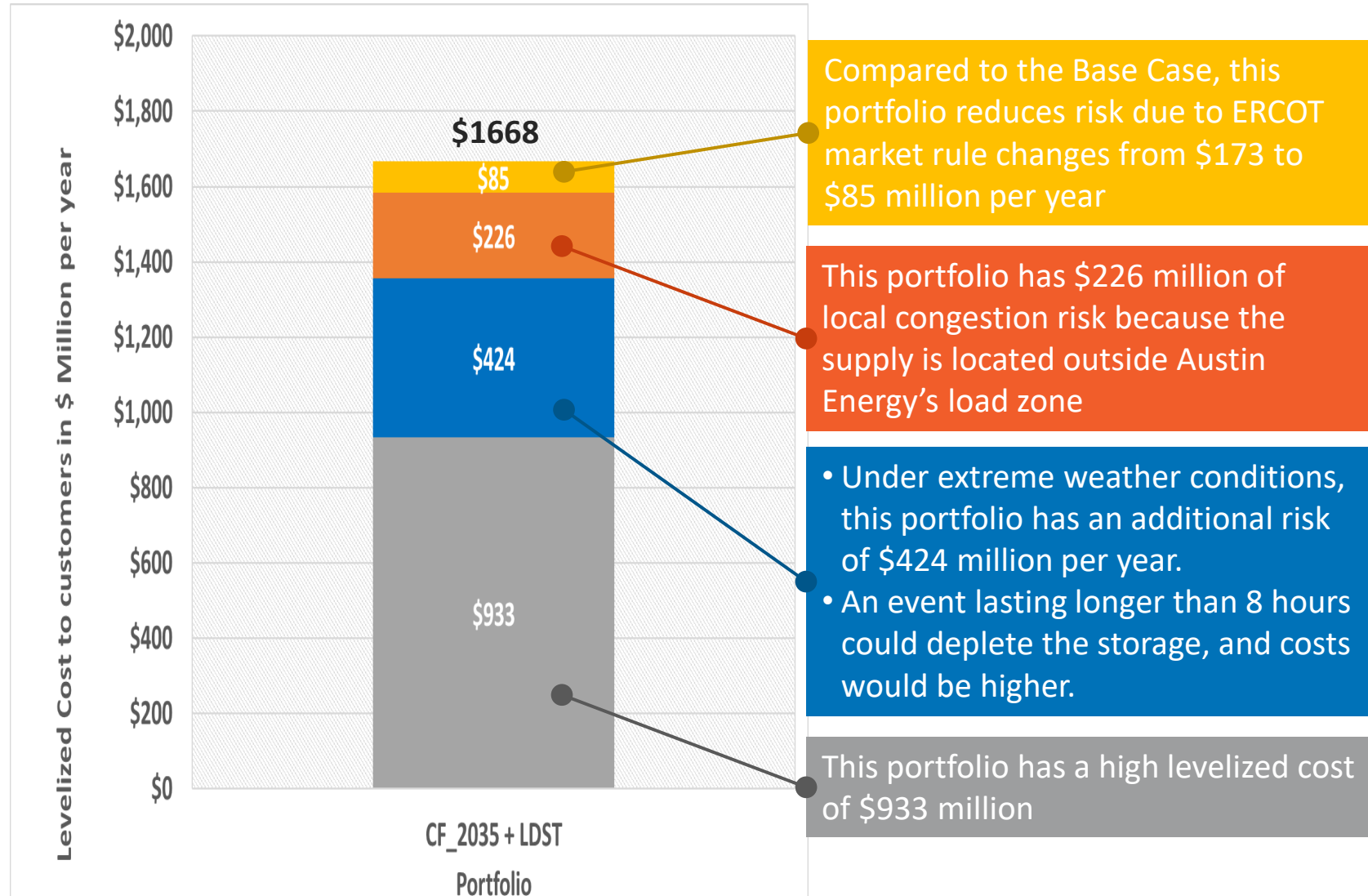
Long Duration Storage

Key Assumptions

Added supply is 100% 8-hr Lithium-ion battery storage located outside Austin Energy's load zone

Key Takeaways

- This portfolio is costly for customers, but less costly than the base case
- There is significant local congestion risk since the storage is not local
- Given current technologies, it would not be feasible to site this much storage in Austin Energy's load zone
- Extreme weather could also pose a problem, especially if the storage fully depleted during a long event



Results Summary – Carbon Free by 2035

Hydrogen-Capable Combined Cycle

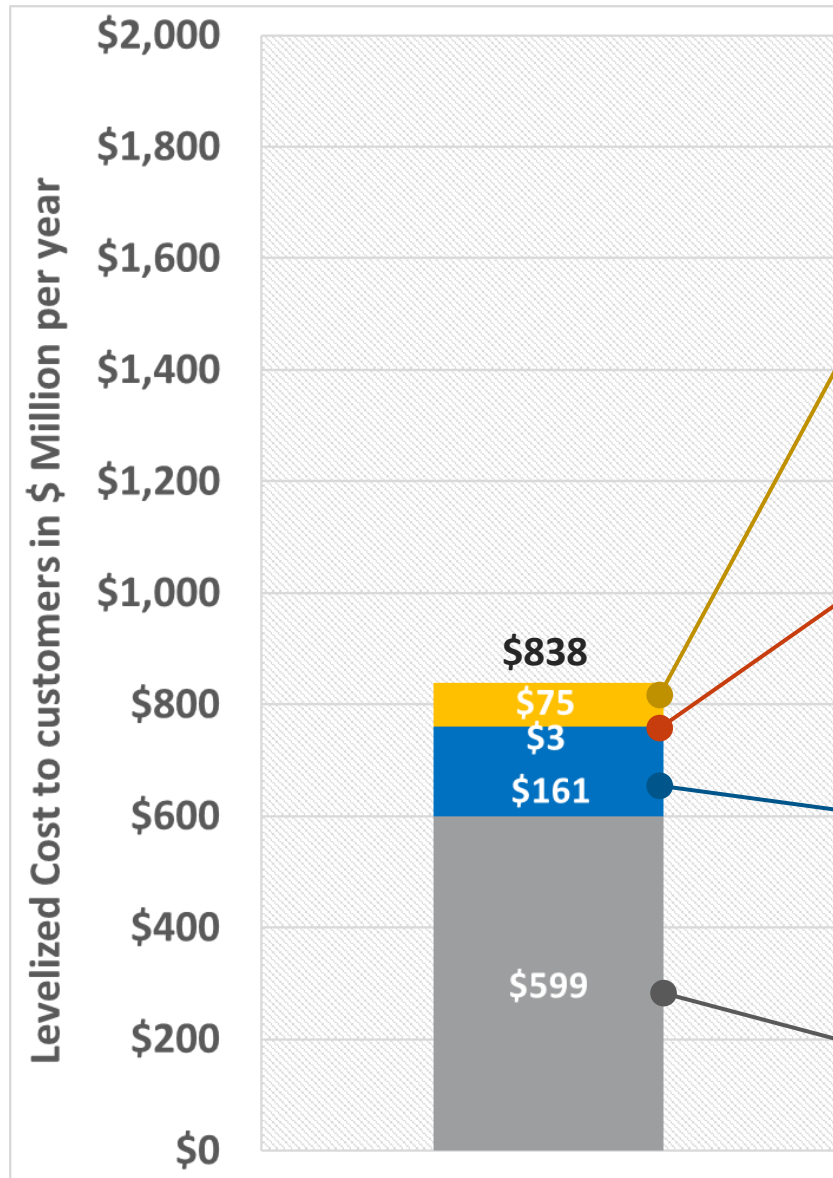
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Key Assumptions

- Added supply is 100% hydrogen capable combined cycle generation
 - Able to burn 75% green hydrogen initially
 - Able to convert to 100% after upgrade
- Sited locally
- Fully dispatchable; can operate in peaker or combined cycle mode
- Can provide Ancillary Services
- Green hydrogen costs \approx natural gas costs

Key Takeaways

- Portfolio reduces total costs compared to base case by \$1 billion per year
- It relies on natural gas initially to provide a bridging solution to minimize risk impact on customers



This portfolio has risk due to ERCOT market rule changes of \$75 million per year, which is \sim \$100 million lower than the Current 2030 Plan (base case)

Local congestion is nearly gone because the supply is located in Austin Energy's load zone

Under extreme weather conditions, this portfolio has an additional risk of \$161 million per year, \sim \$300 million lower than the base case

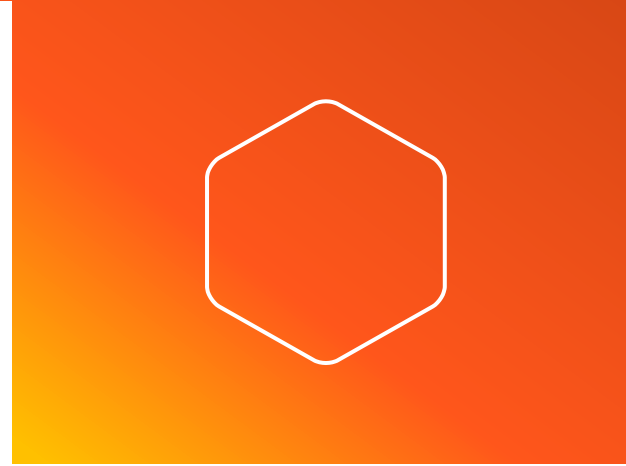
The levelized cost of \$599 million is \sim \$300 million lower than the Current 2030 Plan (base case)

Results Summary

Portfolios 6 – 11

A Combination of Technologies

The Scenario Modeling Appendix has additional information on portfolios 6 – 11, each of which includes a combination of technologies



Summary Matrix

■ Flawed ■ Challenged ■ Meets Criteria

ID	Technology Portfolio	Carbon Free by 2035	Renewable Goals	Demand Side Mgmt Goals	Affordable	Total Cost/Risk (in \$Million)	Levelized Cost (in \$Million)	Extreme Weather Risk (in \$Million)	Local Congestion Risk (in \$Million)	ERCOT Market Rule Change Risk (in \$Million)
①	CF_2035 (Current 2030 Plan or Base Case)	Yes	Yes	Yes	No	\$1,843	\$899	\$477	\$294	\$173
②	CF_2035 without REACH	Yes	Yes	Yes	No	\$1,836	\$892	\$477	\$294	\$173
③	CF_2035 + LSOL	Yes	Yes	Yes	No	\$1,517	\$933	\$417	\$2	\$164
④	CF_2035 + LDST	Yes	Yes	Yes	No	\$1,668	\$933	\$424	\$226	\$85
⑤	CF_2035 + HCCC	Yes	Yes	Yes	Yes	\$838	\$599	\$161	\$3	\$75
⑥	CF_2035 + LSOL + HCCC	Yes	Yes	Yes	Yes	\$954	\$630	\$231	\$1	\$92
⑦	CF_2035 + LDST + HCCC	Yes	Yes	Yes	Yes	\$902	\$643	\$185	(\$3)	\$77
⑧	CF_2035 + LSOL + LLDST + DST	Yes	Yes	Yes	No	\$1,544	\$944	\$448	(\$1)	\$153
⑨	CF_2035 + LLDST + DST + HCCC	Yes	Yes	Yes	Yes	\$1,003	\$651	\$264	\$2	\$86
⑩	CF_2035 + LSOL + LLDST + DST + DSM	Yes	Yes	Yes	No	\$1,582	\$907	\$523	\$5	\$146
⑪	CF_2035 + LSOL + LLDST + DST + HCCC	Yes	Yes	Yes	Yes	\$1,158	\$757	\$304	(\$4)	\$102

Mapping to 2030 Plan Objectives:



Environmental
Sustainability



Affordability
Cost Stability



Reliability
Affordability
Cost Stability



Key Takeaways

Environmental Sustainability All portfolios meet goal by design

Reliability

Only portfolios without high percentages of solar or storage overcome extreme weather risk

Affordability

Only portfolios including hydrogen capable combined cycle meet the affordability goal

Reliability

Cost Stability

Only portfolios with local supply overcome local congestion risk

Affordability

To meet all objectives moving forward

- Austin Energy's portfolio should include local, dispatchable, hydrogen-capable generation
- This mitigates reliability and affordability risk and enables additional renewables to meet Resource Plan goals

Initial Recommendations

Michael Enger

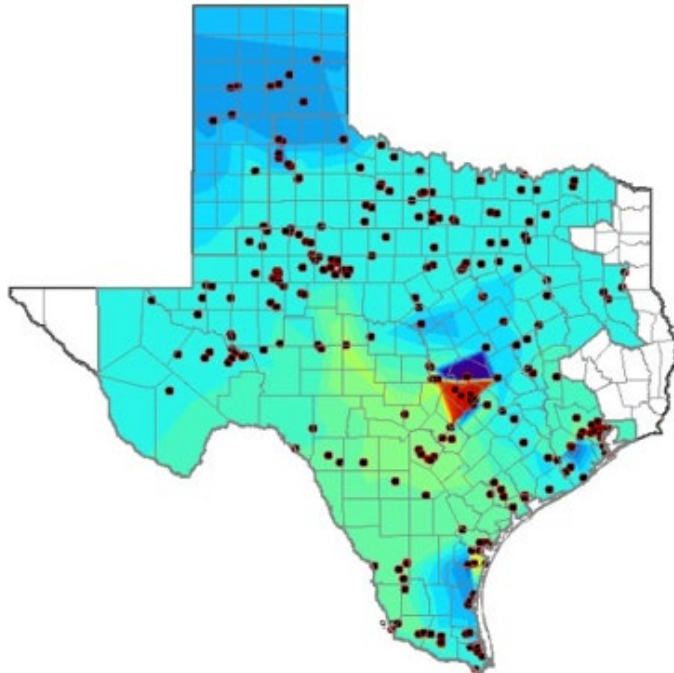
Interim Vice President
Energy Market Operations & Resource Planning



Carbon Generating Assets

Stays the
Same

Carbon free by 2035



Proposed
Update

Local, dispatchable generation with a
pathway to carbon free by 2035

- Provides voltage support in the Austin area

R

- Mitigates load zone price separation risk

A

CS

- Provides for additional renewables to be
affordably added to the supply portfolio

ES

Carbon Reduction Goals



Stays the
Same

Carbon free by 2035



Proposed
Update

Clarify when carbon free
generation goals are a
percentage of load
versus stack emissions



Fayette Power Project



Stays the
Same

Austin Energy's commitment
to exit from the
Fayette Power Project



Proposed
Update

Continue discussions with
LCRA to achieve a viable exit
to Austin Energy's share of
Fayette Power Project



Demand Side Management Portfolio

Stays the Same

- Portfolio focus on environmental sustainability and peak demand reduction
- Equitable Participation in Programs
- Improving affordability for Austin Energy customers

Proposed Update

- Moving away from Megawatt to Greenhouse Gas reduction to improve overall impact and effectiveness

ES

- Enhanced definition of demand response

R A ES CS

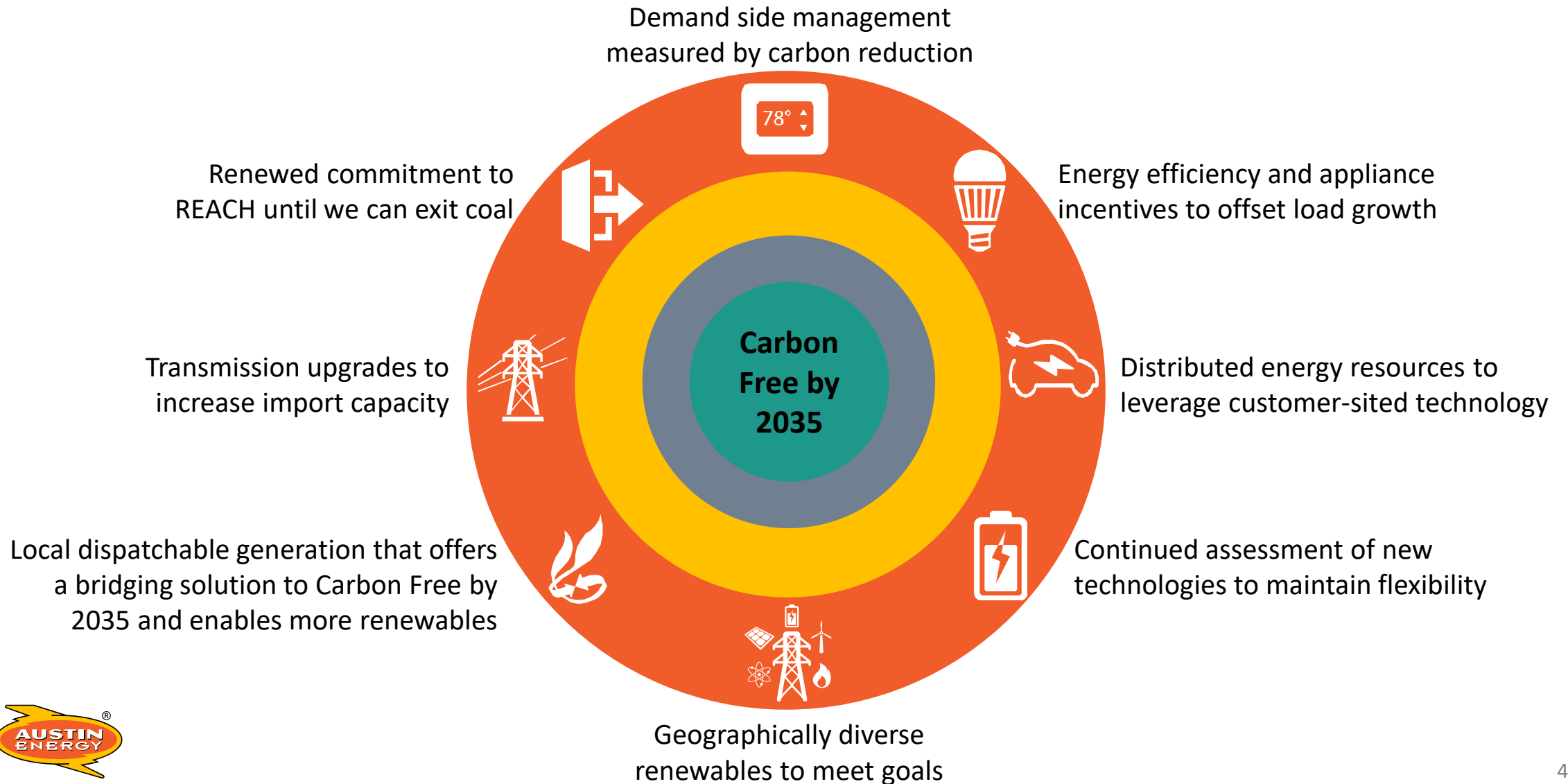
- Driving outcome-oriented program design

R A ES CS



Portfolio Diversity Enables Customer Objectives

- Reliability ● Affordability ● Environmental Sustainability ● Cost Stability



Questions?



**Customer Driven.
Community Focused.SM**



Technology Assessment Appendices



Format/ Icon Description



Innovation/ Breakthrough Value



Market Readiness



Relative Cost (Compared to Alternatives)



Challenges

■ Flawed ■ Challenged ■ Meets Criteria



Technology	Readiness	Affordability	Inside Load Zone	Available 24/7	Dispatchable
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Technology Assessment Appendices

Supply-Side Technologies



Advanced Nuclear



Smaller footprint, reduced permitting times and costs



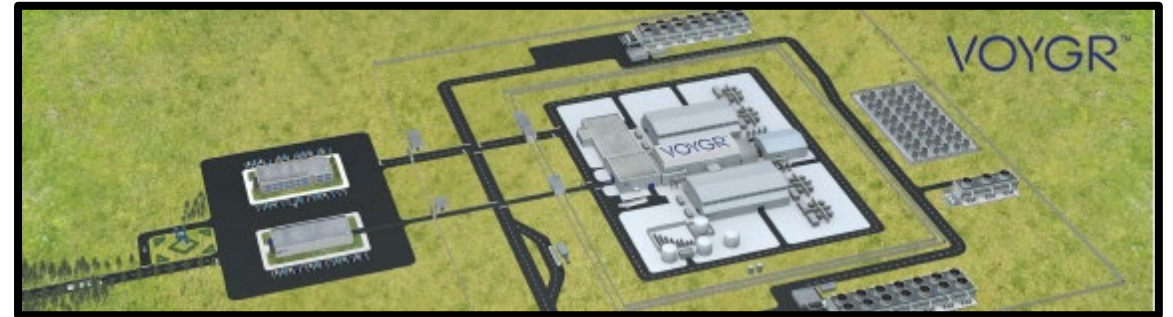
Widespread approval and adoption not yet expected



\$119 MWh with subsidies



Design licensing, readiness, siting



NuScale VOYGR modular power plant (308, 462 or 924 MW) can fit on approx. 32 acres of land, current target \$119/MWh with federal subsidy for 1st plant.



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Advanced Nuclear					

Geothermal



Natural fractures maximize heat output



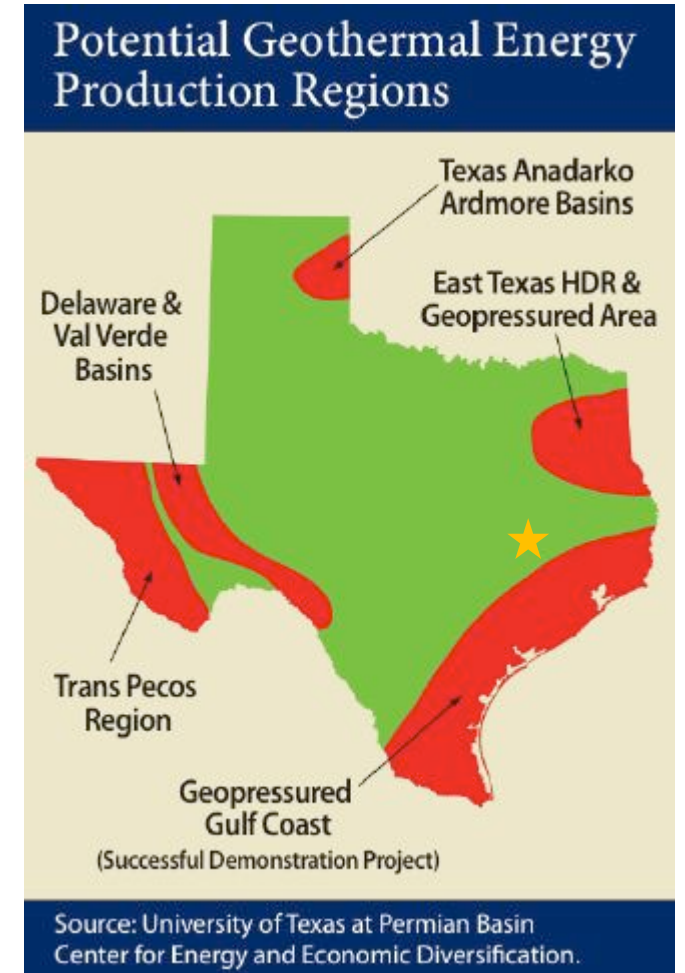
Used worldwide – scaled conversion still nascent



\$.07-.09 kWh



Location load constraints, small scale applications



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Geothermal Generation					

Local Battery Energy Storage Systems (BESS)

Both Long & Short Duration



Solid-state batteries, flow batteries



72 GW of additional capacity to be developed through the end of 2020s



Cost varies depending on application



Procurement, standards development, siting and delivering enough value to justify the cost



Battery at Austin Energy's Kingsbery Substation



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Local Distribution-BESS					

Hydrogen Capable Combined Cycle



High-temperature combustion



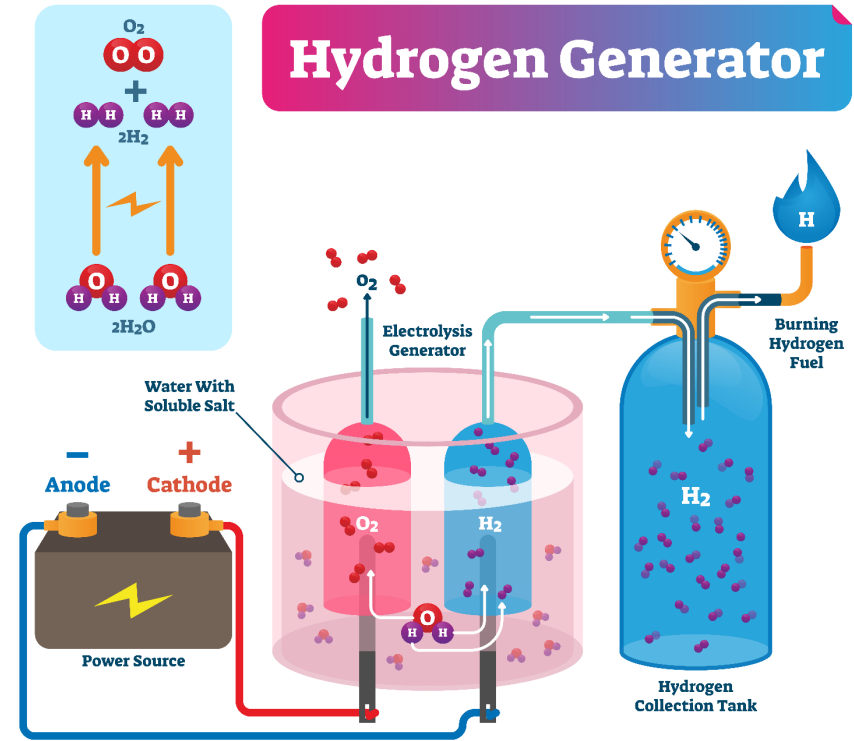
Inherently fuel-flexible



Indicative pricing is competitive



Initial cost of hydrogen, electrolyzers



Electrolyzers split water into hydrogen and oxygen



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Hydrogen Capable Generation					

Remote Transmission-Scale BESS



Economies of scale and co-location



Scaling rapidly



Dependent on land and location



Procurement of transformers and battery resource competition



LADWP's 20 MW energy storage project in the Mojave Desert



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Remote Transmission-Scale BESS	Green	Yellow	Red	Yellow	Green

Local Solar



Safe and highly modular



Readily available



Subsidized and a bankable asset



Non-dispatchable generation, end-of-life considerations, susceptible to hailstorms



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Local Solar					

Technology Assessment Appendices

Demand-Side Technologies



Demand Response



Responsive and agile, shares both control and cost



Devices are market-ready but not yet ready for aggregation across vendors or types of devices



Relatively low cost, depending on technology



Aggregation, customer experience and reliability challenges



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Demand Response					

Customer-Sited BESS



Continuous battery technology improvements



Single vendor aggregation only



Could be utilized for demand response and provide a financial benefit



Expensive, if unmanaged could put significant stress on the local grid



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Customer-Sited BESS					

Managed Charging



Potential for Demand Side Management



Evolving standards and interoperability



Significant variance in cost



Interoperability, vendor proprietary charging/
communication network



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Managed Charging					

Distributed Energy Resource Management Systems (DERMS)



Potentially connected and networked energy resources



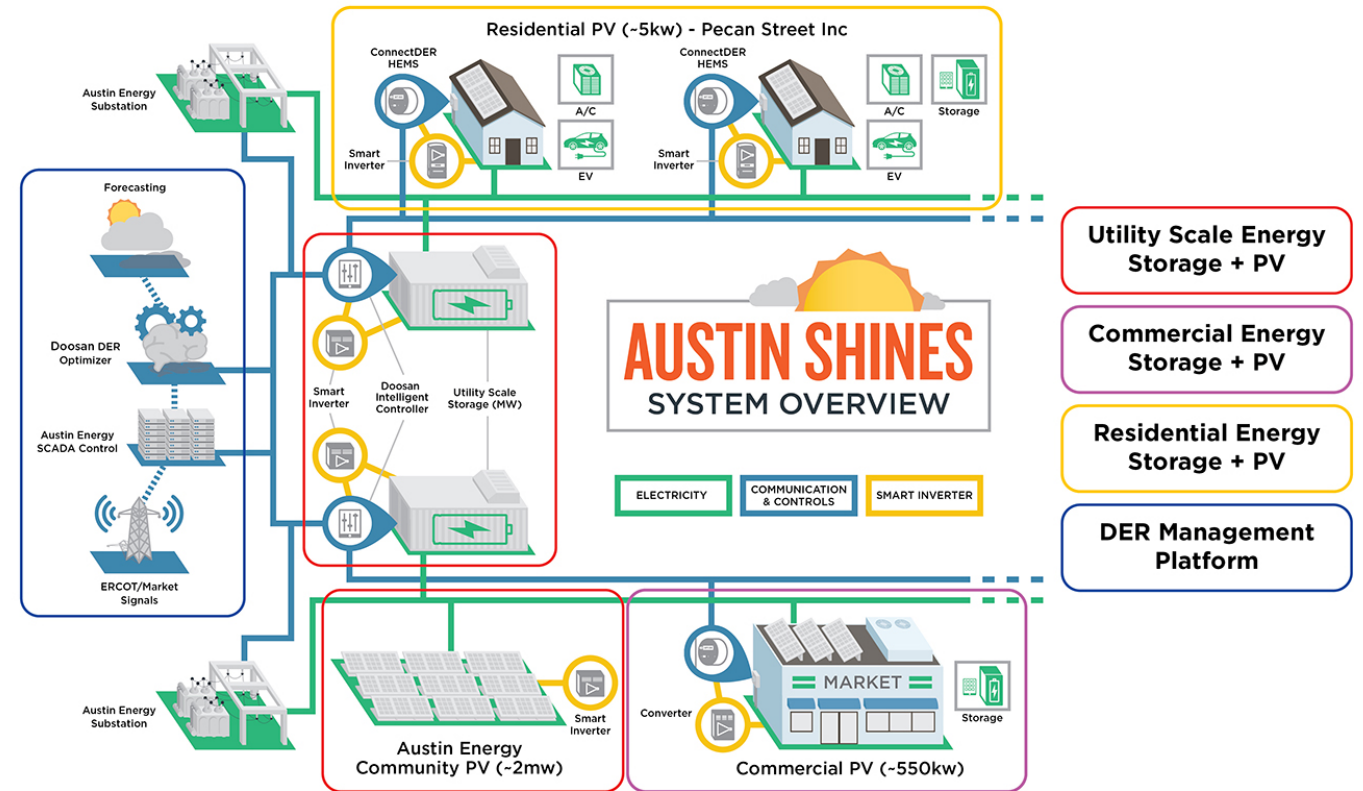
Lacking standards for interoperability



Relatively expensive



Integration



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
DERMS					

Technology Assessment Appendices

Other Technologies



Carbon Capture & Sequestration



Electro swing absorption, zeolites, passive direct air capture



No plants currently in operation

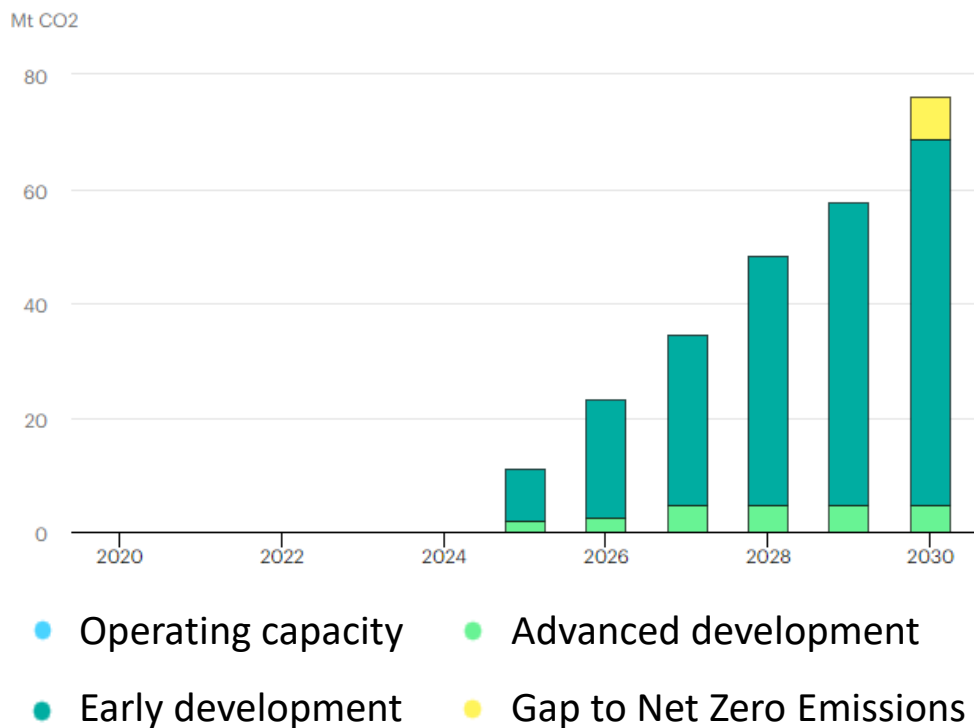


Expensive, cost still unknown



Cost and time-to-market

CO2 Capture by Direct Air Capture
planned projects and in the
Net Zero Emissions by 2050 Scenario



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Direct Air Capture			n/a	n/a	n/a

Energy Efficiency



Low-income weatherization and retrofits, Inflation Reduction Act funding



Expanded programs targeting low-moderate income



Affordable with subsidization



Overcoming barriers for customers



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Energy Efficiency				n/a	n/a

High Efficiency Appliances



Heat pump technologies, induction cooking



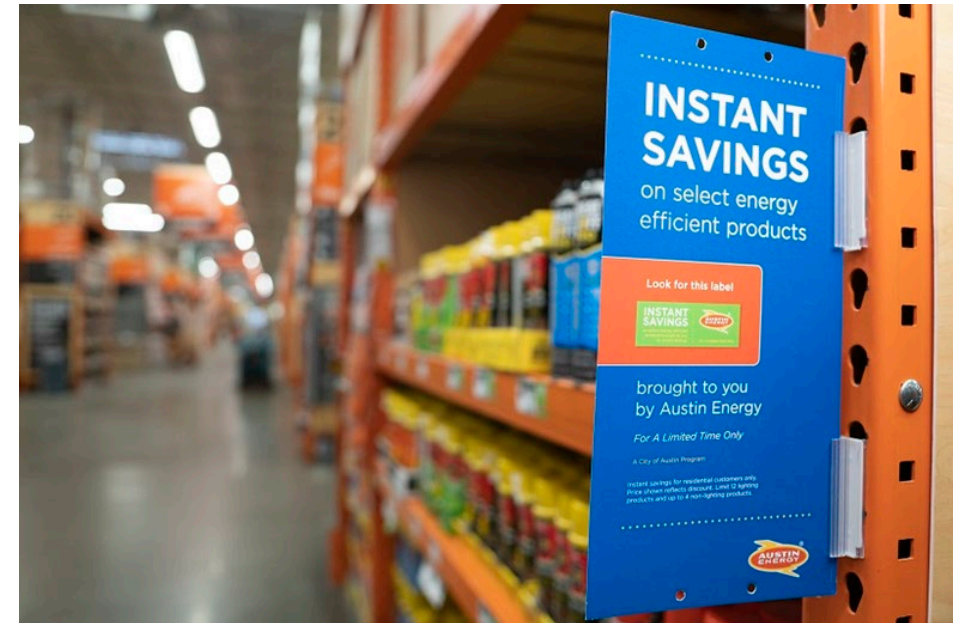
Good for all but heat pump dryers



Mixed by technology, new vs. retrofit



Retrofits, cost, workforce readiness and increased electricity demand



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
High Efficiency Appliances				n/a	n/a

Transmission – Composite Conductors



Lighter with lower coefficient of thermal expansion than steel



Ready, available through multiple manufacturers and currently in use



4-5 times the cost of comparable steel core conductors



Limited applications due to allowable costs



Technology	Readiness	Affordability	Address Congestion	Available 24/7	Dispatchable
Transmission-Composite Cond.				n/a	n/a

Scenario Modeling Appendices



Results Summary – Carbon Free by 2035

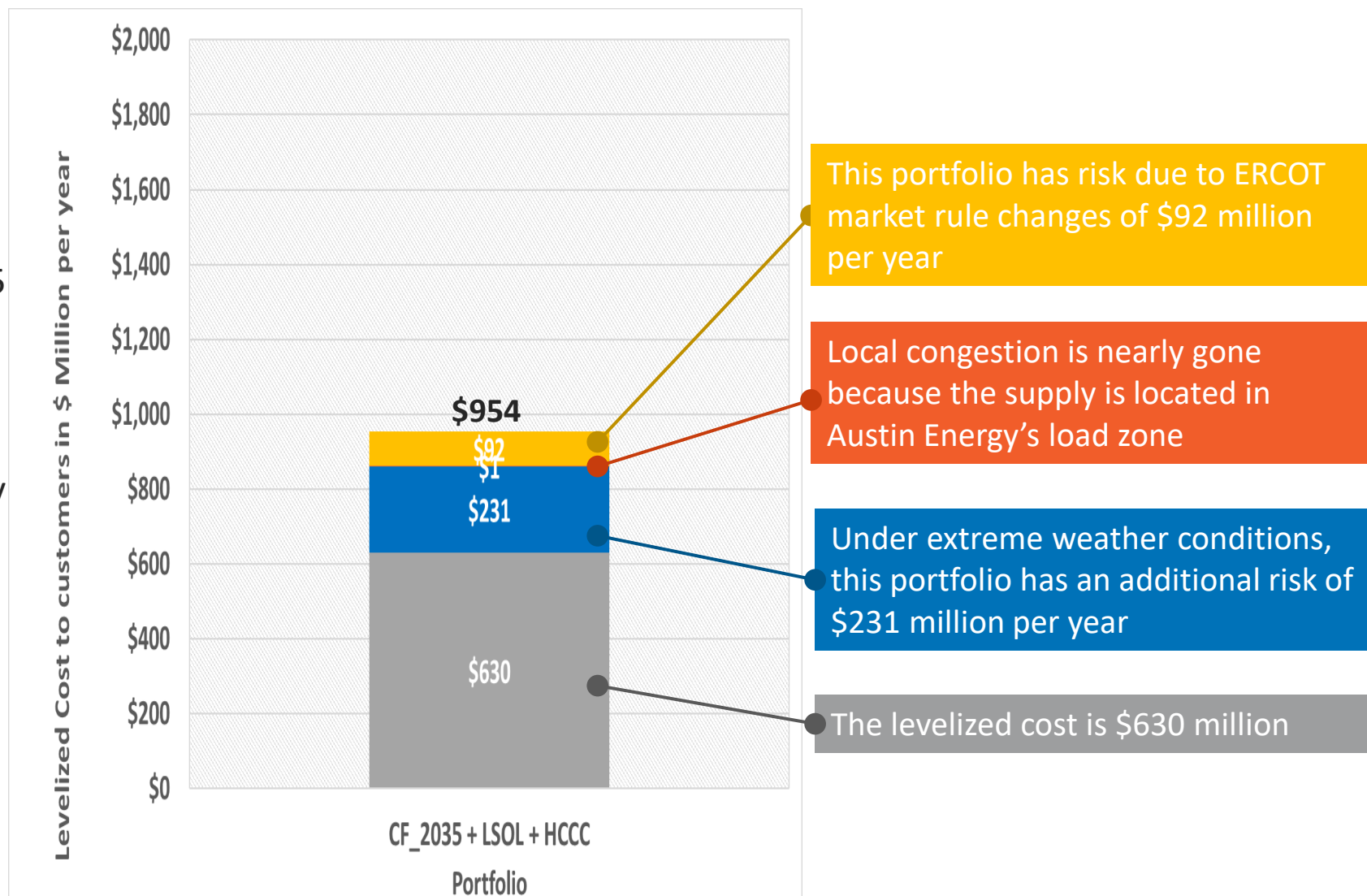
Local Solar and Hydrogen-Capable Combined Cycle

Key Assumptions

- 20% local solar with 50/50 split between behind the meter solar and community solar
- 80% green hydrogen capable combined cycle generation by 2035

Key Takeaways

- While this portfolio reduces total costs compared to the base case by ~\$900 million per year, it remains costlier than Carbon Free by 2035 with Hydrogen-Capable Combined Cycle by ~\$116 million per year
- This is mostly due to extreme weather risk



Results Summary – Carbon Free by 2035

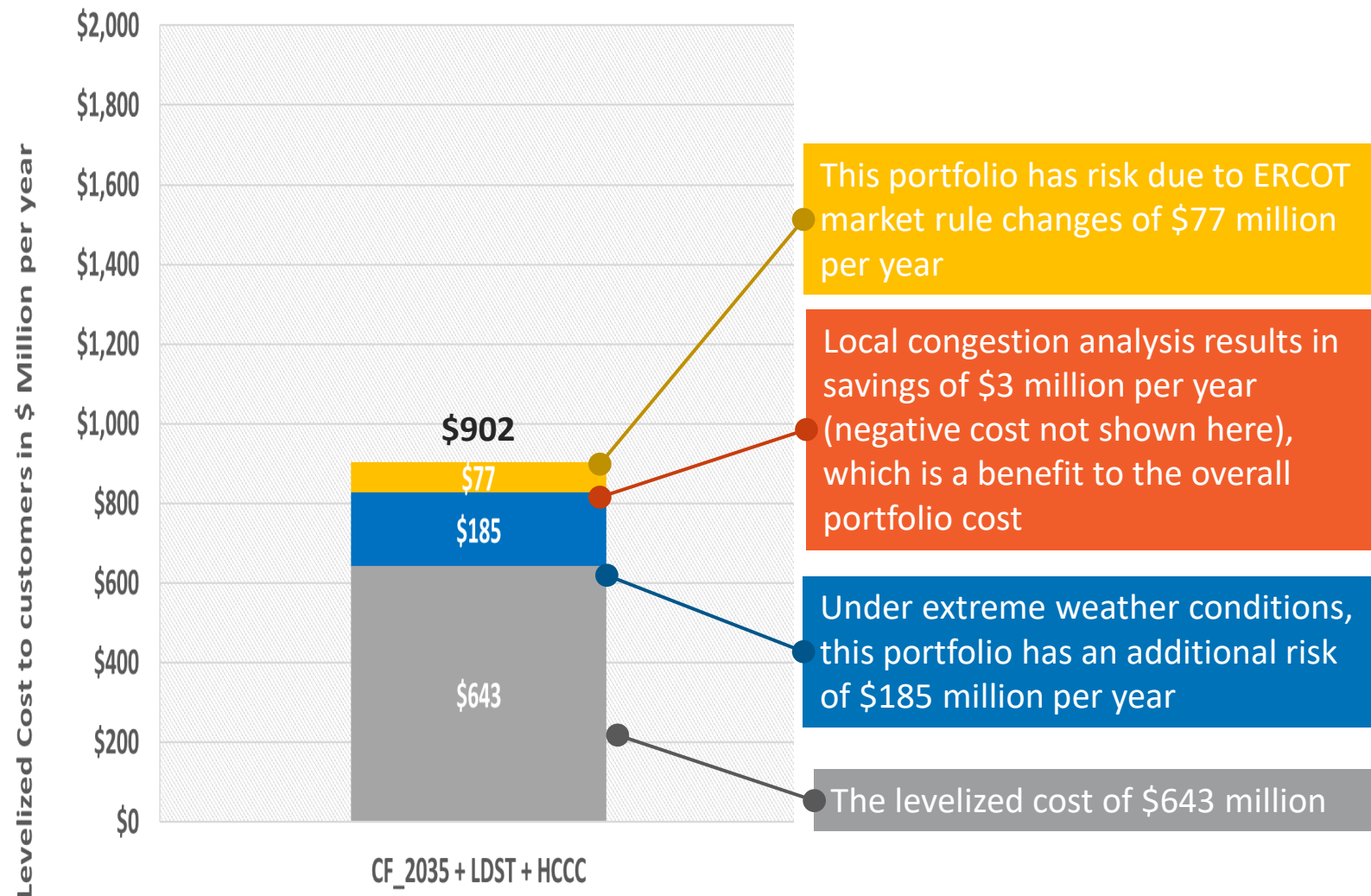
Long Duration Storage and Hydrogen-Capable Combined Cycle

Key Assumptions

- 20% 8-hr Lithium-ion battery storage located outside Austin Energy's load zone
- 80% green hydrogen-capable combined cycle generation by 2035

Key Takeaways

- While this portfolio reduces total costs compared to the base case by ~\$940 million per year, it is costlier than Carbon Free by 2035 with Hydrogen-Capable Combined Cycle by ~\$64 million per year
- This is mostly due to the capital cost of battery storage and partly due to extreme weather risk



Results Summary – Carbon Free by 2035

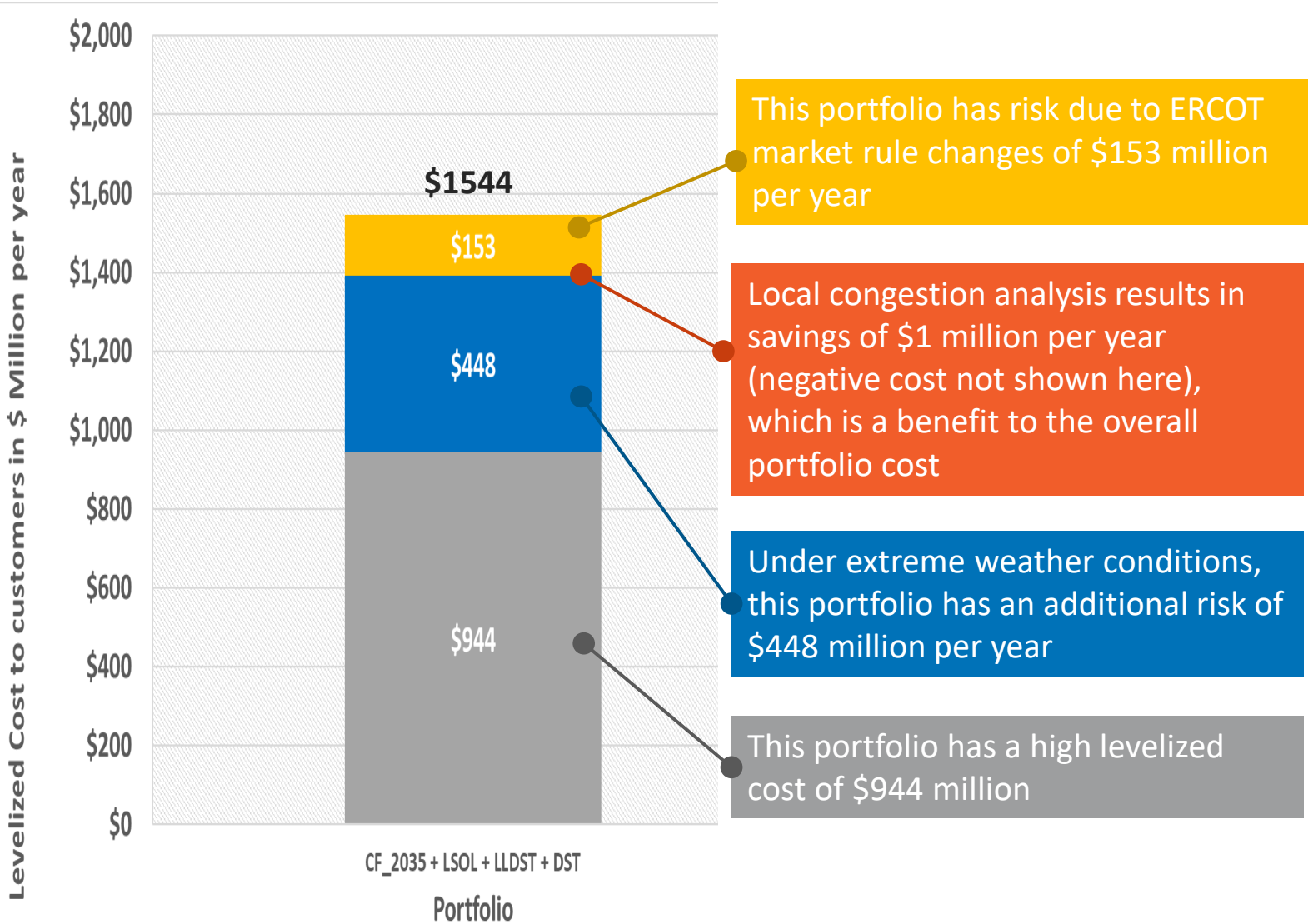
Local Solar, Local Long Duration Storage and Distributed Storage

Key Assumptions

- 80% of local solar with 50/50 split between behind the meter solar and community solar
- Does not include the higher cost of real estate
- 10% 8-hr Lithium-ion battery storage located within Austin Energy’s load zone
- 10% distributed storage within Austin Energy service territory

Key Takeaways

- This portfolio is costly and risky for customers
- It reduces congestion costs but does not mitigate risk during extreme weather even assuming the solar is able to produce
- It also does not perform well under ERCOT market rule changes
- It may not be feasible to obtain and host these large quantities of local solar



Results Summary – Carbon Free by 2035

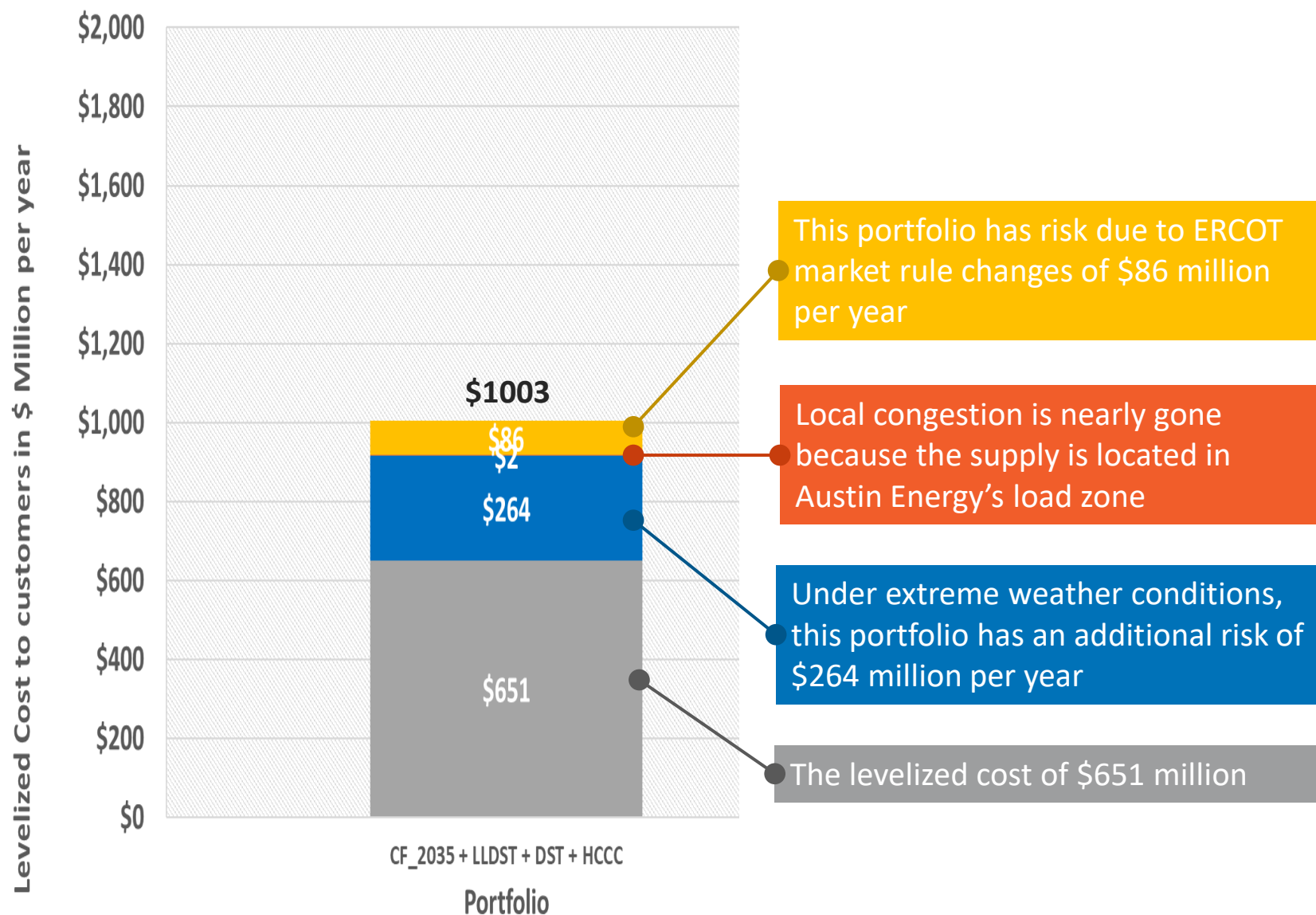
Local Long Duration Storage, Distributed Storage and Hydrogen-Capable Combined Cycle

Key Assumptions

- 10% 8-hr Lithium-ion battery storage located and 10% distributed storage within Austin Energy's load zone
- 80% green hydrogen capable combined cycle generation by 2035

Key Takeaways

- While this portfolio reduces total costs compared to the base case by ~\$840 million per year, it remains costlier than Carbon Free by 2035 with Hydrogen-Capable Combined Cycle by ~\$165 million per year
- This is mostly due to extreme weather risk



Results Summary – Carbon Free by 2035

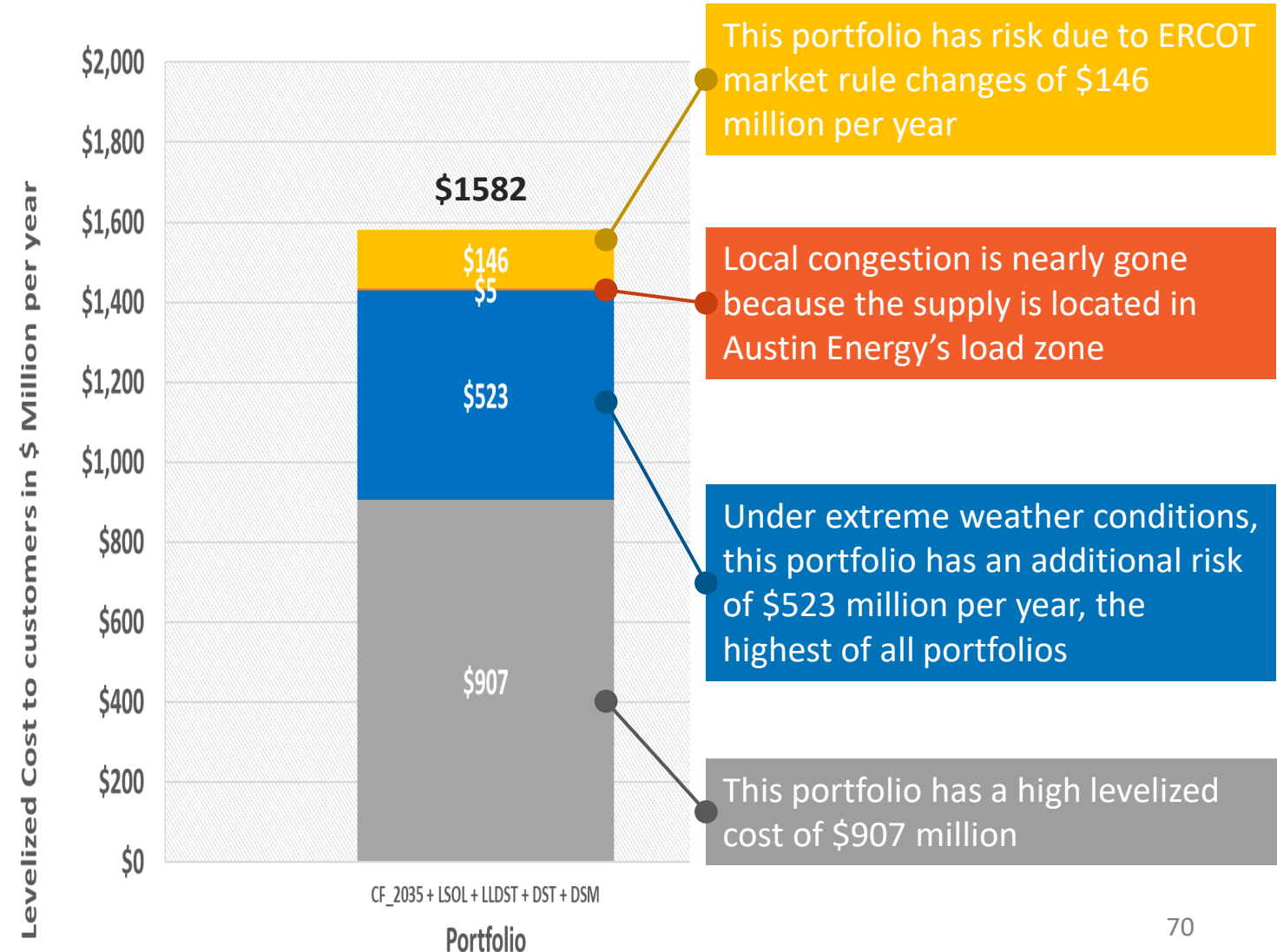
Local Solar, Local Long Duration Storage, Distributed Storage and Demand Side Management

Key Assumptions

- 60% local solar with solar with 50/50 split between behind the meter solar and community solar
- Does not include the higher cost of real estate
- 10% 8-hr Lithium-ion battery storage located & 10% distributed Storage within Austin Energy's load zone
- 20% demand side management (considered "heavier DSM" as all portfolios already include DSM in the load forecast)

Key Takeaways

- This portfolio is costly and risky for customers
- It reduces congestion costs but does not mitigate risk during extreme weather even assuming the solar is able to produce
- It also does not perform well under ERCOT market rule changes
- It may not be feasible to obtain and host these large quantities of local solar



Results Summary – Carbon Free by 2035

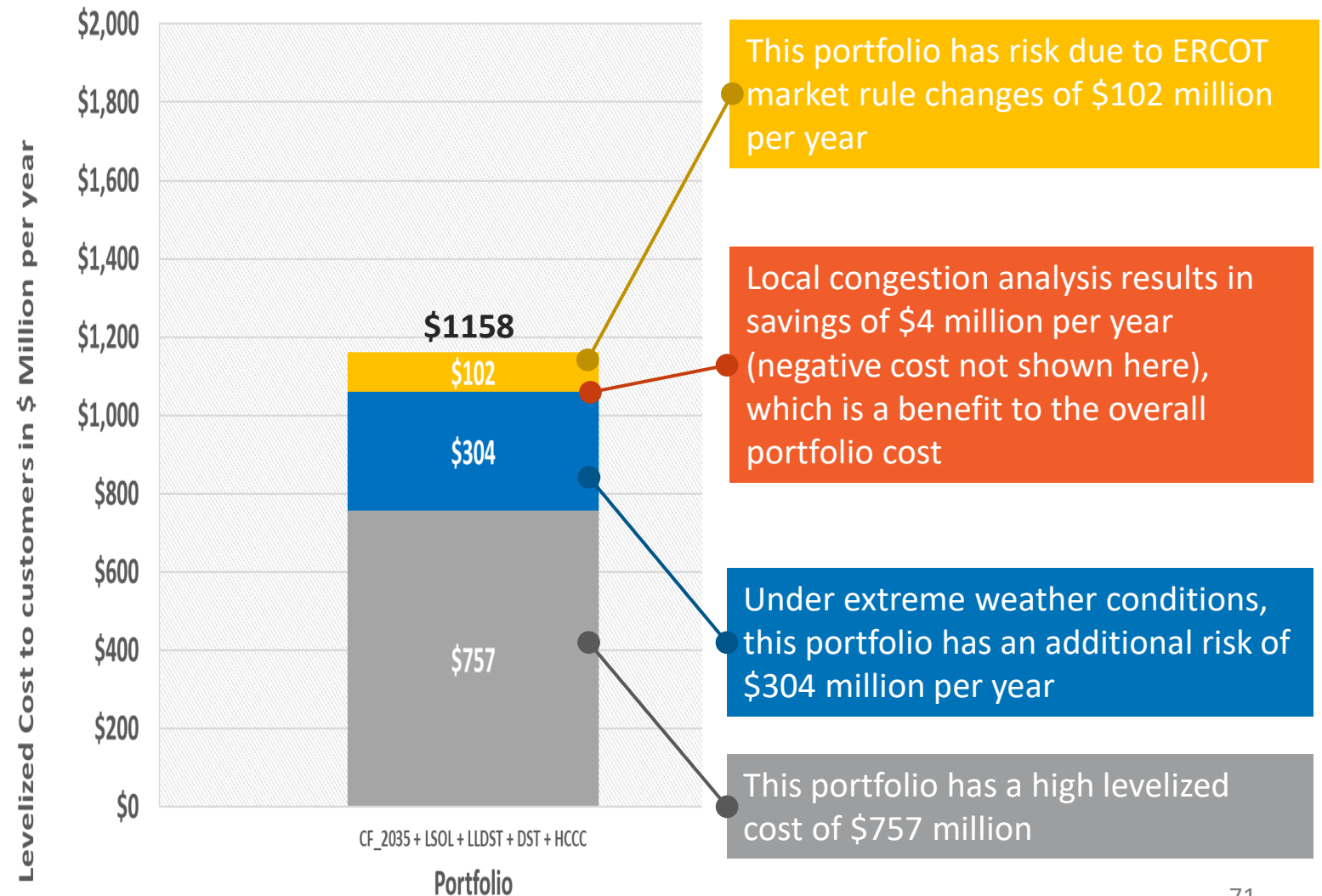
Local Solar, Local Long Duration Storage, Distributed Storage and Hydrogen-Capable Combined Cycle

Key Assumptions

- 20% local solar with 50/50 split between behind the meter solar and community solar
- 10% 8-hr Lithium-ion battery storage located and 10% Distributed Storage within Austin Energy's load zone
- 60% green hydrogen capable combined cycle generation by 2035

Key Takeaways

- While this portfolio reduces total costs compared to the base case, it remains costlier than Carbon Free by 2035 with Hydrogen-Capable Combined Cycle by ~\$320 million per year
- This is mostly due to extreme weather risk and the capital cost of battery storage





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