2021 IRP Supplementary Data Posting

ENTERGY ARKANSAS, LLC

MAY 2021

Entergy® | WE POWER LIFE℠

Creating sustainable value for all

Meeting Agenda

Discussion centers around Stakeholder-requested information from the March 4, 2021 Stakeholder meeting

- Project Schedule Update
- EAL Futures Scope Matrix
- Technology Assessment Updates
- ICF DR & DER Potential Study

Project Schedule Update (Major Milestones)

- Multiple data postings have been completed
- ICF DR & DER Potential Study complete; final narrative report is pending
- AURORA modeling scheduled to begin in May

2021 EAL IRP Scope Matrix

IRP Future Assumptions				
	Future 1 **Reference**	**Future 2** **Policy Paralysis**	**Future 3** **DSM & Renewables**	**Future 4** **Growth & Renewables**
Peak / Energy Load Growth	Reference	Reference*	Low	High
Natural Gas Prices	Reference	Low	Low	High
CO_2 Tax Assumption	Reference	None	Reference	High
EAL DR / EE / DER Additions				
ICF DR Portfolios	AURORA Optimization	AURORA Optimization	AURORA Optimization	AURORA Optimization
EAL EE Programs	Reference (EAL '20-'22 Plan)	Reference (EAL '20-'22 Plan)	Reference (EAL '20-'22 Plan)	Reference (EAL '20-'22 Plan)
ICF DER Portfolios	Medium	Low	High	Medium
EAL CCGT Life Assumption**	Reference (30 Year Life)	Extend through end of study period	Reference (30 Year Life)	Reference (30 Year Life)
EAL Nuclear Life Assumption	ANO1: 2034, ANO2: 2038	ANO1: 2034, ANO2: 2038	ANO1: 2054, ANO2: 2058 (20-year extension)	ANO1: 2054, ANO2: 2058 (20-year extension)
EAL Coal Retirements	Reference Case (All Futures) WB: 2028, ISES: 2030			
	Sensitivity Cases (Future 1): S1: WB1:2023, WB2:2026, S2: WB1-2:2026, S3: ISES1-2:2026, WB1-2:2028			

	Future 1	Future 2	Future 3	Future 4
Generation Focus	Gas & Renewables	Gas	DSM & Renewables	Renewables

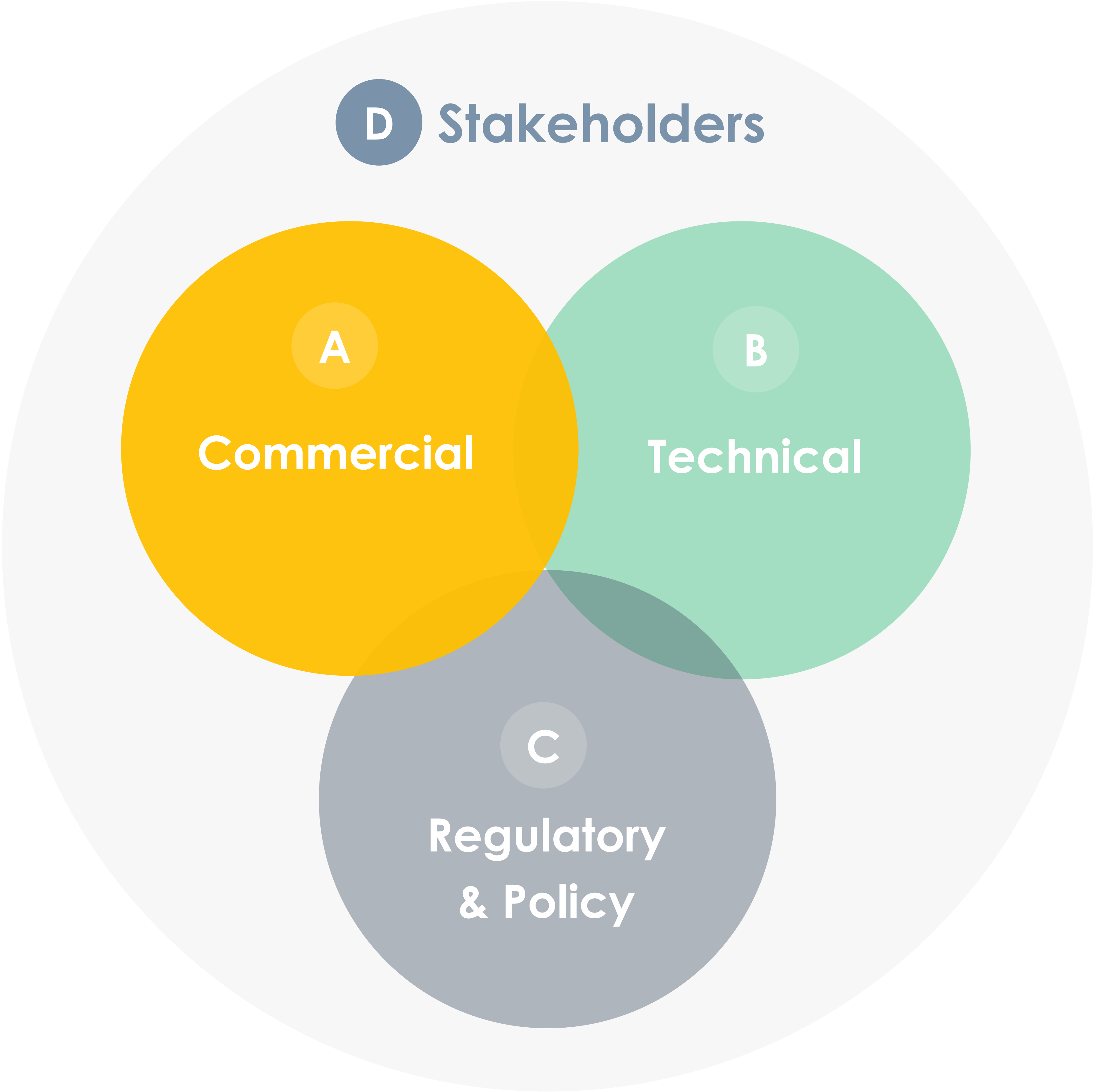
**Load levers for this future are expected to result in peak and energy levels slightly lower than reference, however the profile/shape will vary due to different underlying assumptions*

***Existing EAL CCGTs: Hot Spring, Ouachita 1-2, Union 2*

BP21 Refresh Technology Assessment Summary

Technology Assessment: Four Lenses

As part of an on-going process, Entergy evaluates existing, new and emerging technologies to meet supply-side resource needs.



A COMMERCIAL
What are a technologies **cost** and **market** indicators?

B TECHNICAL
What are the **operational**, **environmental**, and **internal capability** factors associated with a specific technology?

C REGULATORY & POLICY
How do **regulatory bodies** and **federal + state policies** encourage or disincentivize deployment?

D STAKEHOLDERS
How does the technology deliver on the **needs** and **expectations** of our four key stakeholders? **Customers, Communities, Employees, and Shareholders**.

TA Updates and Corporate Sustainability Commitments

- In this IRP, we adopted a screening approach to evaluate the cost-effectiveness and feasibility of deployment of potential resources. This screening consist of quantitative and qualitative criteria that have informed a final selection of supply-side generation alternatives to be included in capacity expansion models.
- EAL continues to focus on balancing affordability, reliability, and environmental stewardship, which includes efforts to reduce emissions profile of supply-side resources over time. These efforts in environmental stewardship are supported by increasing emphasis on decarbonization in state and federal policy conversations as well as increasing announcements of customer climate-related goals. Incorporation of new technologies is one of the ways that protect customers against long-term risks and enable customers to meet their own sustainability objectives. The company is committed to ensuring that the investments we make today continue to serve our customers long into the future.
- For this reason, all future conventional generation plants will be hydrogen capable, allowing these highly efficient machines to transition to hydrogen fuel when it is in the best interest for customers.
  - In alignment with our recent public commitments, we have updated our future new conventional generation alternatives to reflect hydrogen- capability.
  - The OpCo build for capacity expansion will include only conventional generation that is hydrogen-capable.

Supply-side alternatives: Screening Approach

Screening approach is designed to evaluate the cost-effectiveness and feasibility of deployment of potential resources.

TECHNICAL SCREENING

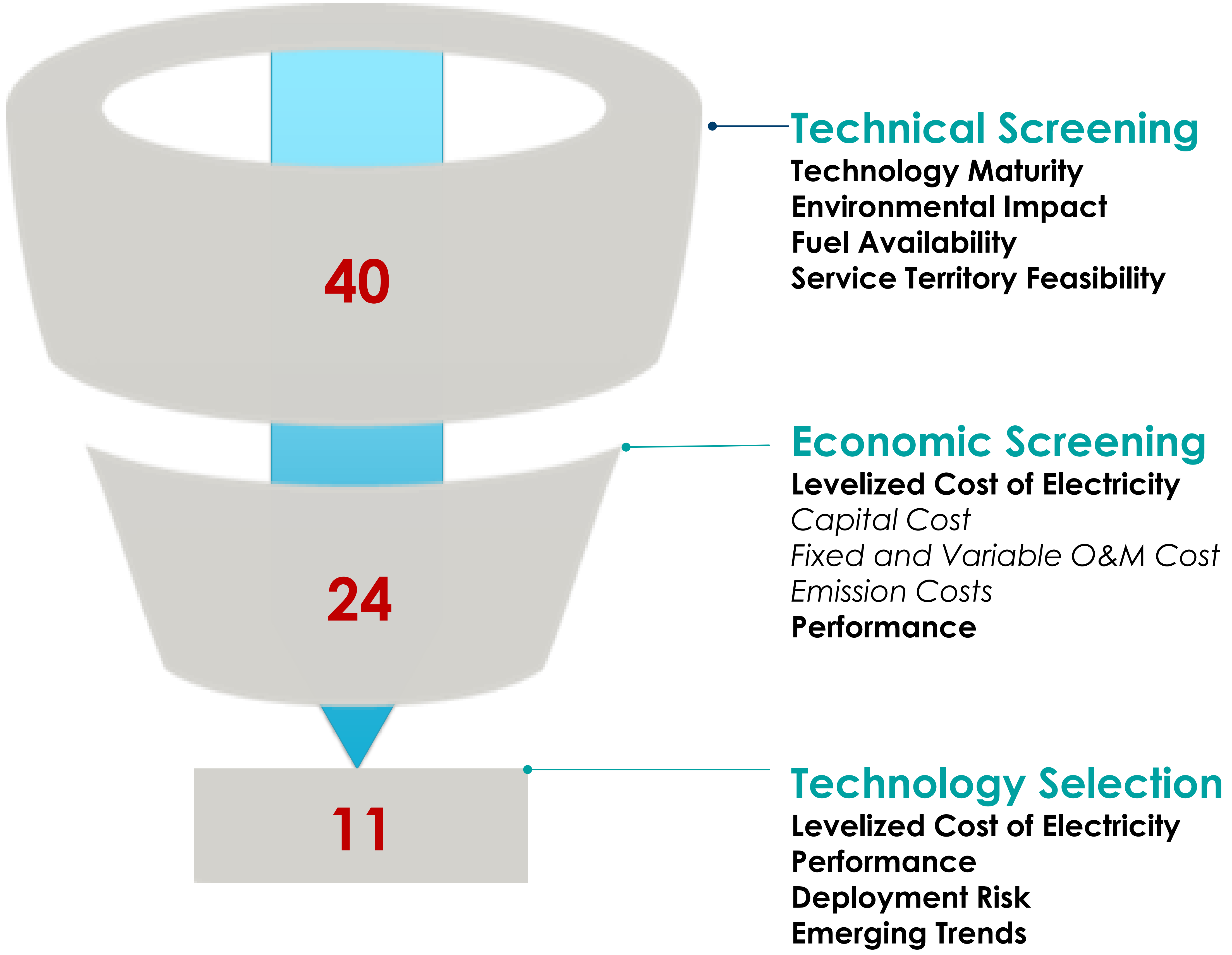
The technical screening process evaluates potential supply side alternatives based on technology maturity, environmental impact, fuel availability, and feasibility to serve EAL's generation needs. From this, generation alternatives are narrowed down for inclusion in the economic screening.

ECONOMIC SCREENING

The economic screening process evaluates levelized cost of electricity metrics and key performance parameters. From this, generation alternatives are narrowed down for inclusion in the capacity expansion.

TECHNOLOGY SELECTION

The technologies selected for inclusion in the capacity expansion model are those deemed to be most feasible to serve EAL's generation needs based on comparative LCOE and performance parameters, deployment risks (cost / schedule certainty), and emerging commercial, technical, and policy trends.



Technical Screening

Evaluated 40 generation alternatives with 24 selected for the economic screening:

STORAGE
- Sodium Sulphur (4-hr)
- Compressed Air (16-hr)
- Fly Wheel
- Flow - Vanadium Redox (4-hr)
- Lithium-Ion (4-hr)
- Lead Acid
- Ultra/Super Capacitor
- Pumped Storage Hydro (16-hr)

CONVENTIONAL GENERATION*
- Aeroderivative CT + 5% H2
- CCGT (2x1 w/DF) + 30% H2
- CCGT (1x1 w/DF) + 30% H2
- CCGT (2x1 w/o DF) + 30% H2
- CCGT (1x1 w/o DF) + 30% H2
- Frame CT + 30% H2
- RICE + 25% H2
- CCGT (2x1, 98.5%CCS)
- Solid-Oxide, Fuel Cell

NUCLEAR
- Generation III+ (AP 1000)
- Small Modular Reactor
- Generation IV

COAL
- Supercritical Coal +90% CCS
- Integrated Coal Gasification CC

SOLID FUEL
- Biogas
- Landfill Gas
- Combined Heat and Power

WIND
- On-shore
- Off-shore Fixed
- Off-shore Floating
- Off System, SPP

SOLAR
- Mono & Bifacial
- Off System, ERCOT
- Concentrating Solar Power
- Off-shore (Anywhere except ocean)

WATER
- Hydro New Stream
- Hydro Non-Powered Dam
- Ocean Thermal Energy Conversation
- Ocean
- Tidal
- Wave
- Geothermal

Notes:
* Any large-scale future gas resources will be hydrogen capable.

SELECTED FOR ECONOMIC SCREENING

Economic Screening

Economic screening evaluated 24 generation alternatives with 11 selected for EAL capacity expansion

STORAGE
- Sodium Sulphur (4-hr)
- Compressed Air (16-hr)
- Flow - Vanadium Redox (4-hr)
- Lithium-Ion (4-hr)
- Pumped Storage Hydro (16-hr)

CONVENTIONAL GENERATION*
- Aeroderivative CT + 5%H2
- CCGT (2x1 w/DF) + 30%H2
- CCGT (1x1 w/DF) + 30%H2
- CCGT (2x1 w/o DF) + 30%H2
- CCGT (1x1 w/o DF) + 30%H2
- Frame CT + 30%H2
- RICE + 25%H2
- CCGT (2x1, 98.5%CCS)
- Solid-Oxide, Fuel Cell

NUCLEAR
- Generation III+ (AP 1000)
- Small Modular Reactor

WIND
- On-shore
- Off-shore Fixed
- Off-shore Floating
- Off System, SPP

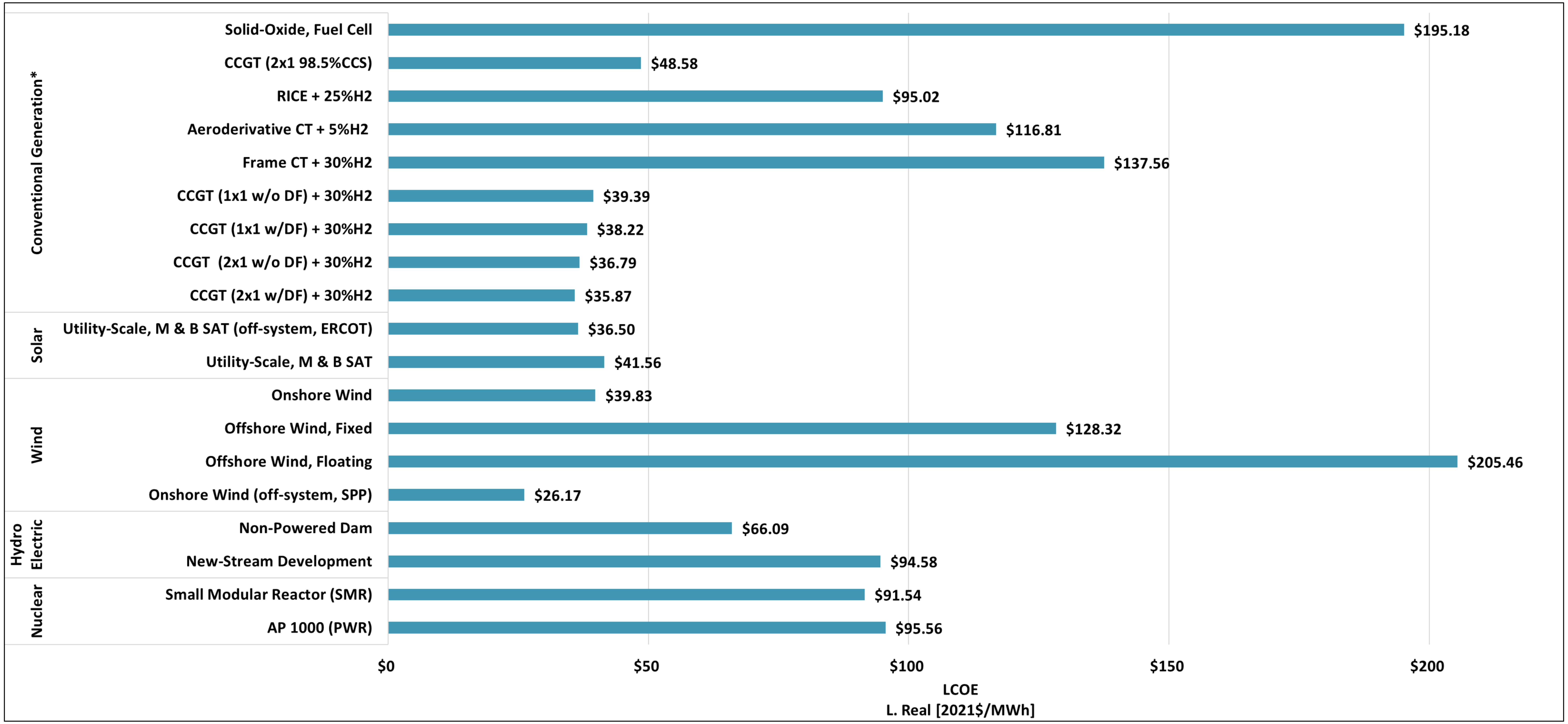
SOLAR
- Mono & Bifacial
- Off System, ERCOT

WATER
- Hydro New Stream
- Hydro Non-Powered Dam

Notes:
* Any large-scale future gas resources will be hydrogen capable.

SELECTED FOR CAPACITY EXPANSION

Overview: Levelized Cost of Electricity



*Any large-scale future gas resources will be hydrogen capable. (H2 gas technologies show the installed capital cost to burn H2, but not the actual cost to burn H2. Currently under development to produce both the ICC and fuel cost associated with burning hydrogen and the reduction in emission cost.)

- LCOE is calculated as levelized total cost over the book life divided by the levelized energy output over the book life. (based on 12.2020 EAL WACC)
- LCOE for storage is not shown because as storage just moves MWh from one time to another there is no actual 'output' of energy therefore it's undefined.
- Both solar off-system (ERCOT) and wind off-system (SPP), does not include transmission cost.
- ITC normalized over useful life and assumes an extended ITC for Solar, PTC for On-shore Wind, and ITC for Off-shore Wind.
- Assumes solar projects online between 2021 and 2023 receive 30% ITC, between 2024 and 2025 receive 26% ITC, beginning 2026 and beyond receive 10% ITC. Assumes on-shore wind projects online in 2021 receive 80% PTC, between 2022 and 2025 receive 60% PTC, in 2026 or beyond are not eligible for tax credits. Assumes off-shore wind projects online between 2021 and 2035 receive 30% ITC.

Technology Selection

Selected generation alternatives include renewables, storage, and hydrogen-capable conventional generation

- **STORAGE**
  - Lithium-Ion (4-hr)
  - Pumped Storage Hydro (16-hr)
- **CONVENTIONAL GENERATION***
  - Aeroderivative CT + 5%H2
  - CCGT (2x1 w/DF) + 30%H2
  - CCGT (1x1 w/DF) + 30%H2
  - Frame CT + 30%H2
  - RICE + 25%H2
- **WIND**
  - On-shore
  - Off-shore Fixed
  - Off System, SPP
- **SOLAR**
  - Mono & Bifacial

Notes:

* Any large-scale future gas resources will be hydrogen capable.

ICF DR & DER Potential Study

Achievable potential DR & DER based on EAL's customers

- EAL engaged with ICF to conduct a forecast of the achievable potential of selected demand response (DR) program types and distributed energy resource (DER) technologies on EAL's system from 2023-2042
- Output from the ICF study will be used as inputs to the IRP modeling:
  - Reference, high and low hourly DER load shapes will be mapped to the respective Future load forecast, resulting in various levels of load reduction
  - The DR programs for the reference, high and low hourly load shapes will be included for selection in the AURORA capacity expansion model using the program cost associated with the demand savings

Appendix

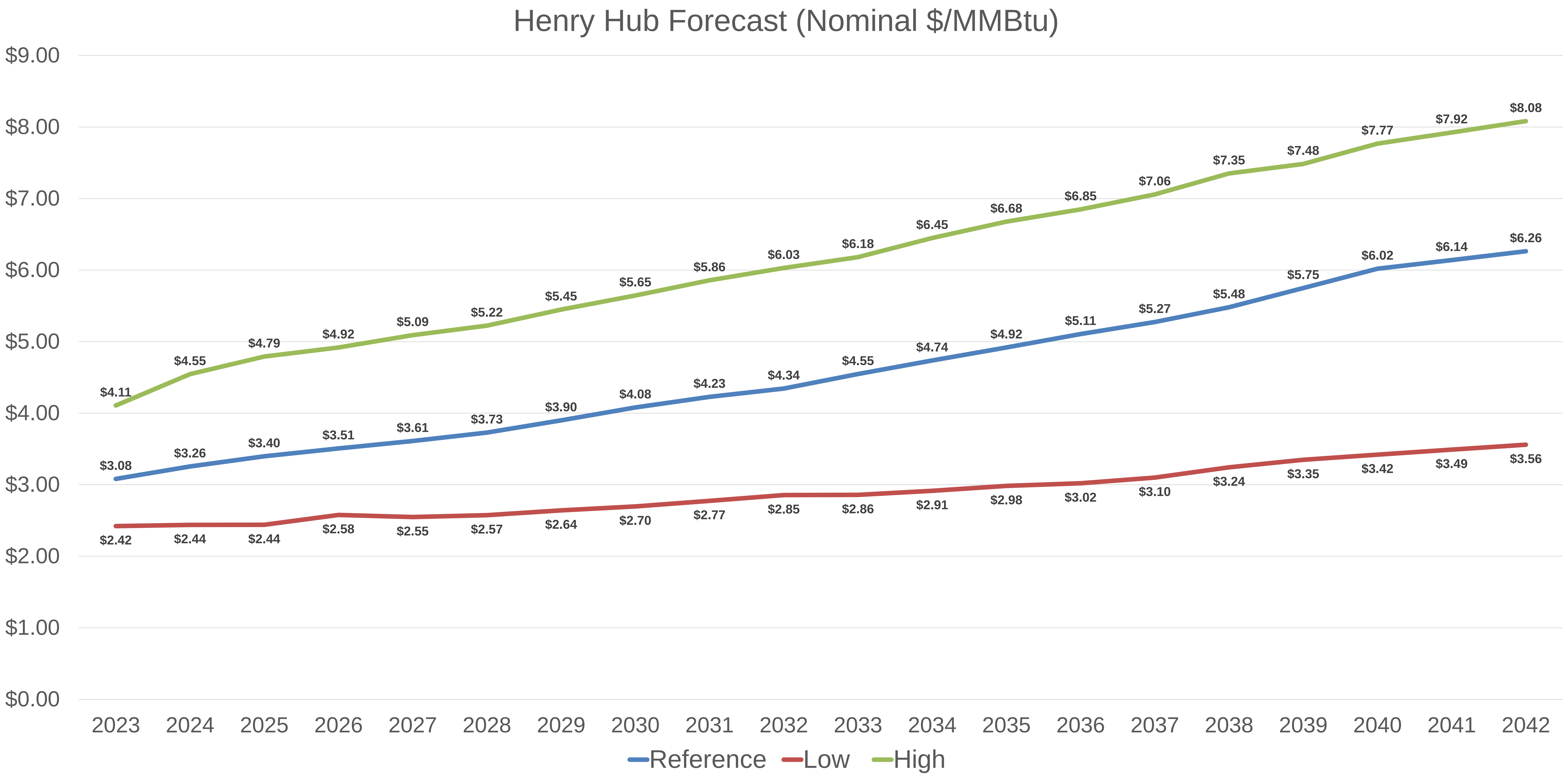
Supplementary Data Posting Slides

2021 IRP Supplementary Data Posting

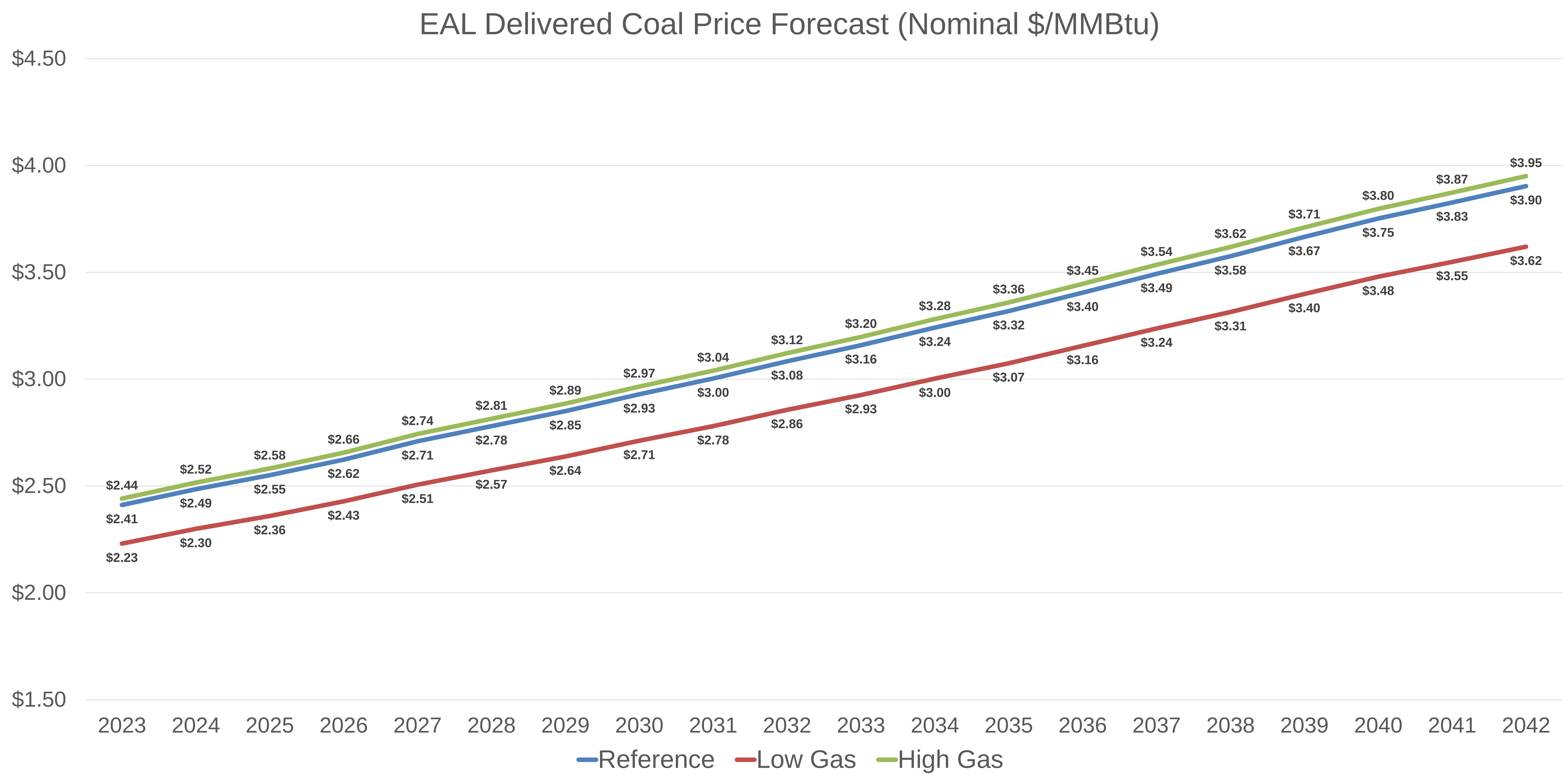
Includes Stakeholder-requested information from the March 4, 2021 conference call meeting

- Fuel Price Forecasts and Sensitivities
  - Gas Price Forecasts (Henry Hub), Coal Price Forecasts
- CO_2 Price Forecasts and Sensitivities
- Levelized Cost of Electricity by Technology Type
- Cost and Performance Assumptions
  - Extended PTC/ITC
  - Renewables (Solar PV & Wind – MISO South)
  - Installed Capital Cost: Renewables & Storage
- Load Forecast Assumptions by Future

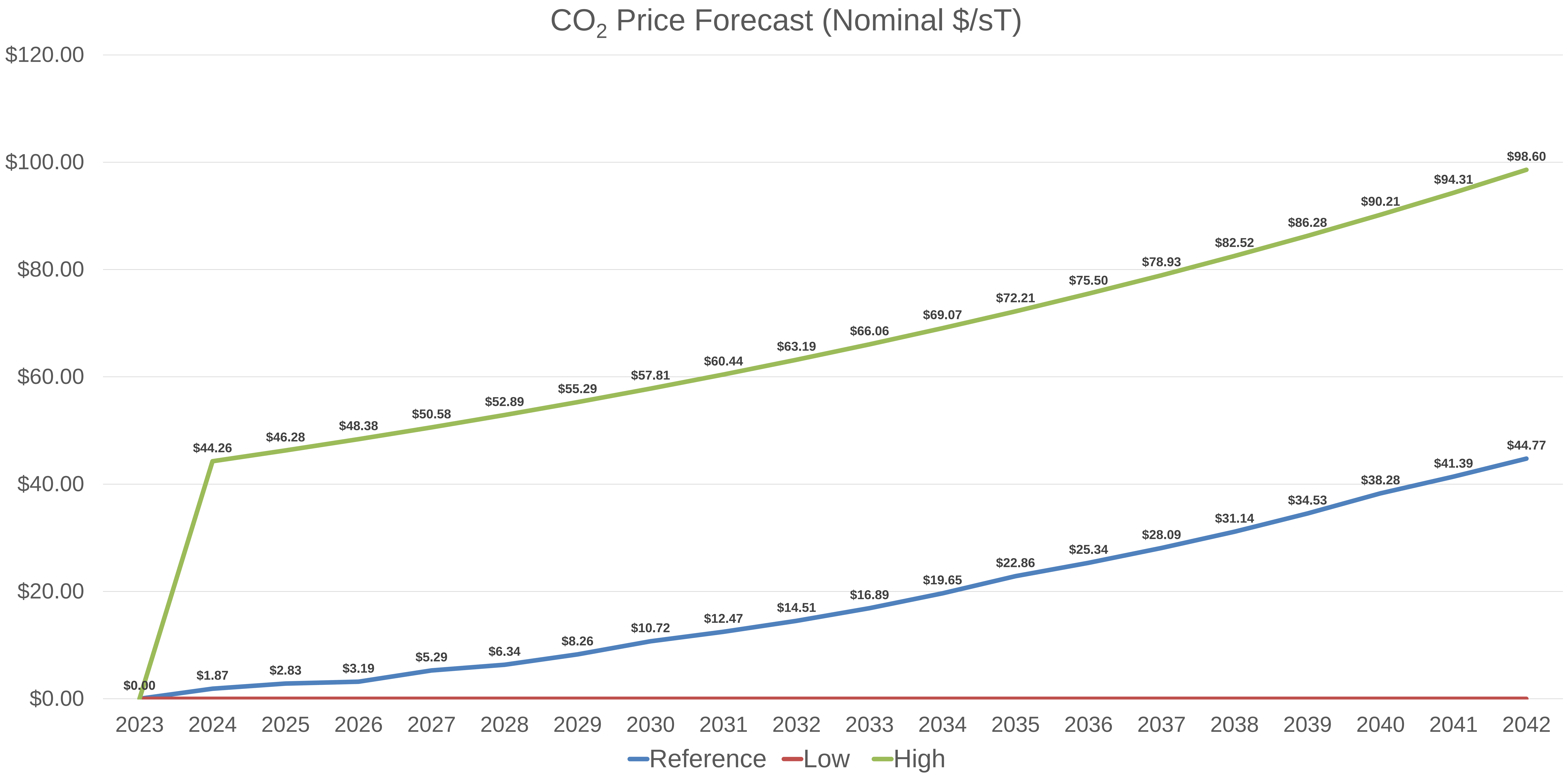
Gas Price Forecast and Sensitivities



Coal Price Forecast and Sensitivities

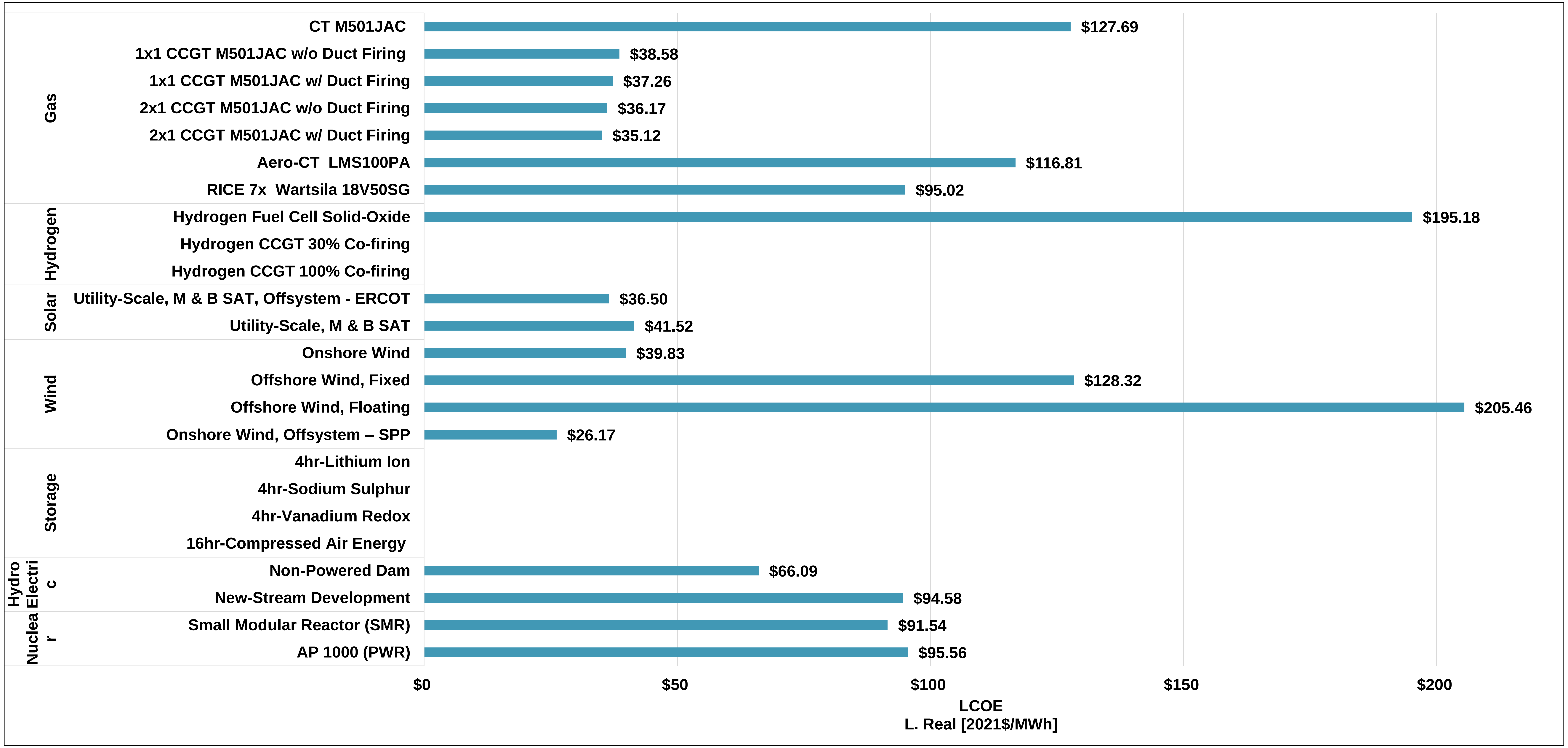


CO_2 Price Forecast and Sensitivities



Entergy WE POWER LIFE℠

Overview: Levelized Cost of Electricity



- LCOE is calculated as levelized total cost over the book life divided by the levelized energy output over the book life. (based on 12.2020 EAL WACC)
- LCOE for storage is not shown because as storage just moves MWh from one time to another there is no actual 'output' of energy therefore it's undefined.
- ITC normalized over useful life and assumes an extended ITC for Solar, PTC for On-shore Wind, and ITC for Off-shore Wind.
  Assumes solar projects online between 2021 and 2023 receive 30% ITC. Assumes solar projects online between 2024 and 2025 receive 26% ITC. Solar projects online beginning 2026 and beyond receive 10% ITC.
  Assumes on-shore wind projects online in 2021 receive 80% PTC. Assumes on-shore wind projects online between 2022 and 2025 receive 60% PTC. On-shore wind projects online in 2026 or beyond are not eligible for tax credits.
  Assumes off-shore wind projects online between 2021 and 2035 receive 30% ITC.

Assumptions: Extended PTC & ITC

Required Construction Start [yr.]	Required Online Date [yr.]	PTC [%]	ITC [%]
Solar			
2016 – 2019	2021 – 2023	N/A	30%
2020 – 2022	2024 -2025	N/A	26%
Any	2026 - Beyond	N/A	10%
On-shore Wind			
2017	2021	80%	24%
2018	2022	60%	18%
2020 or 2021	2023-2024	60%	18%
2021	2025	60%	18%
N/A	2026- Beyond	N/A	N/A
Off-shore Wind			
2017 – 2025	2021 -2035	N/A	30%
N/A	2035 – Beyond	N/A	N/A

Notes:

PTC: Production Tax Credit

ITC: Investment Tax Credit

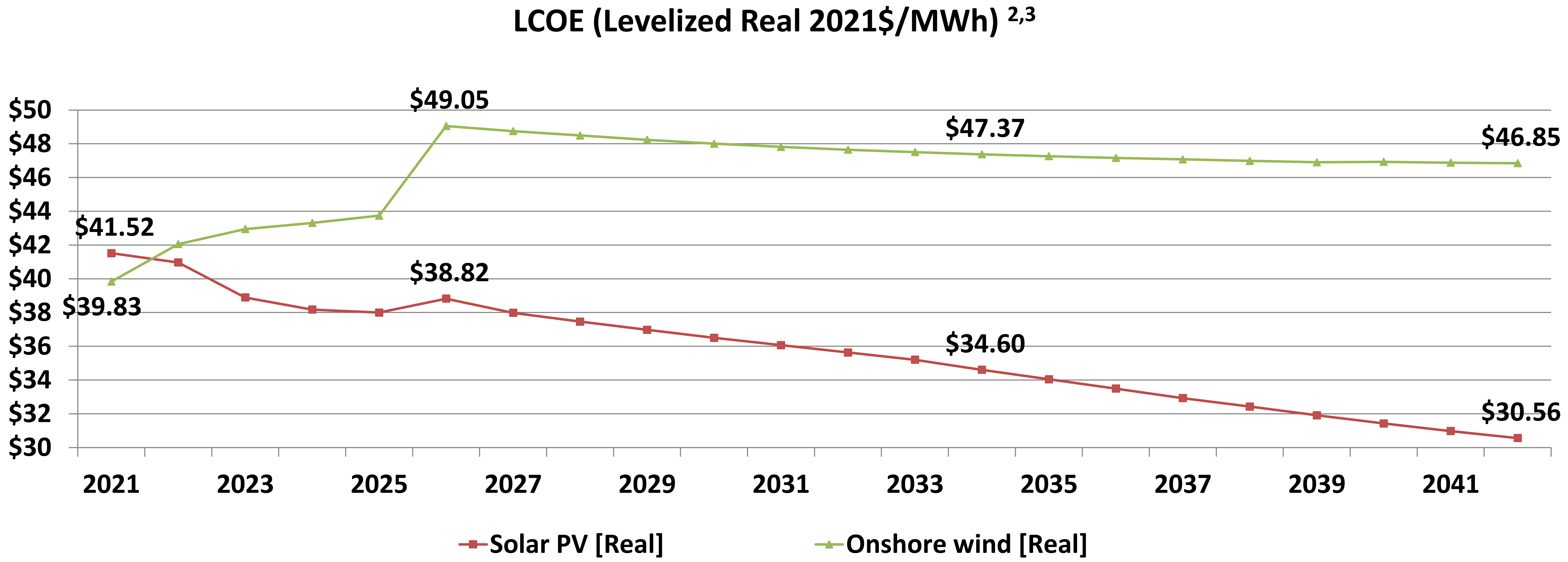
PTC and ITC assumptions included in the EAL IRP evaluation will assume eligibility that is most favorable for each technology and online date.

As resources are procured, eligibility will be determined on a project-specific basis.

Assumptions: Renewables LCOE (Solar PV & Wind – MISO South)

Modeling Assumptions

	Solar	Wind
Size (MW)	100	200
Fixed O&M (Levelized R. 2021$/KWac-yr) [1]	$10.31	$37.59
Useful Life (years)	30	30
MACRS Depreciation (years)	5	5
Capacity Factor	25.6%	36.8%
DC:AC	1.30	N/A
Hourly Profile Modeling Software	PlantPredict	NREL SAM



Note:

1.Solar and Wind Fixed O&M excludes property tax and insurance; Solar includes inverter replacement in year 16.

2.LCOE is calculated as levelized total cost over the book life divided by the levelized energy output over the book life. (based on 12.2020 EAL WACC)

3.ITC normalized over useful life and assumes an extended ITC for Solar, PTC for On-shore Wind, and ITC for Off-shore Wind.

Assumes solar projects online between 2021 and 2023 receive 30% ITC. Assumes solar projects online between 2024 and 2025 receive 26% ITC. Solar projects online beginning 2026 and beyond receive 10% ITC.

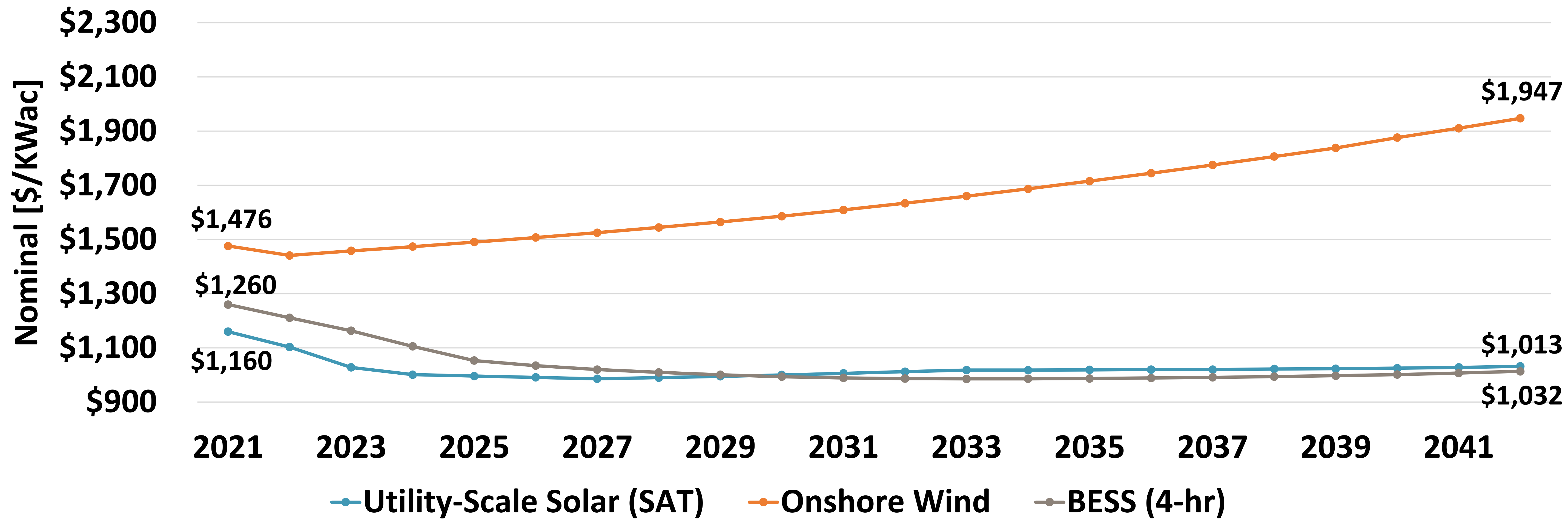
Assumes on-shore wind projects online in 2021 receive 80% PTC. Assumes on-shore wind projects online between 2022 and 2025 receive 60% PTC. On-shore wind projects online in 2026 or beyond are not eligible for tax credits.

Assumes off-shore wind projects online between 2021 and 2035 receive 30% ITC.

Source:

Assumptions for Installed Capital Cost: Renewables & Storage

Installed Capital Cost Forecast (Nominal [$/Kwac], 2021 to 2050) [1,2]



	Utility-Scale Solar (SAT)	On-shore Wind	BESS (4-Hr)
2021	$1,160	$1,476	$1,260
2022	$1,103	$1,441	$1,211
2023	$1,028	$1,458	$1,163
2024	$1,001	$1,474	$1,106
2025	$996	$1,490	$1,053
2026	$991	$1,507	$1,034
2027	$986	$1,525	$1,020
2028	$990	$1,545	$1,009
2029	$995	$1,565	$1,001
2030	$1,000	$1,586	$994
2031	$1,006	$1,609	$989
2032	$1,012	$1,634	$987
2033	$1,018	$1,660	$986
2034	$1,018	$1,687	$986
2035	$1,019	$1,715	$987
2036	$1,020	$1,745	$989
2037	$1,020	$1,775	$991
2038	$1,022	$1,806	$994
2039	$1,023	$1,838	$997
2040	$1,025	$1,876	$1,001
2041	$1,028	$1,911	$1,007
2042	$1,032	$1,947	$1,013

Note:

1. Utility-scale Solar PV is an average between mono and bi-facial with Single Axis Tracking.
2. Battery Installed Capital Cost does not include augmentation.

Source:

Load Forecast Assumptions by Future

Electric Vehicles (GWh)	Future 1 (BP21)	Future 2 (BP21)	Future 3 (2055)	Future 4 (2040)
2023	4	4	27	49
2024	5	5	37	80
2025	6	6	50	130
2026	8	8	68	207
2027	10	10	91	327
2028	12	12	120	514
2029	14	14	159	800
2030	17	17	211	1,222
2031	20	20	280	1,793
2032	25	25	369	2,497
2033	30	30	486	3,292
2034	36	36	640	4,132
2035	43	43	838	4,979
2036	52	52	1,092	5,807
2037	63	63	1,412	6,603
2038	75	75	1,810	7,363
2039	90	90	2,291	8,090
2040	108	108	2,851	8,781
2041	128	128	3,566	9,530
2042	153	153	4,484	10,344

Building Electrification (GWh)	Future 1	Future 2	Future 3	Future 4
2023	80	80	80	25
2024	98	98	98	34
2025	114	114	114	45
2026	130	130	130	57
2027	147	147	147	71
2028	164	164	164	87
2029	181	181	181	105
2030	198	198	198	125
2031	216	216	216	165
2032	234	234	234	193
2033	253	253	253	262
2034	271	271	271	355
2035	291	291	291	477
2036	310	310	310	638
2037	331	331	331	846
2038	351	351	351	1,111
2039	373	373	373	1,442
2040	395	395	395	1,843
2041	418	418	418	2,244
2042	440	440	440	2,646

BTM Solar (GWh)	Future 1	Future 2	Future 3	Future 4
2023	(35)	(25)	(35)	(35)
2024	(42)	(31)	(42)	(42)
2025	(50)	(37)	(50)	(50)
2026	(58)	(43)	(58)	(58)
2027	(67)	(50)	(70)	(70)
2028	(77)	(57)	(86)	(86)
2029	(90)	(63)	(108)	(108)
2030	(112)	(74)	(144)	(144)
2031	(138)	(84)	(189)	(189)
2032	(168)	(95)	(243)	(243)
2033	(199)	(103)	(306)	(306)
2034	(233)	(110)	(381)	(381)
2035	(269)	(115)	(467)	(467)
2036	(306)	(117)	(566)	(566)
2037	(343)	(119)	(675)	(675)
2038	(384)	(121)	(805)	(805)
2039	(432)	(123)	(962)	(962)
2040	(489)	(125)	(1,155)	(1,155)
2041	(552)	(127)	(1,384)	(1,384)
2042	(627)	(129)	(1,667)	(1,667)

Load Forecast Assumptions by Future

Refinery Utilization Due to EVs (GWh)

	Future 1	Future 2	Future 3	Future 4
2023	0	0	(4)	(23)
2024	0	0	(4)	(37)
2025	0	0	(5)	(57)
2026	0	0	(6)	(81)
2027	0	0	(8)	(103)
2028	0	0	(9)	(125)
2029	0	0	(11)	(146)
2030	0	0	(9)	(162)
2031	0	0	2	(171)
2032	0	0	2	(189)
2033	0	0	12	(197)
2034	0	0	20	(207)
2035	0	0	17	(227)
2036	0	0	26	(236)
2037	0	0	32	(246)
2038	0	0	28	(266)
2039	0	0	35	(275)
2040	0	0	38	(287)
2041	0	0	41	(299)
2042	0	0	44	(311)

Res/Com Customer Growth (GWh)

	Future 1	Future 2	Future 3	Future 4
2023	0	(82)	0	4
2024	0	(84)	0	8
2025	0	(85)	0	12
2026	0	(86)	0	16
2027	0	(87)	0	20
2028	0	(87)	0	24
2029	0	(87)	0	28
2030	0	(95)	0	32
2031	0	(121)	0	35
2032	0	(150)	0	39
2033	0	(179)	0	43
2034	0	(207)	0	47
2035	0	(235)	0	51
2036	0	(263)	0	55
2037	0	(291)	0	59
2038	0	(320)	0	62
2039	0	(348)	0	66
2040	0	(375)	0	70
2041	0	(401)	0	74
2042	0	(428)	0	78

Industrial Growth (GWh)

	Future 1	Future 2	Future 3	Future 4
2023	0	(1,003)	0	138
2024	0	(1,009)	0	138
2025	0	(1,003)	0	138
2026	0	(1,003)	0	138
2027	0	(1,003)	0	138
2028	0	(1,003)	0	138
2029	0	(1,003)	0	138
2030	0	(1,003)	0	138
2031	0	(1,003)	0	138
2032	0	(1,003)	0	138
2033	0	(1,003)	0	138
2034	0	(1,003)	0	138
2035	0	(1,003)	0	138
2036	0	(1,003)	0	138
2037	0	(1,003)	0	138
2038	0	(1,003)	0	138
2039	0	(1,003)	0	138
2040	0	(1,003)	0	138
2041	0	(1,003)	0	138
2042	0	(1,003)	0	138