

Constellation Energy



Current Price	\$79
Price Objective	\$102
Holding Period	5-10 years
Margin of Safety	29%

KEY INVESTMENT THEMES

1

Sustainable Nuclear Power

Rain or shine, nuclear power will continue to operate

2

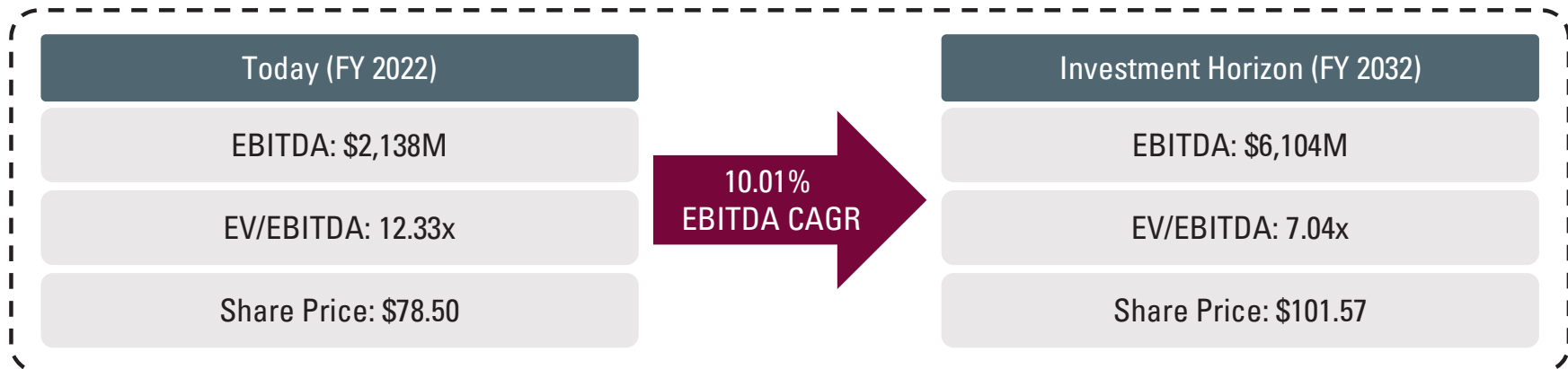
Long-Term Opportunity With Hydrogen

Long-term investments into Pink Hydrogen Energy have strong tailwinds that will soon pay off

3

Incremental FCF From Current and Future Investments

The IRA has provided Constellation with significant incremental FCF



COMPANY OVERVIEW

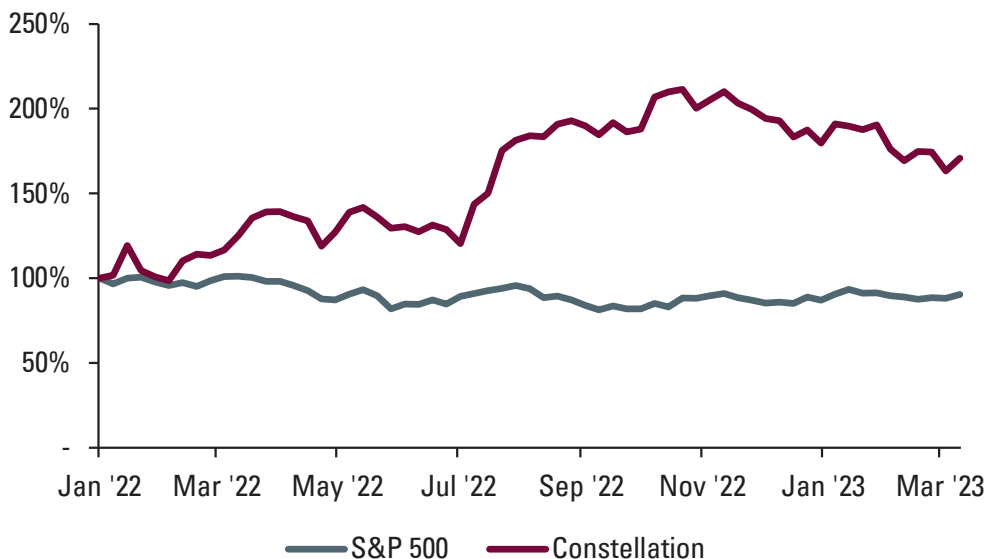
Company Summary

Founded in 1999 and headquartered in Baltimore, Maryland; Constellation Energy provides natural gas, electric, and renewable energy services.

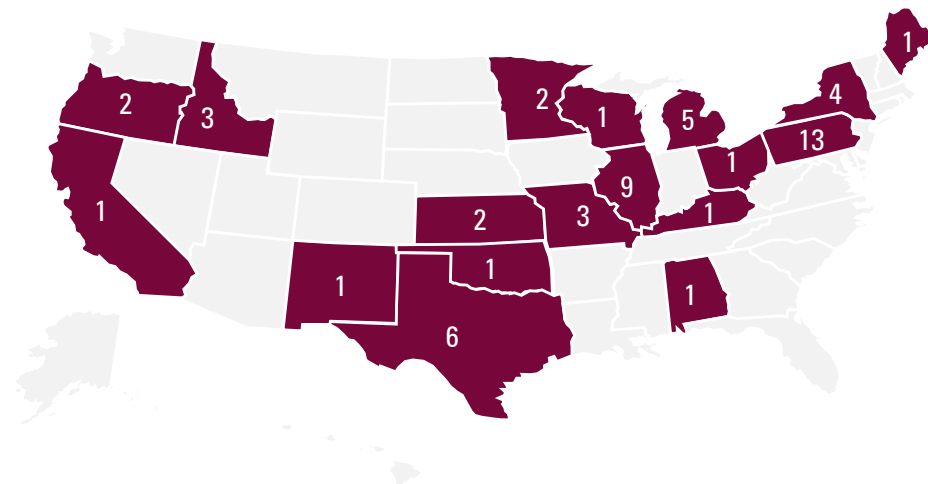
- Constellation split from their parent company, Exelon, in 2022
- Currently produces > 32,000 MWh of energy, with 86% generated from nuclear
- Target of 95% carbon-free by 2030, and 100% carbon-free by 2040
- Current CEO was former CEO at an Exelon company in the energy industry
- Delivers 10% of US carbon-free electricity as the #1 carbon-free energy producer

Stock Price \$78.50	Market Cap \$25.71B	Enterprise Val \$30.24B	Dividend Yield 1.50%
52 Week Range \$42.18 – \$97.89	EPS(TTM) -\$0.50	Net Debt \$7.69B	Target Price \$101.57

Historical Growth



Geographic Breakdown



13 sites in Pennsylvania, 9 sites in Illinois, 6 sites in Texas

Core Investment Themes



Durable assets with the ability to last past 2050



Dividends expected to increase at 10% YoY



Constant, reliable source of energy compared to fossil fuels and other low-carbon options



PTC contribution to financial stability



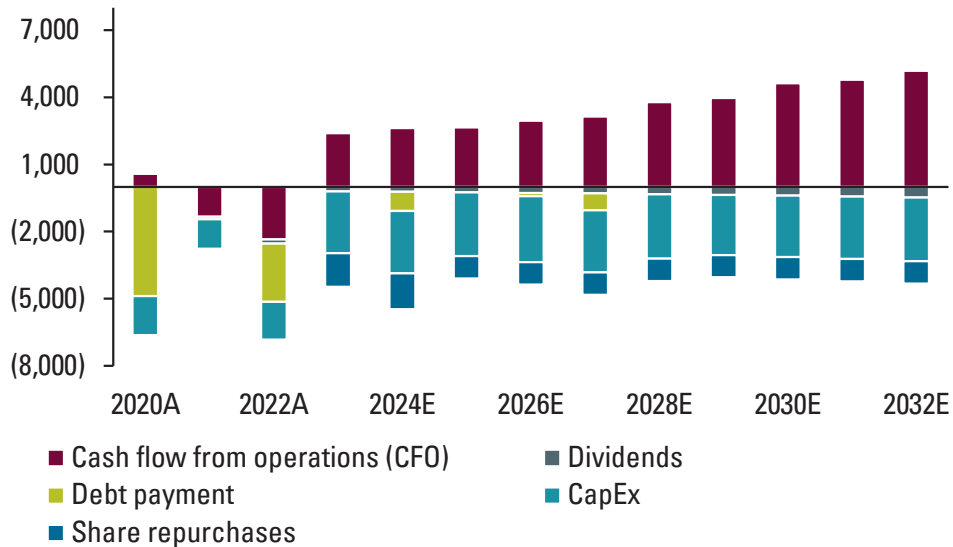
Share repurchase program of over \$1B expected to drive the share price

Constellation is a nuclear dominant company generating over 10% of the nation's carbon-free energy with strong cash flows & future expected growth

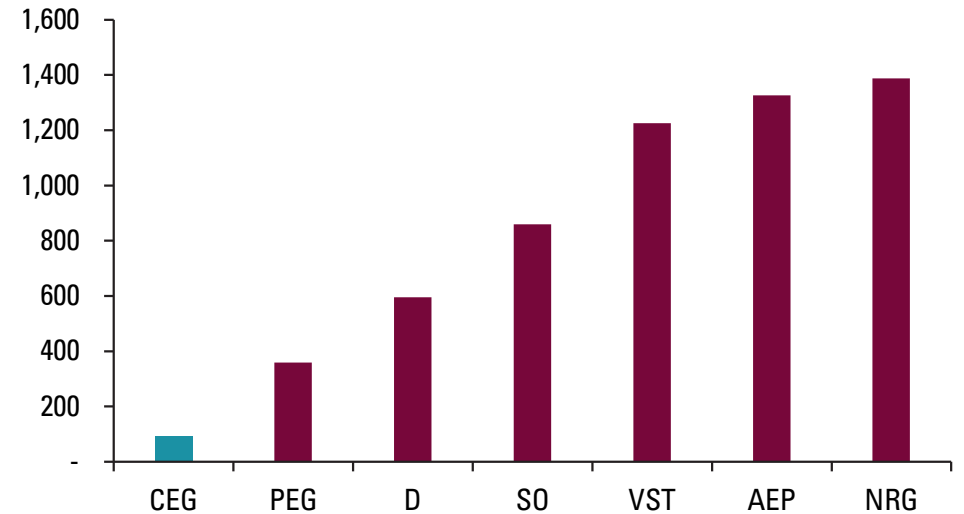
Source: Refinitiv, Bloomberg, Company Filings.
Note: As of close on March 30, 2023, All figures USD unless otherwise stated.

FURTHER ANALYSIS

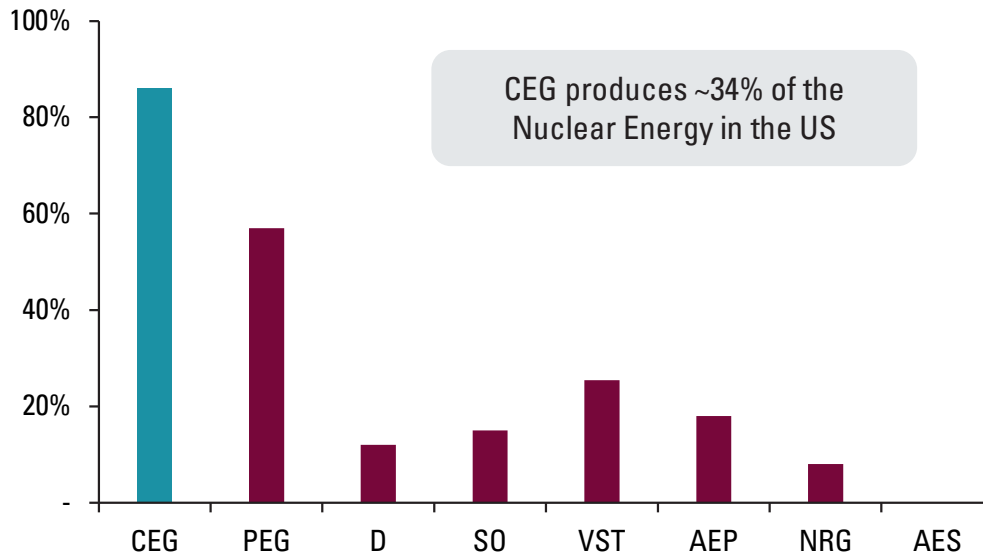
Uses of Cash (\$M)



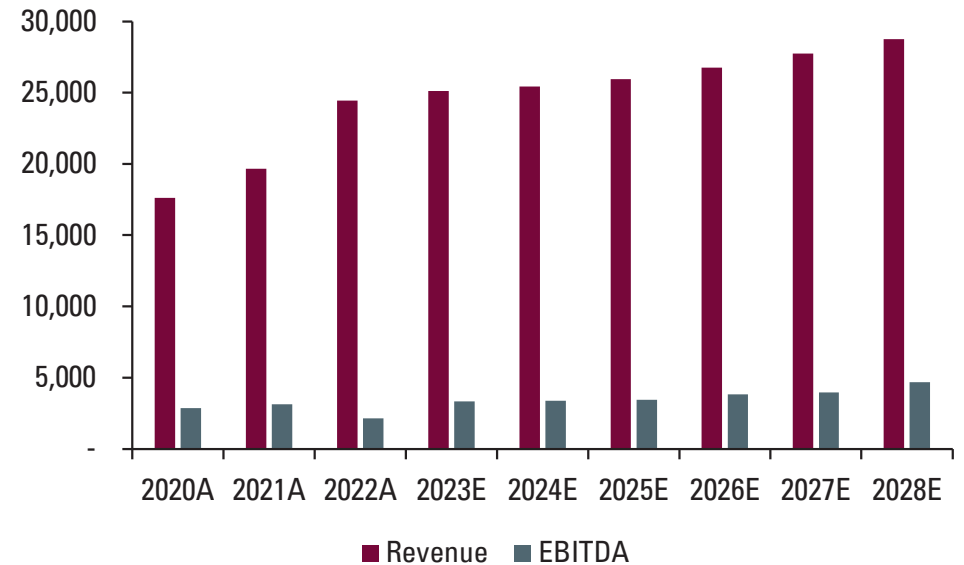
Carbon Intensity (lb/MWh)



Nuclear Percentage of Revenue



Historical and Forecasted Revenue and EBITDA (\$M)



Constellation has the lowest carbon intensity amongst competitors with the highest percentage of revenue tied to nuclear

Source: November 2022 Investor Presentation, Annual Report.
Note: All figures USD unless stated otherwise.

INDUSTRY OVERVIEW – NUCLEAR

Key Trends

Nuclear power generation is a critical piece of the US electricity mix

- Represents 20% of total electric generations



New Nuclear Reactors

- First new nuclear reactors in more than 30 years
- Set to complete construction by 2023



Number of Nuclear Plants

- 93 operable nuclear power reactors in the U.S since 1957
- Encourages the advancement of nuclear deployment at new plants



U.S has more nuclear energy generation capacity than any other country

- Generating more than 778.2 billion kilowatt-hours electricity alone

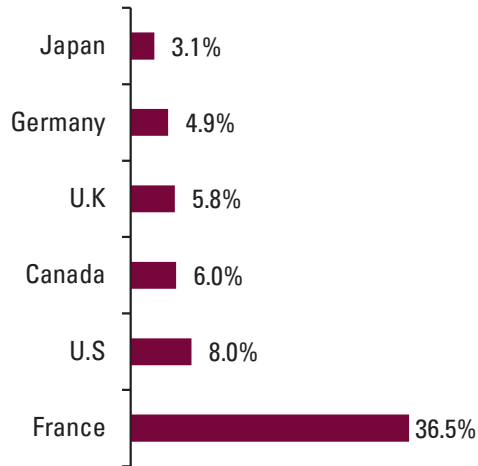


License Extension Key Highlights

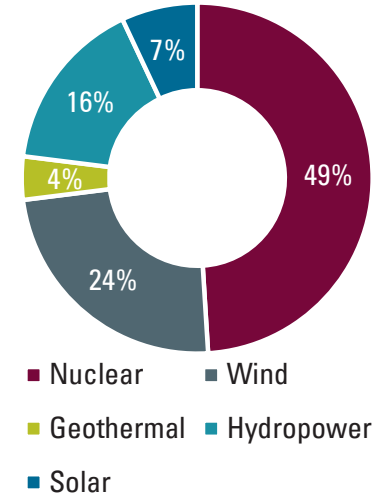
- Seeking license extension on two zero-carbon nuclear plants in Illinois: Dresden & Clinton
- Asked Nuclear Regulatory Commission to extend operating license for another 20 years
- License extension means two plants will contribute billions of additional dollars to Illinois' economy
- Extending the license will be equivalent to taking 3.7 million gas-powered vehicles off the road per year
- Market forces and supportive energy policies will determine the ability of the plants to operate

US Electricity Generation (2021)

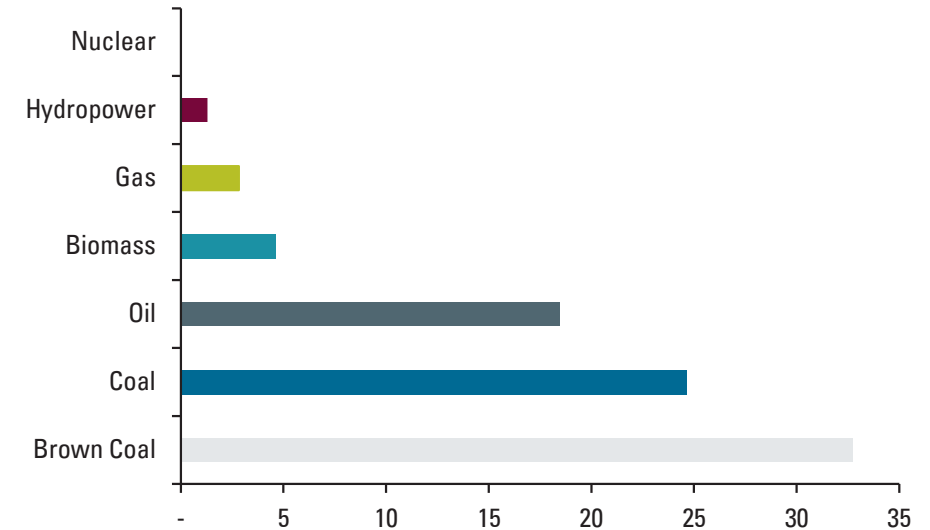
Share of Primary Energy – Nuclear



U.S Electricity Generation



Death Per Terawatt-Hour of Energy Production



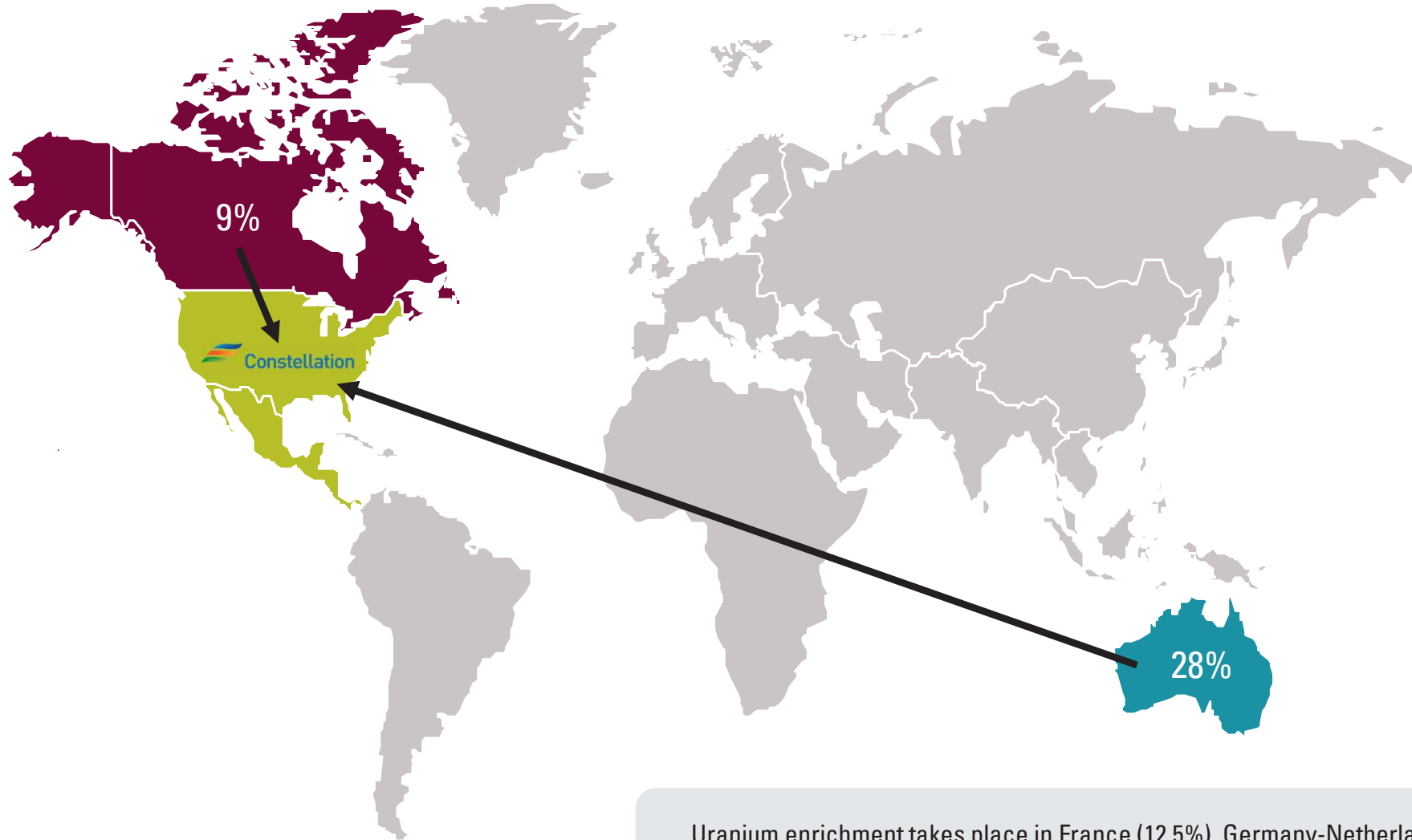
Nuclear energy is a critical piece of the U.S electricity mix, as the U.S has more nuclear energy generation capacity than any other country

Source: Office of Nuclear Energy, World Nuclear Association, Our World in Data.

Note: U.S Electricity Generation 2021 graph consists of Biomass within Geothermal calculation of 3% accounting for a total of 4% displayed.

SUSTAINABLE SUPPLY CHAIN

Uranium Resources

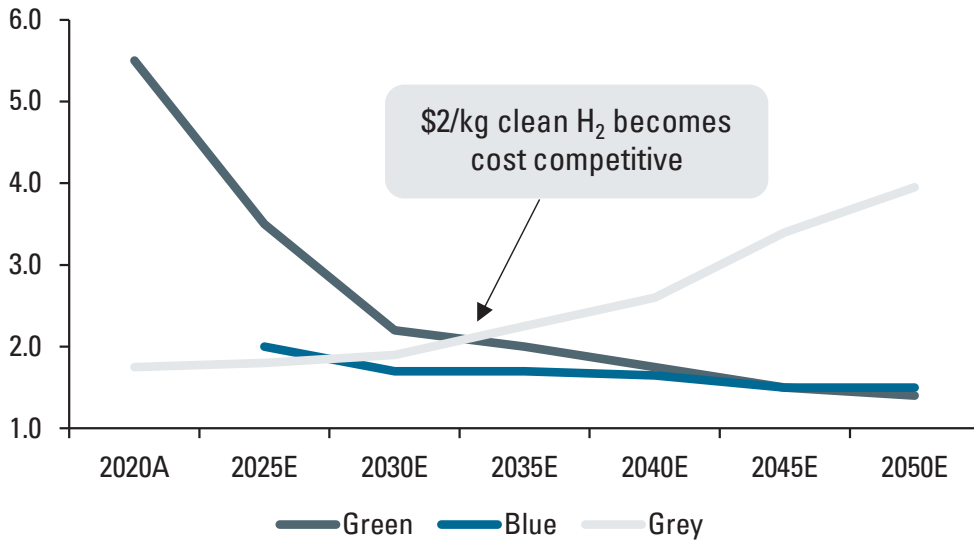


Uranium enrichment takes place in France (12.5%), Germany-Netherlands-UK (22.8%), USA (8.1%), China (10.5%), and Russia (46%)

Nuclear energy is a viable alternative energy because it can be sustainably sourced from friendly jurisdictions while lowering our carbon footprint

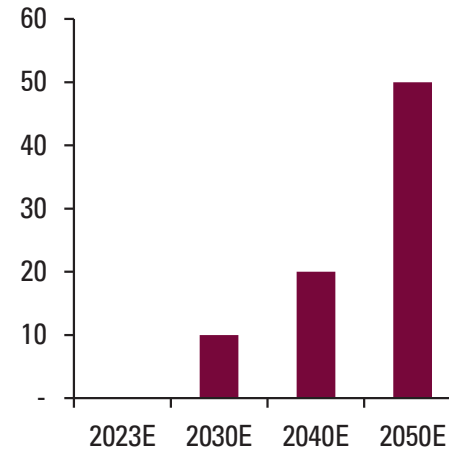
INDUSTRY OVERVIEW – HYDROGEN

Future Costs of Hydrogen (\$/kg)

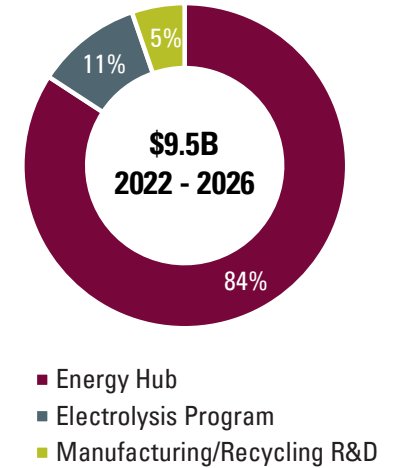


National Clean Hydrogen Strategy

U.S Clean H₂ Production (MMT)



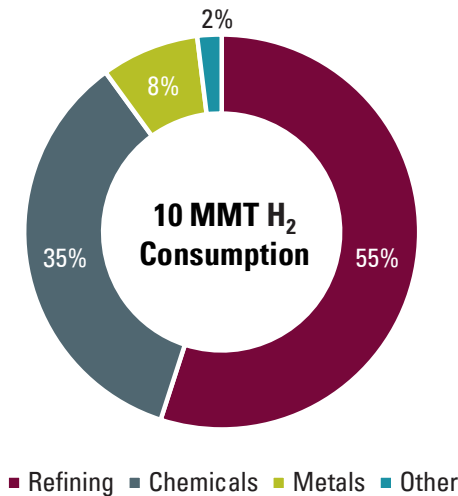
DOE Clean Hydrogen Funding



Hydrogen Consumption & Emerging Demands

Current Hydrogen Consumption

Emerging Demands



Transportation: Rail, heavy vehicles, maritime, aviation



Power generation/storage: Fuel cells, hybrid energy



Industrial: Steel/cement manufacturing, biofuels



Hydrogen/gas blending: Industry or building heating

Nuclear Clean Hydrogen Pilot Projects

Nine Mile Point Nuclear Power Station – Constellation Energy

- First nuclear-powered clean hydrogen production facility
- Expected to power a fuel cell and the grid in 2025



Davis-Besse Nuclear Power Station – Energy Harbor

- Proving feasibility and economic benefits of clean hydrogen
- Expected to produce clean hydrogen in 2023



Prairie Island Nuclear Generating Station – Xcel Energy

- Demonstrating high-temperature electrolysis to scale process
- Hydrogen production expected in early 2024



Palo Verde Generating Station – Arizona Public Service Company

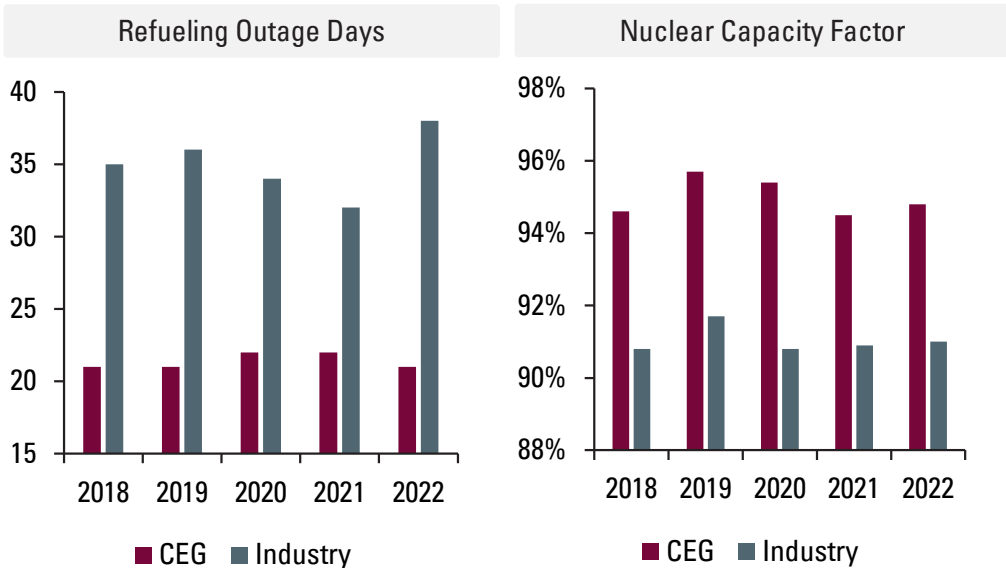
- Goal is to produce electricity to make chemicals and fuels
- Possible production of hydrogen in 2024



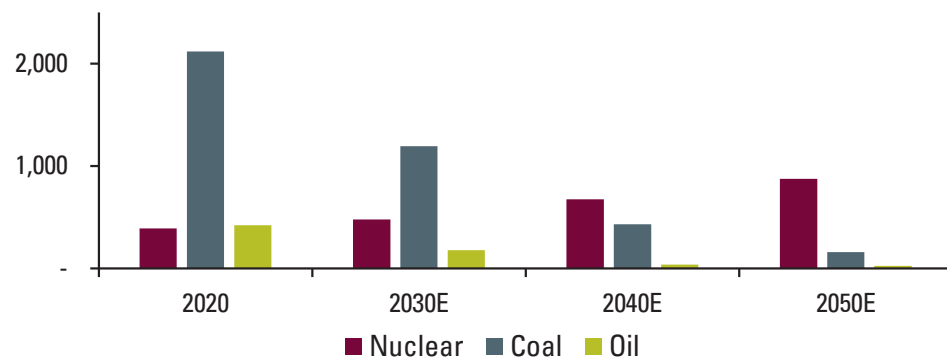
Clean hydrogen production is an emerging market with significant government backing, presenting an opportunity for Constellation

SUSTAINABLE NUCLEAR POWER

Defensible Cash Flows



Nuclear Capacities to Meet Net Zero by 2050



From 2020 to 2050, fossils fuels expected to become nearly non-existent

Nuclear capacities to reach 480GW per year by 2030

Nuclear is a necessity to meet net zero 2050 goals

PTC Subsidy Impact on Revenues

Energy Price of \$38.34		Energy Price of \$28.75	
Op. Revenues	7,651M	Op. Revenues	6,974M
Fuel Cost	(1,244M)	Fuel Cost	(1,244M)
O&M	(2,967M)	O&M	(2,967M)
Depreciation	(1,011M)	Depreciation	(1,011M)
Other Taxes	(492M)	Other Taxes	(492M)
Op. Income	1,937M	Op. Income	1,260M
PTC Generation	73M	PTC Generation	541M

✓ PTC increases share of revenues by 40% when energy prices fall by ~\$10

✓ PTC subsidy supports revenues as energy prices fall

Highlights and Outlook

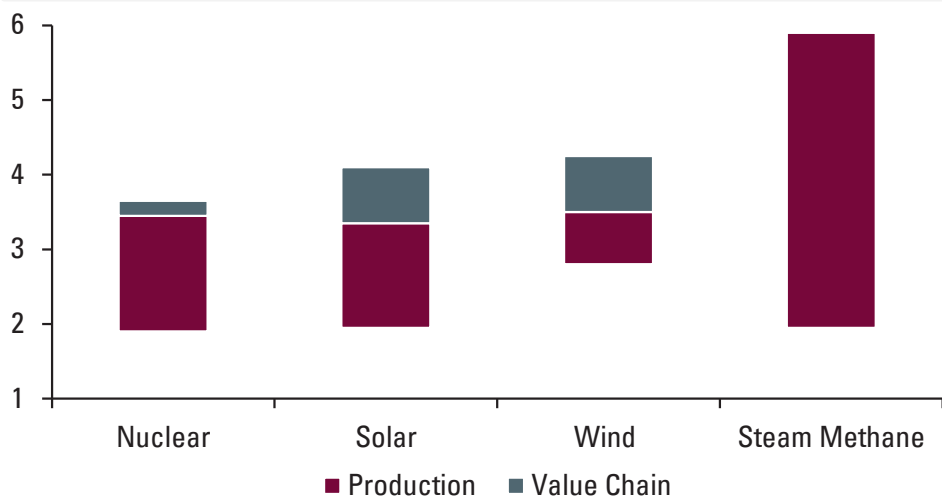
- More ESG projects can be undertaken with Constellation reducing debt and creating ~\$1B FCF annually to invest back into the company
- PTC subsidy growth reflects well for long-term growth with CEG leading, possessing a 20% market share of the nuclear sector
- PTC would contribute \$73M in 2025 or 3.7% of nuclear operating income
- PTC effectively sets the minimum power price ~\$40s/MWh, providing a floor value unique to nuclear, helping produce highly predictable and recurring earnings and cash flows

Regardless of weather conditions nuclear provides stable energy production. Nuclear is necessary in meeting future carbon targets

LONG-TERM OPPORTUNITY WITH HYDROGEN

Competitiveness of Nuclear in the Production of Hydrogen

Levelized Hydrogen Cost (USD/kg H₂) – 2035



Differentiation from Competitors

 Leading the industry having produced 560 kg of clean hydrogen with 1 MW of zero-carbon energy




 Constellation's carbon-free approach and low carbon intensity, positions the company to realize the full benefit of the PTC

 Previous partnerships with the DOE, positions CEG to receive the Hydrogen Hub funding they currently seek

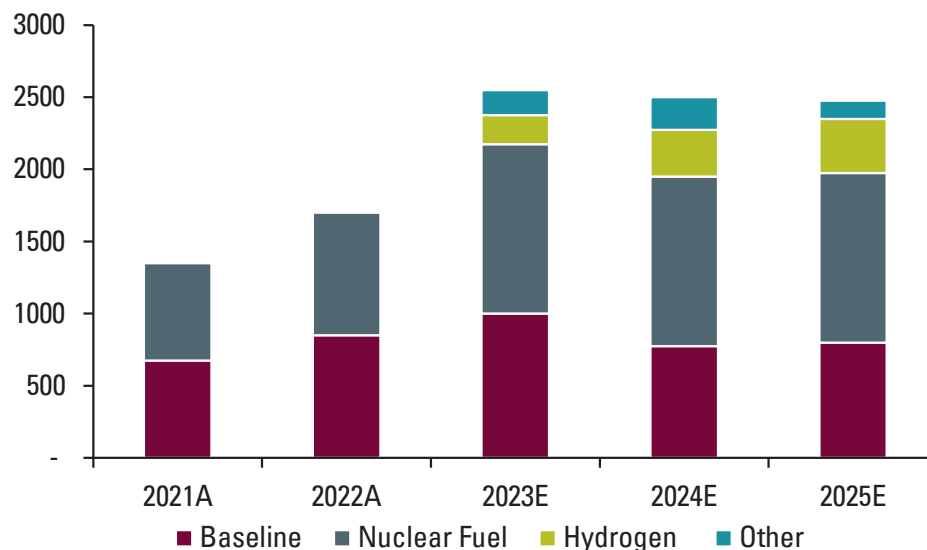
 Commercial production of clean hydrogen is expected to start in 2027, ahead of other competitors such as AES Corp

Hydrogen Production Tax Credit (PTC)

Carbon Intensity (e/kg H ₂)	PTC (\$/kg H ₂)	2026 CEG Credit (33,450 tpa)
0 – 0.45	\$3.00	\$100.35M
0.45 – 1.50	\$1.00	\$33.45M
1.50 – 2.50	\$0.75	\$25.09M
2.50 – 4.00	\$0.60	\$20.07M

-  PTC applies to projects that have started construction before 2033
-  Applies to a project for the first 10 years of operations
-  PTC is inflation adjusted over time

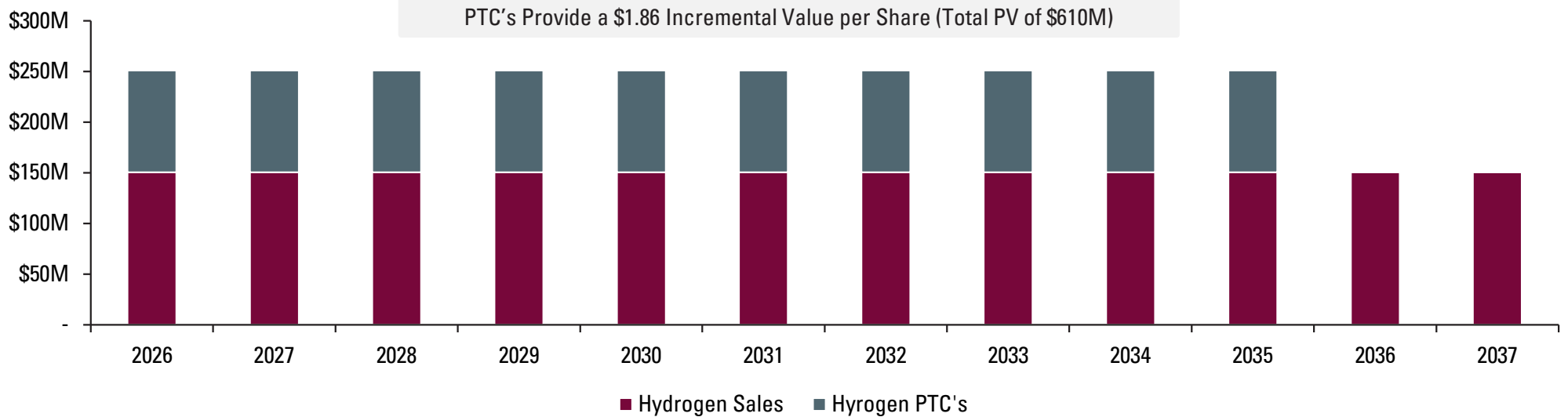
Hydrogen Capital Expenditure Commitments (\$M)



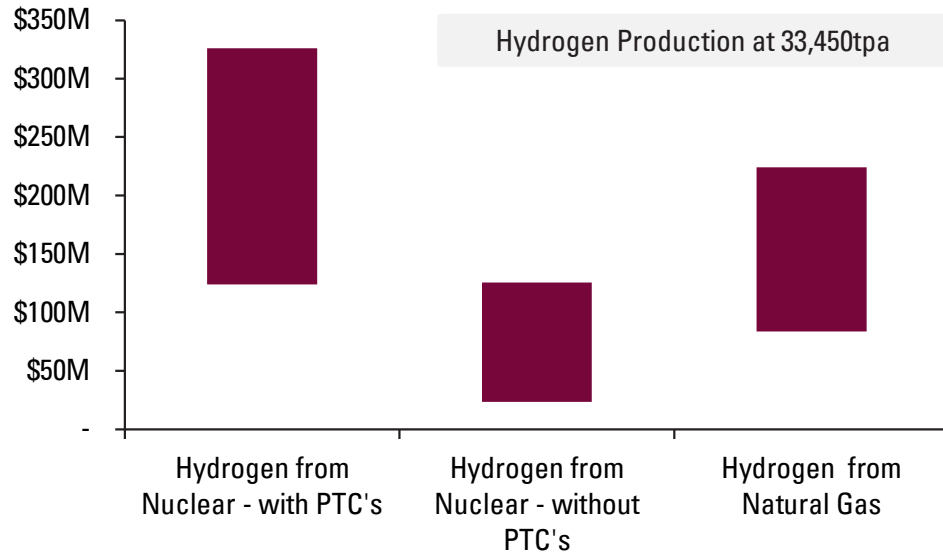
Constellation is a first mover in clean hydrogen production and is well positioned to take advantage of opportunities in the industry

INCREMENTAL FCF FROM CURRENT PROJECTS

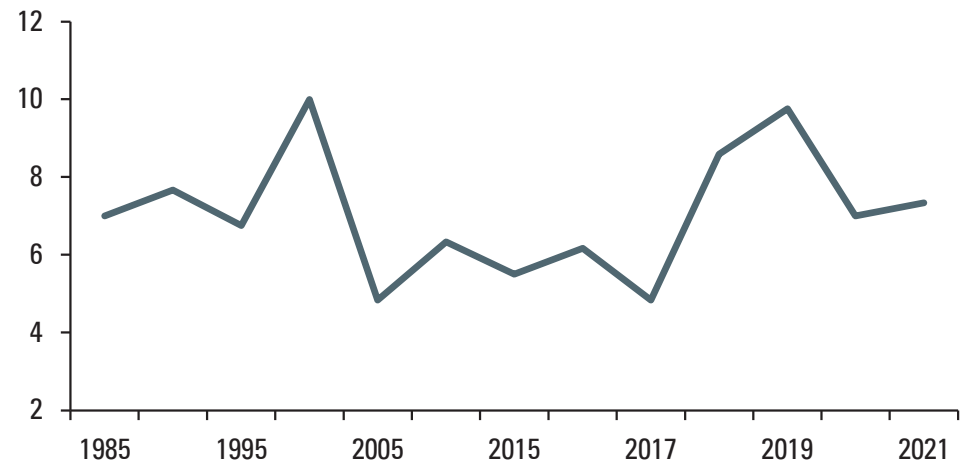
Hydrogen and Nuclear PTC's Increase in FCF



Annual FCF from Hydrogen Production (Nuclear vs. Natural Gas)



Time to Build (Years)

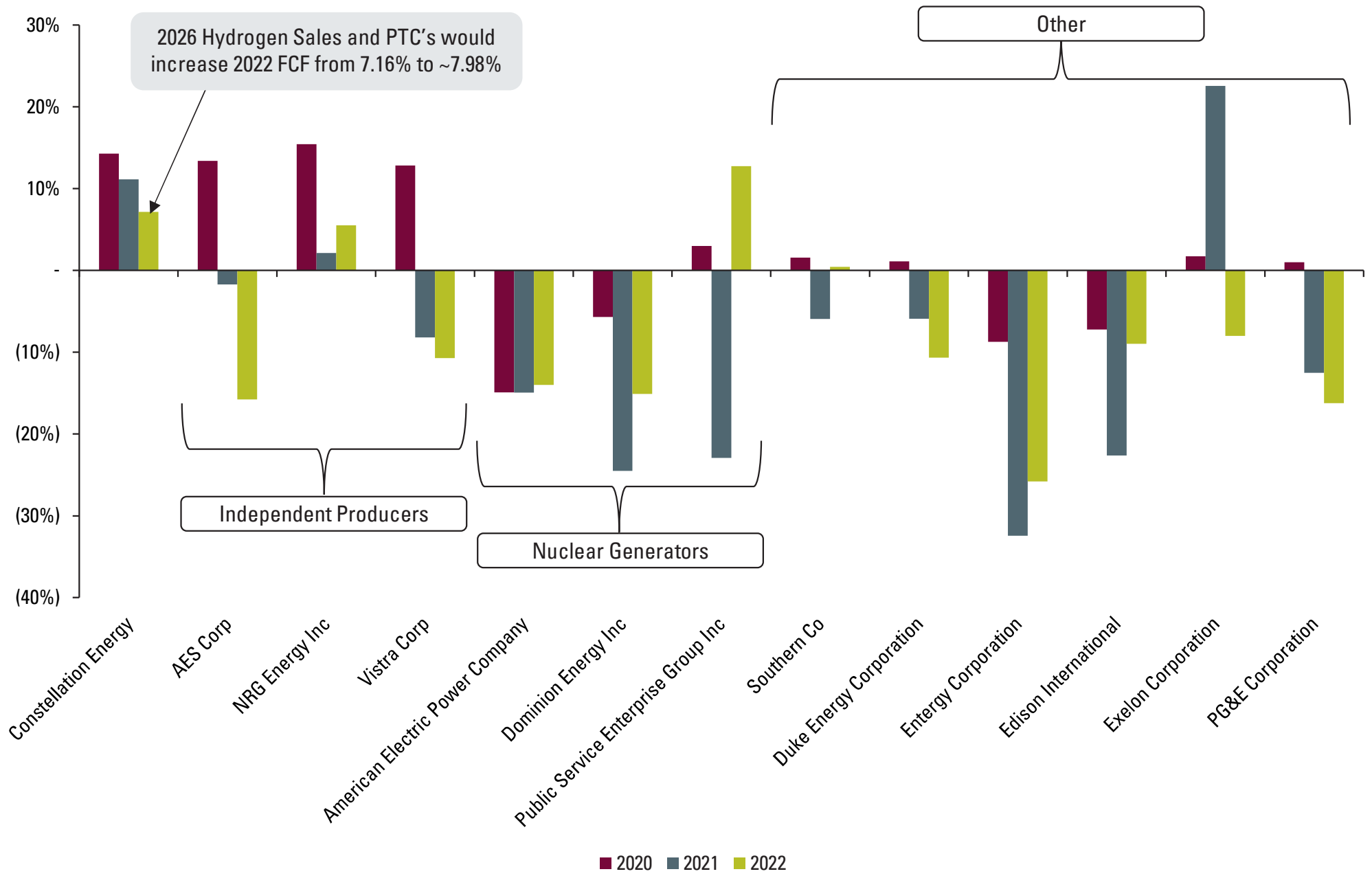


Nuclear reactors take ~7 years to build costing \$6000/KW

The IRA has provided Constellation with significant tailwinds for both Hydrogen and Nuclear energy

Source: Constellation Investor Presentation Q4 2022, World Nuclear Association.
 Note: Assuming an inflation rate of 2% annually.

Superior FCF Margins



CEG is the only Energy Producer in our comps and outside that has annually had positive FCF margins the past three and four years

COMPARABLES ANALYSIS

	Market Cap	Enterprise Value	Price/Book	Rev. Growth	EV/Rev.	EV/EBITDA	NTM EV/EBITDA	EBITDA Margin	Net Debt / EBITDA	Dividend Yield	Nuclear Revenue %
	\$B	\$B	Current	Current	Current	Current	Future	Current	Current	Current	Current
Independent Power Producers											
AES Corp	16.11	41.73	6.61x	13.2%	3.31x	12.26x	10.35x	27.0%	5.72x	2.8%	0.0%
NRG Energy Inc	7.96	15.57	2.06x	16.9%	0.49x	5.06x	6.67x	9.7%	2.50x	4.5%	8.0%
Vistra Corp	9.15	25.00	1.91x	37.3%	1.75x	37.15x	6.47x	18.2%	3.95x	3.2%	25.4%
Mean	11.07	27.43	3.53x	22.5%	1.85x	18.16x	7.83x	18.3%	4.06x	3.5%	11.1%
Median	9.15	25.00	2.06x	16.9%	1.75x	12.26x	6.67x	18.2%	3.95x	3.2%	8.0%
Utilities with Nuclear Generation											
American Electric Power Company	46.76	86.19	1.95x	17.0%	4.39x	12.09x	12.53x	36.3%	5.27x	3.7%	18.0%
Dominion Energy Inc	46.70	94.01	1.67x	23.0%	5.47x	13.01x	12.03x	41.9%	5.96x	4.8%	12.0%
Public Service Enterprise Group Inc	31.15	50.95	2.26x	0.8%	5.2x	19.57x	12.21x	26.6%	7.38x	3.7%	57.0%
Southern Co	75.77	135.52	2.51x	24.6%	4.63x	13.81x	12.07x	33.5%	5.48x	3.9%	15.0%
Mean	50.10	91.67	2.10x	16.3%	4.92x	14.62x	12.21x	34.6%	6.02x	4.0%	25.5%
Median	46.73	90.10	2.11x	20.0%	4.92x	13.41x	12.14x	34.9%	5.72x	3.8%	16.5%
Constellation Energy Corp	25.71	30.24	2.38x	22.7%	1.34x	12.90x	9.48x	17.6%	2.12x	1.5%	86.0%

EV/EBTIDA



EV/Revenue



Constellation is trading in line with peers with a significantly higher percentage of nuclear revenue, deserving a premium multiple

DCF VALUATION

US\$M	2020A	2021A	2022A	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E	WACC	
EBITDA	2,861	3,132	2,138	3,337	3,378	3,445	3,825	3,965	4,685	4,857	5,562	5,674	6,104	Capital Structure	
Less: D&A	(2,123)	(3,003)	(1,091)	(2,663)	(2,696)	(2,750)	(2,946)	(3,053)	(3,165)	(3,281)	(3,347)	(3,413)	(3,482)	Liabilities / Assets	20.00%
EBIT	738	129	1,047	674	682	695	879	912	1,520	1,576	2,216	2,260	2,622	Equity / Assets	80.00%
Less: Tax	(482)	(475)	(552)	(219)	(619)	(631)	(561)	(585)	(610)	(636)	(651)	(666)	(681)	Cost of Debt	
NOPAT	256	(346)	495	856	73	74	419	427	1,011	1,041	1,666	1,695	2,042	Borrowing Rate	6.05%
Add: D&A	2,123	3,003	1,091	2,663	2,696	2,750	2,946	3,053	3,165	3,281	3,347	3,413	3,482	Tax Rate	27.00%
Less: CAPEX	(1,747)	(1,329)	(1,689)	(2,763)	(2,797)	(2,853)	(2,946)	(2,776)	(2,877)	(2,684)	(2,738)	(2,793)	(2,849)	Cost of Equity	
Less: NWC Change	729	(324)	66	(209)	(31)	(51)	(113)	(75)	(125)	(83)	(112)	(64)	(65)	Risk Free Rate	3.55%
UFCF	1,361	1,004	(37)	547	(59)	(80)	306	630	1,174	1,554	2,163	2,252	2,610	Beta	0.66
Discount Factor at 6.97%				0.97x	0.92x	0.86x	0.80x	0.75x	0.70x	0.66x	0.61x	0.57x	0.54x	Equity Risk Premium	6.00%
PV of UFCF				533	(54)	(69)	246	473	823	1,019	1,326	1,291	1,399	WACC	6.97%

Target Price Derivation

Multiples Method		Gordon Growth Method	
EBITDA	6,104	Final Year UFCF	2,610
EBITDA Multiple	11.00x	LT Growth Rate	2.00%
Terminal Value	67,140	Terminal Value	53,589
Discount Rate	0.54x	Discount Rate	0.54x
PV Terminal Value	35,980	PV Terminal Value	28,718
PV Cash Flow	6,988	PV Cash Flow	6,988
Add: Cash	422	Add: Cash	422
Less: Debt	8,596	Less: Debt	4,466
Equity Value	34,794	Equity Value	31,662
Shares Out.	327.13	Shares Outstanding	327.13
Price Per Share	\$106.36	Price Per Share	\$96.79

Scenario Analysis

		WACC						
		5.47%	5.97%	6.47%	6.97%	7.47%	7.97%	8.47%
Exit Multiple	9.0x	\$101	\$96	\$91	\$86	\$82	\$78	\$74
	9.5x	\$107	\$101	\$96	\$91	\$87	\$82	\$78
	10.0x	\$112	\$107	\$101	\$96	\$91	\$87	\$82
	10.5x	\$118	\$112	\$107	\$101	\$96	\$91	\$87
	11.0x	\$124	\$118	\$112	\$106	\$101	\$96	\$91
	11.5x	\$130	\$123	\$117	\$111	\$106	\$101	\$96
	12.0x	\$135	\$129	\$122	\$116	\$111	\$105	\$100
	12.5x	\$141	\$134	\$128	\$121	\$115	\$110	\$104
	13.0x	\$147	\$140	\$133	\$126	\$120	\$114	\$109

We have derived a base-case, weighted average target price of \$101.57, implying a ~29% upside case as of March 31 closing price

Source: Financial Model, Capital IQ.

Note: Target price upside based on closing price of ~\$78 on March 31, 2023.

CATALYSTS & RISKS

Catalysts	Likelihood	Description
Hydrogen		Long term investments into hydrogen technology will make pink hydrogen more cost competitive regardless of IRA PTC's. CEG is a pink hydrogen first mover and positioned to take advantage of future tail winds
US Carbon Targets		The United States carbon targets will require not only renewable energy but also Nuclear to supplement the energy production
Public Sentiment		Public attitude and sentiment is shifting towards building more Nuclear. Lawmakers are also changing their attitudes towards Nuclear

Risks	Likelihood	Description
Environmental Risks		It is challenging to dispose of nuclear waste in stark contrast to other renewable powers such as wind and solar. Currently there is no location in the US to permanently store nuclear waste
Uranium Prices		Russia supplies ~46% of the worlds enriched uranium and China supplies another ~11%. This provides increased long-term risk to fuel prices. Uranium accounts for over half of CEG's total operating expenses
Nuclear Operation Risk		Nuclear operations are at risk relative to other groups. An accident at a non-CEG plant would materially impact CEG share price and Nuclear sentiment in the US

Uranium Supply Chain

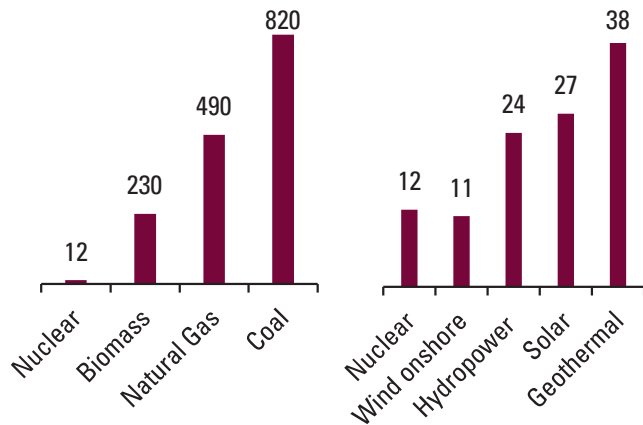


CEG manages uranium fuel through long-term supply and services contracts. They currently expect to have sufficient fuel through 2028.

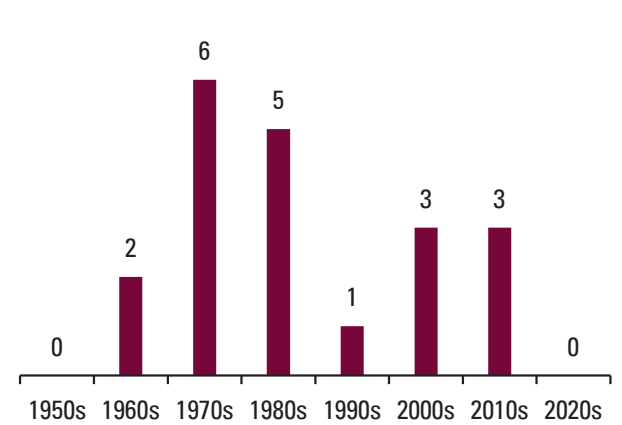


The US is to reopen its only uranium enrichment plant in early 2023.

CO2 Emissions per KWh



Nuclear Environmental/Death Accidents



While there have been deaths and environmental leaks at Nuclear plants there has never been a full meltdown of a reactor

CONCLUSION

Investment Summary

Hydrogen Investments

Investments in hydrogen technology will drive future growth

Nuclear Reliability

Nuclear energy has a low carbon output and can produce power in any weather conditions

Operational Efficiency

Constellation's fleet has superior efficiency relative to any other energy source or nuclear energy provider

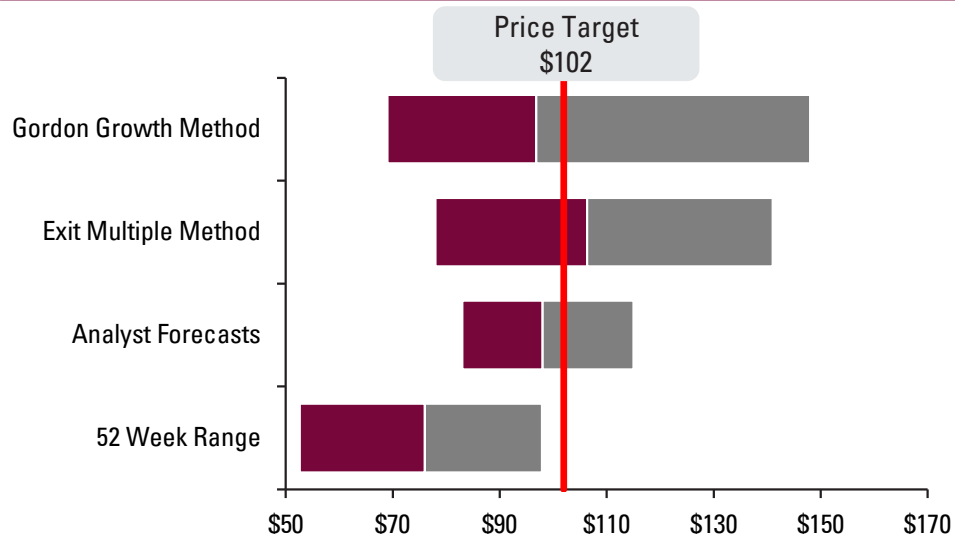
Hydrogen & Nuclear PTC's

Hydrogen and nuclear PTC's are increasing the economic viability of Constellation's energy fleet

Superior FCF Margins

CEG is only company in its peer group that has had positive FCF margins over the past four years

Financial Valuation Target Price



Consensus Valuation

Broker	Date Published	Price Target	Implied Upside
UBS	February 21, 2023	\$108	42%
CREDIT SUISSE	February 17, 2023	\$83	9%
WELLS FARGO	February 16, 2023	\$115	51%
EVERCORE	February 16, 2023	\$93	22%
RBC Capital Markets	January 17, 2023	\$91	20%
Average		\$98	29%
DFIC		\$102	32%

Path to Unlocking Value

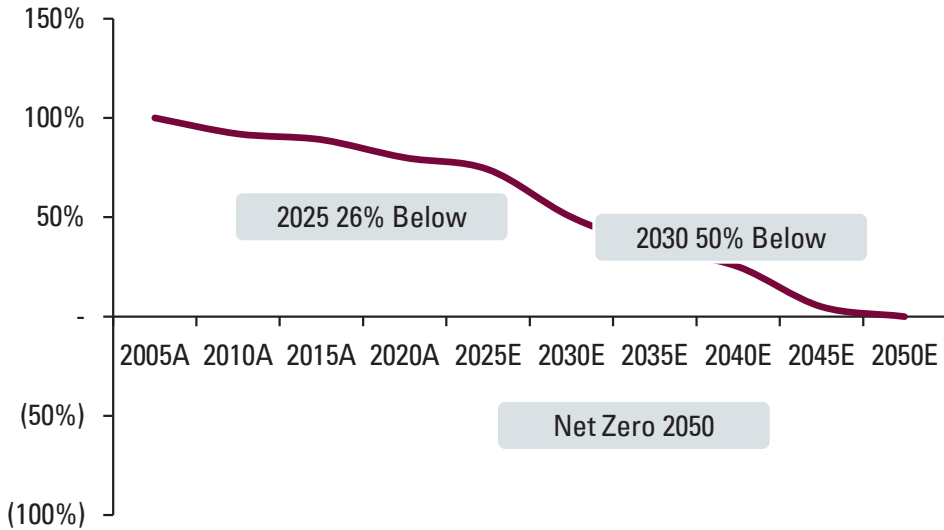
- 2023** **Developing & Building**
CEG is increasing the MWh at multiple Nuclear plants
- 2024** **Inflation Reduction Act**
Hydrogen & Nuclear PTC's are available
- 2026** **Hydrogen Plant**
CEG opens their first Hydrogen plant
- 2033** **End of the IRA**
Plants built after 2033 can not access any credits
- LT** **Further Hydrogen Investment**
CEG will continue to invest in Hydrogen plants

We believe CEG is positioned well in the Nuclear Power industry and can take advantage of significant Hydrogen tailwinds

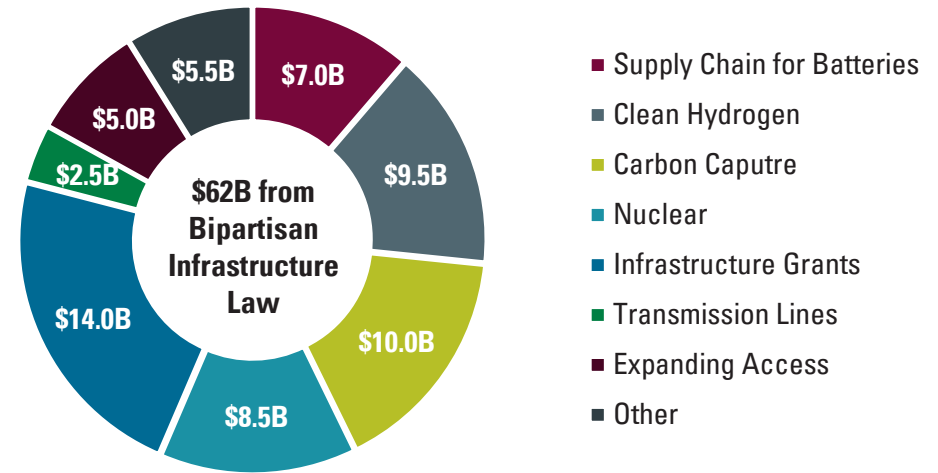
Appendix

United States Transition to Clean Energy

Targeted Emission Below 2005 Levels



DOE Clean Energy Funding Breakdown



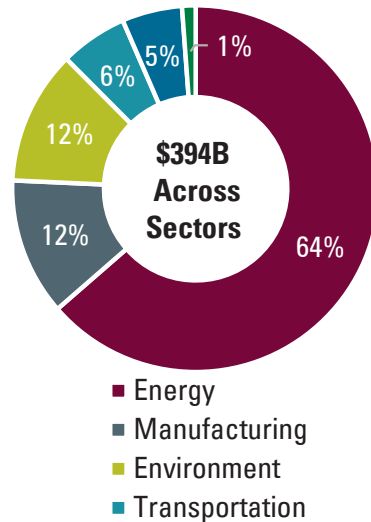
Inflation Reduction Act

The IRA signed in 2022 aims to reduce carbon emission, lower healthcare costs, and increase tax revenue

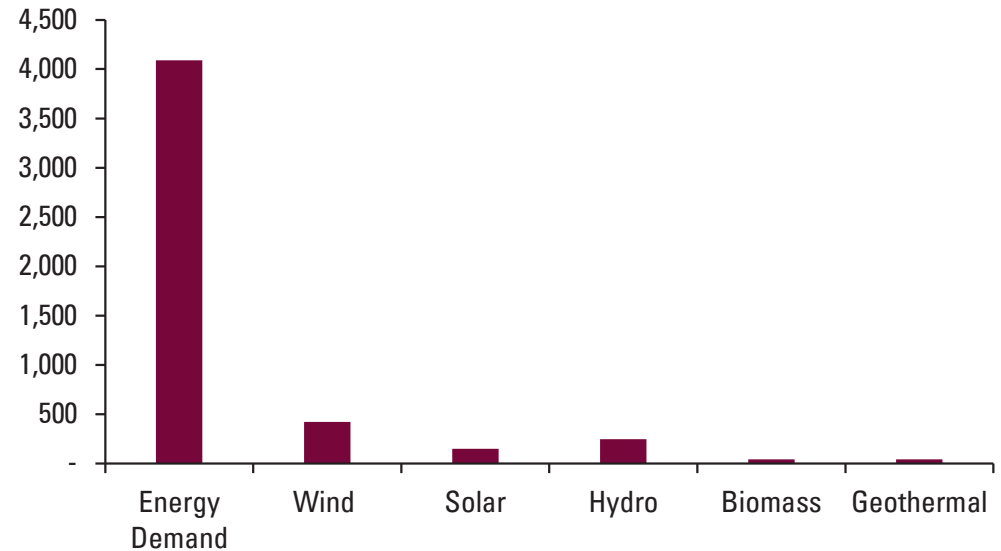
\$394B in federal funding will go directly towards reducing carbon emission and climate change

Majority of the energy and climate funding will be in the form of tax credits for consumers and corporations

Tax credits include \$30/MWh for zero carbon electricity, \$15/MWh for nuclear power, and \$3/kg of clean hydrogen



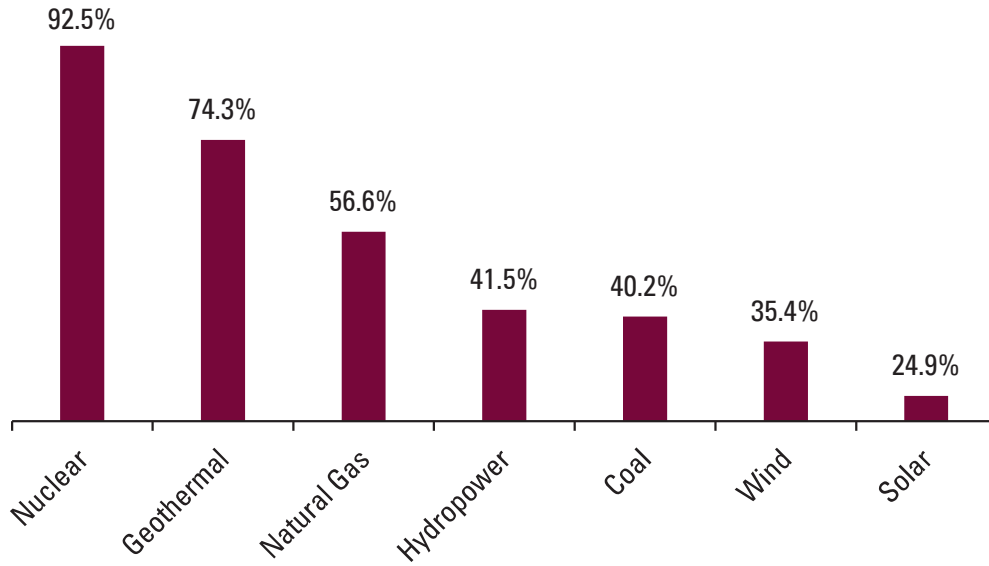
U.S 2022 Renewable Capacity (MWh)



The U.S federal government has committed over \$370B to fund the transition to clean energy across the IRA and BIL

Advantages of Nuclear over Other Energy Sources

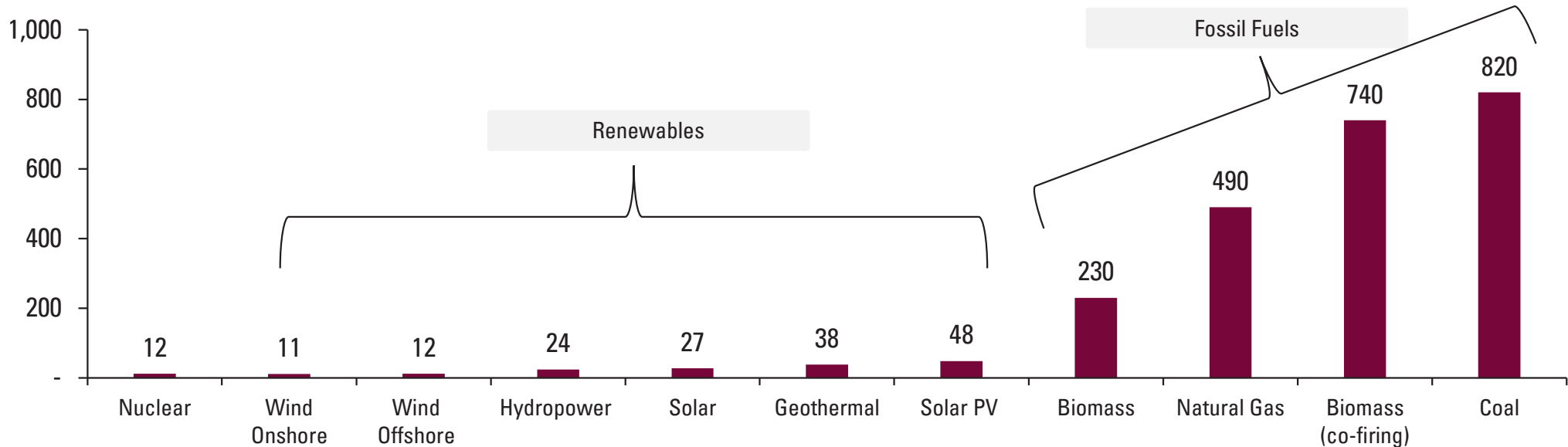
Capacity Factor by Energy Source



Benefits of Nuclear

Emissions	Nuclear is one of the least carbon intensive sources of energy, inline with renewable sources
Nuclear Reliability	Regardless of weather conditions nuclear plants can supply the grid with power unlike wind and solar
Capacity Factor	Nuclear has the highest capacity factor at 92.5% meaning they are consistently producing power
Decommissioning of Coal Plants	60 U.S coal plants are expected to be decommissioned by 2030, representing 64,000 MW
Cost to Consumers	To the end consumer, nuclear energy is one of the cheapest sources of power

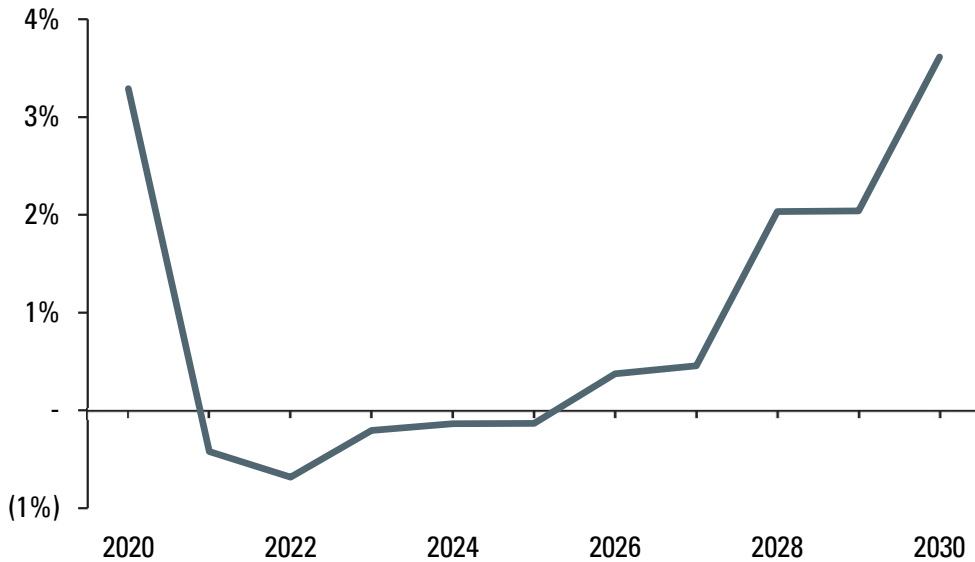
Average Life Cycle CO₂ Emissions per KWh



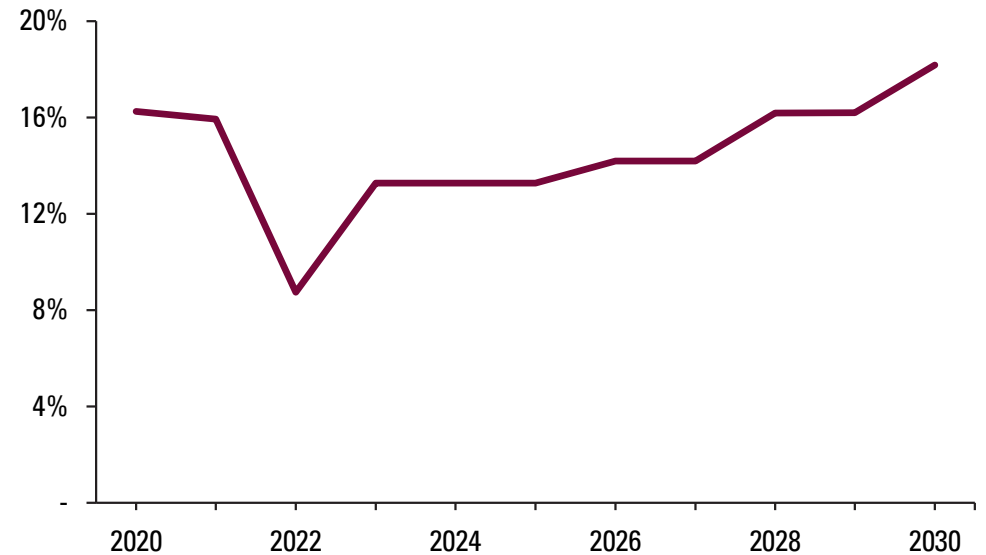
Nuclear energy is the most reliable source of energy and is comparable to renewables in its carbon emissions

Key Lines As a % of Revenue

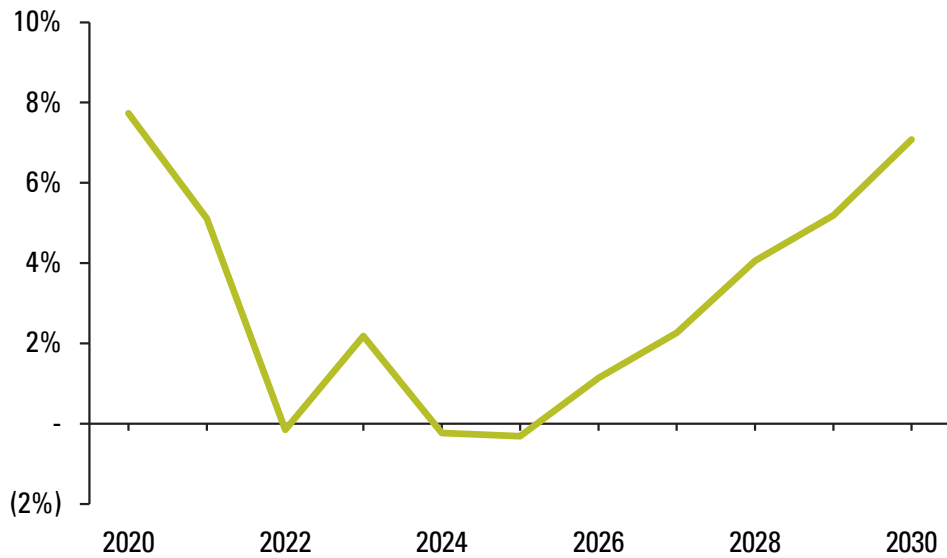
Net Income



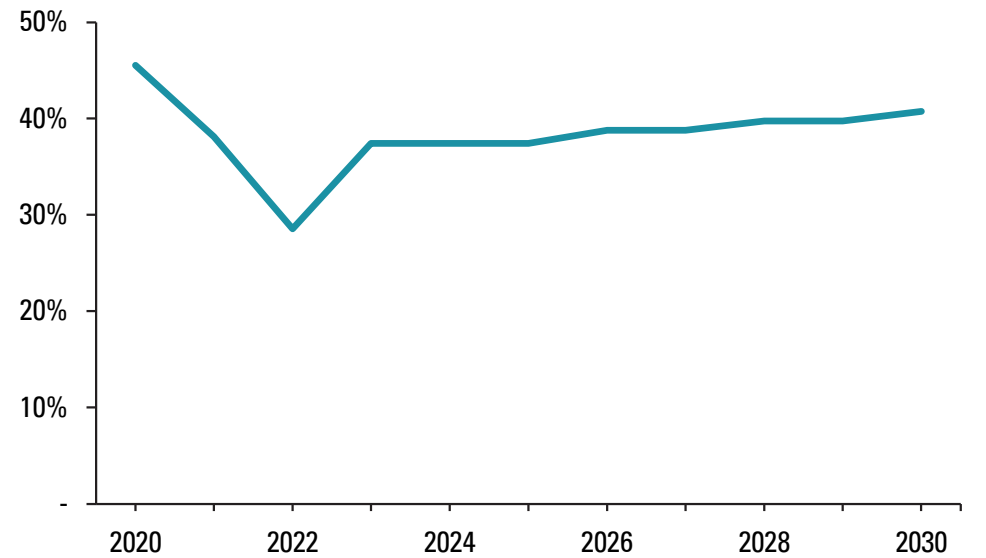
EBITDA



UFCF



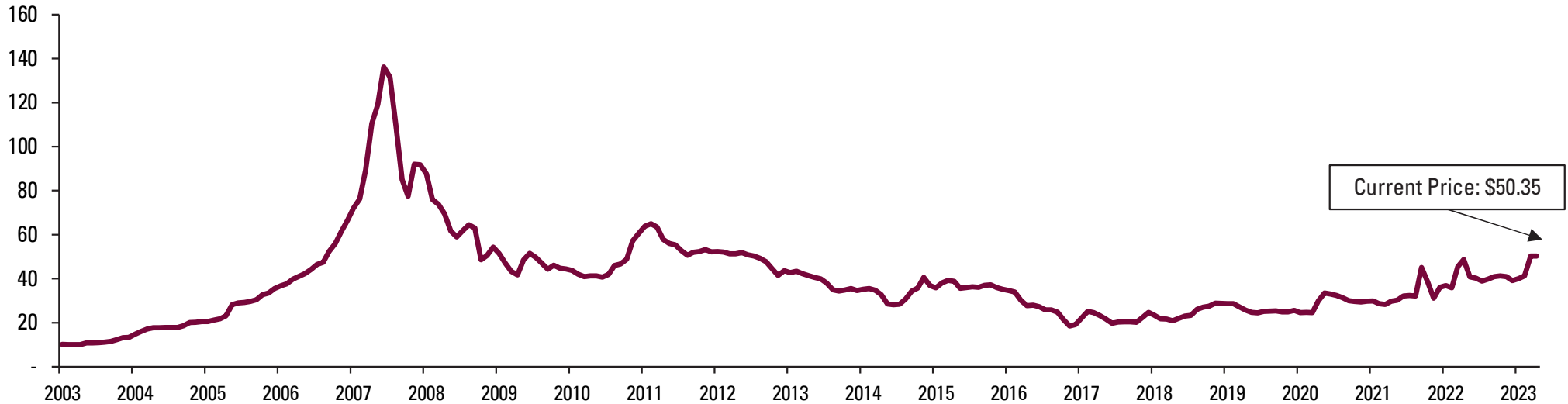
Gross Margin



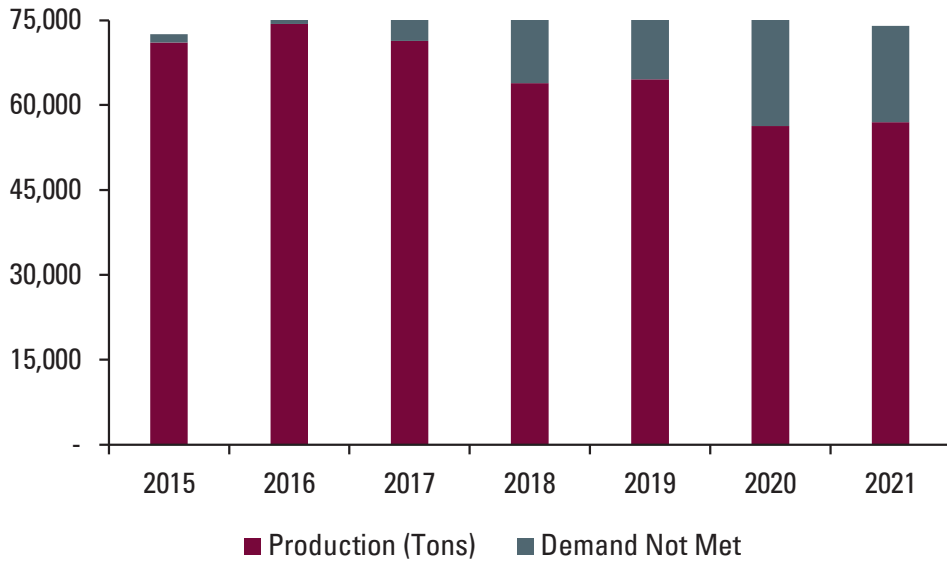
CEG's investments into Nuclear and Hydrogen are driving margin expansion

Nuclear & Uranium

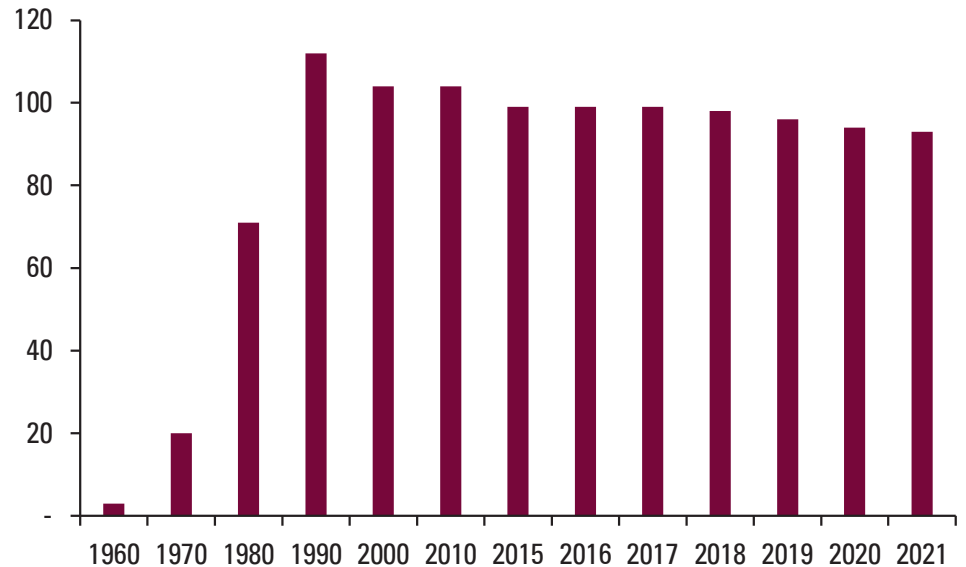
Historical Uranium Price



Annual Uranium Production



Number of Nuclear Plants in the United States



CEG has enough uranium contracts to last them until 2028

Management Overview

Joseph Dominguez

President & Chief Executive Officer



Joseph Dominguez served as the previous CEO of an Exelon company, ComEd, which provides power to upwards of 4 million customers in Illinois. Joseph was also the former Vice President of governmental and regulatory affairs and public policy for Exelon. Prior to Exelon, he was a partner at White and Williams law firm, and a assistant U.S. Attorney.

Compensation
\$3,170,864

Share Ownership
\$3.9M

Kathleen L. Barron

Executive Vice President & Chief Strategy Officer



Kathleen is the former Vice President for government and regulatory affairs and public policy for Exelon. There she evaluated significant federal and state policy targets for the customers of Exelon. She also served as the Deputy General Counsel at the Federal Energy Regulatory Commission (FERC), where she led roughly 90 lawyers on policy related to electric system dependability.

Compensation
Not Reported

Share Ownership
\$0.9M

Daniel L. Eggers

Executive Vice President & Chief Financial officer



Daniel was the former Senior Vice President of corporate finance at Exelon. He led investor relations, treasury, corporate planning, corporate financial operations, and insurance. Prior to joining Exelon, he served as a Managing Director at Credit Suisse in Investment Banking in New York. His career at Credit Suisse lasted 18 years.

Compensation
\$1,638,674

Share Ownership
\$0.9M

Mike Koehler

Executive Vice president & Chief Administrative Officer



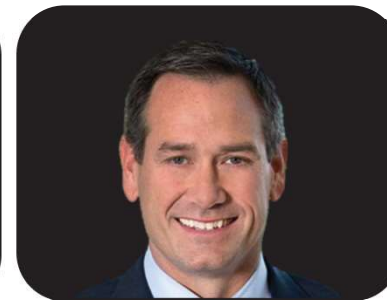
Mike Koehler was the Senior Vice President and Chief Information and Chief Digital Officer at Exelon until he joined Constellation Energy. Mike is a former Senior Vice President for HP, and was involved with market expansion and improving revenue and profit across Canada, Latin America and the United States.

Compensation
Not Reported

Share Ownership
\$2.3M

Bryan Hanson

Executive Vice president & Chief Generation Officer



Bryan Hanson is an experienced executive in the nuclear power industry with more than 30 years of experience. He headed the nuclear division at Exelon as the President and Chief Nuclear Officer. Hanson is also a graduate of the Institute of Nuclear Power Operations Senior Nuclear Power Management Program.

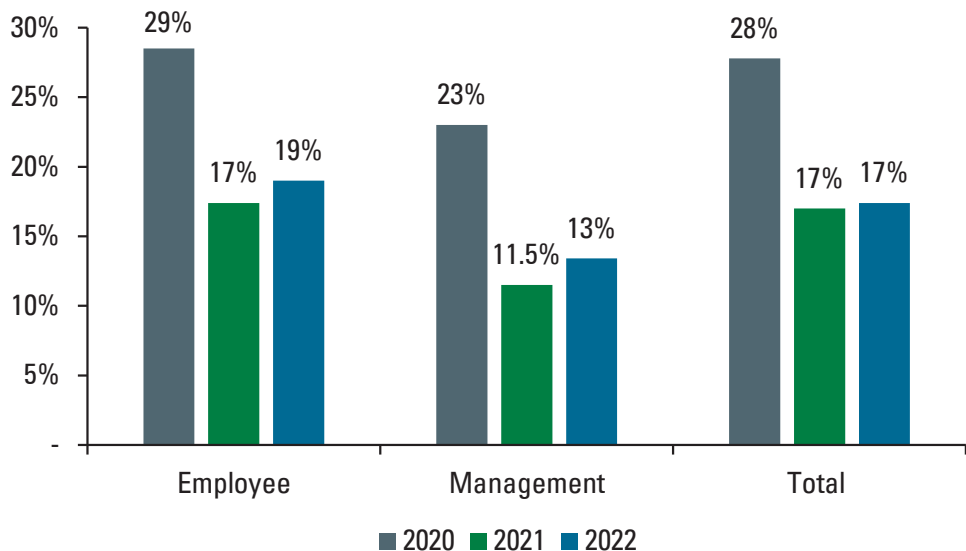
Compensation
\$3,675,236

Share Ownership
\$2.2M

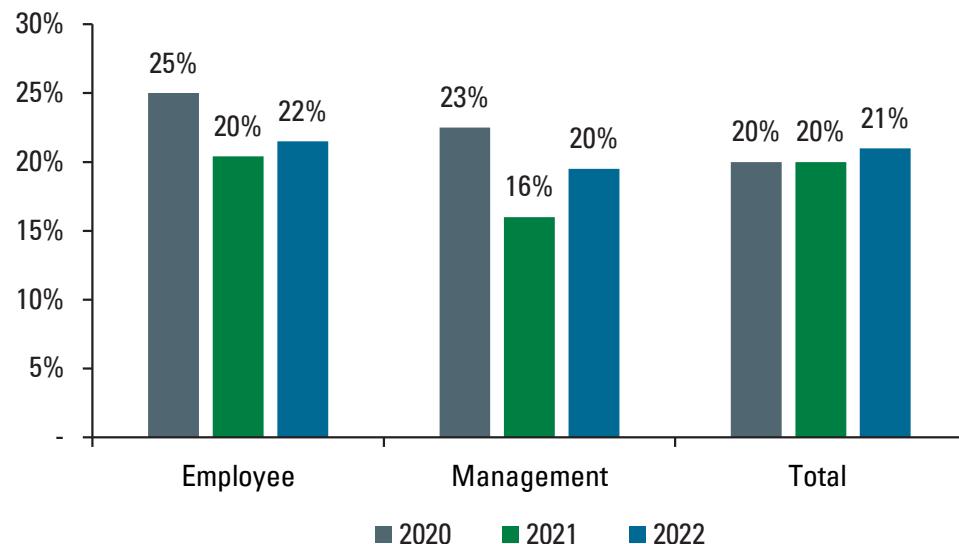
Upper management has significant industry experience

ESG Analysis

People of Colour at Constellation Energy



Women at Constellation Energy



Diversity, Equity, and Inclusion Commitments



Military recruitment and active transitional assistance for veterans and commitment to benchmarking disability inclusion with Disability Equality Index



Commitment to the Human Rights Campaign Business Coalition for the Equity Act to prohibit discrimination on the basis of gender identity and orientation



Active partnerships with the Society of Asian Scientists and Engineers, the Society of Women Engineers, and the National Society of Black Engineers, to identify qualified and diverse talent

Diversity, Equity, and Inclusion Goals



Target 25% of investments to minority and women-led businesses



Active participation and partnerships with Chicago Women in Trades, Society of Women Engineers, and Hire360



Integrates diversity as business imperative and core value



Intentional employee sourcing efforts to attract talent from a diverse population through Women in STEM-based diversity pipeline



Invest \$1,000,000 in community partners investing in creating sustainable careers for women and minorities

CEG is continually working to improve their commitments to their employees, communities and other stakeholders

How Nuclear Works

Creation of Energy

Nuclear Fission

- Nuclear power plants heat water to produce steam
- Steam is used to spin large turbines that generate electricity
- Nuclear power plants use heat produced during nuclear fission to heat water



Use of Uranium

- Uranium is processed into small ceramic pellets and stacked together into sealed metal tubes called fuel rods (around 200)
- Inside the reactor vessel, the fuel rods are immersed in water which acts as both a coolant and moderator
- The moderator helps slow down the neutrons produced by fission to sustain the chain reaction



Heat Production

- Heat produced during nuclear fission in the reactor core is used to boil water into steam, which turns the blades of a steam turbine
- As turbine blades turn, they drive generators to make electricity
- Nuclear plants then cool the steam back into water which is then reused to produce steam



Fuel Cycle

Front End of Cycle

- Starts with exploration for uranium and the development of mines to extract uranium ore
- Next step is to mine the ore using specific techniques such as: underground mining, open pit mining, heap leaching
- Uranium milling is then used to refine the uranium concentrate
- Uranium conversion then takes place to convert yellowcake into uranium hexafluoride gas at a convertor facility
- After conversion, the gas is sent to an enrichment plant where the individual uranium isotopes are separated to produce enriched uranium concentrations
- Once enriched it is ready to be converted into nuclear fuel at a nuclear fuel fabrication facility where it is then transported to reactor sites



Back End of Cycle

- Interim storage takes place as after use in the reactor, fuel assemblies are highly radioactive
- After a few years, the fuels are cooled and moved to a dry cask storage container
- Final step is the collection of spent fuel assemblies from the storage for final disposition in a permanent underground repository



Nuclear energy has several parts within the nuclear fuel cycle production consisting of both a front-end and back-end cycle

How Hydrogen Works

Clean Hydrogen Process

High-Temperature Electrolysis

- Uses heat and electricity from reactor to split water into hydrogen
- Temperature required to operate are 700°- 800°C
- Requires one-third less energy but currently is not a commercialized



Low-Temperature Electrolysis

- Uses heat and electricity to split water molecules but requires less heat than high-temperature electrolysis
- Utilizes waste heat at up 200°C from reactor
- Currently most reliable method of electrolysis



Reduced Carbon Emissions

- Nuclear produced hydrogen has small carbon footprint compared to standard methods of production
- Nuclear electrolysis realises only 3 kg of CO₂ per kg of hydrogen
- Steam methane reformation realises 12 kg of CO₂ per kg of hydrogen



Difference between various types of Hydrogen

Grey Hydrogen

- Hydrogen that is produced using fossil fuels such as natural gas, methane or coal
- This process involves steam reforming
- Currently most abundantly produced and used type of hydrogen as it is the most cost effect method



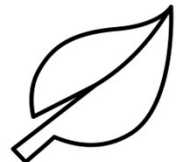
Blue Hydrogen

- Produced using same sources of energy as grey hydrogen but is coupled with carbon capture technology
- Carbon capture collects the pollutants and stores them before they are realised into the atmosphere
- Overall environmental impact is less than that of grey hydrogen



Green Hydrogen

- Hydrogen produced using environmentally friendly sources of energy such as solar, wind, etc.
- Carbon footprint of green hydrogen is essentially zero
- Currently green hydrogen technology is not widely used but will play an important role in the transition to decarbonizing the planet



Hydrogen produced by a nuclear energy source is significantly more environmentally friendly than current methods used

Types of Utilities Companies

Independent Power Producers vs. Investor Owned Utilities

Independent Power Producer

- Privately owned power plants that are not apart of the regular grid
- Electricity that is generated is sold to other utilities, industrial customers, or other end-users
- IPPS are not subject to the same regulations from the government as other utilities
- Required to comply with certain environmental and safety regulations

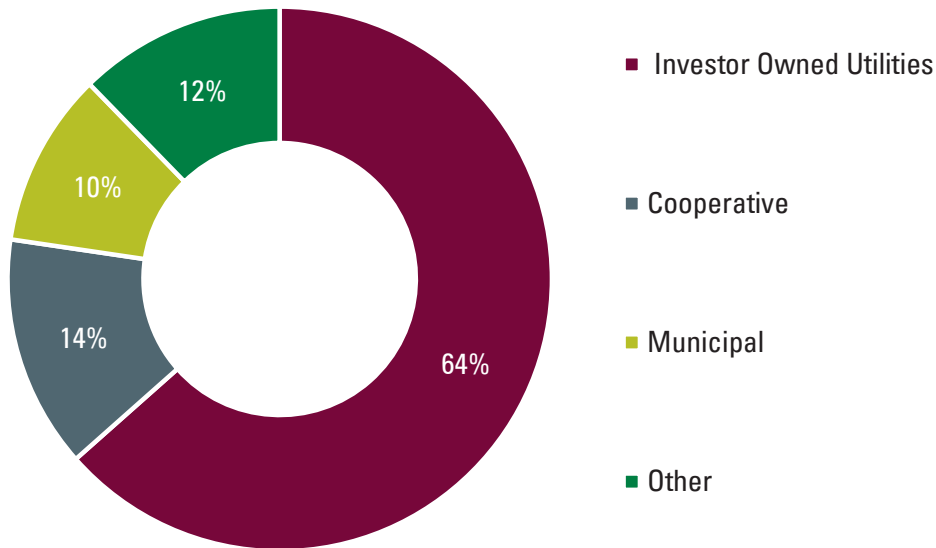


Investor Owned Utilities

- Regulated utilities that own and operate the entire electricity supply chain
- Subjected to government regulations, including rates they can charge customers
- Investor owned utilities accounts for 64% of the total customers, making it the biggest in terms of the type of company
- Protected from competition against other providers by jurisdictional boundaries, limiting the area they serve



Total Customers by Utilities Type



Top Investor Owned Utilities companies

Company	Customer #	Sales (MWh)	Revenues (1,000s)
Florida Power & Light Co	5,214,219	11,239,5915	\$11,239,5915
Southern California Edison Co	3,881,200	57,096,344	\$10,768,619
Commonwealth Edison Co	3,001,870	29,396,464	\$3,734,915
Consolidated Edison Co-NY Inc	2,930,012	20,710,482	\$5,298,569
Georgia Power Co	2,657,949	82,944,041	\$8,481,710

Investor Owned Utilities dominates the current market in the U.S. as they serve three out of four customers in the country

Sensitivity Analysis

Multiple Method

		WACC						
		5.47%	5.97%	6.47%	6.97%	7.47%	7.97%	8.47%
Exit Multiple	9.0x	\$101	\$96	\$91	\$86	\$82	\$78	\$74
	9.5x	\$107	\$101	\$96	\$91	\$87	\$82	\$78
	10.0x	\$112	\$107	\$101	\$96	\$91	\$87	\$82
	10.5x	\$118	\$112	\$107	\$101	\$96	\$91	\$87
	11.0x	\$124	\$118	\$112	\$106	\$101	\$96	\$91
	11.5x	\$130	\$123	\$117	\$111	\$106	\$101	\$96
	12.0x	\$135	\$129	\$122	\$116	\$111	\$105	\$100
	12.5x	\$141	\$134	\$128	\$121	\$115	\$110	\$104
	13.0x	\$147	\$140	\$133	\$126	\$120	\$114	\$109

Gordon Growth

		WACC						
		5.47%	5.97%	6.47%	6.97%	7.47%	7.97%	8.47%
Growth Rate	1.00%	\$121	\$105	\$92	\$81	\$72	\$65	\$58
	1.25%	\$128	\$110	\$96	\$85	\$75	\$67	\$60
	1.50%	\$136	\$116	\$101	\$88	\$78	\$69	\$62
	1.75%	\$144	\$123	\$106	\$92	\$81	\$72	\$64
	2.00%	\$154	\$130	\$112	\$97	\$85	\$75	\$66
	2.25%	\$166	\$139	\$118	\$102	\$89	\$78	\$69
	2.50%	\$179	\$148	\$125	\$107	\$93	\$81	\$72
	2.75%	\$195	\$159	\$133	\$113	\$97	\$85	\$75
	3.00%	\$214	\$172	\$142	\$120	\$103	\$89	\$78

Revenue Schedule

Revenues													
Mid-Atlantic	4,645	4,584	5,164	5,217	5,271	5,376	5,593	5,819	6,054	6,299	6,425	6,553	6,684
<i>(Mid-Atlantic Revenues / Mid-Atlantic MW Capacity) \$/MWh</i>		0.44	0.49	0.47	0.48	0.49	0.50	0.51	0.52	0.53	0.54	0.55	0.57
Midwest	4,024	4,060	4,650	4,769	4,818	4,914	5,015	5,218	5,428	5,648	5,761	5,876	5,993
<i>(Midwest Revenues / Midwest MW Capacity) \$/MWh</i>		0.34	0.39	0.37	0.38	0.39	0.40	0.40	0.41	0.42	0.43	0.44	0.45
New York	1,431	1,575	1,595	1,698	1,715	1,749	1,820	1,893	1,970	2,050	2,091	2,132	2,175
<i>(New York Revenues / New York MW Capacity) \$/MWh</i>		0.51	0.52	0.52	0.53	0.54	0.55	0.57	0.58	0.59	0.60	0.61	0.62
Electric Reliability Council of Texas (ERCOT)	958	1,181	1,543	1,536	1,552	1,583	1,647	1,713	1,783	1,855	1,892	1,930	1,968
<i>(ERCOT Revenues / ERCOT MW Capacity) \$/MWh</i>		0.33	0.43	0.41	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.47	0.48
Other Power Regions	4,002	4,890	6,732	7,050	7,123	7,265	7,559	7,864	8,182	8,512	8,683	8,856	9,033
<i>(Mid-Atlantic Revenues / Mid-Atlantic MW Capacity) \$/MWh</i>		1.49	2.06	2.01	2.05	2.09	2.14	2.18	2.22	2.27	2.31	2.36	2.41
Unallocated	2,543	3,359	4,756	4,851	4,948	5,047	5,148	5,251	5,356	5,463	5,572	5,684	5,798
<i>YoY Growth</i>		0	0										
Total Operating Revenues Excluding Hydrogen	17,603	19,649	24,440	25,121	25,426	25,935	26,782	27,759	28,773	29,826	30,423	31,031	31,652
<i>(total operating revenues / Total MW Capacity) \$/MWh</i>		0.61	0.76	0.77	0.78	0.79	0.81	0.82	0.84	0.85	0.87	0.88	0.90
<i>Sale of Hydrogen</i>	-	-	-	-	-	-	164	164	164	164	164	164	164
Total Operating Revenues Including Hydrogen	17,603	19,649	24,440	25,121	25,426	25,935	26,946	27,923	28,937	29,990	30,587	31,195	31,816
Regional Growth (YoY)													
Mid-Atlantic	-1.31%	12.65%	1.03%	1.03%	2.00%	4.04%	4.04%	4.04%	4.04%	2.00%	2.00%	2.00%	2.00%
Midwest	0.89%	14.53%	2.56%	1.03%	2.00%	2.05%	4.04%	4.04%	4.04%	2.00%	2.00%	2.00%	2.00%
New York	10.06%	1.27%	6.43%	1.03%	2.00%	4.04%	4.04%	4.04%	4.04%	2.00%	2.00%	2.00%	2.00%
Electric Reliability Council of Texas (ERCOT)	23.28%	30.65%	-0.45%	1.03%	2.00%	4.04%	4.04%	4.04%	4.04%	2.00%	2.00%	2.00%	2.00%
Other Power Regions	22.19%	37.67%	4.73%	1.03%	2.00%	4.04%	4.04%	4.04%	4.04%	2.00%	2.00%	2.00%	2.00%
Unallocated	32.09%	41.59%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%	2.00%
Total Revenue Growth	11.62%	24.38%	2.79%	1.22%	2.00%	3.27%	3.65%	3.65%	3.66%	2.00%	2.00%	2.00%	2.00%
Net Generation Capacity (mwh)													
Mid-Atlantic	10,508	10,495	10,495	10,495	10,495	10,705	10,919	11,137	11,360	11,360	11,360	11,360	11,360
Midwest	11,898	11,892	12,162	12,162	12,162	12,167	12,411	12,659	12,912	12,912	12,912	12,912	12,912
New York	3,093	3,093	3,093	3,093	3,093	3,155	3,218	3,282	3,348	3,348	3,348	3,348	3,348
Electric Reliability Council of Texas (ERCOT)	3,610	3,610	3,610	3,610	3,610	3,682	3,756	3,831	3,908	3,908	3,908	3,908	3,908
Other Power Regions	3,291	3,265	3,335	3,335	3,335	3,402	3,470	3,539	3,610	3,610	3,610	3,610	3,610
Total	32,400	32,355	32,695	32,695	32,695	33,111	33,773	34,449	35,138	35,138	35,138	35,138	35,138

Source: Financial Model.
Notes: All figures in (USD \$M).

Income Statement

Operating Revenues													
Operating revenues	16,392	18,461	24,280	-	-	-	-	-	-	-	-	-	-
Operating revenues from affiliates	1,211	1,188	160	-	-	-	-	-	-	-	-	-	-
Total operating revenues	17,603	19,649	24,440	25,121	25,426	25,935	26,782	27,759	28,773	29,826	30,423	31,031	31,652
Operating Expenses													
Purchased power and fuel	9,592	12,157	17,457	15,725.76	15,917.01	16,235.35	16,497.62	17,099.43	17,436.53	18,074.76	18,132.02	18,494.66	18,864.56
Purchased power and fuel from affiliates	-7	6	5	-	-	-	-	-	-	-	-	-	-
Operating and maintenance	4,613	3,934	4,797	6,058.17	6,131.85	6,254.49	6,458.70	6,694.30	6,651.19	6,894.64	6,728.31	6,862.87	6,683.61
Operating and maintenance from affiliates	555	621	44	-	-	-	-	-	-	-	-	-	-
Depreciation and amortization	2,123	3,003	1,091	2,663.46	2,695.85	2,749.77	2,945.99	3,053.46	3,165.03	3,280.88	3,346.50	3,413.43	3,481.70
Taxes other than income taxes	482	475	552	620.84	628.39	640.96	661.88	686.03	711.10	737.12	751.87	766.90	782.24
Total operating expenses	17,358	20,196	23,946	25,068	25,373	25,881	26,564	27,533	27,964	28,987	28,959	29,538	29,812
Gain on sales of assets and businesses	11	201	1	0	0	0	0	0	0	0	0	0	0
Operating (loss) income	256	-346	495	53	53	54	218	225	809	839	1,464	1,493	1,840
Other income and (deductions)													
Interest expense, net	-328	-282	-250	-117.47	-97.75	-97.75	-90.25	-64.00	-64.00	-64.00	-64.00	-64.00	-64.00
Interest expense to affiliates	-29	-15	-1	-	-	-	-	-	-	-	-	-	-
Other, net	937	795	-786	-	-	-	-	-	-	-	-	-	-
Total other income and (deductions)	580	498	-1,037	-117	-98	-98	-90	-64	-64	-64	-64	-64	-64
Income before income taxes	836	152	-542	-65	-44	-43	127	161	745	775	1,400	1,429	1,776
Income taxes	249	225	-388	-14	-9	-9	27	34	156	163	294	300	373
Annual applicable tax credit				0	0	0	27	34	156	163	294	300	154
Actual Income taxes payable				-14	-9	-9	0	0	0	0	0	0	219
Begginging tax credit			0	388	402	411	421	495	562	507	445	252	53
Loss carry forward			388	14	9	9	0	0	0	0	0	0	0
Total annual PTC			0	0	0	0	101	101	101	101	101	101	101
Tax credit used			0	0	0	0	-27	-34	-156	-163	-294	-300	-154
Total tax credit			388	402	411	421	495	562	507	445	252	53	0
Equity in losses of unconsolidated affiliates	-8	-10	-13	0	0	0	0	0	0	0	0	0	0
Net (loss) income	579	-83	-167	-51	-35	-34	101	128	589	612	1,106	1,129	1,403
Net income (loss) attributable to noncontrolling interests	-10	122	-7	0	0	0	0	0	0	0	0	0	0
Net (loss) income attributable to membership interest	589	-205	-160	-51	-35	-34	101	128	589	612	1,106	1,129	1,403
Comprehensive (loss) income, net of income taxes													
Net (loss) income	579	-83	-167	-51	-35	-34	101	128	589	612	1,106	1,129	1,403

Source: Financial Model.
Notes: All figures in (USD \$M).

Tax Credit

Breakdown

Income before income taxes	836	152	-542	-65	-44	-43	127	161	745	775	1,400	1,429	1,776
Income taxes	249	225	-388	-14	-9	-9	27	34	156	163	294	300	373
Annual applicable tax credit				0	0	0	27	34	156	163	294	300	154
Actual Income taxes payable				-14	-9	-9	0	0	0	0	0	0	219
Begginging tax credit			0	388	402	411	421	495	562	507	445	252	53
Loss carry forward			388	14	9	9	0	0	0	0	0	0	0
Total annual PTC			0	0	0	0	101	101	101	101	101	101	101
Tax credit used			0	0	0	0	-27	-34	-156	-163	-294	-300	-154
Total tax credit			388	402	411	421	495	562	507	445	252	53	0

DCF with Tax Credit

	2020A	2021A	2022A	2023E	2024E	2025E	2026E	2027E	2028E	2029E	2030E	2031E	2032E
EBITDA	2,861	3,132	2,138	3,337	3,378	3,445	3,825	3,965	4,685	4,857	5,562	5,674	6,104
Less: D&A	(2,123)	(3,003)	(1,091)	(2,663)	(2,696)	(2,750)	(2,946)	(3,053)	(3,165)	(3,281)	(3,347)	(3,413)	(3,482)
EBIT	738	129	1,047	674	682	695	879	912	1,520	1,576	2,216	2,260	2,622
Tax Credit				402	10	10	101	101	101	101	101	101	101
Less: Tax	(482)	(475)	(552)	(219)	(619)	(631)	(561)	(585)	(610)	(636)	(651)	(666)	(681)
NOPAT	256	(346)	495	856	73	74	419	427	1,011	1,041	1,666	1,695	2,042
Add: D&A	2,123	3,003	1,091	2,663	2,696	2,750	2,946	3,053	3,165	3,281	3,347	3,413	3,482
Less: CAPEX	(1,747)	(1,329)	(1,689)	(2,763)	(2,797)	(2,853)	(2,946)	(2,776)	(2,877)	(2,684)	(2,738)	(2,793)	(2,849)
Less: NWC Change	729	(324)	66	(209)	(31)	(51)	(113)	(75)	(125)	(83)	(112)	(64)	(65)
UFCF	1,361	1,004	(37)	547	(59)	(80)	306	630	1,174	1,554	2,163	2,252	2,610
Discount Factor at 6.97%				0.97x	0.92x	0.86x	0.80x	0.75x	0.70x	0.66x	0.61x	0.57x	0.54x
PV of UFCF				533	(54)	(69)	246	473	823	1,019	1,326	1,291	1,399

Source: Financial Model.
Notes: All figures in (USD \$M).