INVE$TING

IN CLEAN ENERGY & DECARBONIZATION

2025 MCEC LEGISLATIVE RECEPTION

Thursday, February 20, 2025 | 10 AM – 3 PM

Welcome

Kathy Magruder

EXECUTIVE DIRECTOR

Maryland Clean Energy Center

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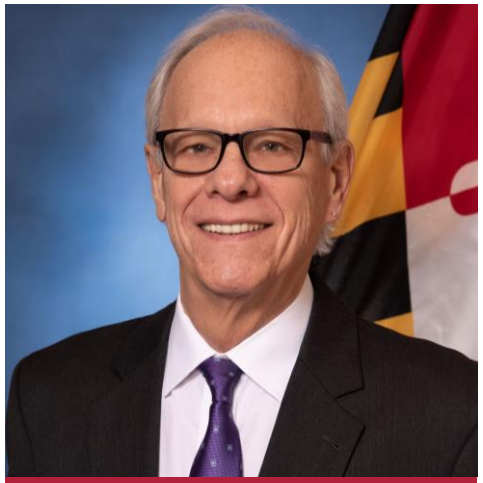

Maryland Path to Decarbonization

Paul Pinsky

DIRECTOR

Maryland Energy Administration

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Guest Speaker

Comptroller Brooke Lierman

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Legislative Session Highlights

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Legislative Session Highlights

SENATOR BRIAN FELDMAN

Chair, Senate Education, Energy, and the Environment Committee, District 15

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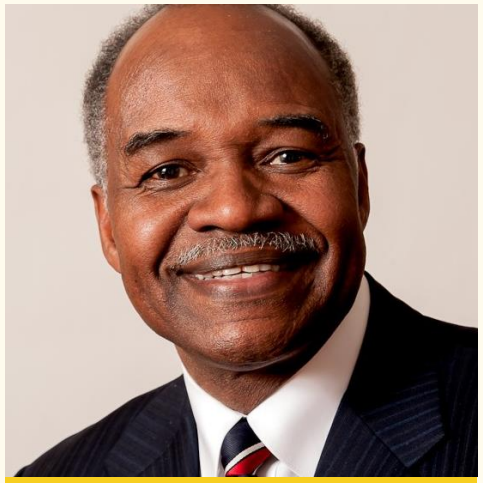

Legislative Session Highlights

SENATOR BENJAMIN BROOKS

Senate Education, Energy, and the Environment Committee, District 10

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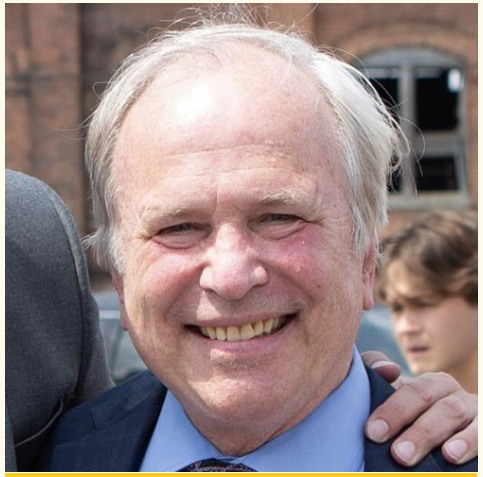

Legislative Session Highlights

DELEGATE DANA STEIN

Speaker Pro Tem, Maryland House of Delegates,
District 11 B

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Speaker Pro Tem Dana Stein's Bio

2024 Speaker Pro Tem
2015 Environment and Transportation Committee (Vice-Chair 2023)
2019 Chair, Environment Subcommittee of the Environment and Transportation Committee
2015 Natural Resources, Agriculture and Open Space Subcommittee of the Environment and Transportation Committee (Chair, 2019)
2024 Legislative Policy Committee
2024 Joint Committee on Administrative, Executive, and Legislative Review (AELR)
2015 House Committee on Rules and Executive Nominations
2015 House Chair, Joint Committee on the Chesapeake and Atlantic Coastal Bays Critical Area
2011- Joint Subcommittee on Program Open Space/Agricultural Land Preservation
2024 Maryland Legislative Jewish Caucus

Past House Service
Deputy Majority Whip, 2013-2015; Local Government and BiCounty Issues of the Environment and Transportation Committee, 2015-2019; Motor Vehicles and Transportation Subcommittee of the Environment and Transportation Committee, 2015-2020; Environmental Matters Committee, 2007-2015; Motor Vehicles and Transportation Subcommittee of the Environmental Matters Committee, 2007-2015; Housing and Real Property Subcommittee of the Environmental Matters Commit, 2012-2015; Environment Subcommittee of the Environmental Matters Committee, 2009-2011; Land Use and Ethics Subcommittee of the Environmental Matters Committee, 2007-2010; Local Government and Bi-County Agencies Subcommittee of the Environmental Matters Committee, 2007-2009; Ground Rent Workgroup of the Environmental Matters Committee, 2007; Ways and Means Committee, 2002-2003; Finance Resources Subcommittee of the Ways and Means Committee, 2002-2003.

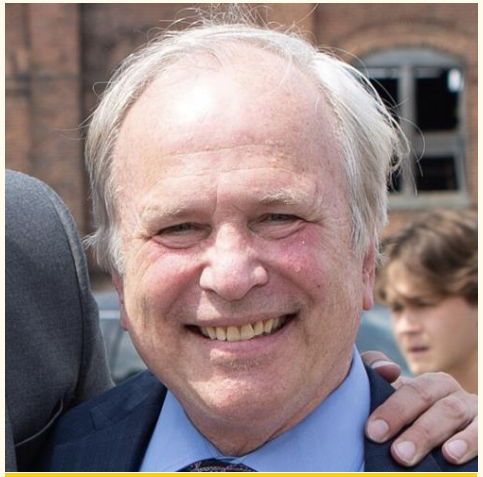
Public Service
Chesapeake Bay Commission, 2018-; Maryland Commission on Climate Change, 2015-; Atlantic States Marine Fisheries Commission, 2015-; Task Force to Ensure Retirement Security for all Marylanders, 2014-2015; Maryland Thermal Renewable Energy Credit Task Force, 2013; Co-Chair, Financial Education and Capability Commission, 2012-; Task Force on the Membership and Operation of the Baltimore County Board of Education, 2011; Financial Literacy Education Advisory Council, 2010-2017; Co-Chair, Task Force to Study How to Improve Financial Literacy in the State, 2008-2010; Board of Trustees, Maryland Environmental Trust, 2008-.

Speaker Pro Tem Dana Stein's Bio (continued)

Memberships
Maryland Legislative Transit Caucus, 2019-; Chair, Social Action Committee, Temple Oheb Shalom, 2000-2005; Chair, Baltimore County Democratic Central Committee, 2001-2002; Board of Directors, Hillel of Greater Baltimore, 2000-2002; Treasurer, Liberty Road Community Council, 1999-2002; Vice Chair, Baltimore County Democratic Central Committee, 1998-2001; President, Liberty Road Community Council, 1996-1998; President, Grassroots Recycling, Inc., 1992-1998; Baltimore County Democratic Central Committee, 1996-2002; Leadership Class, Greater Baltimore Committee, 1995; United Way of Central Maryland; Jewish Volunteer Connection; Maryland Chapter, American Jewish Congress; Board of Directors, National Association of Service and Conservation Corps; Liberty-Randallstown Coalition; Baltimore Jewish Council.

Awards
Casper R.Taylor, Jr. Founder's Award, House of Delegates, 2020; Legislative Leadership Award, Maryland Clean Energy Center, 2013.

Biographical Information
Born, Baltimore, Maryland, September 19, 1958; Attended Harvard College, B.A., Government, cum laude, 1981; Woodrow Wilson School of Public and International Affairs, Princeton University, M.P.A., Public Affairs, 1985; Columbia University School of Law, J.D., 1985 (Stone Scholar, 1981-82); Attorney, Squire, Sanders & Dempsey, 1985-92; Co-Founder, President, and Executive Director, Civic Works, 1992 -; Author, Fire in the Wind, 2010; Married; three childre



Legislative Session Highlights

DELEGATE DANA STEIN

Speaker Pro Tem, Maryland House of Delegates,
District 11 B

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Legislative Session Highlights

DELEGATE MARC KORMAN

Chair House Environment and Transportation Committee,
District 16

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Legislative Session Highlights

DELEGATE LORIG CHARKOUDIAN
House Economic Matters Committee,
District 20

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Legislative Session Highlights

DELEGATE DAVID FRASER-HIDALGO
House Economic Matters Committee,
District 15

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Legislative Session Highlights

DELEGATE LILY QI

House Economic Matters Committee,
District 15

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Legislative Session Highlights

DELEGATE JOE VOGEL
Ways and Means Committee,
District 17

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Energy Demand from a Regulatory Perspective

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Energy Demand from a Regulatory Perspective

KUMAR BARVE
Commissioner
Maryland Public Service Commission

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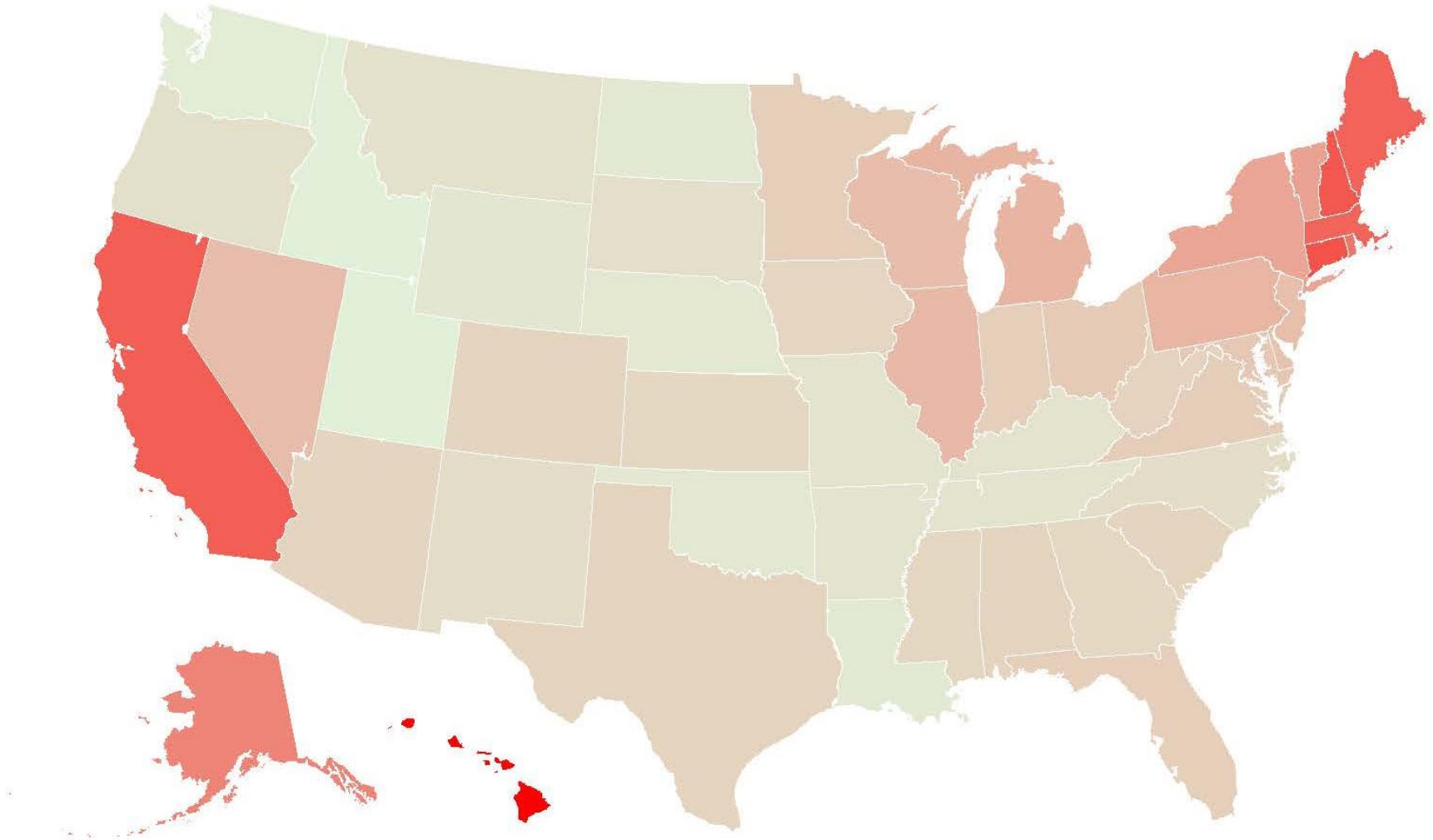
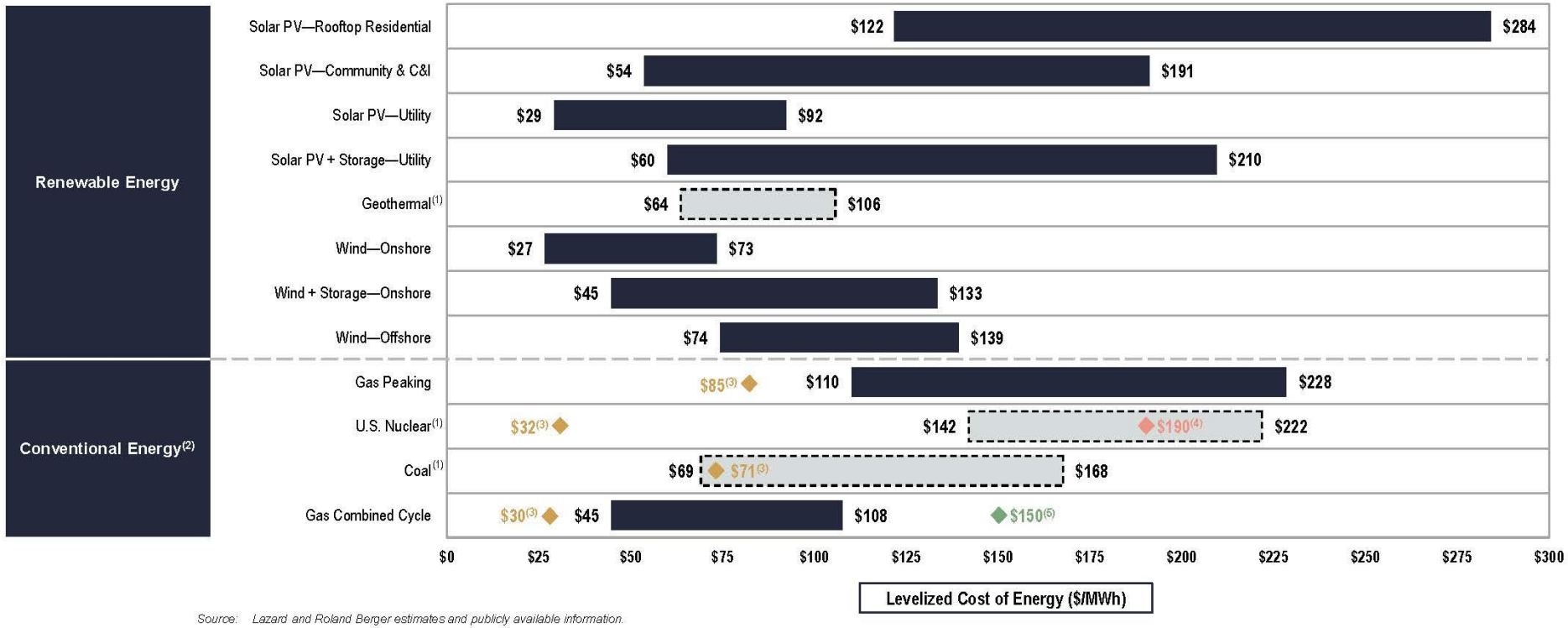
Electricity by State

Energy Information Agency



Levelized Cost of Energy Comparison—Version 17.0

Selected renewable energy generation technologies remain cost-competitive with conventional generation technologies under certain circumstances



Source: *Lazard and Roland Berger estimates and publicly available information.*

Note: Here and throughout this analysis, unless otherwise indicated, the analysis assumes 60% debt at an 8% interest rate and 40% equity at a 12% cost. See page titled "Levelized Cost of Energy Comparison—Sensitivity to Cost of Capital" for cost of capital sensitivities.

(1) Given the limited public and/or observable data available for new-build geothermal, coal and nuclear projects the LCOE presented herein reflects Lazard's LCOE v14.0 results adjusted for inflation and, for nuclear, are based on then-estimated costs of the Vogtle Plant. Coal LCOE does not include cost of transportation and storage.

(2) The fuel cost assumptions for Lazard's LCOE analysis of gas-fired generation, coal-fired generation and nuclear generation resources are $3.45/MMBTU, $1.47/MMBTU and $0.85/MMBTU respectively, for year-over-year comparison purposes. See page titled "Levelized Cost of Energy Comparison—Sensitivity to Fuel Prices" for fuel price sensitivities.

(3) Reflects the average of the high and low LCOE marginal cost of operating fully depreciated gas peaking, gas combined cycle, coal and nuclear facilities, inclusive of decommissioning costs for nuclear facilities. Analysis assumes that the salvage value for a decommissioned gas or coal asset is equivalent to its decommissioning and site restoration costs. Inputs are derived from a benchmark of operating gas, coal and nuclear assets across the U.S. Capacity factors, fuel, variable and fixed operating expenses are based on upper- and lower-quartile estimates derived from Lazard's research. See page titled "Levelized Cost of Energy Comparison—New Build Renewable Energy vs. Marginal Cost of Existing Conventional Generation" for additional details.

(4) Represents the illustrative midpoint LCOE for Vogtle nuclear plant units 3 and 4 based on publicly available estimates. Total operating capacity of ~2.2 GW, total capital cost of ~$31.5 billion, capacity factor of ~97%, operating life of 60 – 80 years and other operating parameters estimated by Lazard's LCOE v14.0 results adjusted for inflation. See Appendix for more details.

(5) Reflects the LCOE of the observed high case gas combined cycle inputs using a 20% blend of green hydrogen by volume (i.e., hydrogen produced from an electrolyzer powered by a mix of wind and solar generation and stored in a nearby salt cavern). No plant modifications are assumed beyond a 2% increase to the plant's heat rate. The corresponding fuel cost is $6.66/MMBTU, assuming ~$5.25/kg for green hydrogen (unsubsidized PEM). See LCOH—Version 4.0 for additional information.

Energy Demand from a Rate Payers Perspective

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Energy Demand from a Rate Payers Perspective

DAVID LAPP
Maryland People's Counsel,
Maryland Office of People's Counsel

MARYLAND CLEAN ENERGY CENTER

OPC

OFFICE OF PEOPLE'S COUNSEL

State of Maryland

Maryland Clean Energy Center

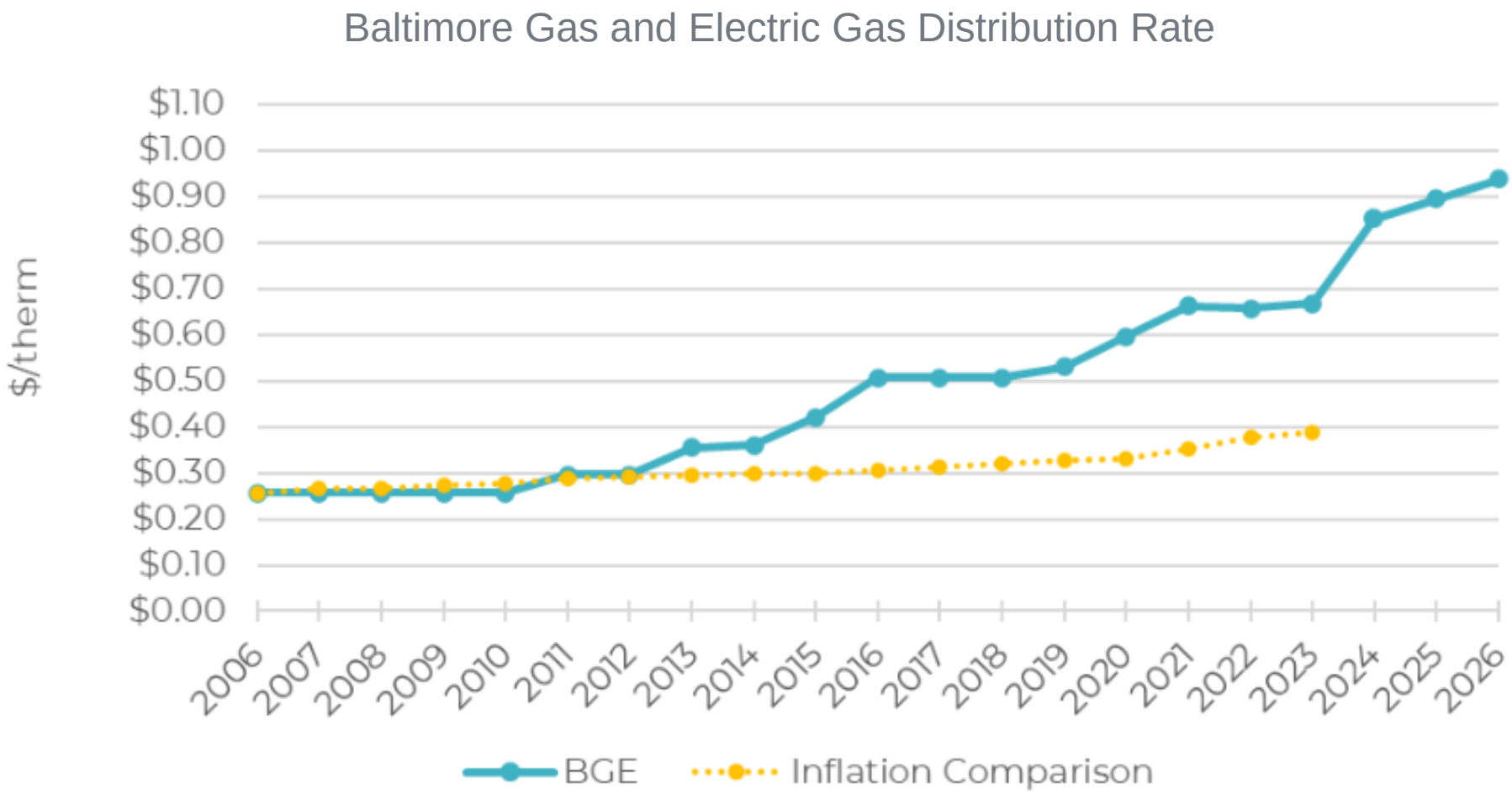
David Lapp, Maryland People's Counsel

February 2025

OPC

OFFICE OF PEOPLE'S COUNSEL

State of Maryland



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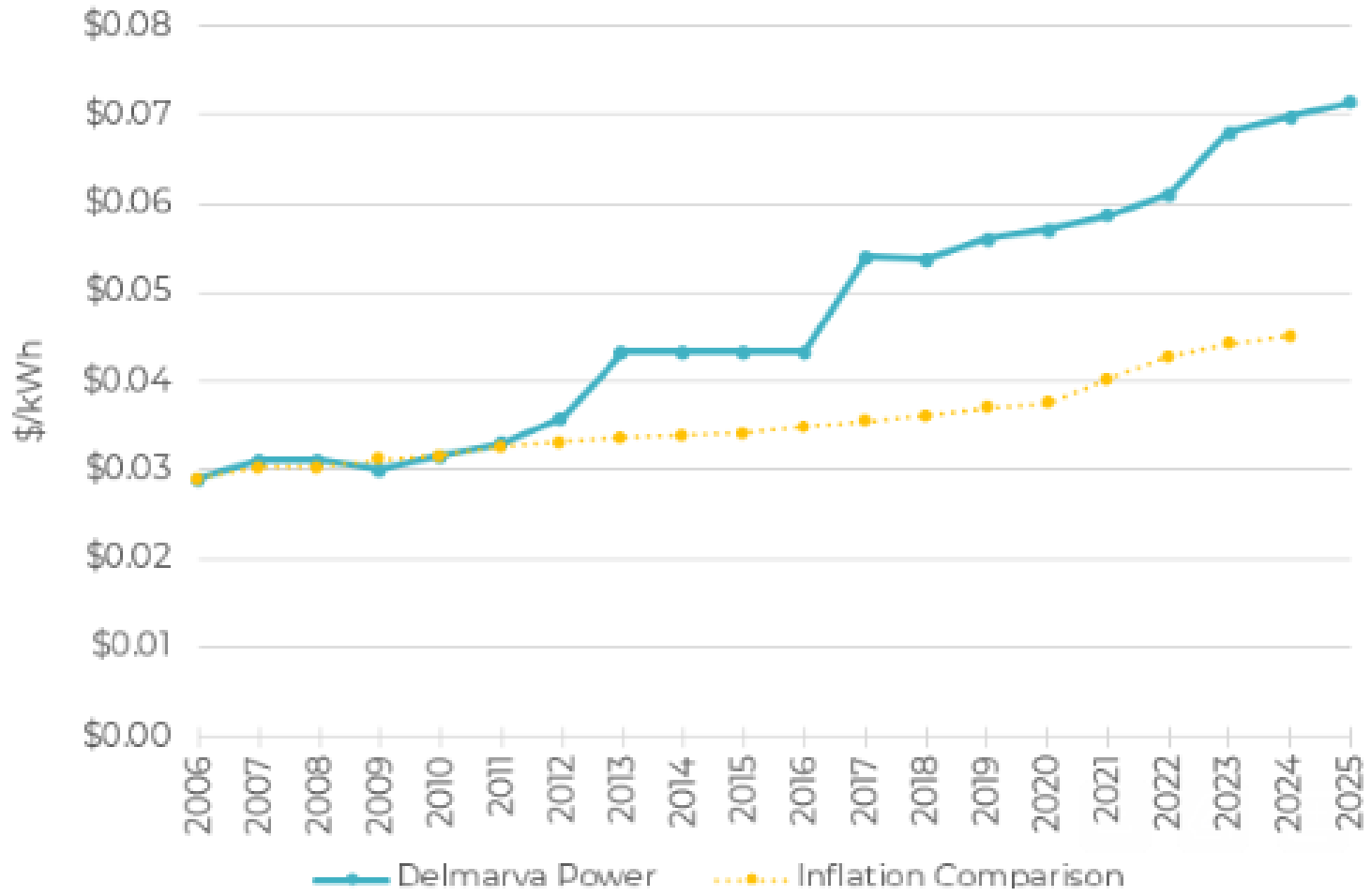
OFFICE OF PEOPLE'S COUNSEL

State of Maryland

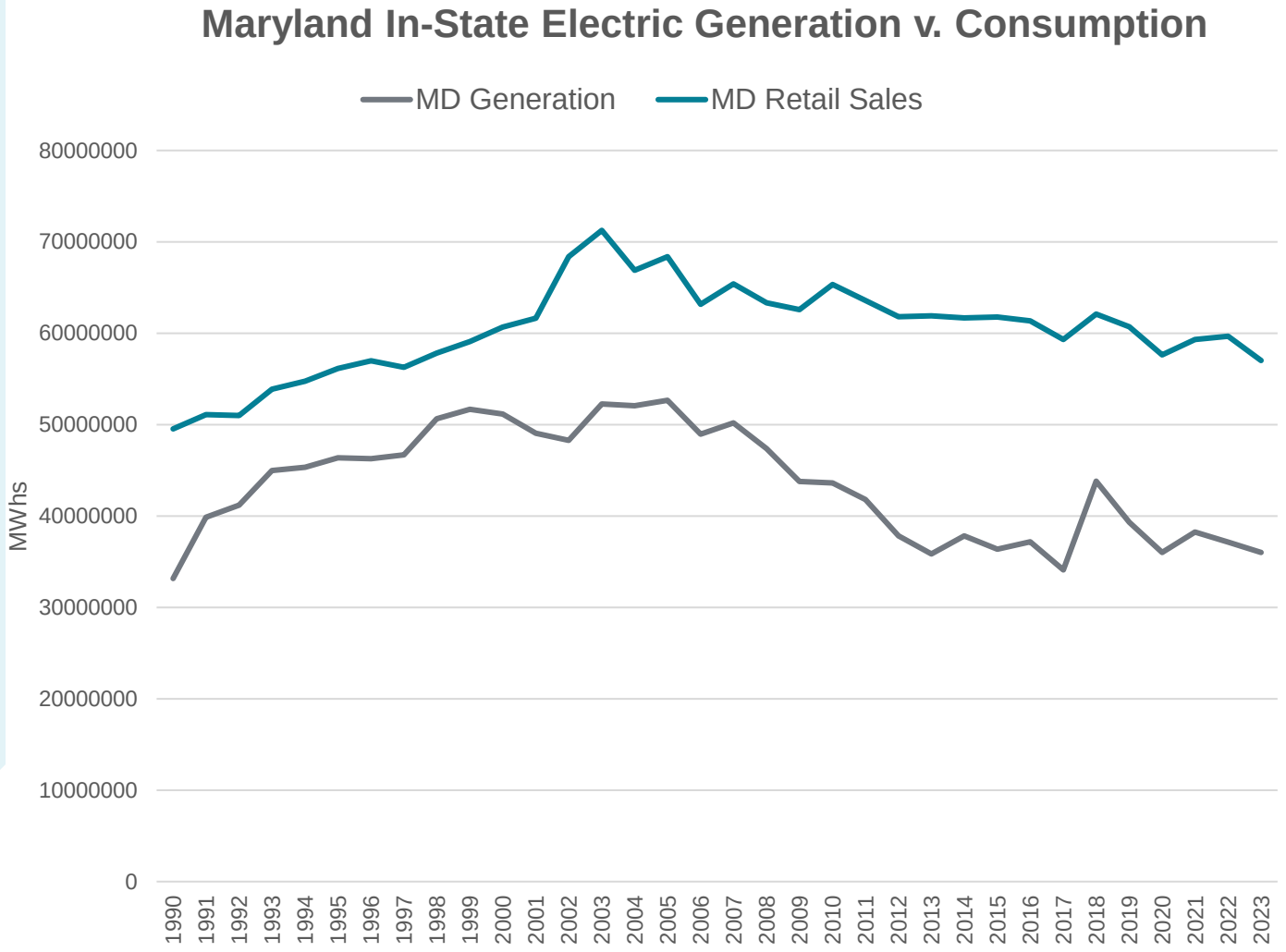
Delmarva Power Electric Distribution Rate



Maryland has long been a net importer of electricity

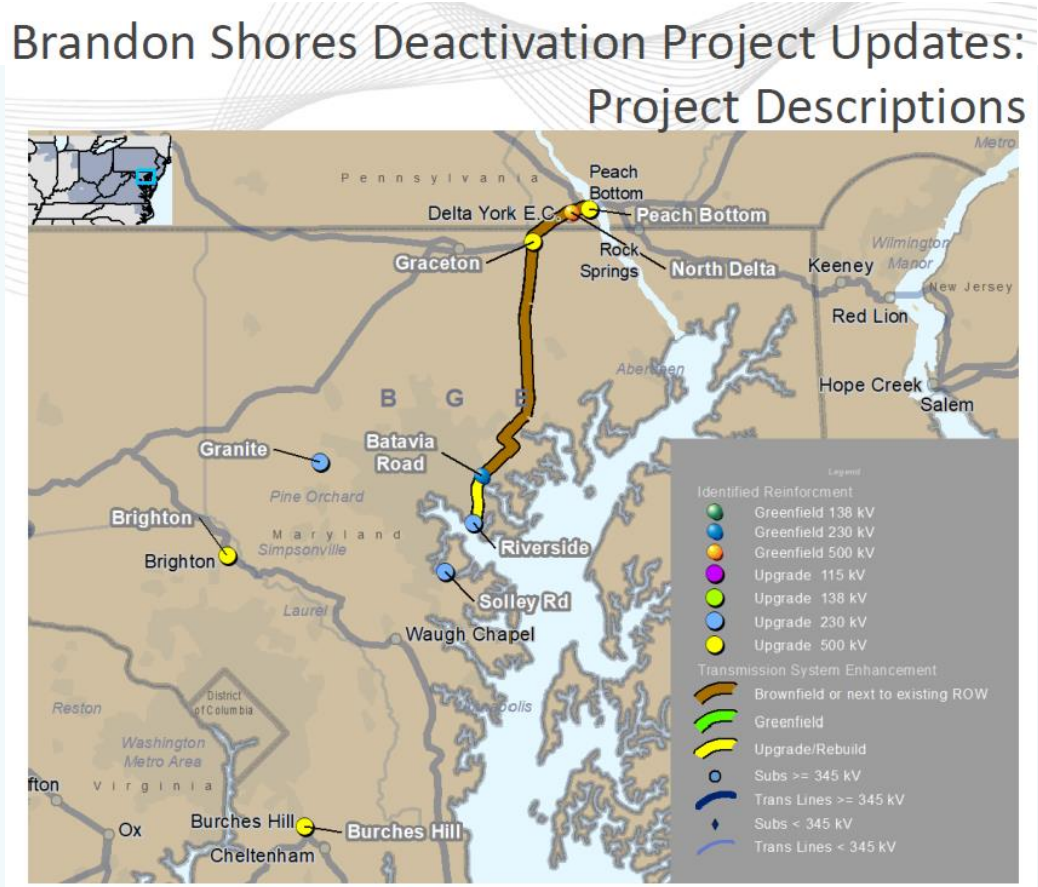
… as have most PJM territories, including Virginia, Delaware, D.C.

The regional market benefits Maryland customers, despite past and current flaws



No urgent, Maryland-driven reliability issues

- Further Maryland retirements unlikely
- Brandon Shores transmission solution under development
- PJM controls transmission planning and solutions subject to federal law
- Historically, Maryland has approved virtually all new transmission



Large load growth: Uncertain, and not Maryland ratepayers' issue to resolve

- Key Maryland zones (Delmarva, Pepco, BGE): large load growth through 2030 is less than 0.4% of PJM's projected growth—**124 MWs**
- Large load growth is due to Virginia (34%), Ohio (30%), Pa. (14%), Illinois (7%); rest of PJM (13.7%) —**32,671 MWs**
- BGE's most recent long-term forecast went down from previous year, showing modest growth through 2045

https://www.pjm.com/planning/resource-adequacy-planning/load-forecast-dev-process.aspx

- Demand growth "is likely to fail to materialize as forecast" which "can lead to significant bill increases for ratepayers."[i]
- DeepSeek artificial intelligence breakthrough "sends independent power stocks tumbling."[ii]
- PJM could use existing generation to accommodate 23,000 MWs of data center load using flexible system headroom.[iii]

[i] US Power & Utilities: Year Ahead 2025: Is Past What's Prologue?, Bank of America (January 7, 2025).
[ii] Wall Street Journal (Jan. 27, 2025).
[iii] https://nicholasinstitute.duke.edu/sites/default/files/publications/rethinking-load-growth.pdf

Low(er)-cost, low-regret mitigation actions

- Demand response programs
- Energy efficiency
- Grid-enhancing transmission technologies
- Increased deployment of distributed energy resources (DERs)
- Cost-effective large-scale energy storage

2025 Maryland Demand Report

MARYLAND CLEAN ENERGY CENTER

2025 Maryland Demand Report

JASON STANEK
Executive Director for Governmental Services,
PJM Interconnection

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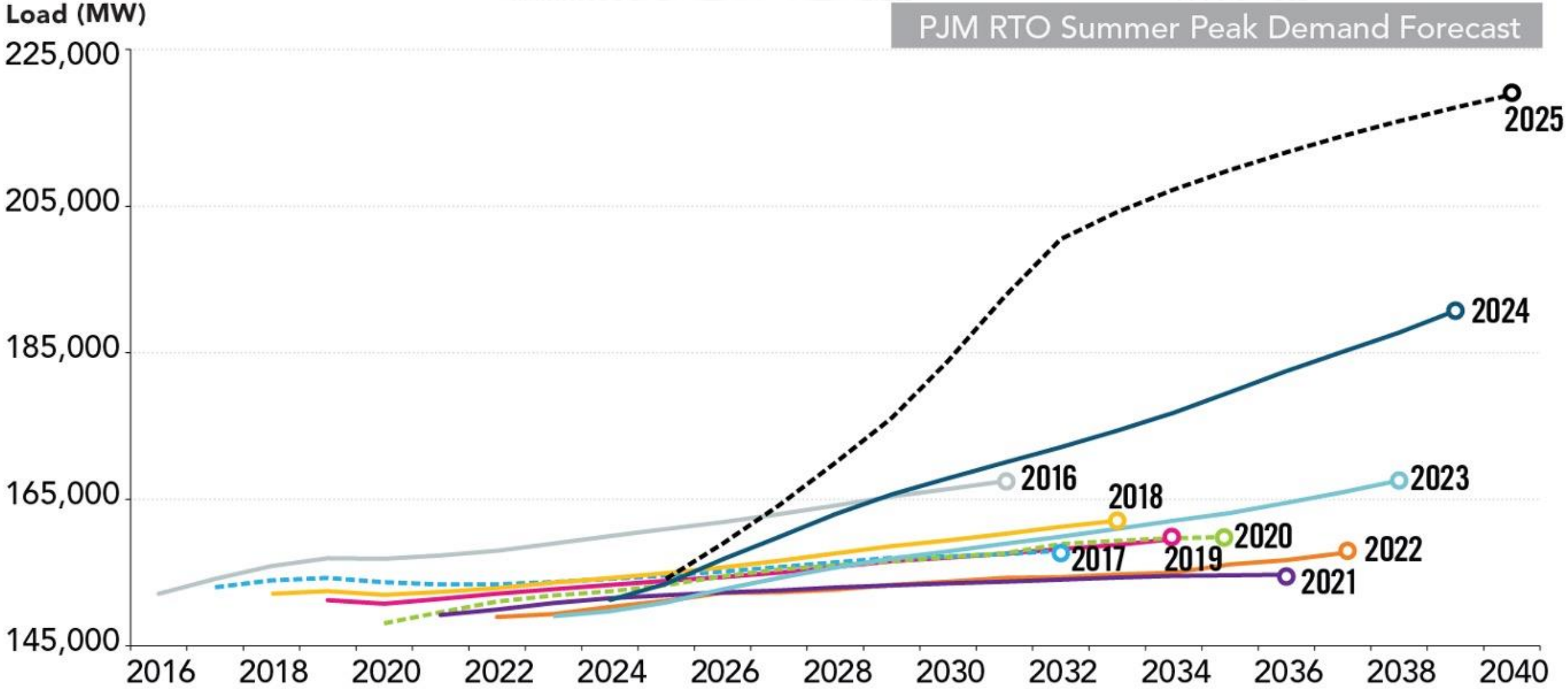
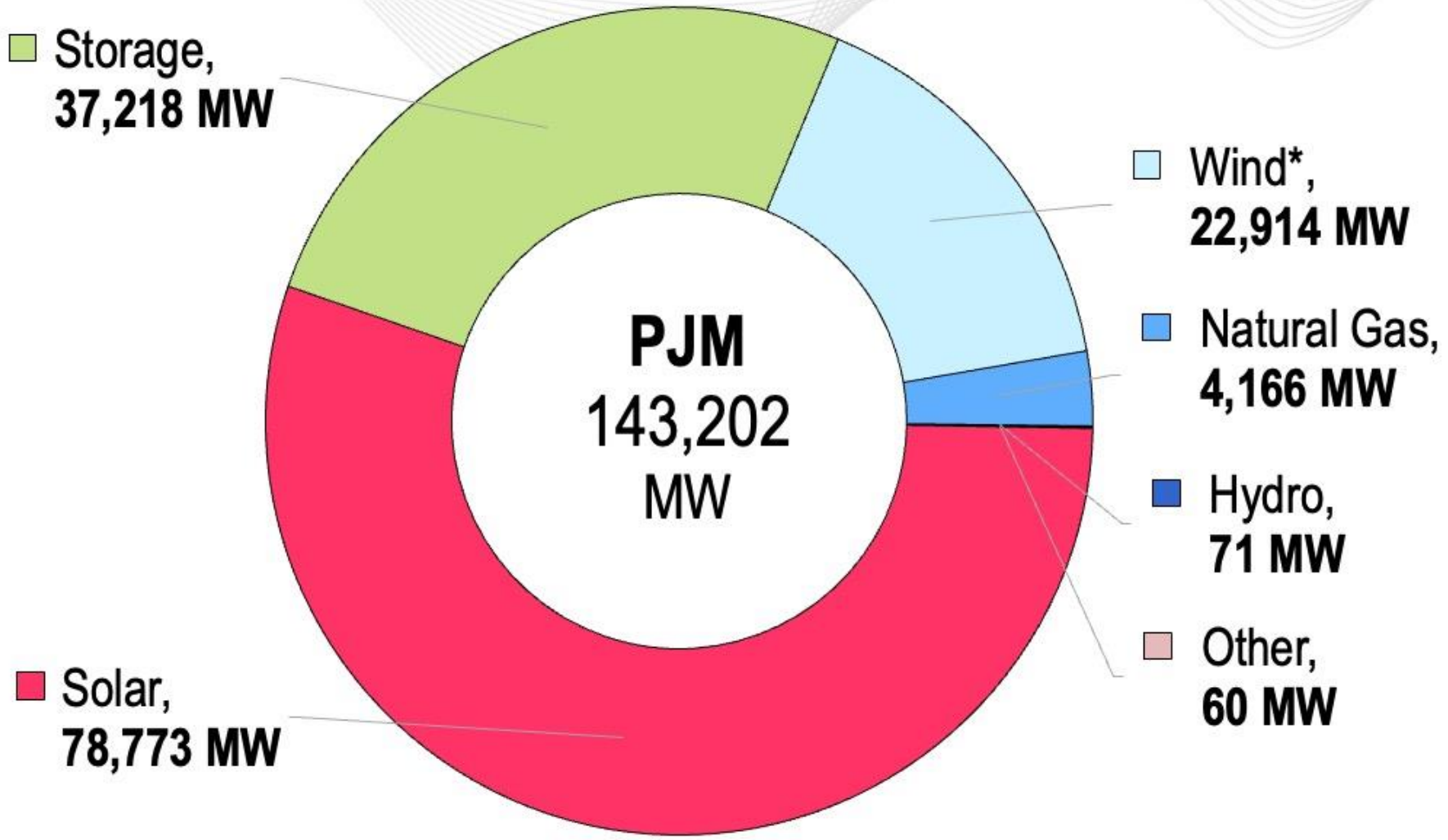
Electricity Demand Growth

PJM RTO Summer Peak Demand Forecast



PJM Queued Capacity (Nameplate) by Fuel Type

("Active" in the PJM Queue as of Jan. 31, 2025)

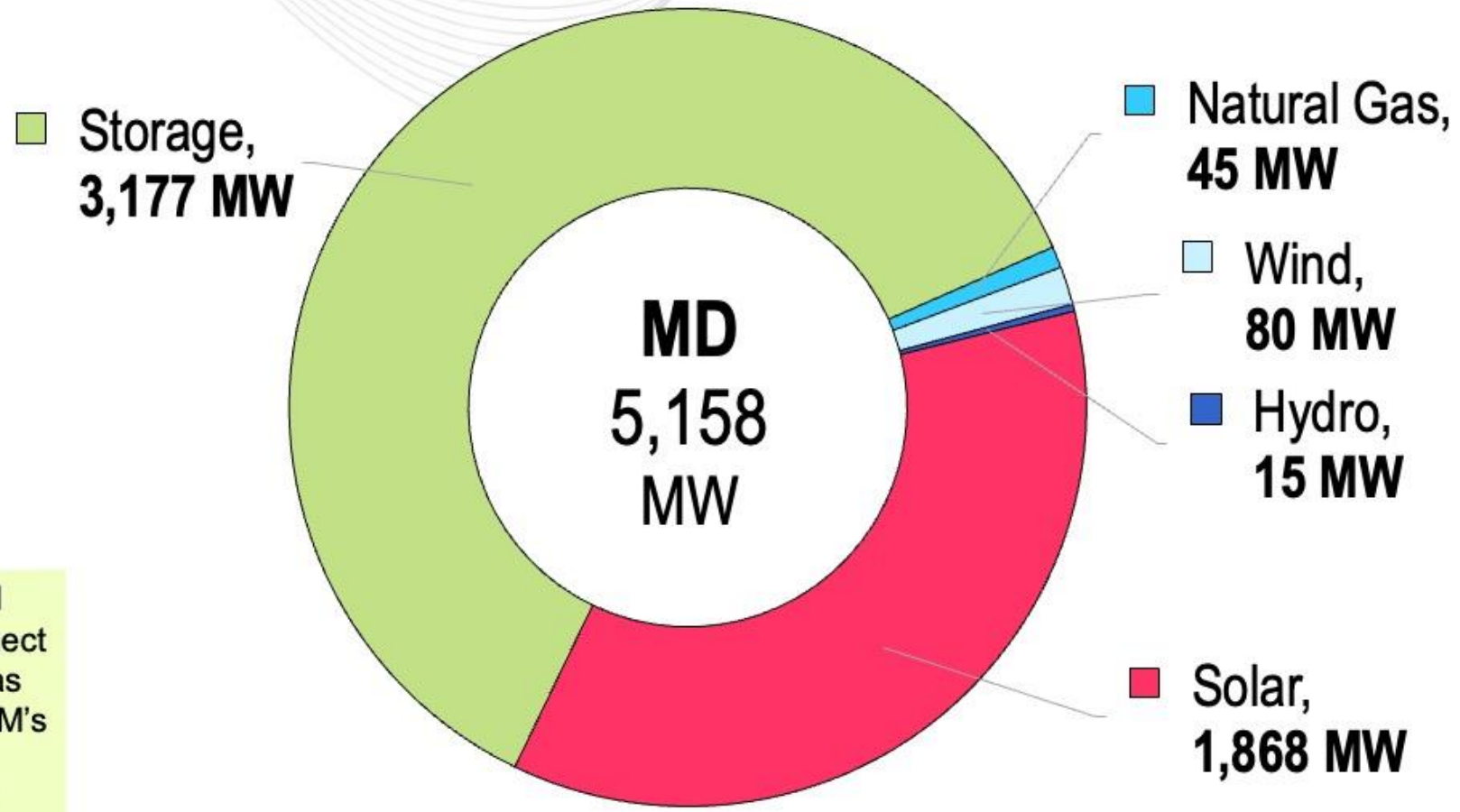


*Includes offshore wind

Maryland Queued Capacity (Nameplate) by Fuel Type

("Active" in the PJM Queue as of Jan. 31, 2025)

Number of Projects	
Fuel	**Total**
Solar	37
Storage	20
Natural Gas	1
Wind	3
Hydro	1



Because Maryland's offshore wind projects are proposed to interconnect into Delaware, they are captured as Delaware's queued capacity in PJM's RTEP. There are 1,670 MW of nameplate offshore wind capacity queued in Delaware.

Meeting Demand

Meeting Demand

LAEL CAMPBELL
Vice President State Government Affairs,
Constellation

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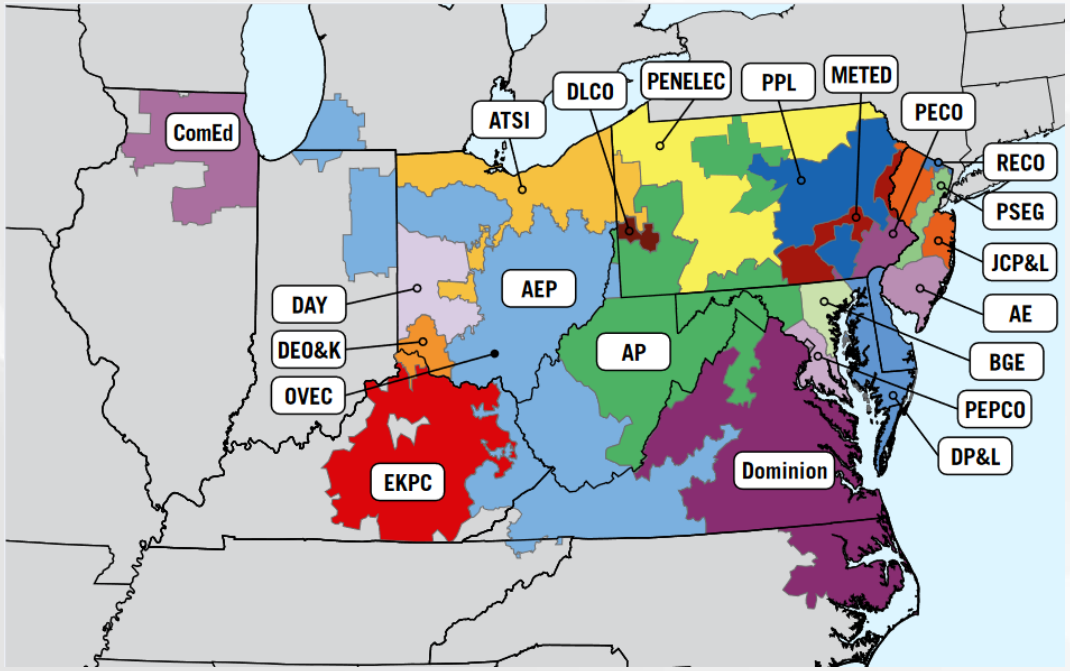
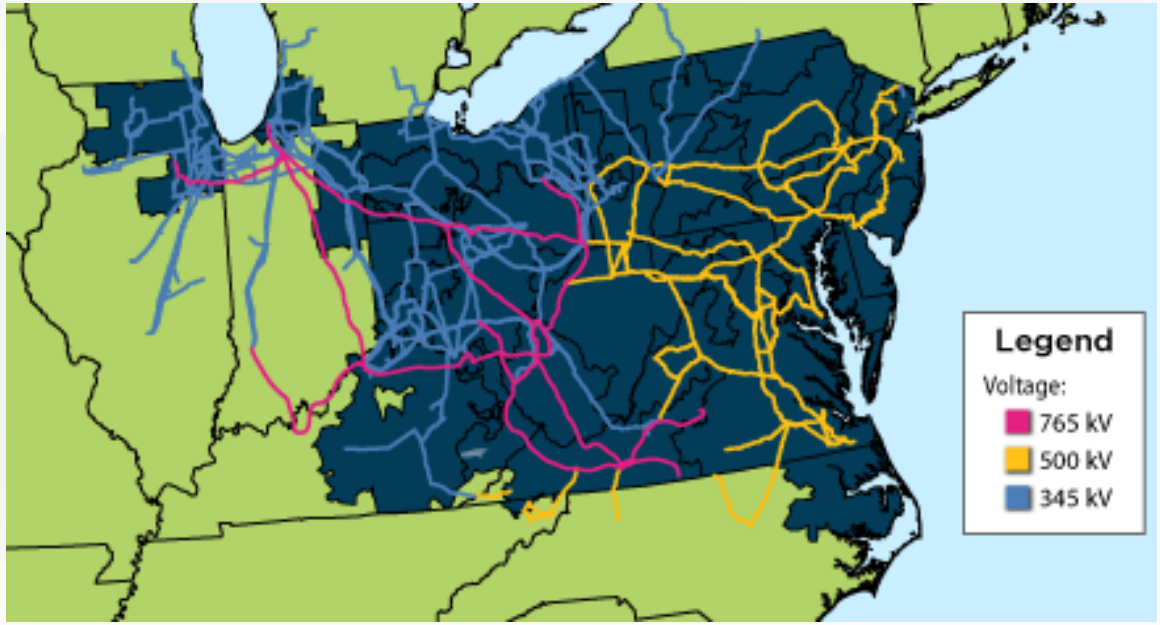
PJM Market Overview

- PJM is a regional transmission organization (“RTO”) that coordinates the generation and movement of wholesale electricity in all or parts of 13 states and the District of Columbia
- PJM has 3 priorities:
  1. Keeping the Lights On: Grid Operations, Supply/Demand Balance, Transmission monitoring
  2. Buying & Selling Electricity (Market Operations): Energy, Capacity, Ancillary Services, Reserves
  3. Planning for the Future: 15-year Outlook

PJM Transmission Zones



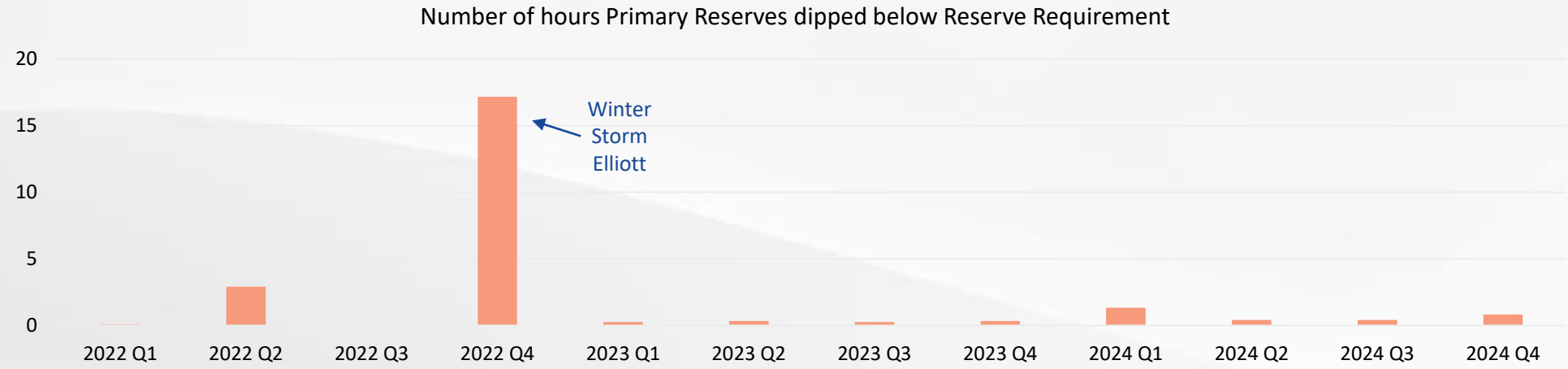
PJM High Voltage Transmission System



Constellation

Availability of Generation in PJM

- Generation capacity in PJM far exceeds demand in almost all hours in all seasons.
- Recent PJM resource adequacy studies show the risk of generation shortfalls is weighted towards a small number of hours. In winter, extreme weather is coupled with weather-related gas-fired generation failures and lower fuel availability. Data from recent years shows that PJM rarely dips into its primary reserves:



- If large loads like a data center were allowed to rely on its own back-up power during these limited hours, it could make use of excess energy available on the grid most of the time without stressing the system during grid emergencies. This would allow the data center to invest in Maryland without impacting resource adequacy.

Constellation

Nuclear Opportunities in Maryland

- Calvert Cliffs produces 80% of the state's carbon-free power. Its continued operation is essential to the state realizing its emission reduction goals.
- In 2029, Constellation must initiate the NRC process to renew the 20-year operating license, just as the federal nuclear production tax credit is approaching expiration.
- Constellation is evaluating an increase to the output of Calvert Cliffs of more than 10%, which would produce more carbon-free power than all of the wind and utility-scale solar operating in Maryland now.
- Calvert Cliffs is the ideal location in the state for a new reactor given available land, community acceptance, and existing security infrastructure.

Long-term contracts with data center customers provide the financial stability needed to extend operating licenses, invest in increased output, and pursue potential new units

Maryland can leverage data center investment to enable the preservation and expansion of nuclear by:

- Supporting long-term power supply arrangements between data centers and nuclear plants, including through co-location arrangements
- Including nuclear in the state's clean energy programs
- Providing matching funds to nuclear developers seeking NRC early site permits
- Implementing programs to help nuclear developers manage the cost and schedule risks of first-of-a-kind technologies

Constellation®

Investing in Transmission Infrastructure

MARYLAND CLEAN ENERGY CENTER

Investing in Transmission Infrastructure

JIM GILROY
State Government Affairs Manager,
PSEG

MARYLAND CLEAN ENERGY CENTER

Financing Distribution Projects

MARYLAND CLEAN ENERGY CENTER

Financing Distribution Projects

DIVESH GUPTA
Director, Clean Energy Solutions,
BGE

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LUNCHEON

12:30 pm – 1:30 pm

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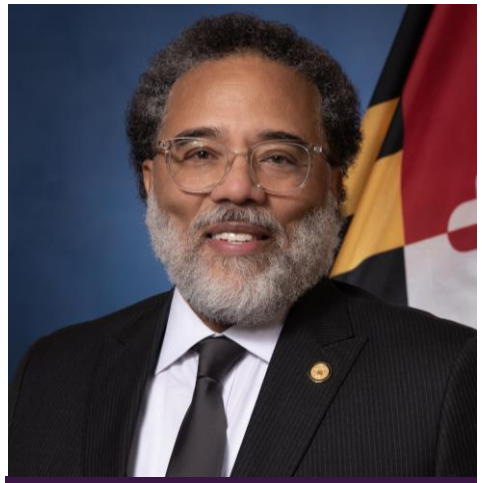
Luncheon Speaker



HARRY COKER JR

Secretary, Maryland Department of Commerce

MARYLAND CLEAN ENERGY CENTER

Fostering Innovation in Clean Energy

MARYLAND CLEAN ENERGY CENTER

Fostering Innovation in Clean Energy

BEN MARGOLIS
Director,
Maryland Energy Innovation Institute (MEIA)

MARYLAND CLEAN ENERGY CENTER

MARYLAND ENERGY INNOVATION ACCELERATOR

Introduction to MEIA

February 20, 2025

Climate Tech Opportunity

- **40X Increase** in Climate Tech Investment over the past decade[1]
- **$2 Trillion** needed to be invested by 2030 to meet stated climate goals[2]
- **Only 10%** of technologies needed are commercially competitive[2]

1. Wyne, et al., The Climate Tech Opportunity. Oxford Climate Tech Initiative, 2023
2. Heid, B., Linder, M., Mayer, S., Orthofer, A., & Patel, M. (2023). What would it take to scale critical climate technologies? In McKinsey & Company. https://www.mckinsey.com/capabilities/sustainability/our-insights/what-would-it-take-to-scale-critical-climate-technologies

Climate Tech Opportunity in Maryland

& universiti

- **#5** in R&D I
- **JHU is #8** in
- **USM is #9** c

1. Wyne, et al., The Climate Tech Opportunity. Oxford Climate Tech I
2. Heid, B., Linder, M., Mayer, S., Orthofer, A., & Patel, M. (2023). Wh
   https://www.mckinsey.com/capabilities/sustainability/our-insights

MEIA Approach

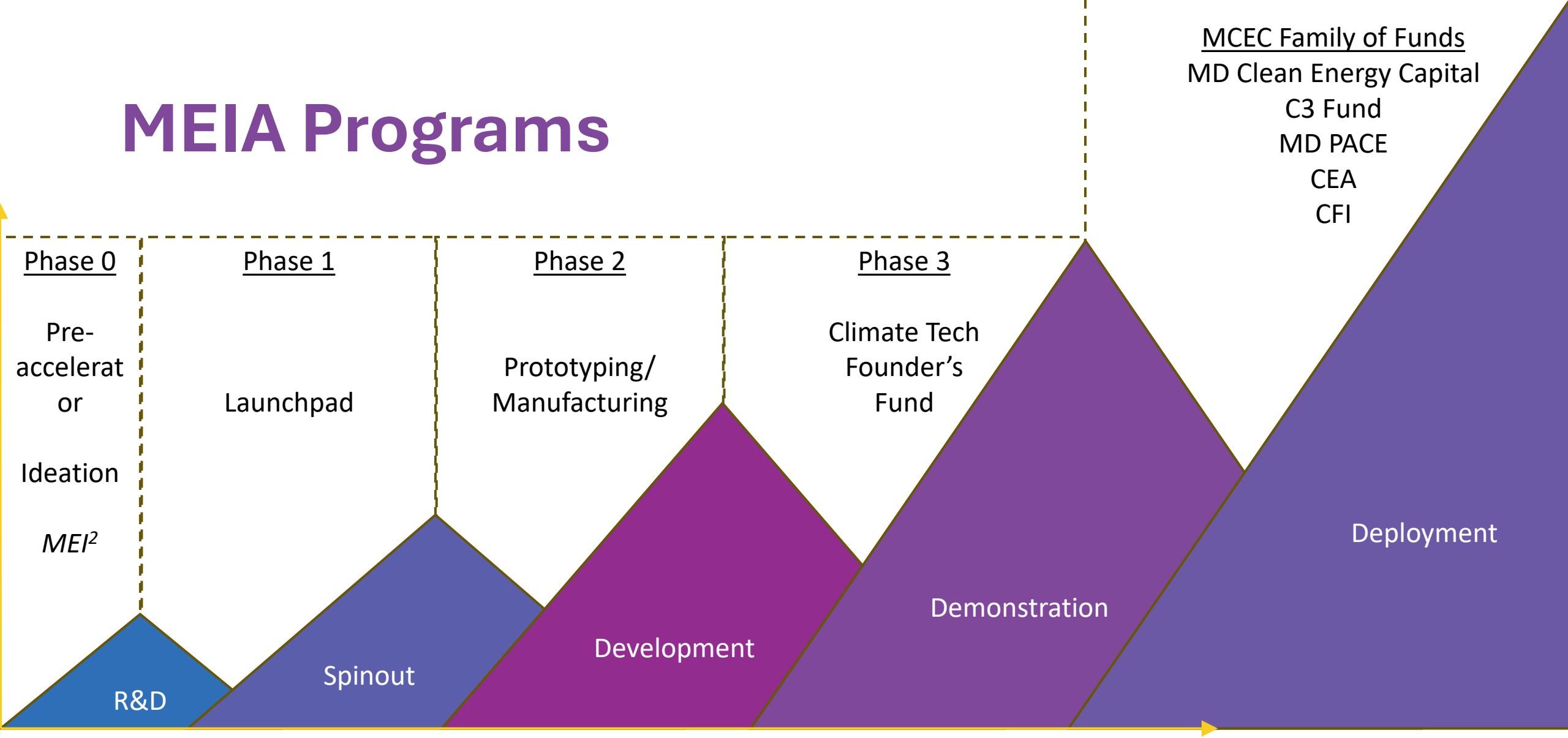
ENERGY EXECUTIVES IN RESIDENCE

PROFESSIONAL SERVICES SUPPORT

STRATEGIC PARTNERSHIPS

PROGRAM MANAGEMENT

MEIA Programs

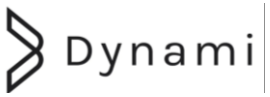


Impact of MEIA and Maryland Energy Innovation Institute (MEI²)

$79,393,747 EQUITY RAISED	**$111,648,232** GRANTS AWARDED

116 COMPANIES ACCELERATED	**8** NEW COMPANIES FORMED	**225** FULL AND PART-TIME JOBS CREATED
202 PATENTS FILED	**22** NEW PRODUCTS DEVELOPED	**123** CUTOMER ENGAGEMENTS

Startup Company Highlights



MEIA Difference Makers

Mike Ducker

Emily Sheppard

Ben Margolis

Now to the main presentation…

Fostering Innovation in Clean Energy

Randi Williams
Founder, Metallic Luxury

MARYLAND CLEAN ENERGY CENTER

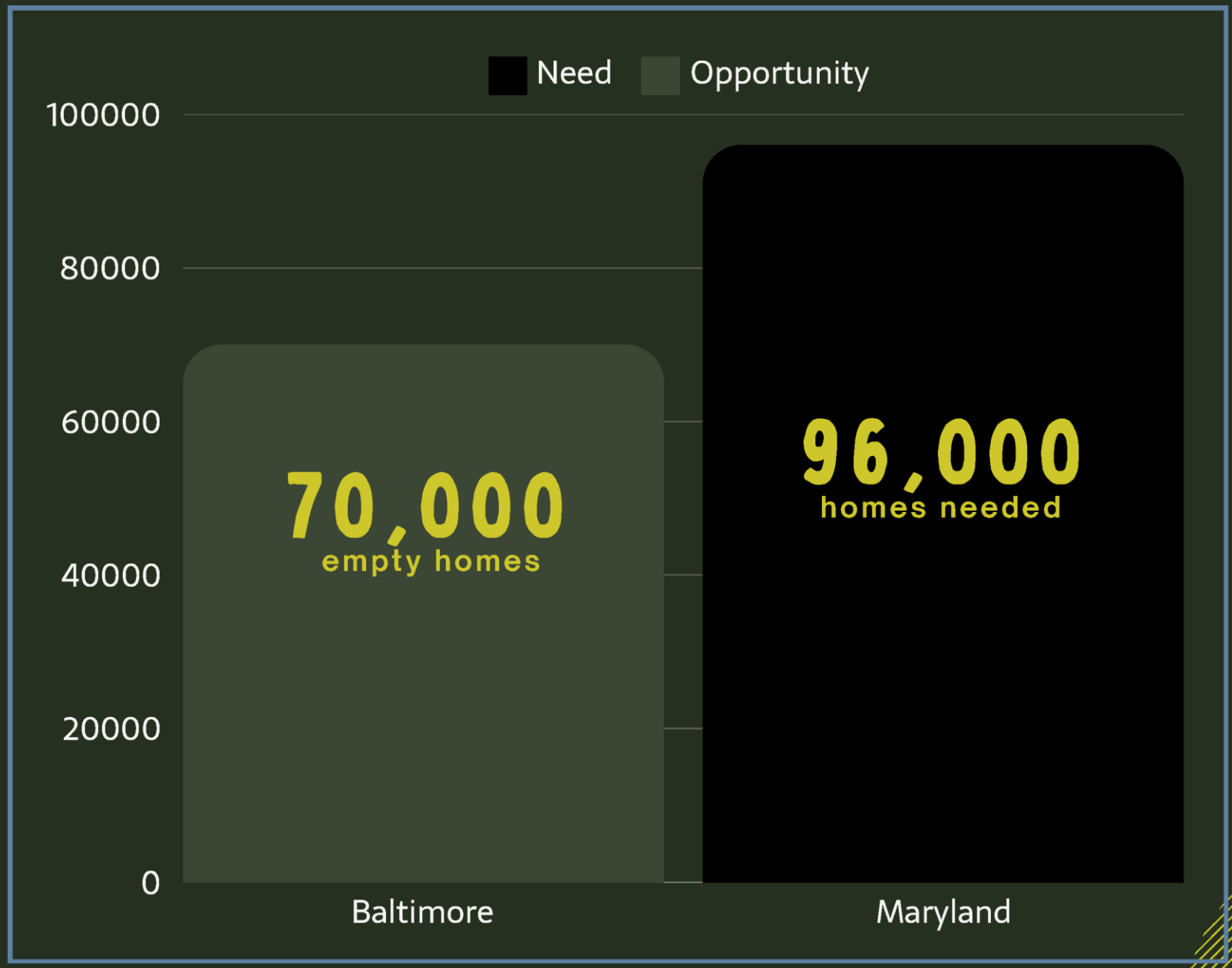

www.metallicluxury.com
Metallic
Luxury

PURPOSE

METALLIC LUXURY WAS CREATED TO INITIATE THE CHAIN OF GENERATIONAL WEALTH WITH CLIMATE RESILIENT CONSTRUCTION AND FORECLOSURE PREVENTION EDUCATION THROUGH HOMEOWNERSHIP FOR LOW TO MODERATE INCOME HOME BUYERS.

PROBLEM

BALTIMORE, COLUMBIA, AND TOWSON, MARYLAND HAVE ONE OF THE HIGHEST FORECLOSURE RATES IN THE COUNTRY. IN THE FIRST HALF OF 2023, THERE WAS ABOUT ONE FORECLOSURE FOR EVERY 431 HOMES.



SOLUTION

the opportunity for disruption requires:

Modular Construction

Climate Resilient Home Features

Foreclosure Prevention Education

THANK YOU

Randi Williams

- +1 (443)-760-8311
- randiwms@metallicluxury.com
- www.metallicluxury.com
- Baltimore, MD

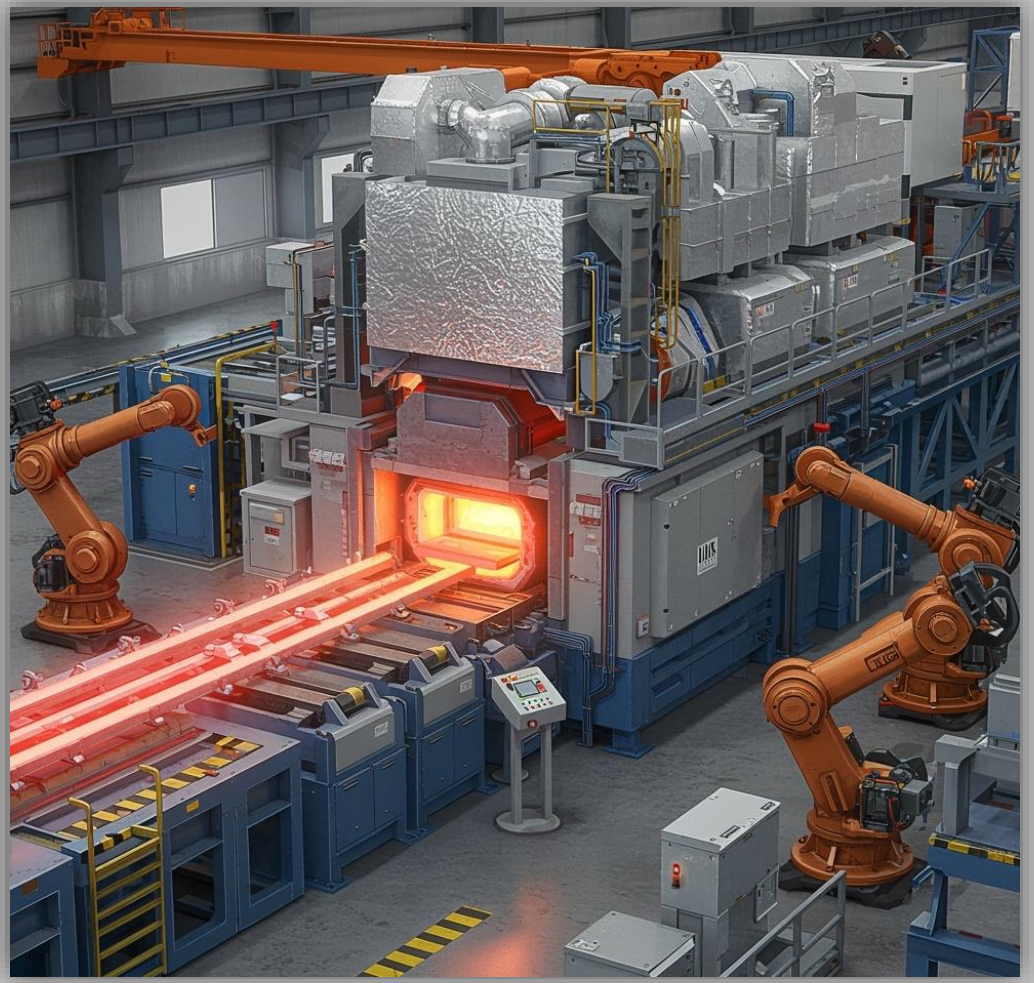
Fostering Innovation in Clean Energy

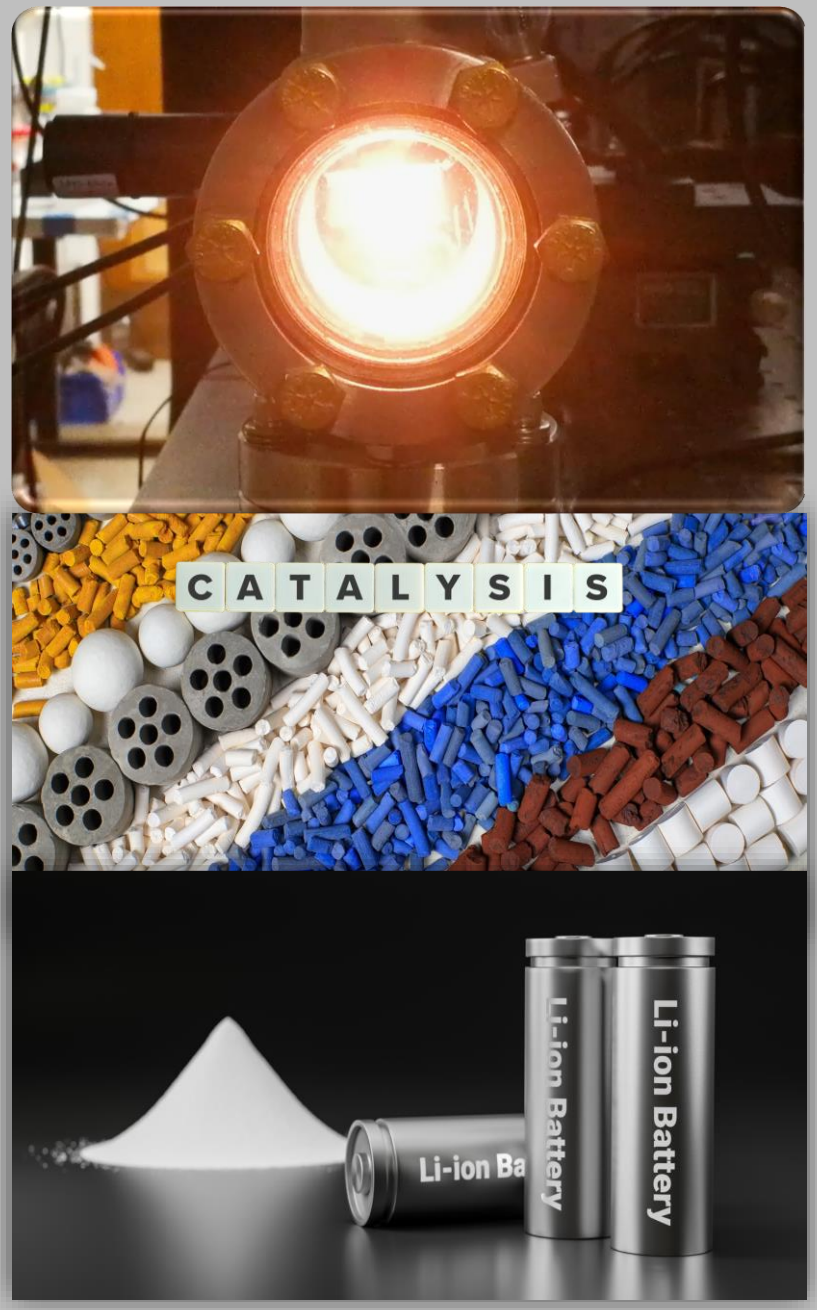
BOB GATTE
CEO, High T Tech

MARYLAND CLEAN ENERGY CENTER

HighT-Tech

Electrified Rapid Manufacturing to Decarbonize New Materials Production





Platform for Multiple Products

- Electrified high temperature manufacturing
- 5,000x faster processing; AI applicable
- Energy efficient and low environmental impact
- Protected by composition, structure and processing patents from UMD
- Recognized by the Department of Energy
- +$15M and 5:1 funding track record of Non-Dilutive funding for TRL de-risking

Materials that were previously impossible to make – now possible

Build Advanced Manufacturing in Maryland

- 10,000 sq ft advanced electrified manufacturing infrastructure in PG county, Maryland
- Hiring local staff, up to 12 jobs in 2025; 40 jobs at full capacity
- Attract venture capital, federal funding, and private investments into the State
- Licensing, royalty and tax revenue to Maryland once commercialization

Support of the clean-tech business ecosystem of Maryland

Fostering Innovation in Clean Energy

KOBBY OSEI-KUSI
Founder and CEO, Pirl

MARYLAND CLEAN ENERGY CENTER

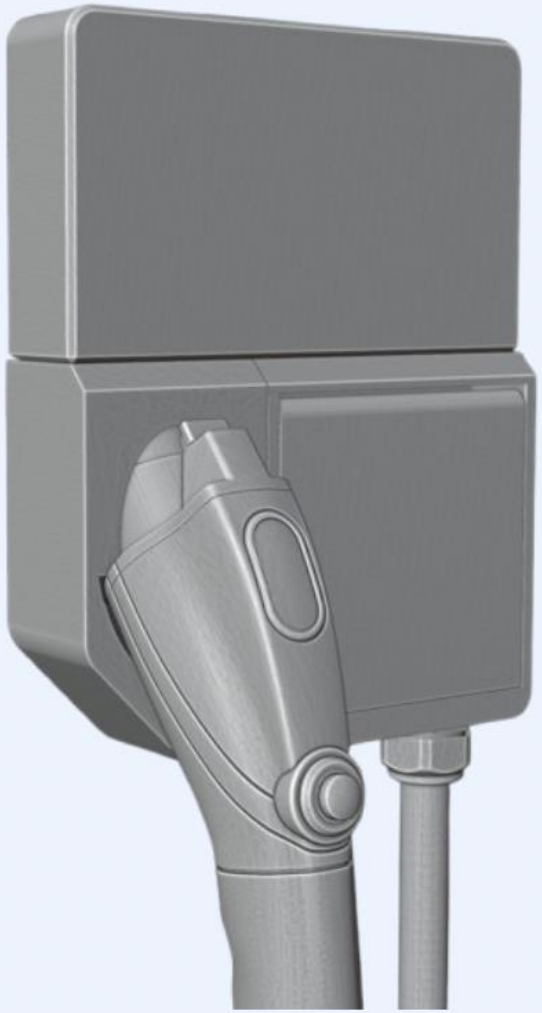
kobby@thepirl.com

pirlcharger.com

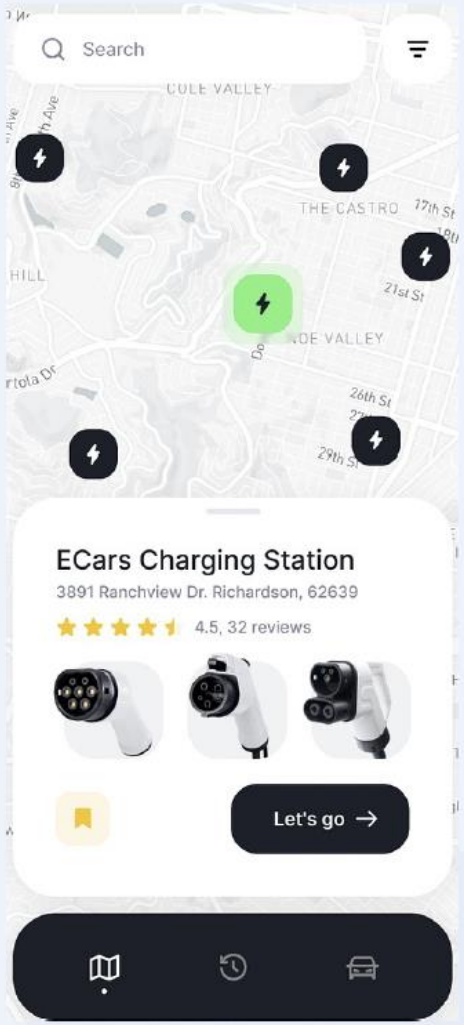
Our vision

Building America's largest & most reliable charging network by empowering SMBs to profitably offer charging as a service to their customers

Our single, integrated platform



Award-winning
Level 2 charger



All-in-one
app

MD Ecosystem support

Investment

TEDCO
LEADING INNOVATION TO MARKET

C3 CLIMATE CATALYTIC CAPITAL FUND

Pending

Advisory

MARYLAND ENERGY INNOVATION ACCELERATOR

TU The StarTUp

Grants

mbia

Fostering Innovation in Clean Energy

OLIVER BARHAM
COO, TerraFusion

MARYLAND CLEAN ENERGY CENTER

TERRA FUSION

Terra Fusion: Revolutionizing Clean Green Energy in Maryland

Oliver Barham
COO | Co-Founder
oliver@tf.energy

MCEC
Legislative Reception
20 Feb 2025

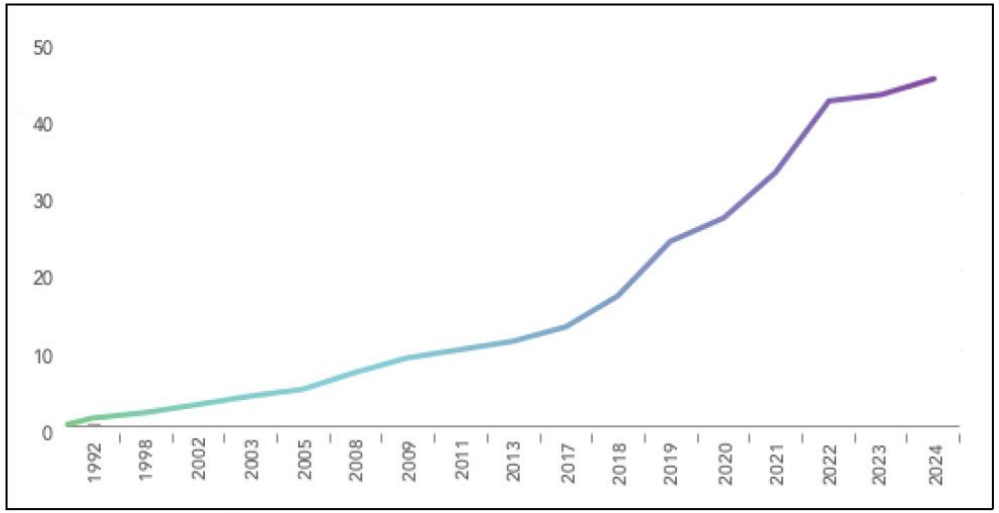
What's the Big Deal with Fusion Energy?

Fusion energy is finally within reach

Advantages:

- 4,000,000x more energy than fossil fuels
- Zero CO_2 emissions
- Zero long-lived radioactive waste
- Zero proliferation concerns

Number of Fusion Energy Companies



Fusion Industry Assn: "The global fusion industry in 2024"

TERRA FUSION

www.tf.energy

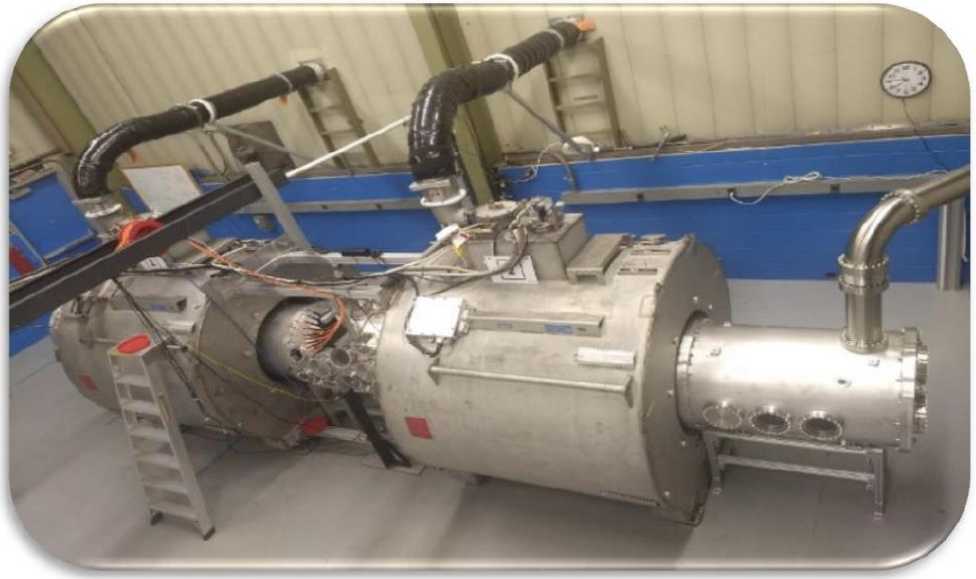
Terra Fusion Energy Corporation

Maryland's only fusion energy company

- Spin-out from UMD & UMBC
- Current HQ in College Park
- Searching for an industrial site in MD
- Graduated from MD Energy Innovation Accelerator (MEIA)
- Currently fundraising & hiring first employees

Prof. Carlos A. Romero-Talamas
Chief Executive Officer

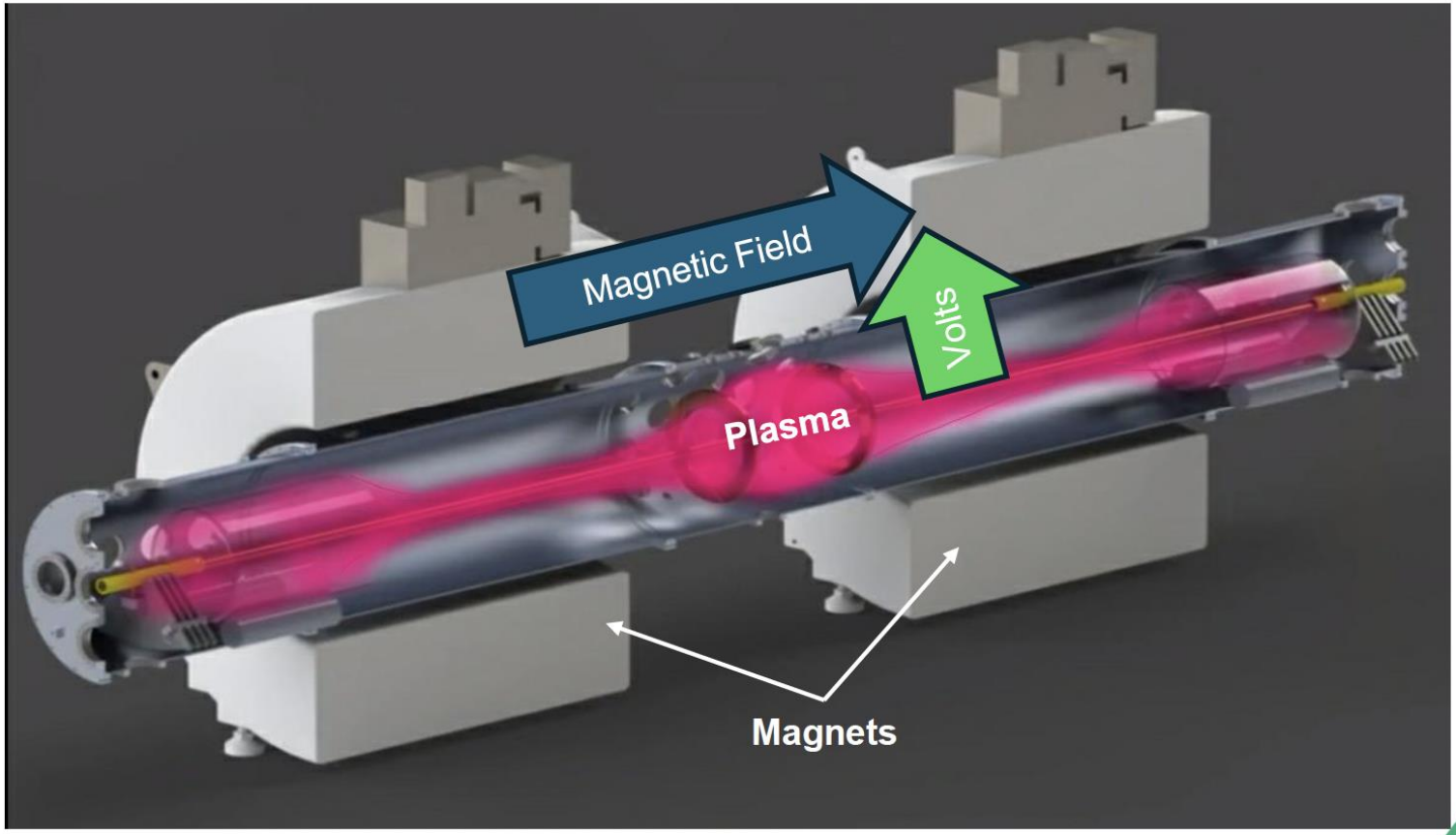
Dr. Oliver M. Barham
Chief Operating Officer



What is a Rotating Magnetic Mirror?

Fusion w/engineering simplicity

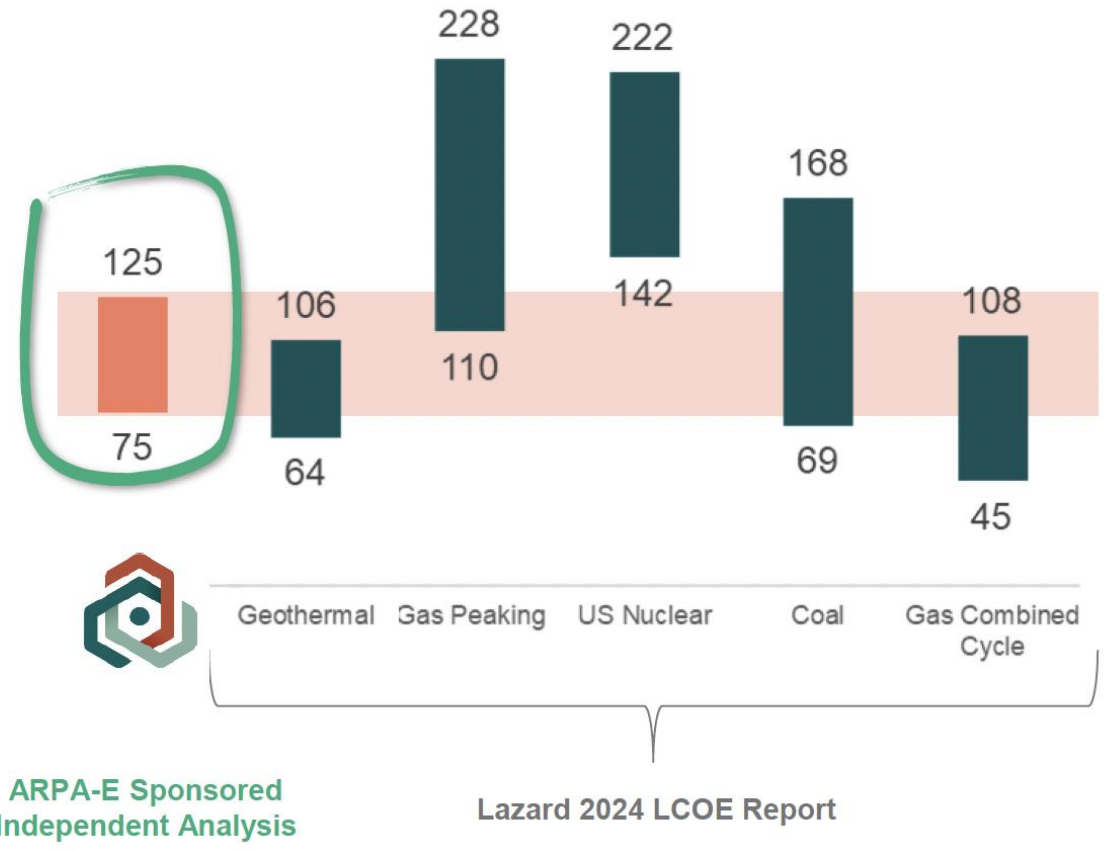
- 2 large magnets
- Fusion fuel injected into vacuum chamber
- Large voltage applied across fuel, perpendicular to magnetic field
- This technology is lower cost to market and more scalable than the competition



Competitive Electricity Generation

Compares favorably to electricity generated by all major methods

Our design, tenth of a kind = $75 / MWh
(first of a kind = $125)



ARPA-E Sponsored Independent Analysis

Lazard 2024 LCOE Report

TERRA FUSION

Please Reach Out With Questions!

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www.tf.energy

Closing Remarks

MARYLAND CLEAN ENERGY CENTER

Save the Date

2025 MARYLAND CLEAN ENERGY SUMMIT

Balancing Supply, Demand & Sustainability: Innovation in the Energy Marketplace

October 14–15, 2025
College Park Marriott Hotel & Conference Center

MARYLAND CLEAN ENERGY CENTER

Thank You

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