CFTC

COMMODITY FUTURES TRADING COMMISSION

February 28, 2023 Energy and Environmental Markets Advisory Committee

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Opening Remarks

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COMMODITY FUTURES TRADING COMMISSION

Panel 1: Financial Transmission Rights

Jackie Roberts, West Virginia Public Service Commission
Joe Bowring, Monitoring Analytics
Demetri Karousos, Nodal Exchange, Inc.

Financial Transmission Rights (FTRs) and how electrification and increased renewable and intermittent energy production could affect the electric grid and the FTR market.

Setting the table

Commodity Futures Trading Commission
Energy and Environmental Market Advisory Committee
February 28, 2023

Jackie Roberts
Federal Policy Advisor
Public Service Commission of West Virginia

DISCLAIMER

The Public Service Commission Speaks only through its Orders.

Any Opinions Presented here are not attributable to the PSC WV.

The Transition to Low Carbon Generation in PJM

FERC, NERC, the DOE in its draft Transmission Study just released, and PJM are all concerned about the transition to low carbon generation and its effect on the grid. With significant base load generation retiring and replacement generation being predominantly intermittent generation, there are significant concerns with grid reliability.

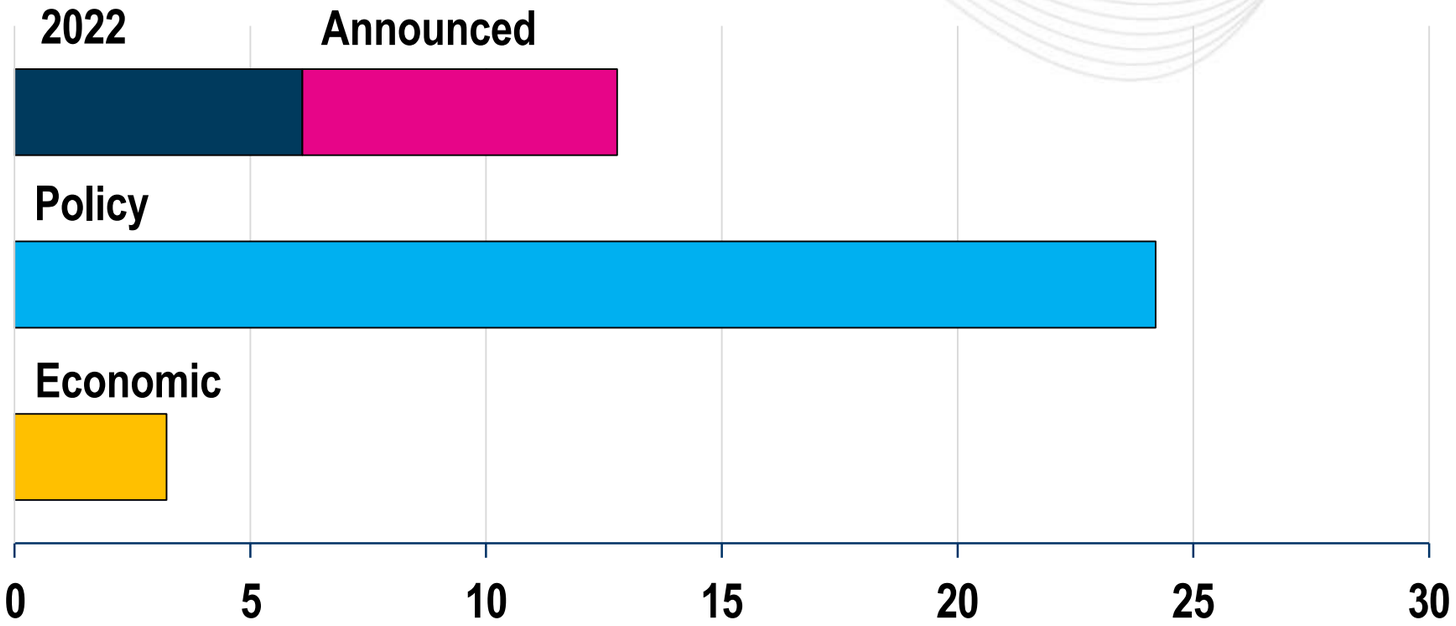
Energy Transition in PJM: Emerging Characteristics of a Decarbonizing Grid

The composition and performance characteristics of the resource mix will ultimately determine PJM's ability to maintain reliability. PJM's installed capacity is about 180,000 MW, and there are about 160,000 MW in the interconnection queue, of which about 80,000 MW are intermittent generation.

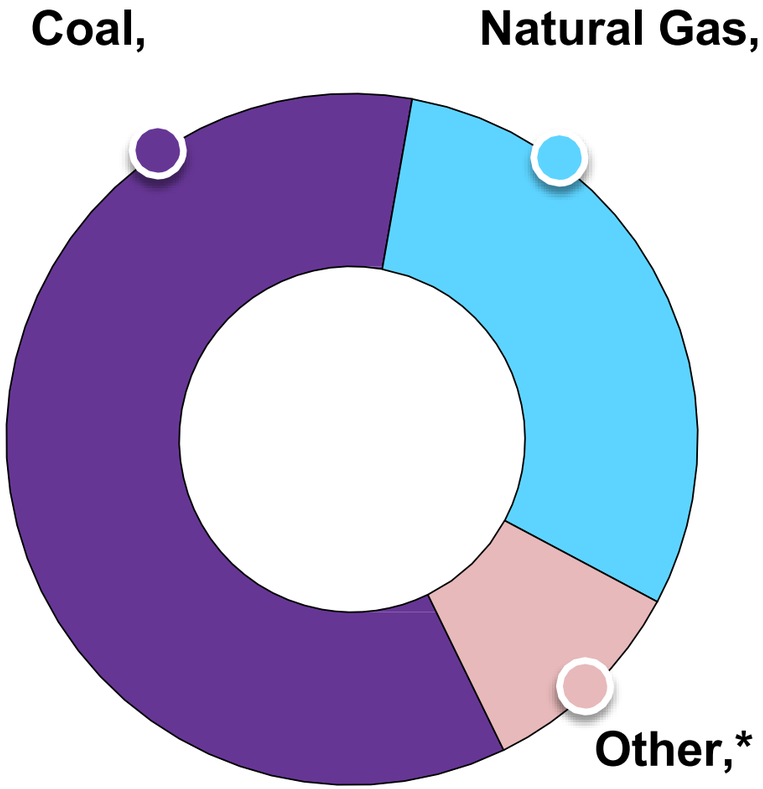
The next few slides were released by PJM last week and summarize the retirements and new generation expected through 2030.

Forecasted Retirements (2022–2030)

Total Forecasted Retirement Capacity (GW)

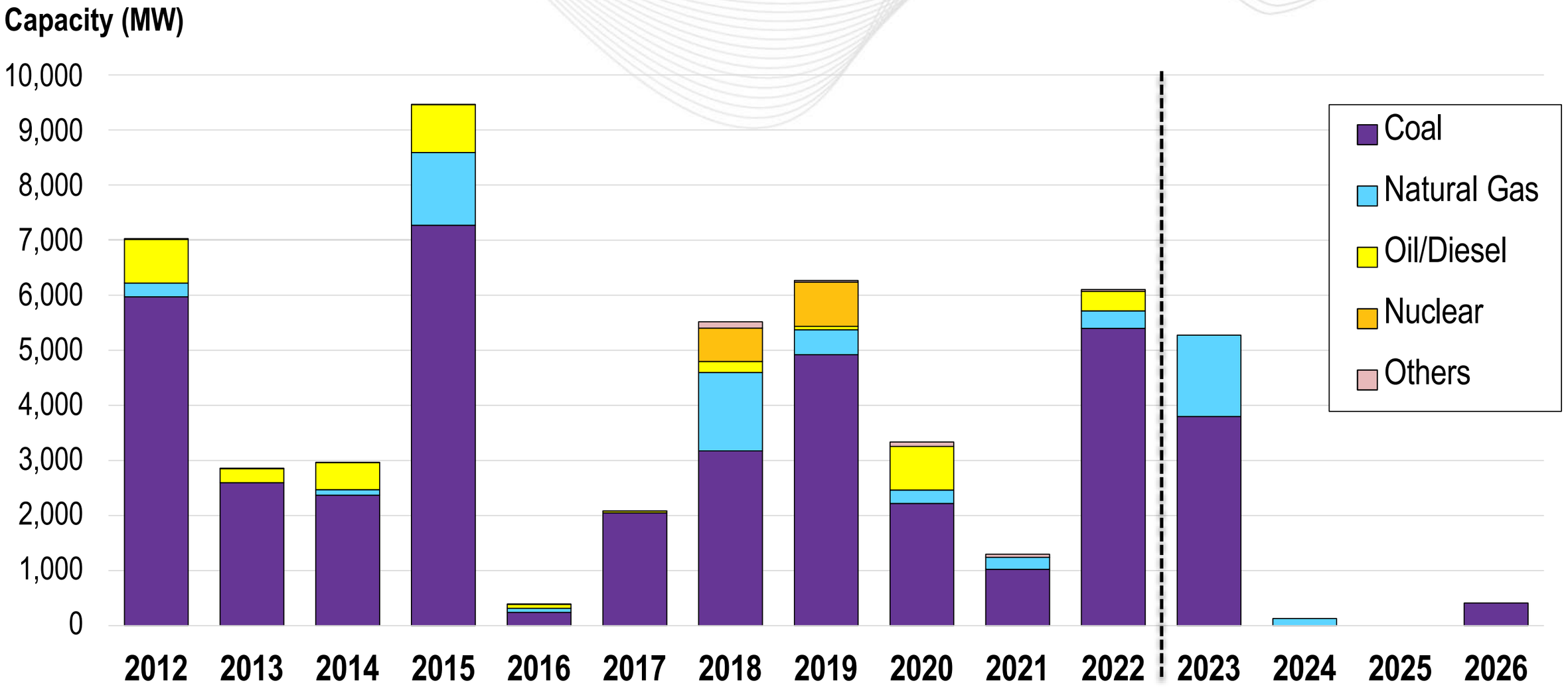


This **40 GW** represents
21% of PJM's current
192 GW of installed generation



**Other includes diesel, etc.*

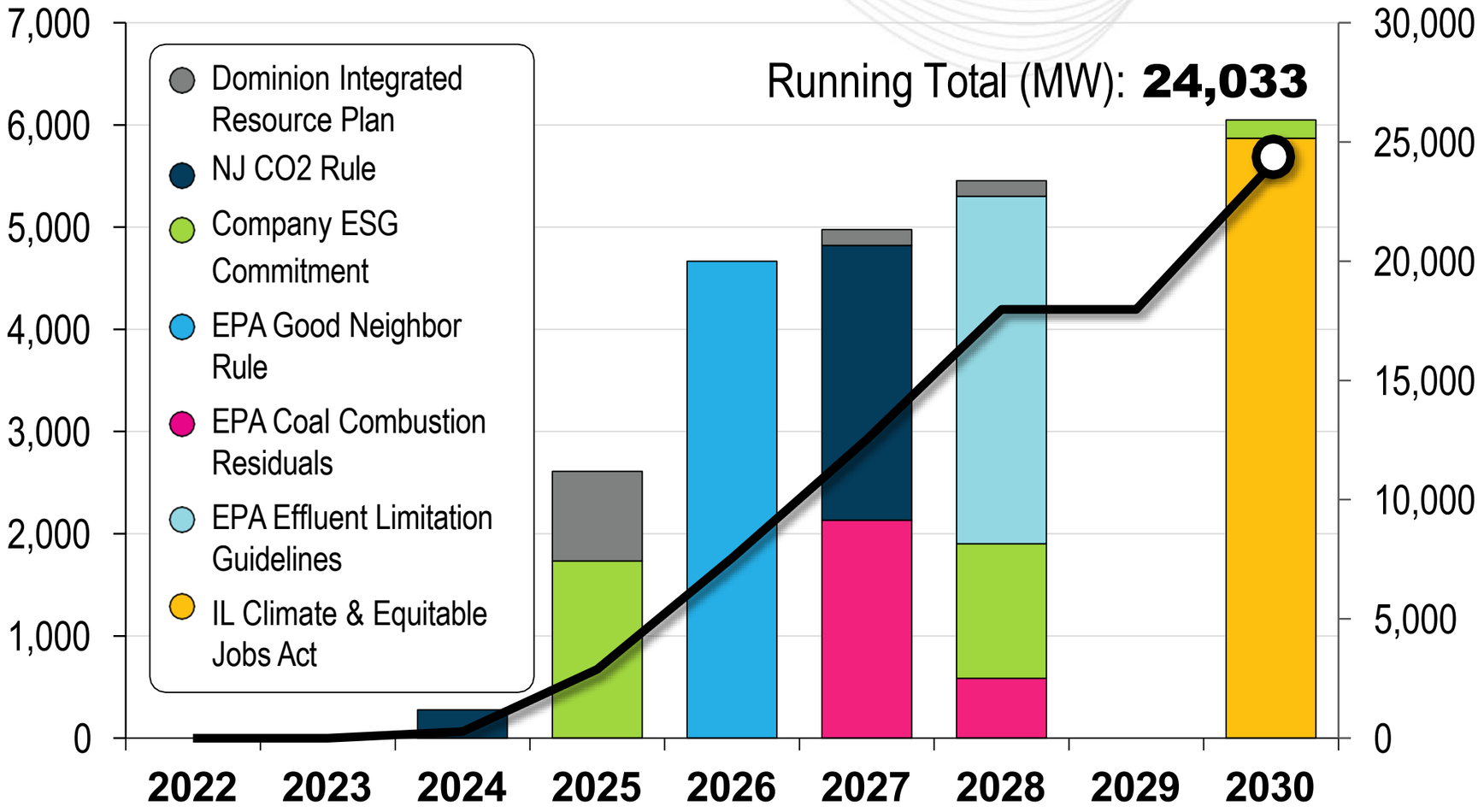
Deactivations & Announced Retirements (2011-2026)

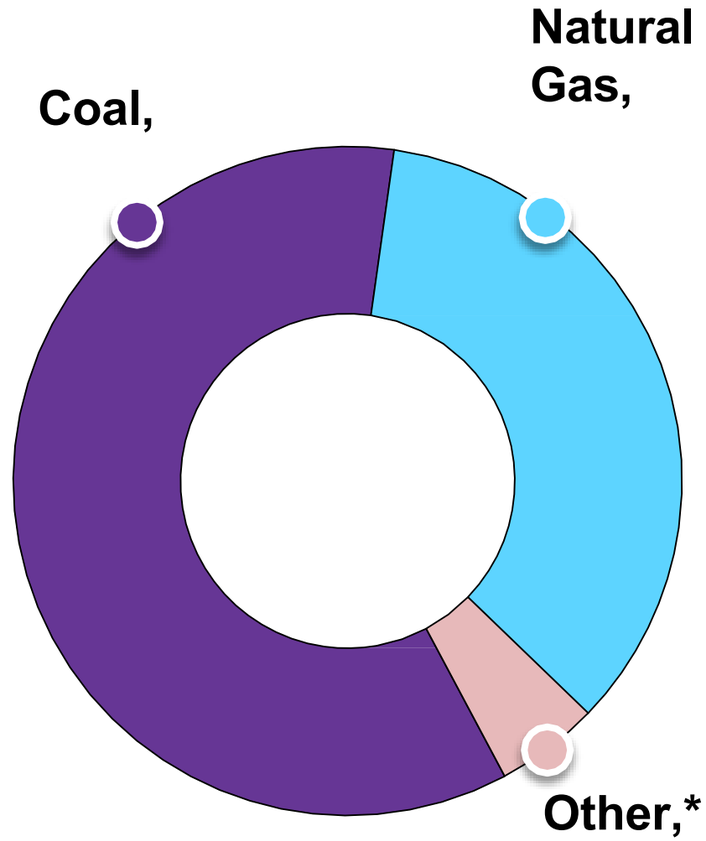


Forecasted Policy Retirements (2022–2030)

Annual Policy Retirement Capacity (MW)

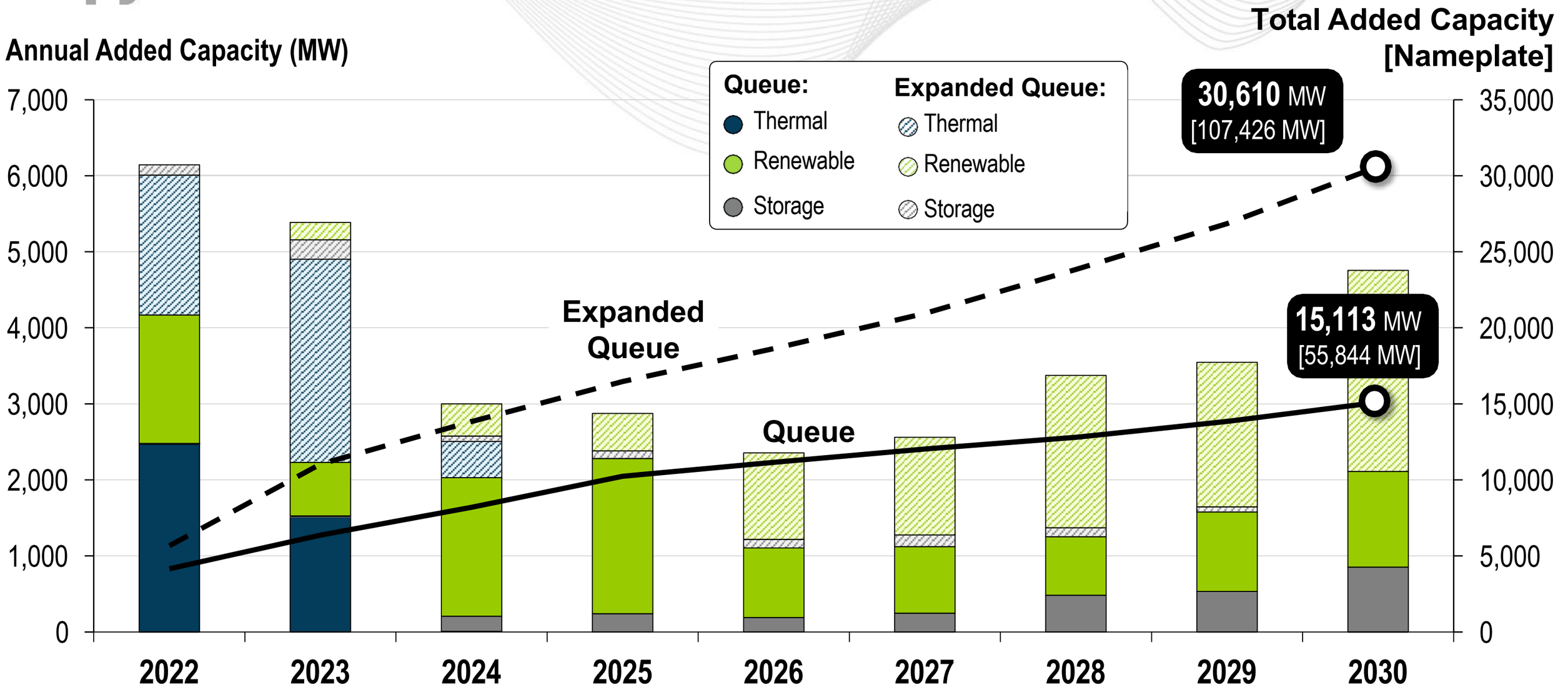
Total Policy Retirement Capacity (MW)



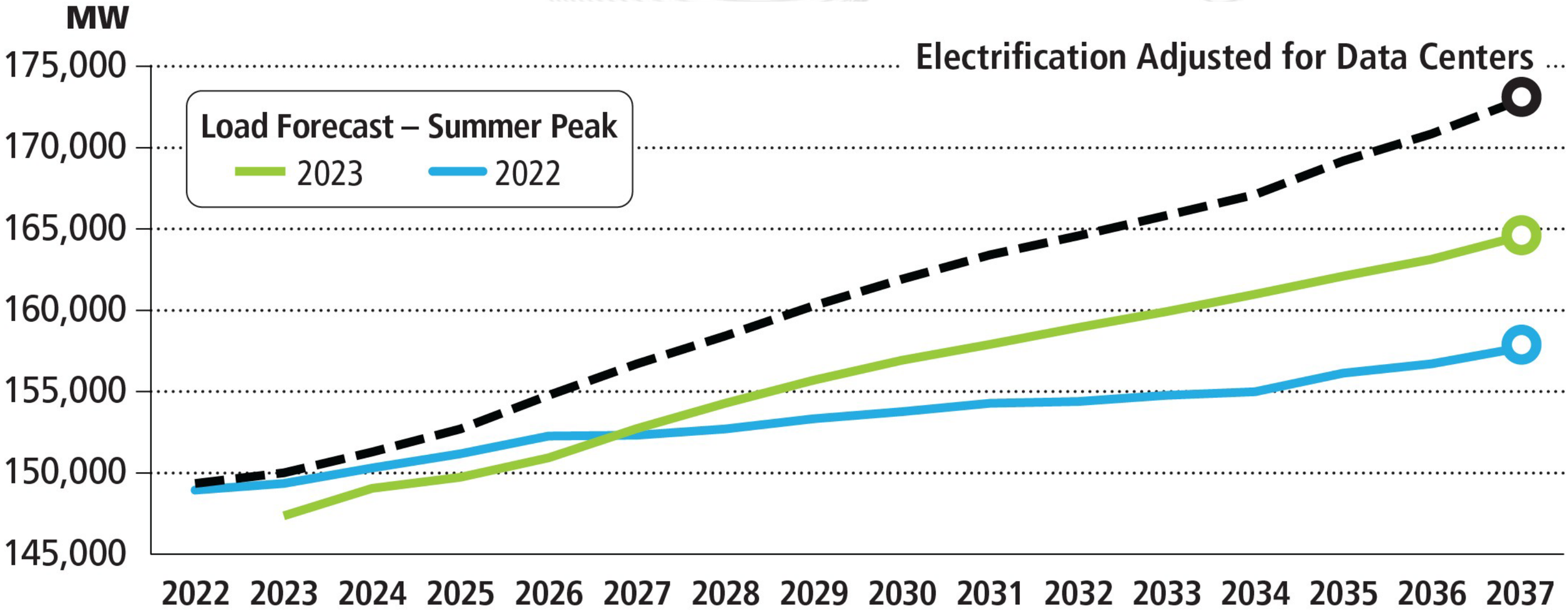


**Other includes diesel, etc.*

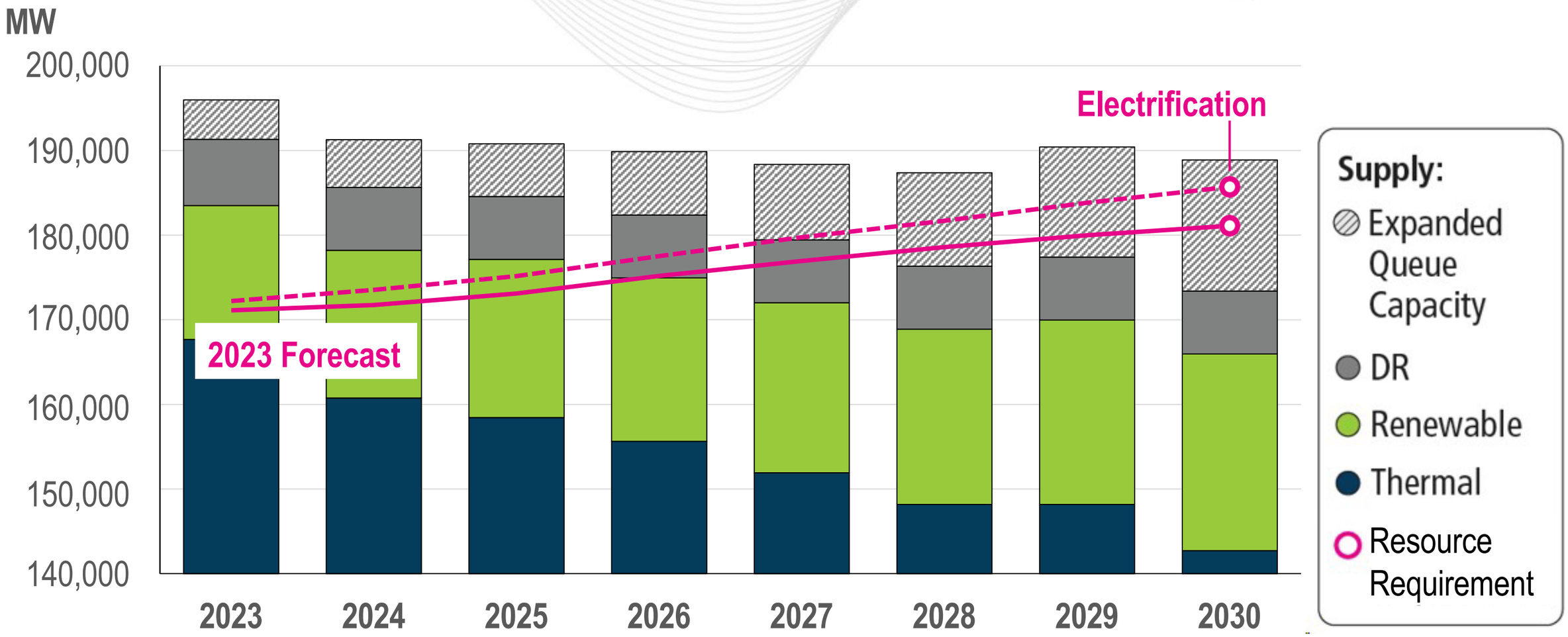
PJM Forecasted New Entry (2022–2030



Load Growth Forecasts



Forecasted Reserve Margin



FTRs and the energy transition

Financial Transmission Rights are expected to be integral in the transition to low carbon generation. Significant proposed generation will require transmission expansion because of its remote location to the grid. Congestion will definitely increase in certain areas of the grid.

PJM comments in the DOE draft, *National Transmission Needs Study*, February 24, 2023 (at p. 116):

Current utility plans for transmission development in the Mid-Atlantic do not meet anticipated needs.

FTRs and the Energy Transition, *cont*.

What are FTRs?

Financial Transmission Rights:

financial instruments awarded to bidders in the FTR Auctions that entitle the holder to a stream of revenues (or charges) based on the hourly Day Ahead congestion price differences.

Who Can Participate in FTR Markets?

FTRs are a commodity that is not connected to the sale and delivery of electricity. There is no requirement that participants in these markets own generation or transmission, and many participants are financial traders.

PJM designs these markets and sets the collateral requirements for market participation, subject to the oversight of FERC. Shortfalls in collateralization become the responsibility of load (the retail electric customers).

Jurisdiction

Because of the concurrent jurisdiction of the CFTC and FERC, RTOs and ISOs requested an exemption of FTRs from CFTC oversight (except for fraud and manipulation). This was found to be in the public interest and granted by the CFTC.

In the exemption Order, the CFTC defined FTRs:

A transaction, however named, that entitles one party to receive, and party to pay, an amount based solely on the difference between the price for electricity, established on an electricity market administered by a Requesting Party, at a specified source (*i.e.*, where electricity is deemed injected into the grid of a Requesting Party) and a specified sink (*i.e.*, where electricity is deemed withdrawn from the grid of a Requesting Party). The term "FTR" includes Financial Transmission Rights, and Financial Transmission Rights in the form of options (*i.e.*, where one party has only the obligation to pay, and the other party only the right to receive, an amount as described above).

In the Matter of the Application for an Exemptive Order Under Section 4(c) of the Commodity Exchange Act by various RTOs, ISOs, February 7, 2012

Given the importance of FTRs in the emerging low carbon markets, who should oversee FTR hedging: the CFTC or FERC?

Congestion and FTRs

CFTC

Environmental Market Advisory Committee

February 28, 2023

Joe Bowring

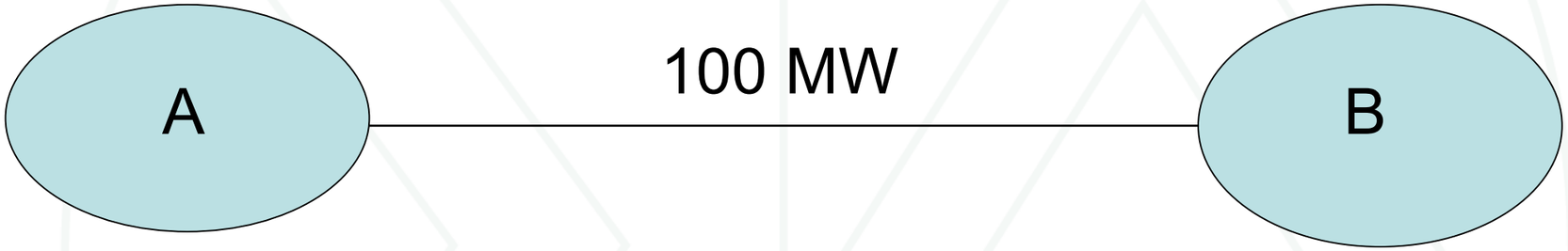
PJM Independent Market Monitor

Monitoring Analytics

Simple System Example: Congestion

A
Load: 0
Gen: 100

B
Load: 150
Gen: 50



Simple System Example: Congestion

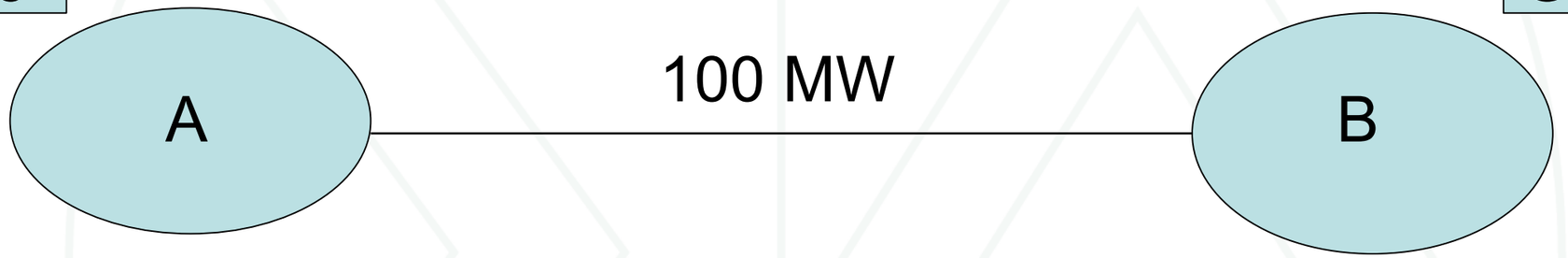
A
Load: 0
Gen: 100

Gen MC = $5

What are the LMPs at A and B?

B
Load: 150
Gen: 50

Gen MC = $15



Simple System Example: Congestion

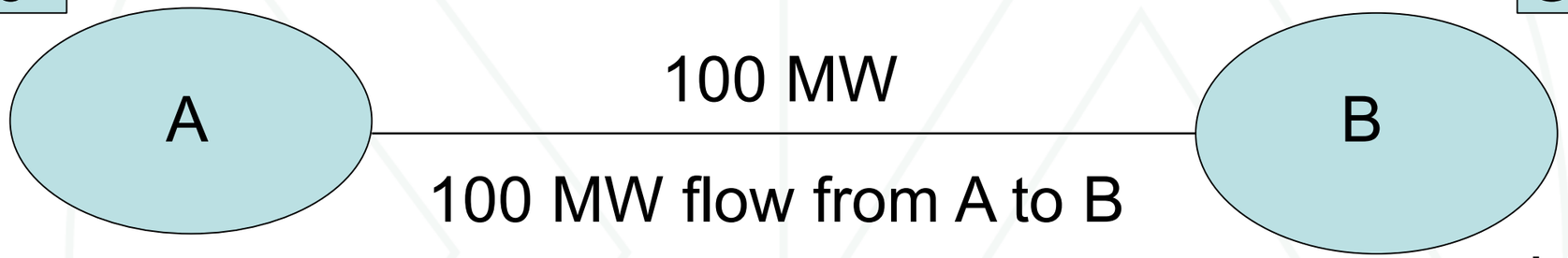
A
Load: 0
Gen: 100

B
Load: 150
Gen: 50

What are the LMPs at A and B?

Gen MC = $5

Gen MC = $15



LMP = $5

LMP = $15

100 MW flow from A to B

Line AB constrains the flow from A to B
Gen at B is needed to meet some of load.

Simple System Example: Congestion

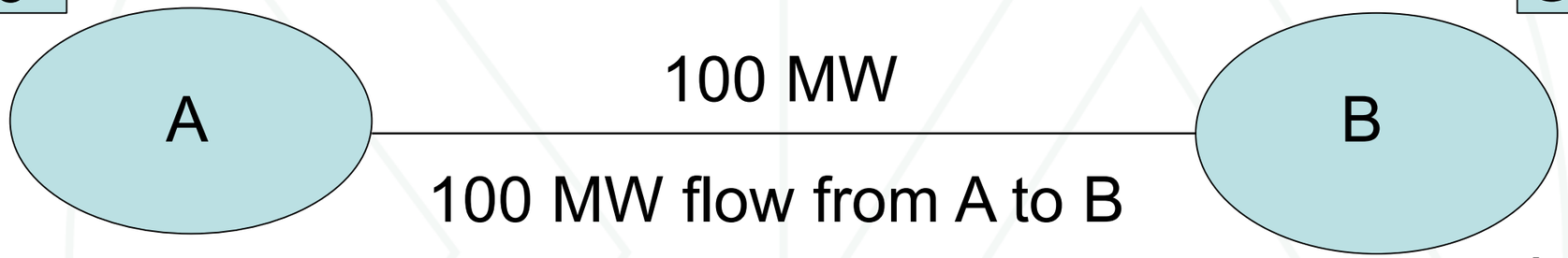
A
Load: 0
Gen: 100

B
Load: 150
Gen: 50

What are the LMPs at A and B?

Gen MC = $5

Gen MC = $15



LMP = $5

LMP = $15

Line AB constrains the flow from A to B
Gen at B is needed to meet some of load.

	A	Constraint	B
LMP	$5	---->	$15

	Zone A	Zone B
Load MW	0	150
Marginal Price of Power	$5.00	$15.00

(LMP x MW)	Zone A	Zone B	Total
Load Charges	$0.00	$2,250.00	$2,250.00
Generation Credits	$500.00	$750.00	$1,250.00
Total Credits/Charges	($500.00)	$1,500.00	$1,000

Congestion= Load Charges – Gen Credits

Simple System Example: Congestion

	A	Constraint	B
LMP	$5	---->	$15

	Zone A	Zone B
Load MW	0	150
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Total Credits/Charges	($500.00)	$1,500.00	$1,000

Congestion= Load Charges – Gen Credits

FTR Basics

- Congestion is paid by load.
- Congestion is the difference between what load pays and generation receives in an LMP system with transmission constraints.
- Congestion should be returned to load in order to ensure that introduction of LMP does not create a wealth transfer.
- The purpose of FTRs is to return congestion to load.

FTR Logic

- **If implemented correctly:**
  - **FTRs are a perfect hedge for load against congestion.**
  - **There is no such thing as underfunding.**
  - **Payments equal congestion, exactly.**

ARRs and FTRs

- Two parts of current design
  - ARRs
  - FTRs
- Goal of ARR design:
  - A mechanism to assign congestion rights to load.
- Goal of FTR design:
  - A mechanism to permit load to sell its rights to congestion.
  - Load can sell the rights to an uncertain level of congestion for a fixed payment.

Issues with the ARR/FTR Design

- **Load does not have the rights to congestion revenues under the current design. Property rights not defined.**
- **Load not allowed to sell FTRs.**
- **Load cannot set the sale price of the rights to congestion revenues in the FTR auction under the current design.**
- **Load does not receive all auction revenues.**
- **Congestion is not defined by the bill.**
- **Load cannot receive rights to all congestion under the current design.**

Issues with the ARR/FTR Design

- ARR rights assigned on an historic generation to load path basis do not align with actual network use.
  - Realized and available offset varies widely among customers
- Not all congestion paid by load can be claimed by ARR holders.
  - Self scheduling all allocated ARR rights would have returned less than 62 percent of congestion in the last four planning periods (17/18, 18/19, 19/20, 20/21)
- FTRs are available on paths that do not include physical load and where load does not pay congestion.
  - Over 50 percent of FTR MW are generator node to generator node

Proposed FTR Auction Approach

- When congestion is defined and the rights to congestion are assigned, a market mechanism is needed to permit load to sell its rights to congestion
- That market mechanism could be the FTR auction(s)
- The FTR auction should allow load to sell their congestion rights.
- FTR auction design can take many forms
  - The FTR auction design can look a lot like the current design
  - The FTR auction design can include paths
  - The FTR design cannot pay out more than actual congestion
  - FTR auctions could be operated by a third part exchange

ARR and FTR Total Congestion Offset ($M) for Load: 2011/2012 through 2021/2022

	Revenue								Pre 2017/2018 (Without Balancing)		2017/2018 (With Balancing)		Post 2017/2018 (With Balancing and Surplus)		Effective Offset	
Planning Period	ARR Credits	Unadjusted FTR Credits	Day Ahead Congestion	Balancing + M2M Congestion	Total Congestion	Surplus Revenue Pre 2017/2018 Rules	Surplus Revenue 2017/2018 Rules	Post 2017/2018 Rules	Total ARR/FTR Offset	Percent Offset	Current Revenue Received	Percent Offset	New Revenue Received	New Offset	Cumulative Revenue	Offset
2011/2012	$515.6	$310.0	$1,025.4	($275.7)	$749.7	($50.6)	$35.6	$113.9	$775.0	103.4%	$585.5	78.1%	$663.8	88.5%	$775.0	103.4%
2012/2013	$356.4	$268.4	$904.7	($379.9)	$524.8	($94.0)	$18.4	$62.1	$530.7	101.1%	$263.2	50.2%	$306.9	58.5%	$530.7	101.1%
2013/2014	$339.4	$626.6	$2,231.3	($360.6)	$1,870.6	($139.4)	($49.0)	($49.0)	$826.5	44.2%	$556.3	29.7%	$556.3	29.7%	$826.5	44.2%
2014/2015	$487.4	$348.1	$1,625.9	($268.3)	$1,357.6	$36.7	$111.2	$400.6	$872.2	64.2%	$678.4	50.0%	$967.8	71.3%	$872.2	64.2%
2015/2016	$641.8	$209.2	$1,098.7	($147.6)	$951.1	$9.2	$42.1	$188.9	$860.2	90.4%	$745.5	78.4%	$892.3	93.8%	$860.2	90.4%
2016/2017	$648.1	$149.9	$885.7	($104.8)	$780.8	$15.1	$36.5	$179.0	$813.1	104.1%	$729.6	93.4%	$872.1	111.7%	$813.1	104.1%
2017/2018	$429.6	$212.3	$1,322.1	($129.5)	$1,192.6	$52.3	$80.4	$370.7	$694.2	58.2%	$592.8	49.7%	$883.1	74.1%	$592.8	49.7%
2018/2019	$531.6	$130.1	$832.7	($152.6)	$680.0	($5.8)	$16.2	$112.2	$655.87	96.4%	$525.3	77.2%	$621.3	91.4%	$621.3	91.4%
2019/2020	$547.6	$91.9	$612.1	($169.4)	$442.7	($1.6)	$21.6	$157.8	$637.9	144.1%	$491.7	111.1%	$627.9	141.8%	$627.9	141.8%
2020/2021	$392.7	$179.9	$899.6	($256.2)	$643.4	($43.2)	($0.0)	($0.0)	$529.31	82.3%	$316.4	49.2%	$316.4	49.2%	$316.4	49.2%
2021/2022	$390.8	$324.4	$1,516.9	($326.9)	$1,190.0	($71.4)	($9.1)	($9.1)	$643.9	54.1%	$379.3	31.9%	$379.3	31.9%	$379.3	31.9%
Total	$5,280.9	$2,850.8	$12,954.9	($2,571.5)	$10,383.4	($292.7)	$303.9	$1,527.1	$7,839.0	75.5%	$5,864.1	56.5%	$7,087.3	68.3%	$7,215.4	69.5%

* ten months of 2021/2022 planning period

ARR/FTR Zonal Congestion Offset 2021/2022

Zone	ARR Credits	Adjusted FTR Credits	Balancing+ M2M Charge	Surplus Allocation	Total Offset	Day Ahead Congestion	Balancing Congestion	M2M Payments	Total Congestion	Offset
ACEC	$3.1	($0.0)	($3.7)	$0.0	($0.6)	$14.7	($3.2)	($0.5)	$11.0	(5.8%)
AEP	$35.7	$58.3	($45.1)	$0.0	$48.9	$218.8	($39.2)	($5.9)	$173.7	28.2%
APS	$26.0	$28.8	($21.8)	$0.0	$32.9	$119.9	($19.5)	($2.3)	$98.1	33.6%
ATSI	$17.4	$0.6	($21.7)	$0.0	($3.6)	$107.3	($18.6)	($3.1)	$85.6	(4.2%)
BGE	$75.0	$3.5	($11.9)	$0.0	$66.7	$56.3	($10.4)	($1.5)	$44.4	150.2%
COMED	$35.0	$5.3	($30.7)	$0.0	$9.6	$146.0	($26.3)	($4.4)	$115.3	8.3%
DAY	$4.4	$0.9	($5.8)	$0.0	($0.5)	$24.4	($5.0)	($0.8)	$18.6	(2.8%)
DOM	$24.2	$171.2	($68.8)	$0.0	$126.6	$277.6	($63.7)	($0.6)	$213.3	59.4%
DPL	$31.7	$12.3	($8.6)	$0.0	$35.4	$58.3	($7.7)	($5.1)	$45.4	77.9%
DUKE	$20.7	$1.2	($8.8)	$0.0	$13.1	$36.0	($7.6)	($1.2)	$27.2	48.1%
DUQ	$4.9	$0.1	($4.3)	$0.0	$0.7	$16.2	($3.6)	($0.9)	$11.7	5.8%
EKPC	$3.2	$0.0	($4.9)	$0.0	($1.7)	$20.8	($4.3)	($0.6)	$16.0	(10.4%)
EXT	$0.6	$0.0	($7.5)	$0.0	($6.9)	$22.3	($7.5)	$0.0	$14.8	(46.7%)
JCPLC	$1.7	$0.0	($9.1)	$0.0	($7.4)	$38.1	($8.1)	($1.1)	$29.0	(25.5%)
MEC	$6.6	$2.2	($9.0)	$0.0	($0.3)	$34.5	($8.3)	($0.7)	$25.5	(1.1%)
OVEC	$0.0	$0.0	($0.3)	$0.0	($0.3)	$1.2	($0.3)	$0.0	$0.9	(36.6%)
PE	$8.7	$9.6	($7.0)	$0.0	$11.3	$39.9	($6.2)	($0.8)	$33.0	34.3%
PECO	$17.1	$0.3	($14.9)	$0.0	$2.5	$68.2	($13.1)	($1.8)	$53.2	4.7%
PEPCO	$19.2	$5.4	($10.8)	$0.0	$13.8	$50.2	($9.5)	($1.3)	$39.4	35.1%
PPL	$27.7	$12.7	($15.1)	$0.0	$25.2	$85.1	($13.2)	($1.9)	$70.0	36.1%
PSEG	$27.9	$2.9	($16.6)	$0.0	$14.1	$76.0	($14.6)	($2.0)	$59.4	23.8%
REC	$0.2	$0.0	($0.6)	$0.0	($0.3)	$5.3	($0.5)	($0.1)	$4.7	(6.9%)
Total	$390.9	$315.2	($326.9)	$0.0	$379.2	$1,516.9	($290.2)	($36.6)	$1,190.0	31.9%

Offset Available to Load if all ARRs Self Scheduled

	19/20 Planning Period				20/21 Planning Period				21/22 Planning Period*			
	SS FTR	Bal+M2M Charges	Congestion +M2M	Offset	SS FTR	Bal+M2M Charges	Congestion +M2M	Offset	SS FTR	Bal+M2M Charges	Congestion +M2M	Offset
ACEC	$2.6	($2.1)	$3.7	15.6%	$1.8	($2.7)	$5.5	(16.4%)	($0.1)	($3.7)	$11.0	(34.5%)
AEP	$62.7	($28.2)	$81.9	42.1%	$77.3	($38.1)	$110.9	35.3%	$112.7	($45.1)	$173.7	39.0%
APS	$31.2	($10.4)	$31.9	65.1%	$42.0	($14.8)	$45.2	60.3%	$85.7	($21.8)	$98.1	65.1%
ATSI	$27.9	($13.9)	$36.8	38.1%	$30.7	($19.5)	$50.6	22.1%	$30.1	($21.7)	$85.6	9.9%
BGE	$53.7	($6.7)	$15.3	308.0%	$79.7	($9.1)	$24.8	284.2%	$107.1	($11.9)	$44.4	214.5%
COMED	$40.6	($19.8)	$65.2	31.9%	$69.6	($28.5)	$78.3	52.4%	$51.1	($30.7)	$115.3	17.7%
DAY	$5.6	($3.9)	$9.7	17.4%	$8.0	($5.3)	$11.0	24.9%	$6.5	($5.8)	$18.6	3.5%
DOM	$32.8	($16.9)	$59.2	26.9%	$117.0	($37.9)	$87.9	90.0%	$239.8	($68.8)	$213.3	80.2%
DPL	$27.3	($8.7)	$17.4	107.3%	$56.4	($6.7)	$36.2	137.4%	$64.4	($8.6)	$45.4	122.7%
DUKE	$30.5	($6.0)	$14.9	164.2%	$40.9	($8.4)	$17.4	187.2%	$35.7	($8.8)	$27.2	99.2%
DUQ	$8.1	($3.2)	$5.1	95.2%	$8.9	($4.0)	$6.2	79.7%	$3.9	($4.3)	$11.7	(3.1%)
EKPC	$4.1	($2.9)	$7.4	16.8%	$6.6	($4.2)	$8.4	29.3%	$7.1	($4.9)	$16.0	13.7%
EXT	$0.9	($2.2)	($1.7)	74.3%	$0.3	($13.8)	$11.0	(122.3%)	$1.2	($7.5)	$14.8	(42.5%)
JCPLC	$2.3	($4.6)	$9.2	(25.5%)	$0.9	($6.1)	$12.9	(40.2%)	$8.8	($9.1)	$29.0	(1.1%)
MEC	$0.8	($4.2)	$8.7	(38.5%)	$8.0	($5.3)	$16.5	16.5%	$27.7	($9.0)	$25.5	73.3%
OVEC	NA	$0.1	$0.5	NA	NA	($0.3)	$0.9	NA	NA	($0.3)	$0.9	(36.6%)
PE	$11.2	($3.8)	$10.8	69.1%	$13.5	($6.5)	$16.4	42.8%	$27.3	($7.0)	$33.0	61.7%
PECO	$16.8	($8.2)	$13.4	63.8%	$14.0	($10.9)	$24.9	12.4%	$16.1	($14.9)	$53.2	2.2%
PEPCO	$23.2	($6.1)	$13.7	124.3%	$37.3	($8.3)	$20.5	141.7%	$45.5	($10.8)	$39.4	88.2%
PPL	$39.2	($8.5)	$20.5	149.9%	$43.7	($11.5)	$30.8	104.5%	$133.8	($15.1)	$70.0	169.6%
PSEG	$21.3	($8.9)	$18.4	67.2%	$43.2	($13.9)	$25.0	117.0%	$88.9	($16.6)	$59.4	121.7%
REC	$0.2	($0.3)	$0.6	(22.6%)	$1.0	($0.6)	$2.1	21.0%	$2.5	($0.6)	$4.7	40.2%
Total	$443.0	($169.4)	$442.7	61.8%	$700.9	($256.2)	$643.4	69.1%	$1,095.7	($326.9)	$1,190.0	64.6%

* First ten months of the 2021/2022 planning period

Monitoring Analytics, LLC
2621 Van Buren Avenue
Suite 160
Eagleville, PA
19403
(610) 271-8050

MA@monitoringanalytics.com
www.MonitoringAnalytics.com

Financial Transmission Rights (FTRs)

Energy & Environmental Markets Advisory Committee Meeting

February 28th, 2023

part of eex group

Seven markets currently publish nodal Locational Marginal Prices (LMP) of electricity and offer Financial Transmission Rights (FTR) auctions for their markets based on congestion spreads

Map source: ISO/RTO Council

Locational Marginal Price (LMP)

LMP = Energy + Congestion + Loss*

Energy is the price that comes from optimal dispatch in an ideal grid with no congestion or loss

- Same for all locations within an RTO/ISO at any given time

Congestion represents the cost of network capacity constraints in the grid resulting from “out of merit order” generation dispatch

- Varies by location

Loss represents the cost of electrical loss in the system, and is largely a function of the distance from generation to load

- Varies by location

RTOs/ISOs simultaneously derive LMPs for all their pricing locations for both their Day Ahead scheduling market as well as their Real Time dispatch markets

*In ERCOT, Loss is not included in the LMP

Background: what is an FTR[1]?

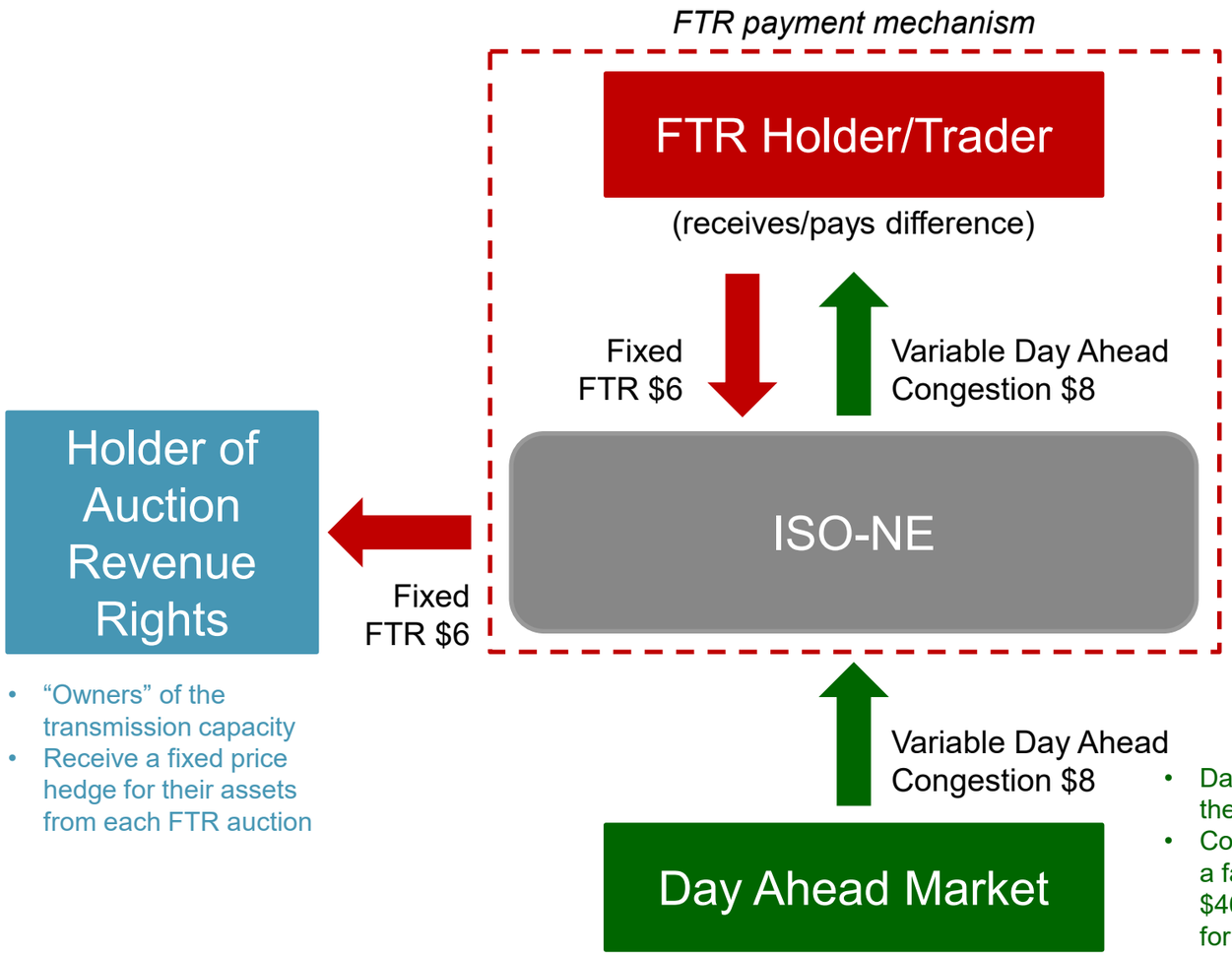
- An FTR is a financial forward spread contract that exists in FERC markets that settles to the difference in prices between two locations (often referred to as the source and sink)

- FTRs are created in periodic (i.e., monthly) auctions that allow the RTO/ISO to pre-sell, on behalf of the transmission capacity owners, the congestion revenues they will collect on the network (thereby exchanging the variable price for a fixed price)

- More specifically, FTR auction markets exist for two purposes:
  - Distribute congestion revenue
  - Provide transmission capacity owners the ability to hedge congestion

1. FTRs in this presentation refer to the similar locational spread contracts offered by the 7 organized markets; however, the nomenclature differs among the entities for these similar contracts: Financial Transmission Rights (PJM, ISO-NE, MISO); Transmission Congestion Contracts (NY-ISO); Congestion Revenue Right (ERCOT, CAISO); Transmission Congestion Right (SPP)

FTRs create a fixed for floating exchange of cash flows that exposes the ISO to forward price and credit risk



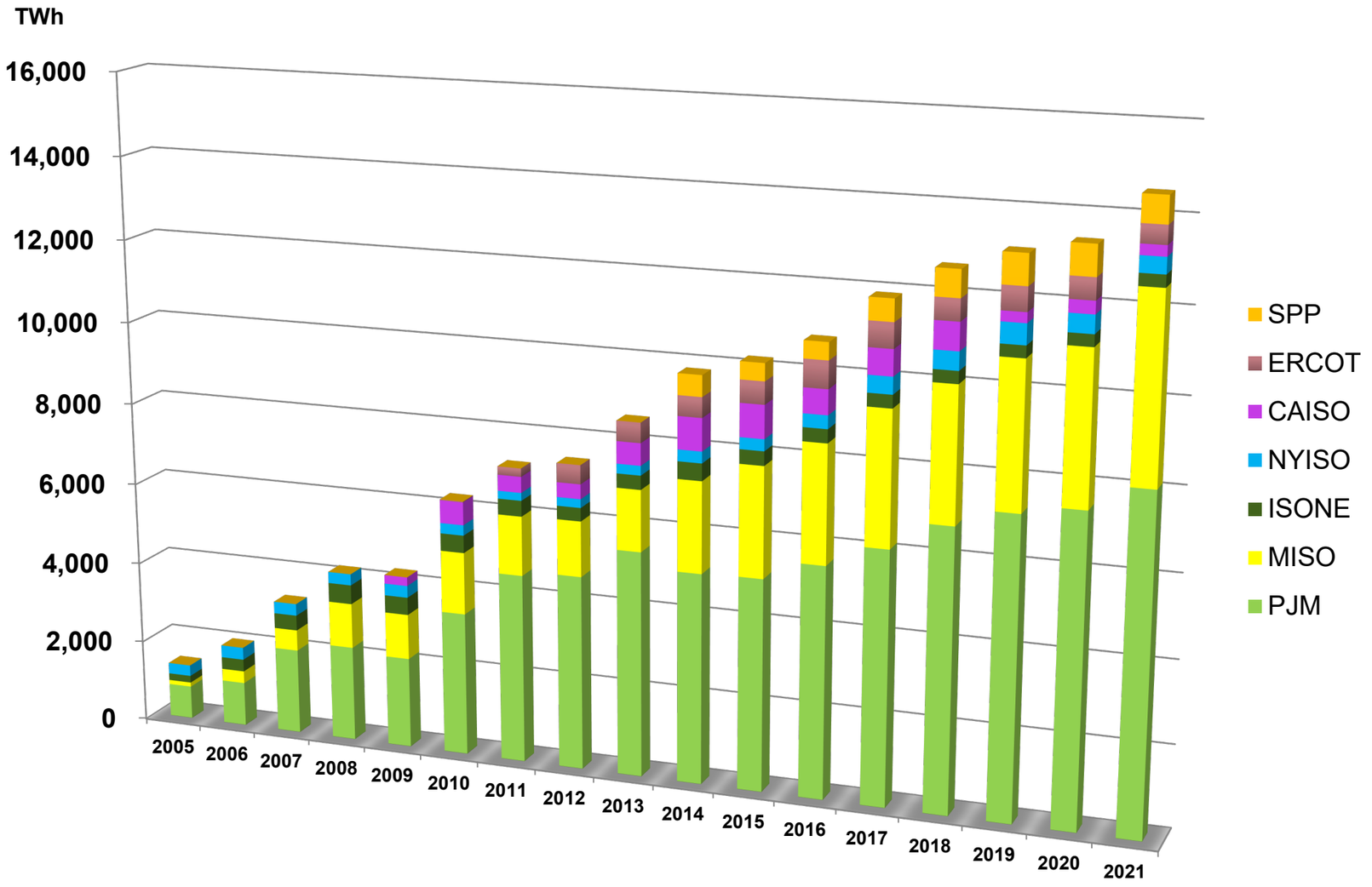
- Market participants, hedge funds, speculators
- Willing to provide the fixed price hedge by bidding on FTRs in exchange for anticipated profits from the variable daily congestion exposure
- This fixed for floating exchange of cash flows creates forward price and credit risk for the ISO

- Collects and distributes payments
- In the case of non-payment, socializes default among market participants

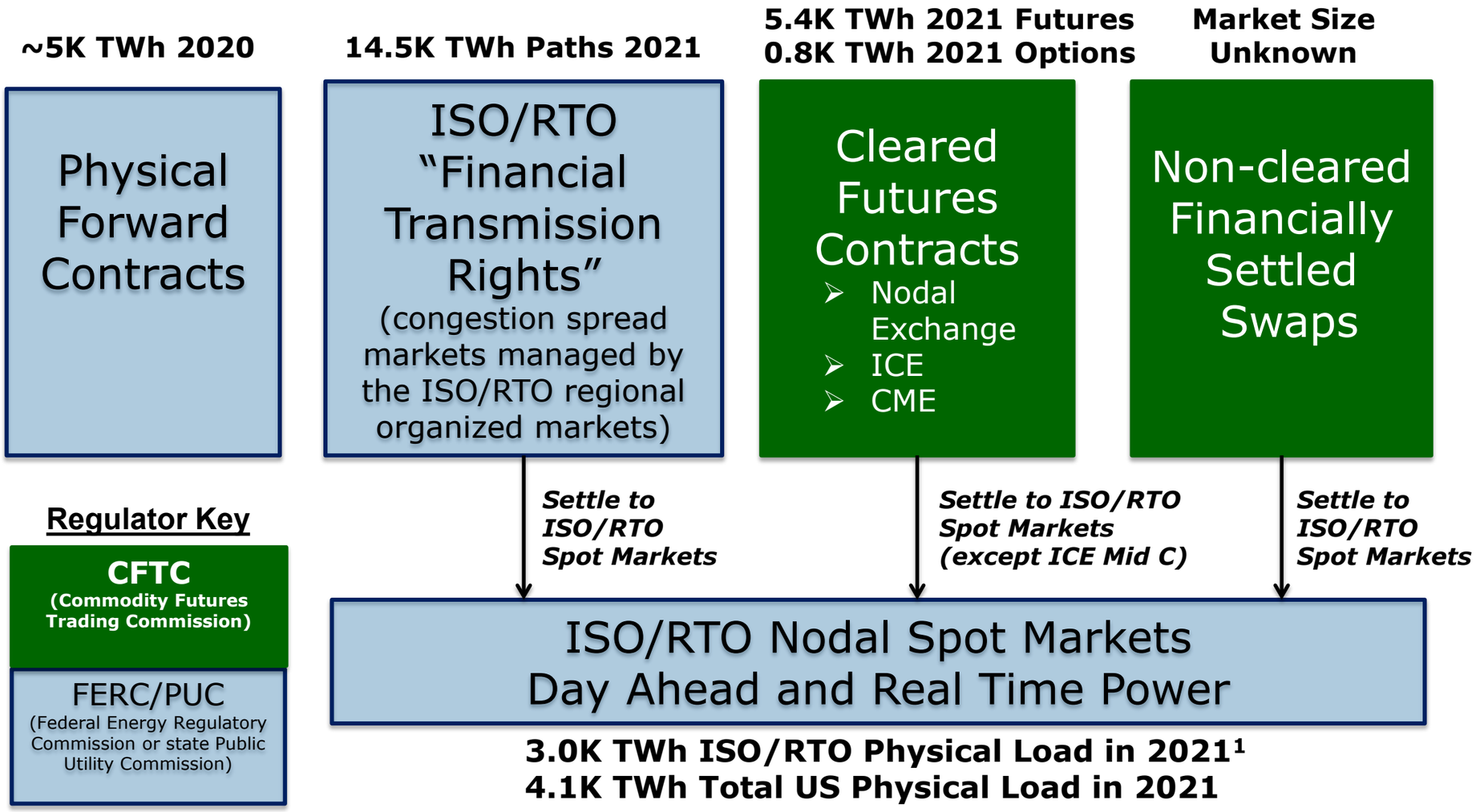
- "Owners" of the transmission capacity
- Receive a fixed price hedge for their assets from each FTR auction

- Daily purchase and sale of electricity in the ISO
- Congestion = the difference between what a factory or utility may pay for power (e.g., $46/MWh) and what a generator receives for that power (e.g., $38/MWh)

The FTR markets continue to grow both through new geographies and organically; growth in 2021 over 2020 was 8.5%



FTRs are a significant part of the United States power markets

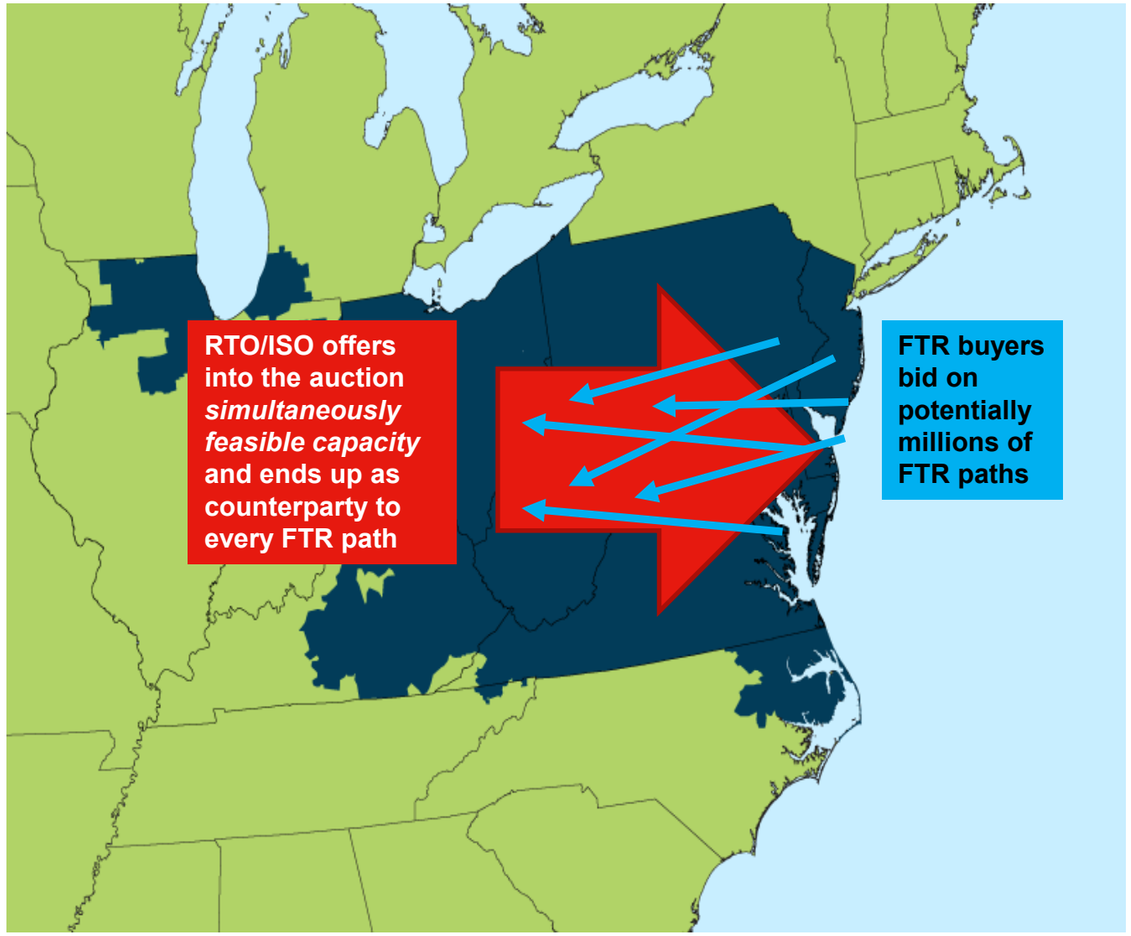


1. *Approximation based on ISO/RTOs serve ~72% of U.S. population and 2021 generation was about 4,116 TWh*

Source: Nodal Exchange analysis and compiled estimates for FERC/PUC regulated markets from the U.S. Energy Information Administration, FERC, Platts and the RTOs/ISOs; estimates for CFTC regulated markets from ICE, CME and NFX

RTO/ISOs are uniquely capable of running the regional FTR auctions, which serve a critical role in organized power markets

FTR auctions allow market participants to hedge the value of transmission capacity across the electricity market area



- The FTR auctions run by the ISOs/RTOs represent a one-to-many matching, with the RTO/ISO serving as the counterparty to all FTRs
- The auction takes into account the system capacity constraints and solves for both the total awards and the individually awarded FTR prices based on a simultaneous feasibility test
- The expertise required to ensure feasible results is a core competence of the RTO/ISO in their role as grid operator
- Due to the physical nature of the grid and the role as the grid operator, only the RTO/ISO can create FTRs which are needed for hedging market risk

Each RTO/ISO has its own approach to FTR risk management; some components of these methodologies are summarized below

RTO/ISO	Reference Value for Margin Calculation	Mark-to-Auction	Volumetric Minimum
CAISO	5th percentile value based on the most current 36 months of historical data	No	None
SPP	75th percentile of the positive flow value, 90th percentile of the opposite flow value, depending on mean price	No	$0.10/MWh
ISONE	Proxy price based on 36 month rolling look back and using the standard deviation of the historical FTR path congestion components	Yes	None
NYISO	Certain values use historical data to account for volatility	Yes	None
MISO	Higher of the 50th percentile value and 75th percentile value for each pricing node calculation on a rolling twelve-month basis	Yes	$0.05/MWh
PJM	Historical simulation value based on 97th percentile value from history of 2008 to present	Yes	$0.10/MWh
ERCOT	Path specific adder based on the 99th percentile of average day-ahead market price from the last 3 years	Yes	None

1. CAISO Response to Order to Show Cause of the CAISO Corporation under EL22-62: https://elibrary.ferc.gov/eLibrary/filedownload?fileid=574D348A-2E9D-C967-90C3-841616100000
2. Response of SPP, Inc. to July 28, 2022 Order to Show Cause under EL22-65: https://elibrary.ferc.gov/eLibrary/filedownload?fileid=F3FC8541-740A-C9CC-906B-841620F00000
3. Answer of ISO-NE Inc. under EL22-63: https://elibrary.ferc.gov/eLibrary/filedownload?fileid=CA7A039C-A0EF-CB1F-9324-84159AE00000
4. Answer of NYISO, Inc. to the July 28, 2022 Order to Show Cause under EL22-64: https://elibrary.ferc.gov/eLibrary/filedownload?fileid=03C684D6-CA3C-CD34-9E2A-8415B3E00000
5. MISO Credit for FTR and ARR Obligations: https://www.misoenergy.org/markets-and-operations/market-participation/credit/#2978Tab2
6. Revisions to PJM's FTR Credit Requirement: https://elibrary.ferc.gov/eLibrary/filedownload?fileid=AADD92CF-4388-C3EA-9F7D-812B53800000
7. ERCOT Congestion Revenue Rights Protocols, section 7.5.5.3: https://www.ercot.com/files/docs/2021/08/01/07-020123_Nodal.docx:

The FERC, RTO/ISOs and FTR market participants are actively examining these varying FTR risk management approaches

- **FERC Show Cause Orders: EL22-62-000 (CAISO), EL22-63-000 (ISONE), EL22-64-000 (NYISO), EL22-65-000 (SPP)**
  - FERC has issued orders for the RTO/ISOs listed above to show cause why their risk management approaches are not unjust and unreasonable in the absence of:
    - Mark-to-auction mechanisms for the calculation of market participants' FTR collateral requirements
    - Volumetric minimum collateral requirements for FTR market participants

- **FERC Notice of Proposed Rulemaking (NOPR) (RM22-13-000)**
  - Would allow electric power market operators to share credit-related information among themselves so they can more accurately assess market participants' credit risks
  - FERC recognized that market participants also transact in markets that are not FERC-jurisdictional, and requested comments on possible frameworks that would allow information sharing amongst both sides
  - Sharing credit-related information could improve RTO/ISO ability to accurately assess market participant risk and could enable them to respond to credit events more quickly and effectively

1. FERC news release: https://www.ferc.gov/news-events/news/ferc-tackles-credit-risk-measures-nopr-show-cause-order
2. Show cause order: https://www.ferc.gov/media/e-2-el22-62-000
3. NOPR: https://www.ferc.gov/media/e-1-rm22-13-000

CFTC exemptive relief of FTR markets does not conflict with RTO/ISO exploration of novel risk management solutions

- CFTC order dated April 2, 2013 exempts RTO/ISOs and their market participants from the provisions of the Commodity Exchange Act and CFTC regulations (except anti-fraud and anti-manipulation provisions) with respect to the FTR markets

- This is an appropriate regulatory solution for FTRs given the unique nature of the FTR market, but should not preclude RTO/ISOs from exploring suitable risk management solutions for their markets, including solutions involving CFTC-jurisdictional entities

Improved risk management of FTRs supports moving toward a carbon-free future

- Renewable generation development (e.g., solar, wind, nuclear as a bridge to renewables) requires financing

- FTRs provide granularity: participants can bid on generator paths that might be hard to find a counterparty for outside the FTR market, offering a trusted hedging approach that ultimately lowers the cost of financing renewable generation projects
  - RTO/ISOs can award FTRs on any permitted path as long as all awards are simultaneously feasible given capacity constraints
  - In other markets, a counterparty would likely charge a premium to trade the specific path of interest, providing the same hedge at higher cost

- A robust risk management solution supports the continued viability of the FTR markets offering granular, long-term products for effective, low-cost hedging

Thank you

nodal

part of eex group

CFTC

COMMODITY FUTURES TRADING COMMISSION

Panel 2: Electric Vehicles and the Effect on Metals Markets

Dan Bowerson, Alliance for Automotive Innovation
George Pullen, CFTC DMO Product Review

Transportation Electrification's Impact on CFTC-regulated Metals Markets

Dan Bowerson, Senior Director, Energy & Environment

CFTC Energy and Environmental Markets Advisory Committee

February 28, 2023

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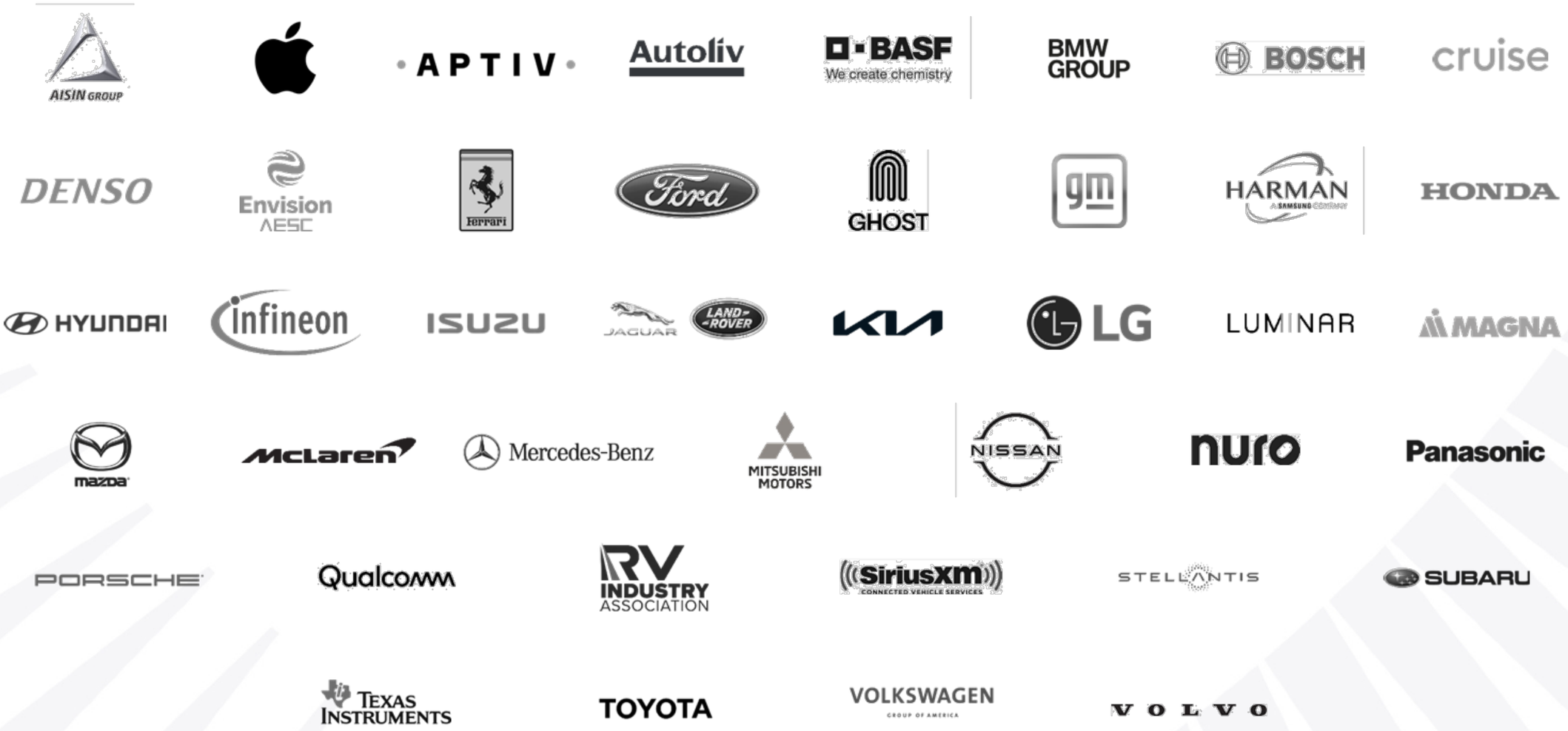
Our Members


AISIN GROUP
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BASF
We create chemistry
BMW GROUP
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Envision AESC
Ferrari
Ford
GHOST
gm
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MAGNA
mazda
McLaren
Mercedes-Benz
MITSUBISHI MOTORS
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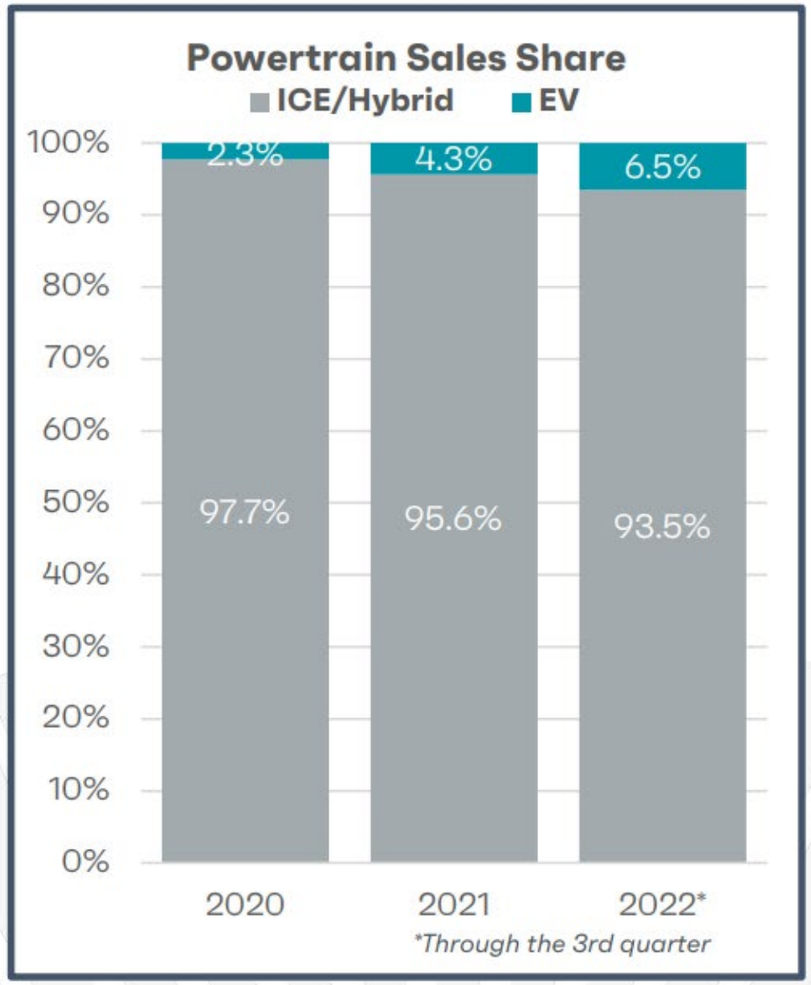
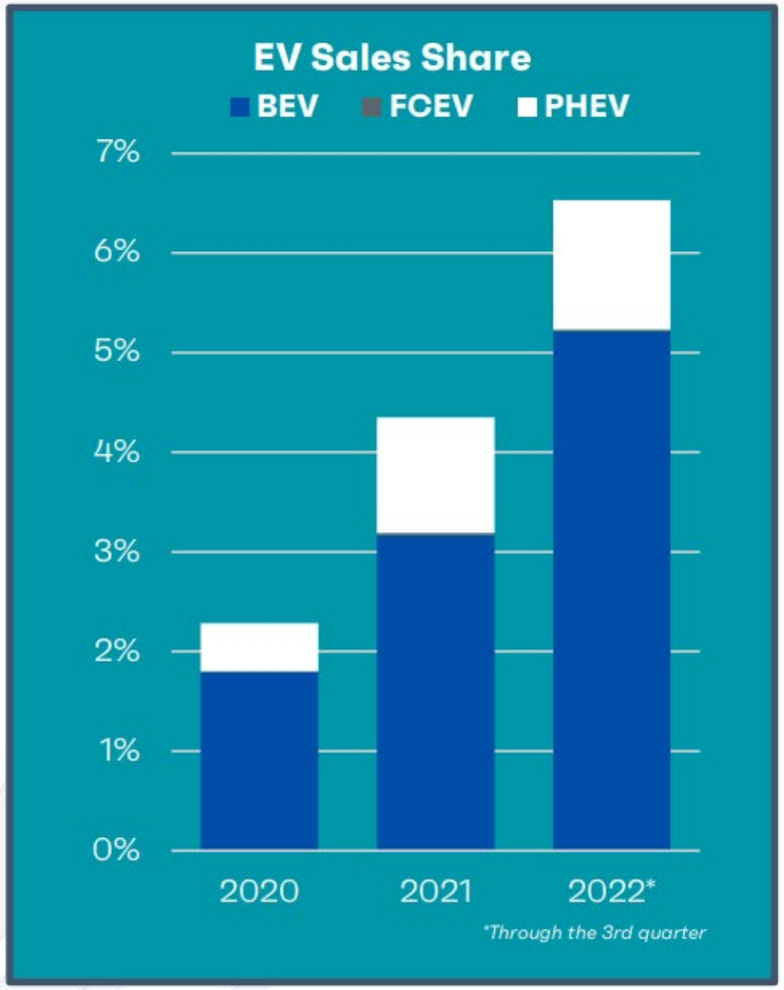
Qualcomm
RV INDUSTRY ASSOCIATION
SiriusXM
CONNECTED VEHICLE SERVICES
STELLANTIS
SUBARU
TEXAS INSTRUMENTS
TOYOTA
VOLKSWAGEN
GROUP OF AMERICA
VOLVO

What are customers buying?





EV Model Availability

86 Vehicle Models Sold in Q3 2022:

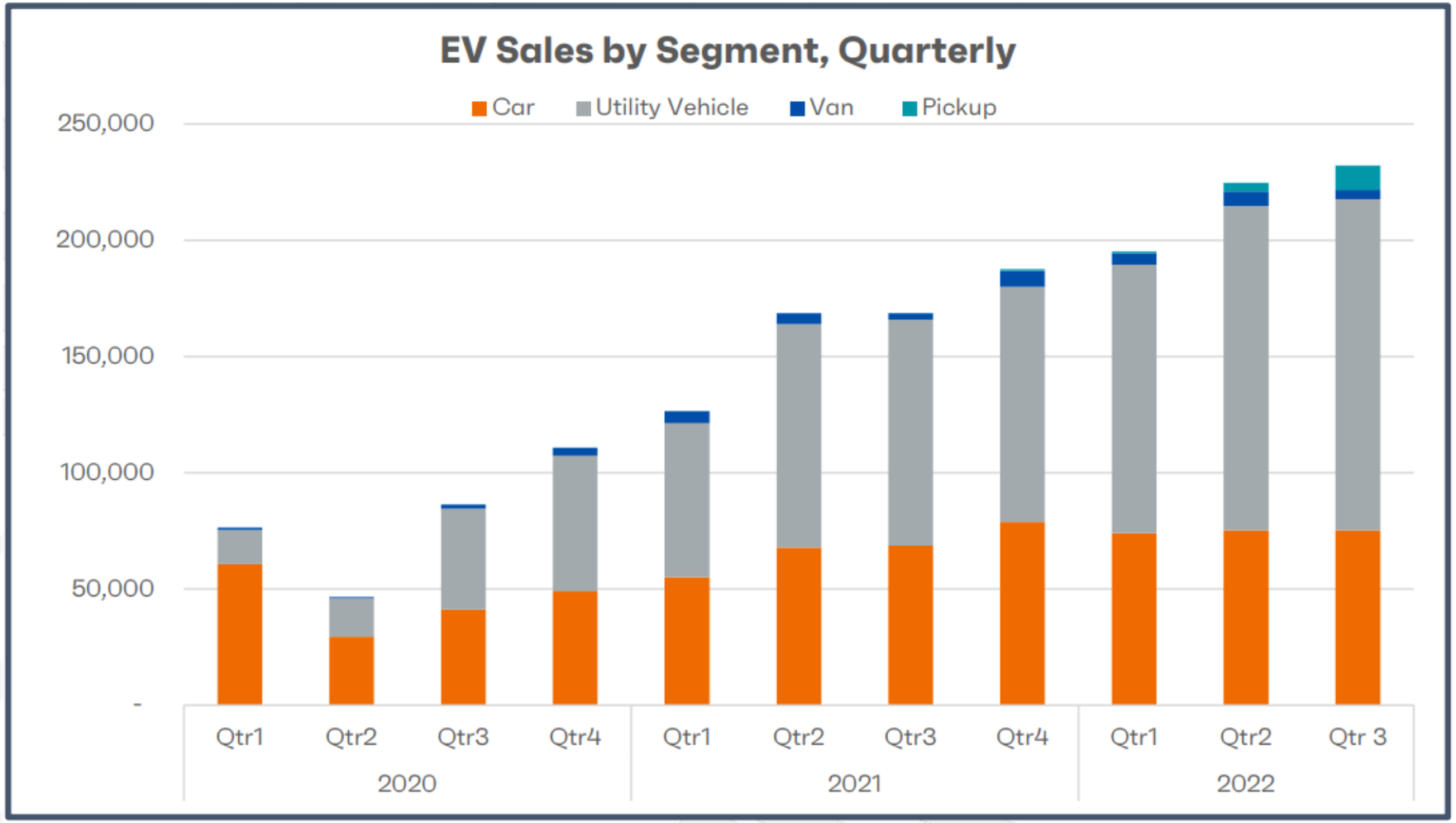
45 Battery Electric Vehicles
- 17 Cars
- 23 Utility Vehicles
- 3 Pickups
- 2 Vans

39 Plug-in Hybrid Vehicles
- 17 Cars
- 21 Utility Vehicles
- 1 Van

2 Fuel Cell Electric Vehicles
- 1 Cars
- 1 Utility Vehicle

Source: https://www.autosinnovate.org/posts/papers-reports/Get%20Connected%20Electric%20Vehicle%20Quarterly%20Report%202022%20Q3.pdf

What are customers buying?



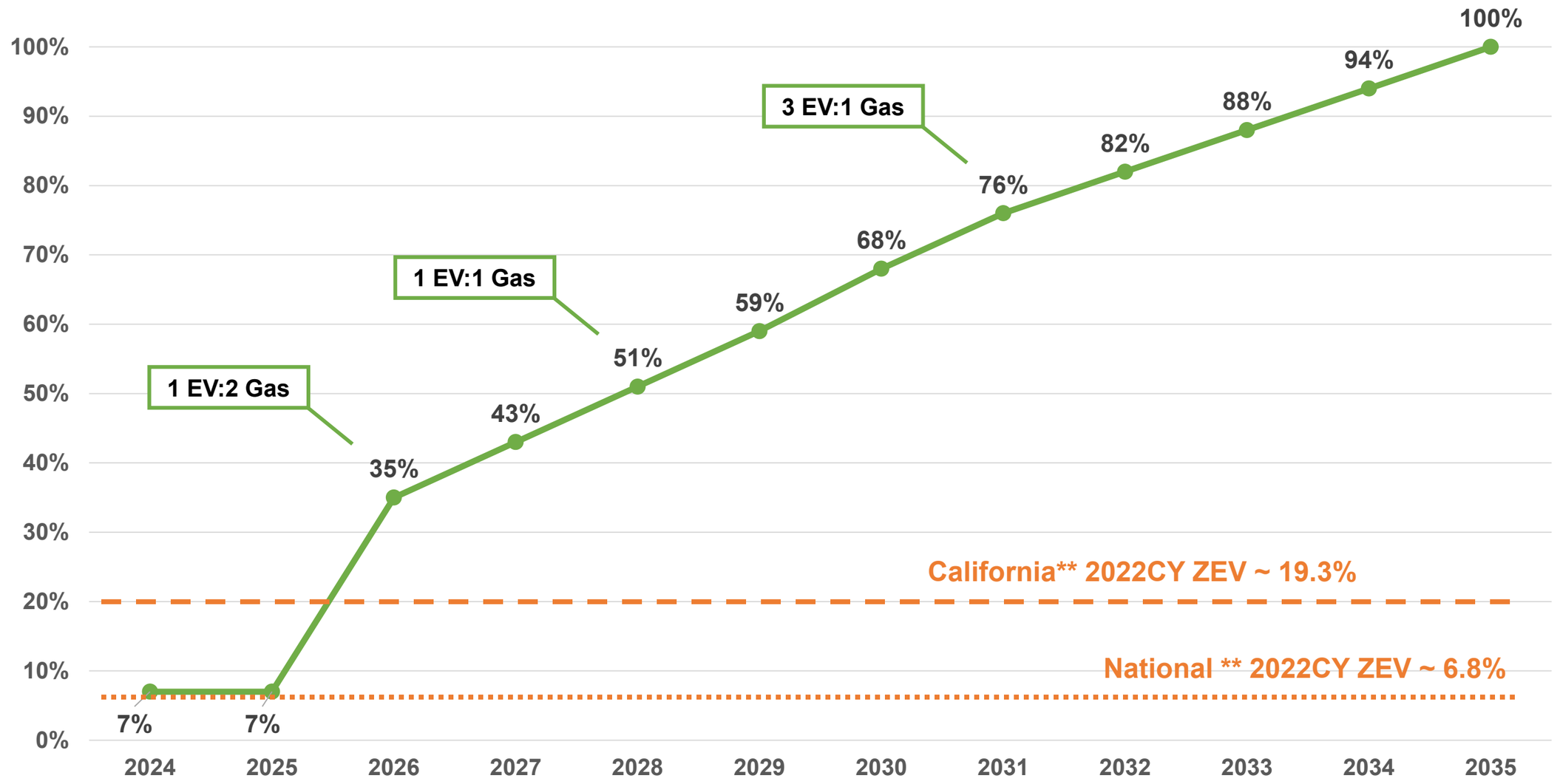
Larger Vehicles = Larger Batteries

Source: https://www.autosinnovate.org/posts/papers-reports/Get%20Connected%20Electric%20Vehicle%20Quarterly%20Report%202022%20Q3.pdf

1 Tailpipe, 3 Agencies, 6 Regulations

	California Advanced Clean Cars (ACC I)	U.S. EPA	NHTSA
	GHG, 2021-25MY (GHG, Fuel Economy) Adopted 2012	**GHG, 2023-26MY** (GHG, Fuel Economy) Adopted Dec, 2021	**CAFE, 2024-26MY** (Fuel Economy) Adopted Apr 2022
August 2022 Update to ACC 2.0	**LEV III, 2015-25MY** (Criteria Emissions) Adopted 2012	**Tier 3, 2017-25MY** (Criteria Emissions) Adopted 2012	
August 2022 Update to ACC 2.0	**ZEV, 2015-25** (Criteria Emissions, GHG, Fuel Economy) Adopted 2012		

California ACC II – ZEV Mandate



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* See, https://www.coxautoinc.com/wp-content/uploads/2023/02/Jan-2023-Kelley-Blue-Book-Average-Transaction-Price-data-tables.pdf

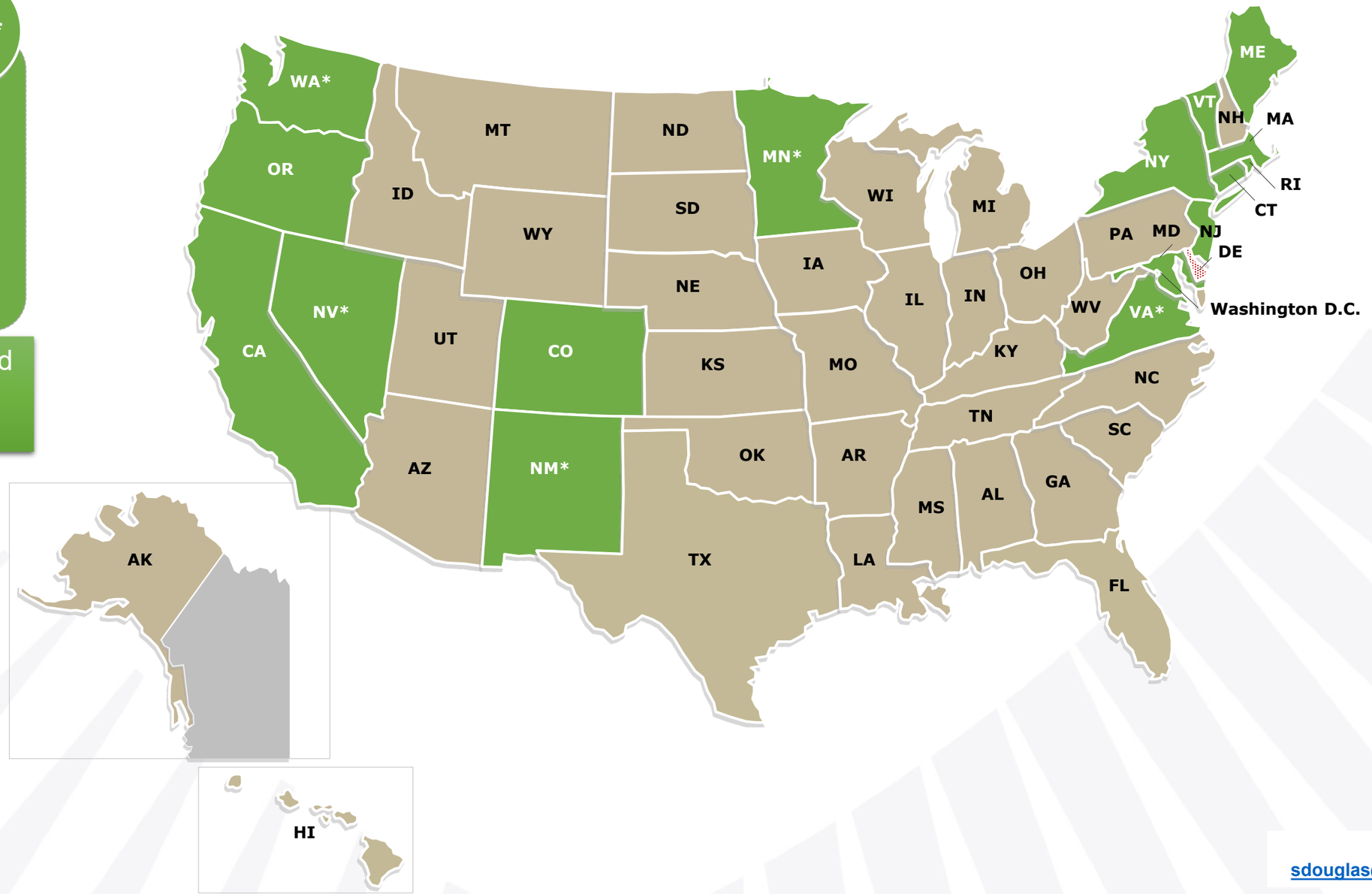
** Thru, Sep 2022, See https://www.autosinnovate.org/resources/electric-vehicle-sales-dashboard

ZEV States (~ 35% of U.S. Market)

16 Existing ZEV States*

- CA
- CO
- CT
- MA
- MD
- ME
- MN*
- NJ
- NM*
- NY
- NV*
- OR
- RI
- VA*
- VT
- WA*

Most of these states will need to officially adopt ACC II or revert to Federal standards.



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Steve Douglas
sdouglas@autosinnovate.org

1 Tailpipe, 3 Agencies, 6 Regulations

California Advanced Clean Cars (ACC I)	U.S. EPA	NHTSA
GHG, 2021-25MY (GHG, Fuel Economy) Adopted 2012	**GHG, 2023-26MY** (GHG, Fuel Economy) Adopted Dec, 2021	**CAFE, 2024-26MY** (Fuel Economy) Adopted Apr 2022
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ZEV, 2015-25 (Criteria Emissions, GHG, Fuel Economy) Adopted 2012		

March 2023 Update*

March 2024 Final

*** President Biden EO 14037 set a goal of 50% ZEV by 2030.**

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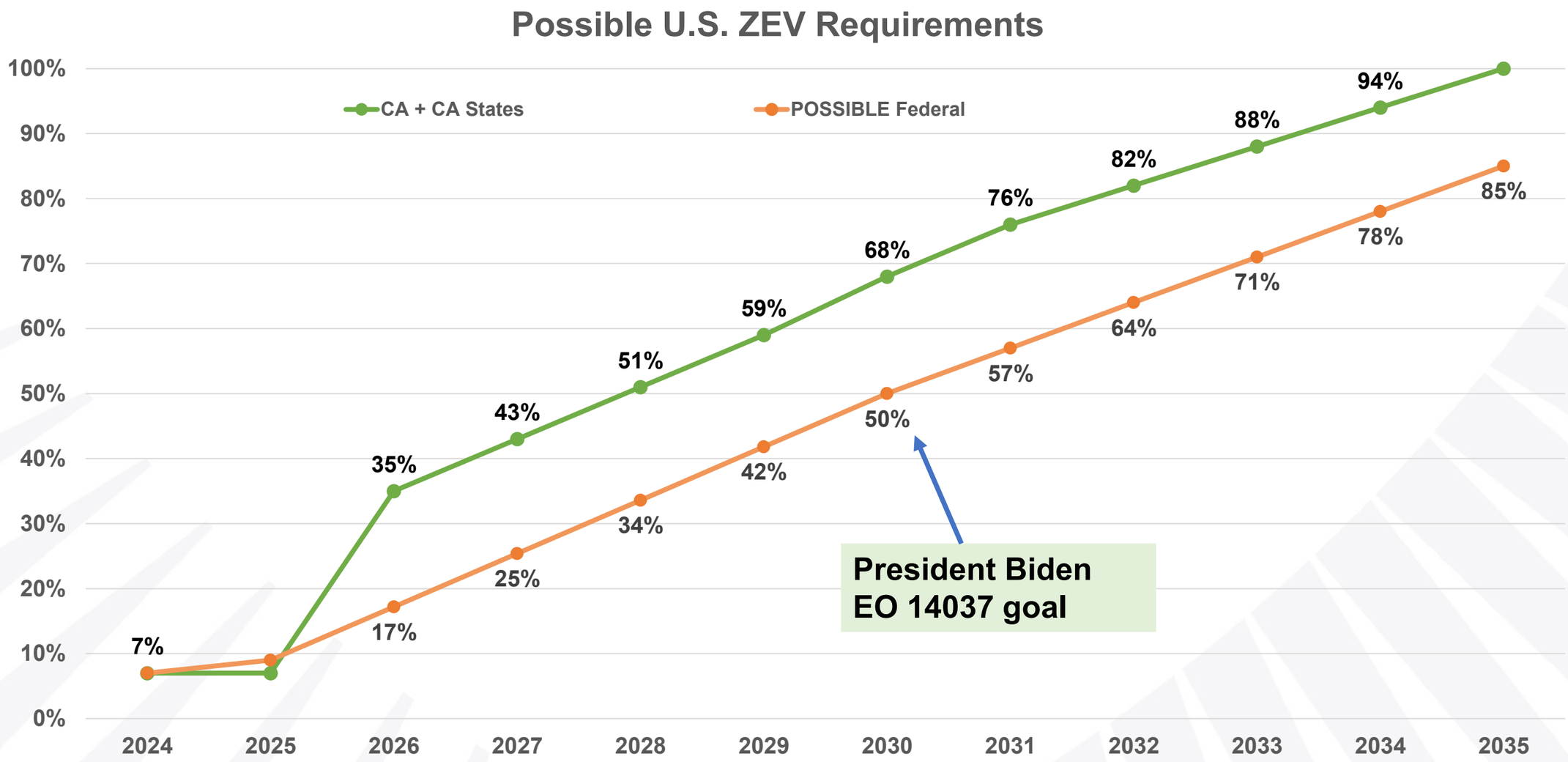
Possible Combined U.S. EV Requirement



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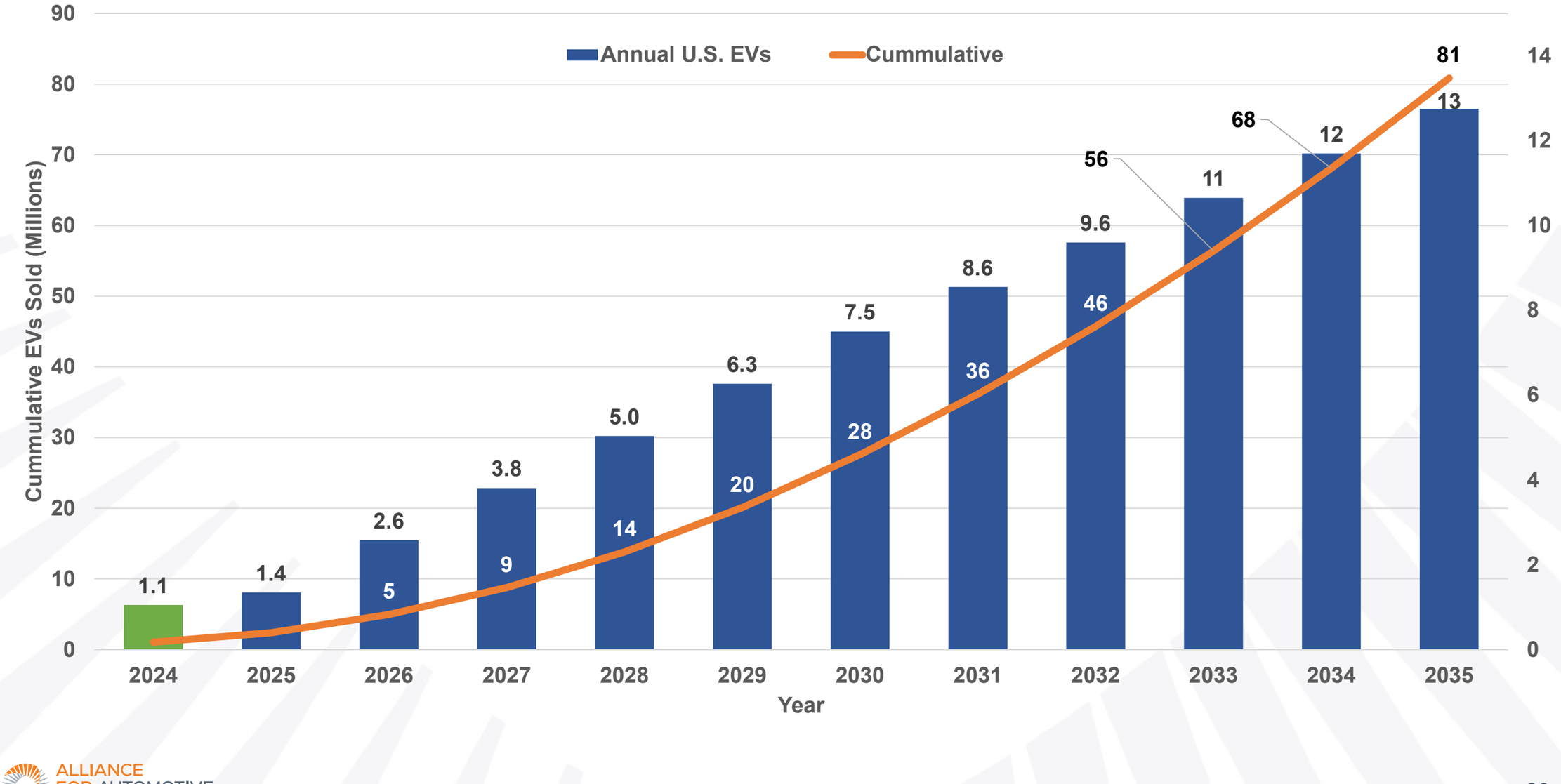
80 Million EVs ~ 6 Billion kWh (6 TWh) of batteries*



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* Assumes 75 kWh/vehicle

We Are Not Alone

Europe & China Gas Cars 2035

- February 14, 2023: EU Parliament approves law banning gas and diesel cars by 2035
- October 2020: China will require 50% EVs by 2035 (other 50% HEVs)*
- EU = U.S. New vehicle sales
- China ~ 1.3 x U.S. New Vehicle sales
- (EU + China + U.S.) 2035 ~ 2.7 x current U.S. demand

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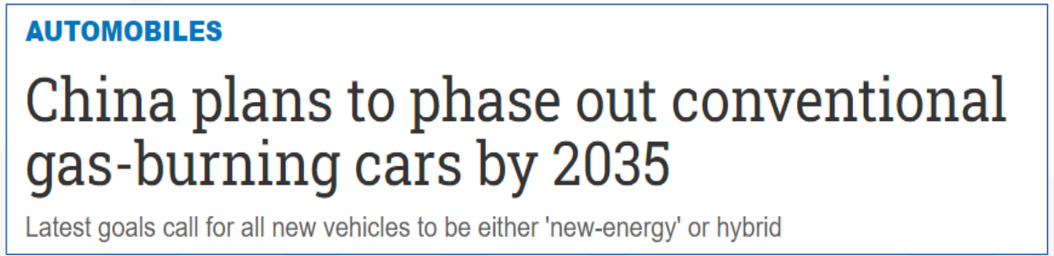


AUTOMOBILES

China plans to phase out conventional gas-burning cars by 2035

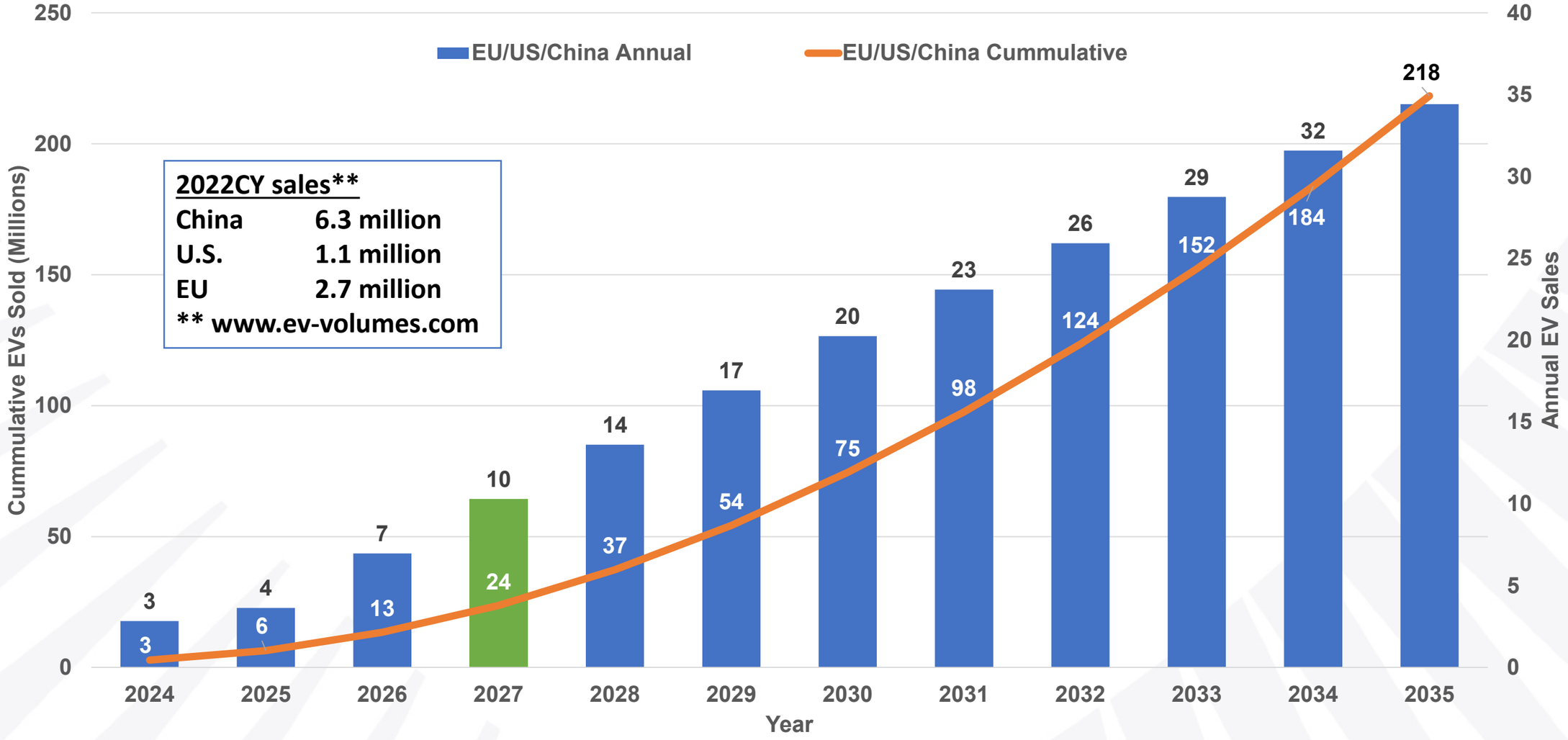
Latest goals call for all new vehicles to be either 'new-energy' or hybrid

2 minute read · February 14, 2023 7:57 AM PST · Last Updated 5 days ago

EU lawmakers approve effective 2035 ban on new fossil fuel cars

By Kate Abnett

Minimum: U.S. + EU + China
216 Million EVs ~ 16 Billion kWh (16 TWh) of batteries*



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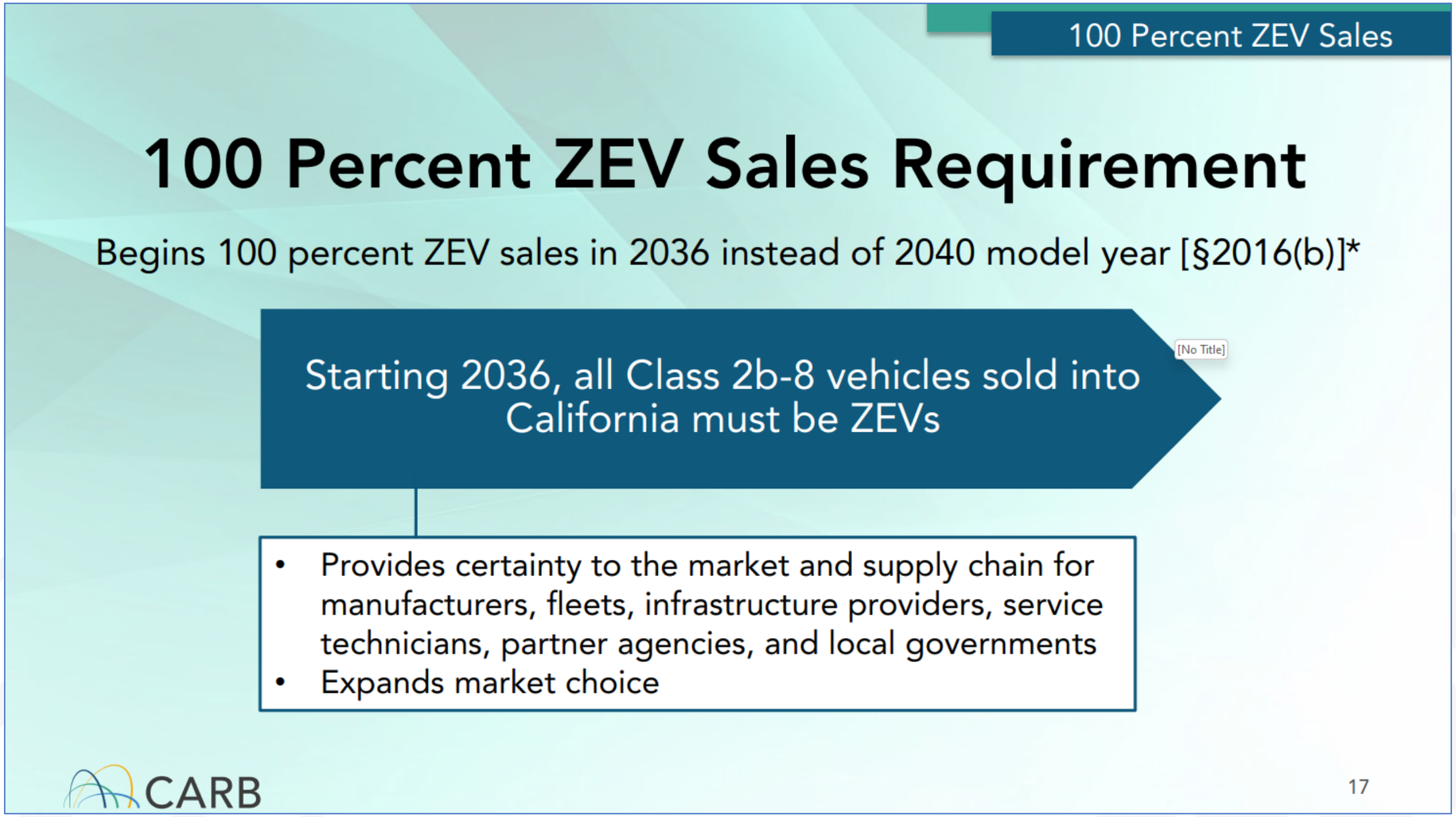
* Assumes 75 kWh/vehicle

California Heavy-Duty ZEV Mandate (Class 2B-8)*



13-Feb-2023: CARB proposed requirement.
https://ww2.arb.ca.gov/sites/default/files/2023-02/acfpres230213_ADA.pdf

The Race to Electrify Everything

The Global Competition to Electrify Everything

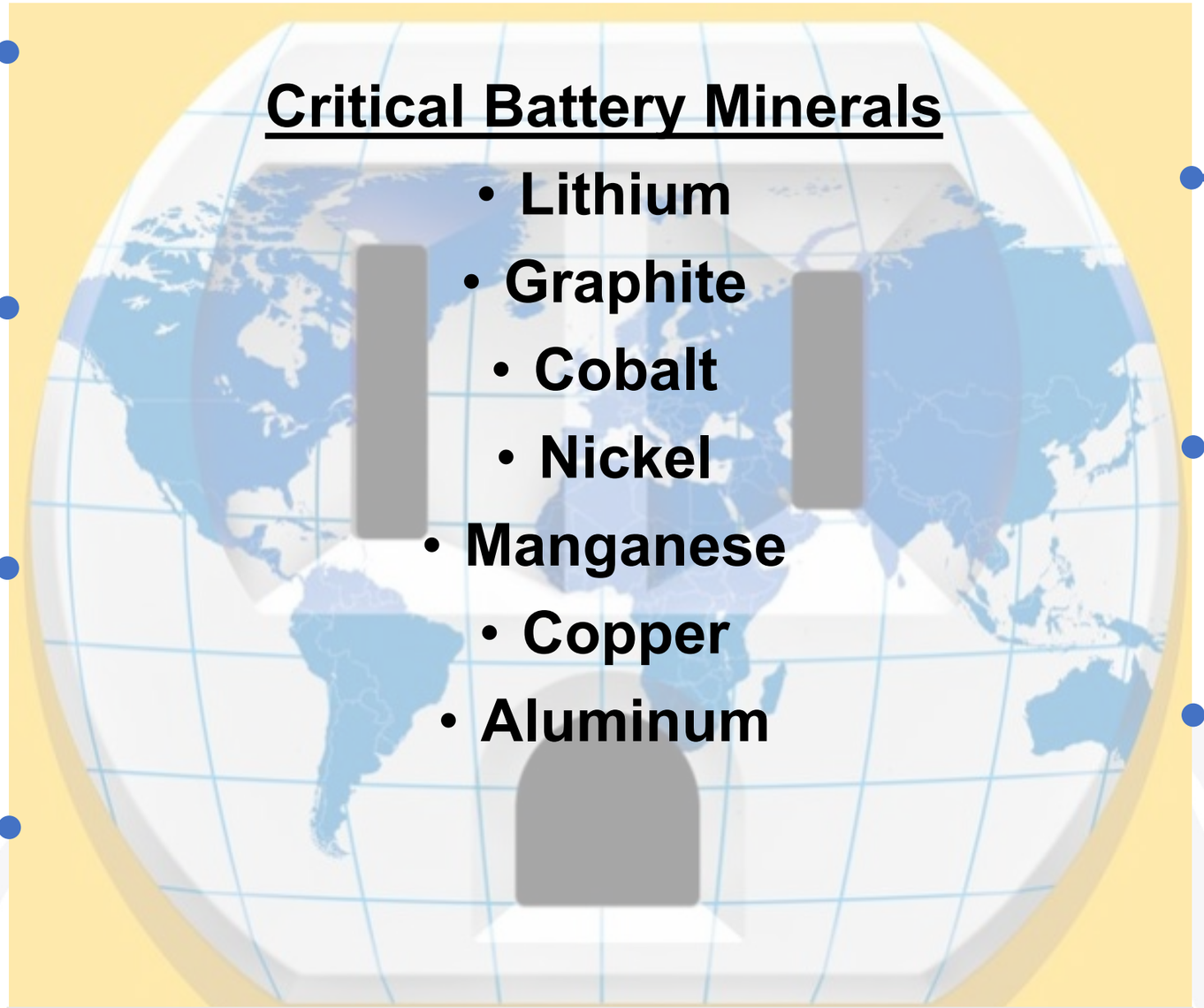
Test for Electrification: Does It Move? Or even if it doesn't…

Large Off-Road Vehicles

Light-Duty Vehicles

Traditional (phones, laptops)

Stationary Source Energy Storage



Heavy-Duty Vehicles

Small Off-Road (e.g., lawn & garden)

e-Bikes, Scooters

Image source: https://www.wsj.com/articles/electrification-of-everything-11620843173

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Conditions Necessary For a Successful Transformation

Conditions for EV Transformation

Residential infrastructure
- Equitable charging for those not living in a single-family home

Hydrogen fuel roll out in CA and beyond
- Woefully lacking – 53/54 public H2 stations are in CA

Public infrastructure (NEVI, PUC, public, etc.)
- $7.5B in NEVI is a good starting point, more continues to be needed.

Battery production facilities and battery critical mineral supply chain
- Over $100B committed to investing in domestic battery and EV production*

Incentives – federal (IRA) and state
- 30D split with battery component and critical mineral content requirements
- EV cost continues to be a challenge

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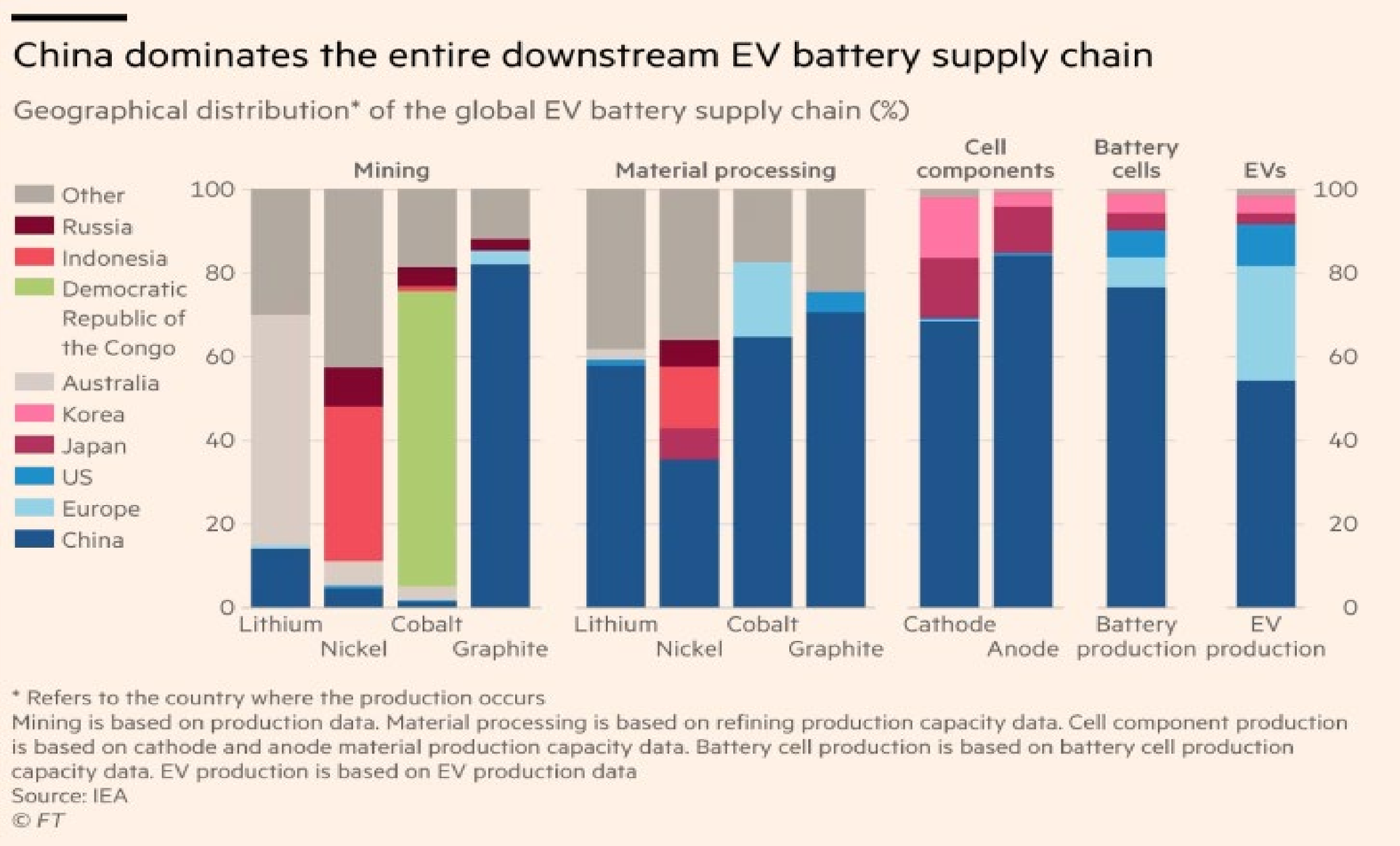
* Source: https://www.autosinnovate.org/committees/communications/The%20Future%20Is%20Electric%20Infographic_copy_1

Today's Battery Supply Chain*



Source: *J. Miller, H. Dempsey (2022, August 10), Carmakers' battery plans in peril as raw material costs soar. *Financial Times,* https://www.ft.com/content/b4002e49-07ce-41d8-9d3b-b6ed55af798c

Inflation Reduction Act (IRA)

Inflation Reduction Act

Manufacturing and Supply Chain

- 45X Manufacturing tax credits ($30.6 billion budget score)
- Advanced Technology Vehicle Manufacturing loans ($3 billion)
- Domestic manufacturing conversion grants ($2 billion)
- Defense Production Act to spur onshoring of critical minerals ($500 million)

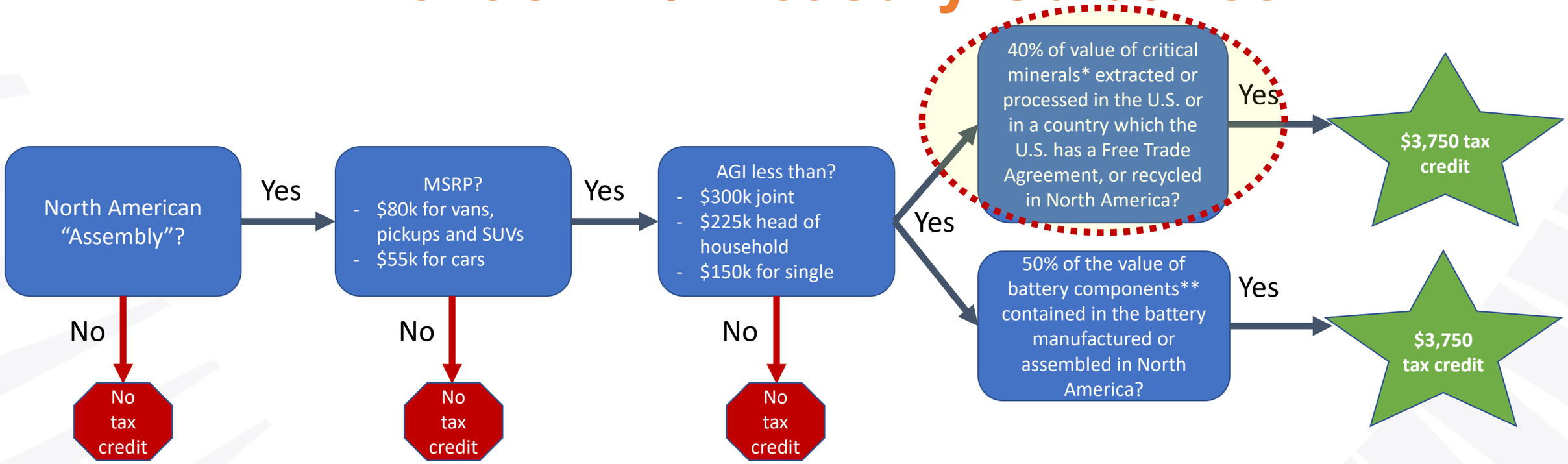
Infrastructure

- 30C Alternative Fuel Refueling Property Credit ($1.7 billion budget score)
- 48C Advanced Energy Project Credit ($6.3 billion budget score)

Customer Incentives

- 30D Clean Vehicle Tax Credit ($7.5 billion budget score)
  - Up to $7,500 per vehicle
  - Removes per manufacturer cap on credits
  - Requires N. American production
  - Adds income and MSRP limits
  - N. American battery and component manufacturing requirements
  - Critical mineral sourcing / processing restrictions
- 45W Qualified Commercial Vehicle Tax Credit ($1.3 billion budget score)
  - Light vehicles qualify for up to $7,500 per vehicle
  - Commercial lessors of personal vehicles can qualify
- 25E Previously-Owned Clean Vehicle Tax Credit ($1.3 billion budget score)

Retail – New EV Tax Credit (30D)
2023CY w/ Treasury Guidance



*Critical Minerals:
- Before CY2024 – 40%
- 2024 – 50%
- 2025 – 60%
- 2026 – 70%
- After 2026 – 80%

**Battery Components:
- Before CY2024 – 50%
- 2024-2025 – 60%
- 2026 – 70%
- 2027 – 80%
- 2028 – 90%
- After Dec. 31, 2028 – 100%

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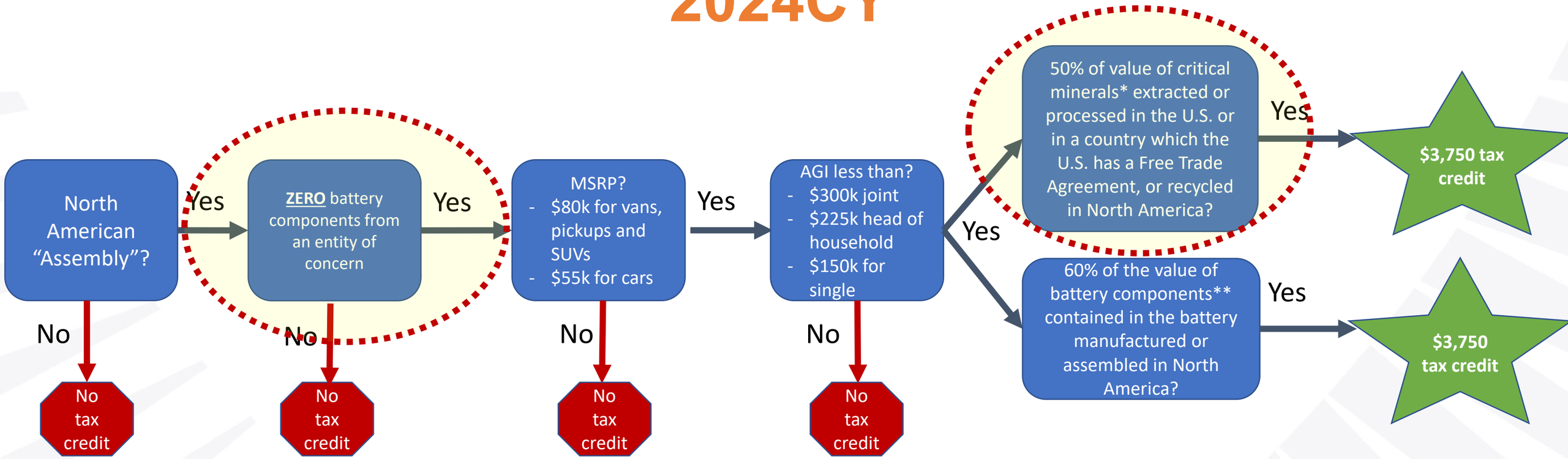
Notes:
1. The above is Auto Innovators staff interpretation of legislative language and issuance of Treasury draft guidance to no later than December 31, 2022
2. MSRP and AGI are not indexed to inflation. AGI is calculated for two tax periods (purchase year + prior tax year)
3. Critical Minerals: Calculated as the value of the critical minerals contained in such a battery as certified by OEM
4. Battery Components: Calculated as the value of components contained in such a battery as certified by OEM
5. Excluded entities:
   - Starting January 1, 2024, no components contained in a battery of such vehicle can be manufactured or assembled by an entity of concern.
   - Starting January 1, 2025, no applicable critical minerals contained in a battery can be extracted, processed, or recycled by a foreign entity of concern
6. Aggregate battery capacity must be greater than 7 kWh
7. Transfer of Credit not available to auto dealer until January 2024

Retail – New EV Tax Credit (30D)
2024CY



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**Battery Components:
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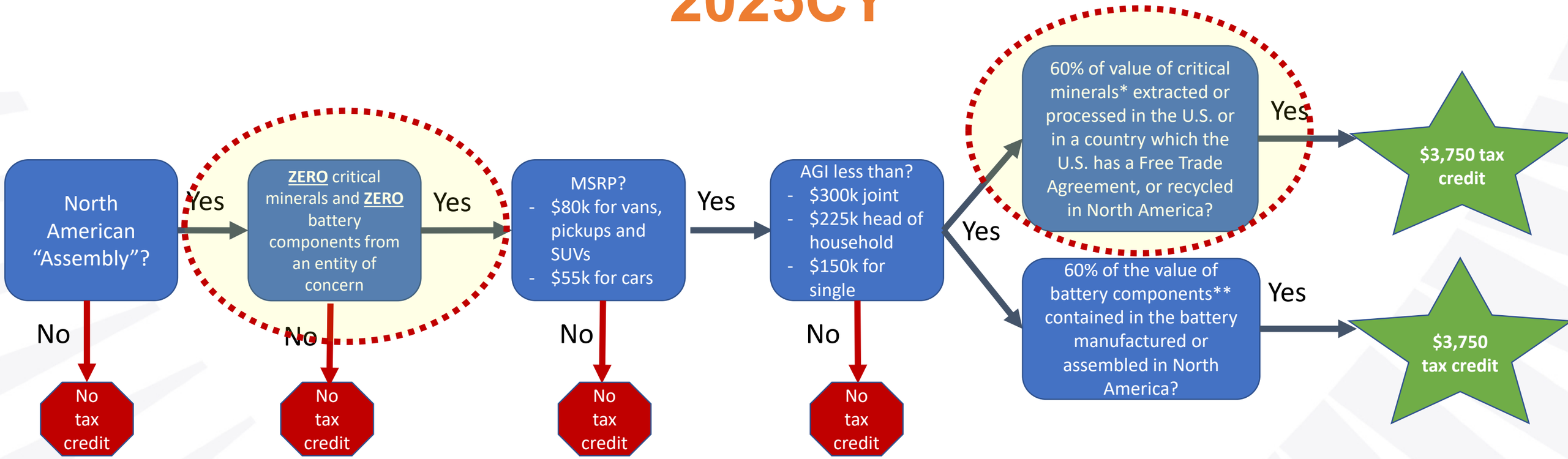
- 2024-2025 – 60%
- 2026 – 70%
- 2027 – 80%
- 2028 – 90%
- After Dec. 31, 2028 – 100%

ALLIANCE FOR AUTOMOTIVE INNOVATION

Notes:

1. All of the above is Auto Innovators staff interpretation of legislative language and pending Department of Treasury draft guidance to be issued no later than December 31, 2022
2. MSRP and AGI are not indexed to inflation. AGI is calculated for two tax periods (purchase year + prior tax year)
3. Critical Minerals: Calculated as the value of the critical minerals contained in such a battery as certified by OEM
4. Battery components: Calculated as the value of components contained in such a battery as certified by OEM
5. Excluded entities:
   - Starting January 1, 2024, no components contained in a battery of such vehicle can be manufactured or assembled by an entity of concern. This makes a vehicle placed in service after 12/31/2023 ineligible
   - Starting January 1, 2025, no applicable critical minerals contained in a battery can be extracted, processed, or recycled by a foreign entity of concern
6. Aggregate battery capacity must be greater than 7 kWh
7. Transfer of Credit to auto dealer available starting January 2024

Retail – New EV Tax Credit (30D)
2025CY



*Critical Minerals:
- Before CY2024 – 40%
- 2024 – 50%
- 2025 – 60%
- 2026 – 70%
- After 2026 – 80%

**Battery Components:
- Before CY2024 – 50%
- 2024-2025 – 60%
- 2026 – 70%
- 2027 – 80%
- 2028 – 90%
- After Dec. 31, 2028 – 100%

ALLIANCE FOR AUTOMOTIVE INNOVATION

Notes:

1. All of the above is Auto Innovators staff interpretation of legislative language and pending Department of Treasury draft guidance to be issued by the end of December 2022
2. MSRP and AGI are not indexed to inflation
3. Critical minerals are calculated as the critical minerals contained in such a battery as certified by the manufacturer
4. Battery components are calculated as the value of components contained in such a battery as certified by the manufacturer
5. Excluded entities (China, Russia, Iran, North Korea):
   - Starting Jan. 1, 2024, no components contained in a battery of such vehicle can be manufactured or assembled by an entity of concern. This makes a vehicle placed in service after 12/31/2023 ineligible
   - Starting Jan. 1, 2025, no applicable critical minerals contained in a battery can be extracted, processed, or recycled by a foreign entity of concern. Vehicle placed in service after 12/31/2024 is ineligible.
6. Aggregate battery capacity must be greater than 7 kWh

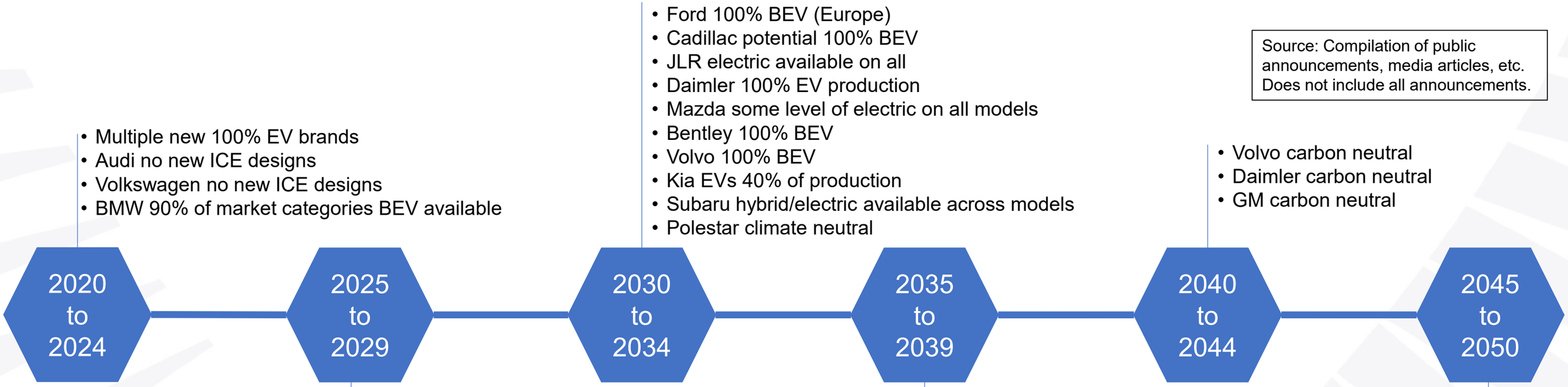
ALLIANCE
FOR AUTOMOTIVE
INNOVATION

Transforming Personal Mobility

Dan Bowerson
Senior Director, Energy & Environment
dbowerson@autosinnovate.org

Automaker Announcements, Goals, and Aspirations

Source: Compilation of public announcements, media articles, etc. Does not include all announcements.



- Multiple new 100% EV brands
- Audi no new ICE designs
- Volkswagen no new ICE designs
- BMW 90% of market categories BEV available

- Ford $29 billion investment by 2025
- Mini all new models EV
- GM $27 billion investment by 2025
- GM 40% of models EV; 20 EVs in N.A.
- Cadillac 100% EV available
- Jaguar 100% EV
- Bentley 100% plug-in
- Jeep 100% plug-in available
- Toyota 60 new hybrid/electric/fuel cell vehicles
- Volvo 50% of global sales EVs

- Ford 100% BEV (Europe)
- Cadillac potential 100% BEV
- JLR electric available on all
- Daimler 100% EV production
- Mazda some level of electric on all models
- Bentley 100% BEV
- Volvo 100% BEV
- Kia EVs 40% of production
- Subaru hybrid/electric available across models
- Polestar climate neutral

- GM 100% BEV

- Volvo carbon neutral
- Daimler carbon neutral
- GM carbon neutral

Carbon neutral / near- or net-zero: Ford, Nissan, VW, Honda, Mazda, Toyota, Mitsubishi

All signs point towards industry-wide electrification

ALLIANCE FOR AUTOMOTIVE INNOVATION

Minerals needed for 281 TWh of Li-Ion Batteries*

CFTC will cover

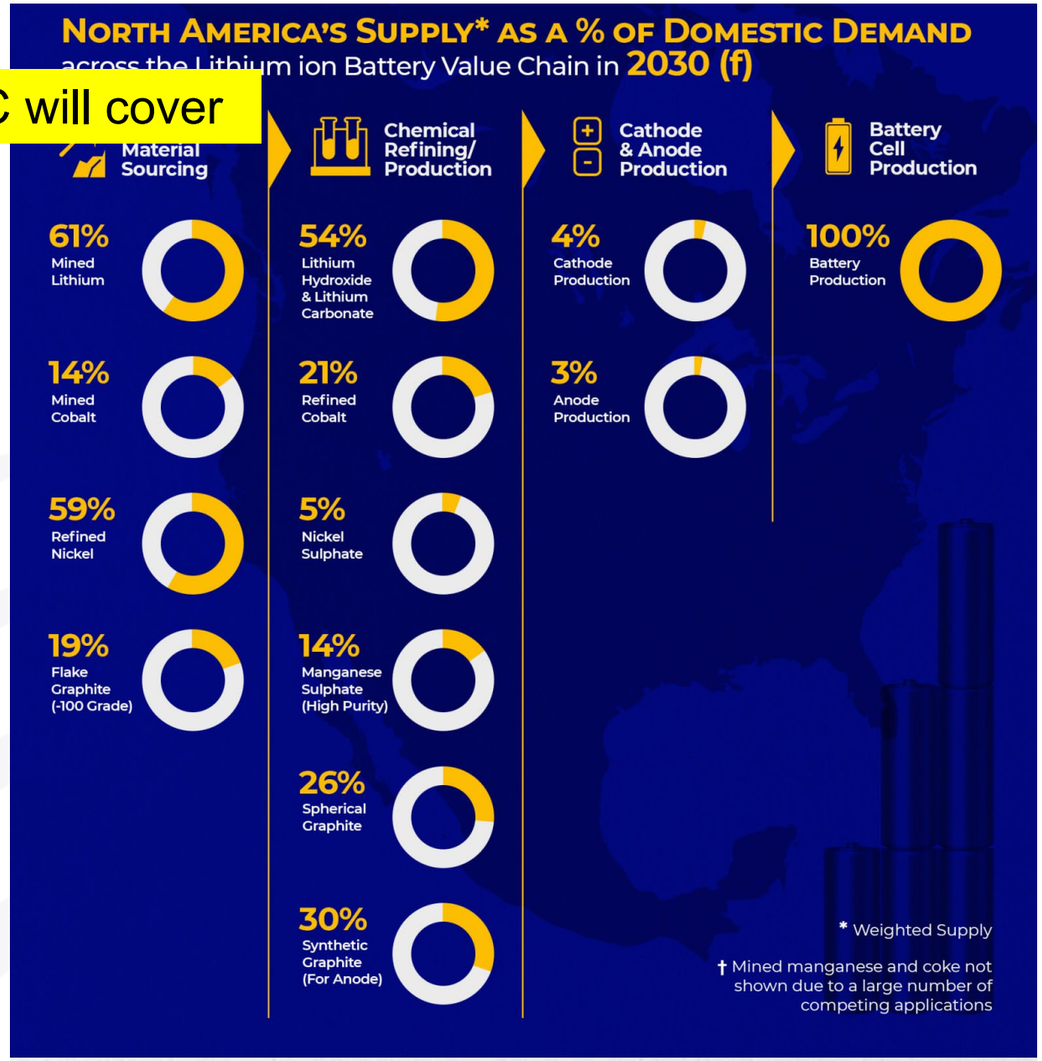
Mineral	Kg per kWh	Million Metric Tons for 281 TWh
Graphite	0.87	244
Aluminum	0.58	164
Nickel	0.48	136
Copper	0.33	94
Steel	0.33	94
Manganese	0.17	47
Cobalt	0.13	37
Lithium	0.10	28
Iron	0.08	23

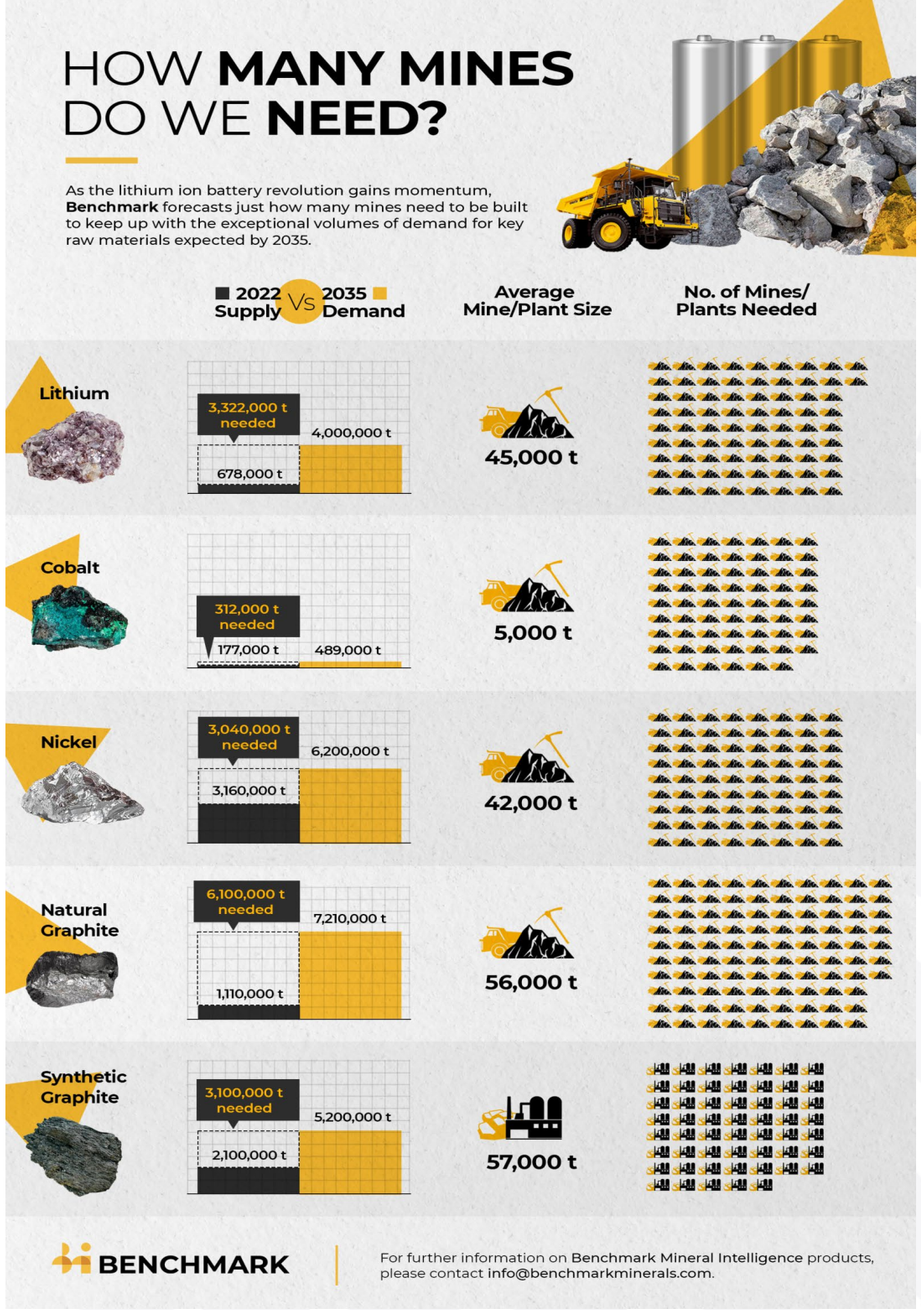
ALLIANCE FOR AUTOMOTIVE INNOVATION

*Based on the sales-weighted average of EV batteries in 2020. See https://elements.visualcapitalist.com/the-key-minerals-in-an-ev-battery/

Supply Chain – Still A Challenge

CFTC will cover





Sources:

- Benchmark Minerals Intelligence, "Can North America Build a Battery Supply Chain?" (Nov. 17, 2022) https://source.benchmarkminerals.com/article/can-north-america-build-a-battery-supply-chain
- Benchmark Minerals Intelligence, "More than 300 new mines required to meet battery demand by 2035", https://source.benchmarkminerals.com/article/more-than-300-new-mines-required-to-meet-battery-demand-by-2035

CFTC

COMMODITY FUTURES TRADING COMMISSION

Division of Market Oversight: Product Review Branch

Electrified Vehicle Market Derivatives Summary

EEMAC Meeting February 28, 2023

The analyses and views expressed here are those of the authors and do not necessarily reflect the views of the Commission or CFTC staff.

This presentation is for its intended audience only.

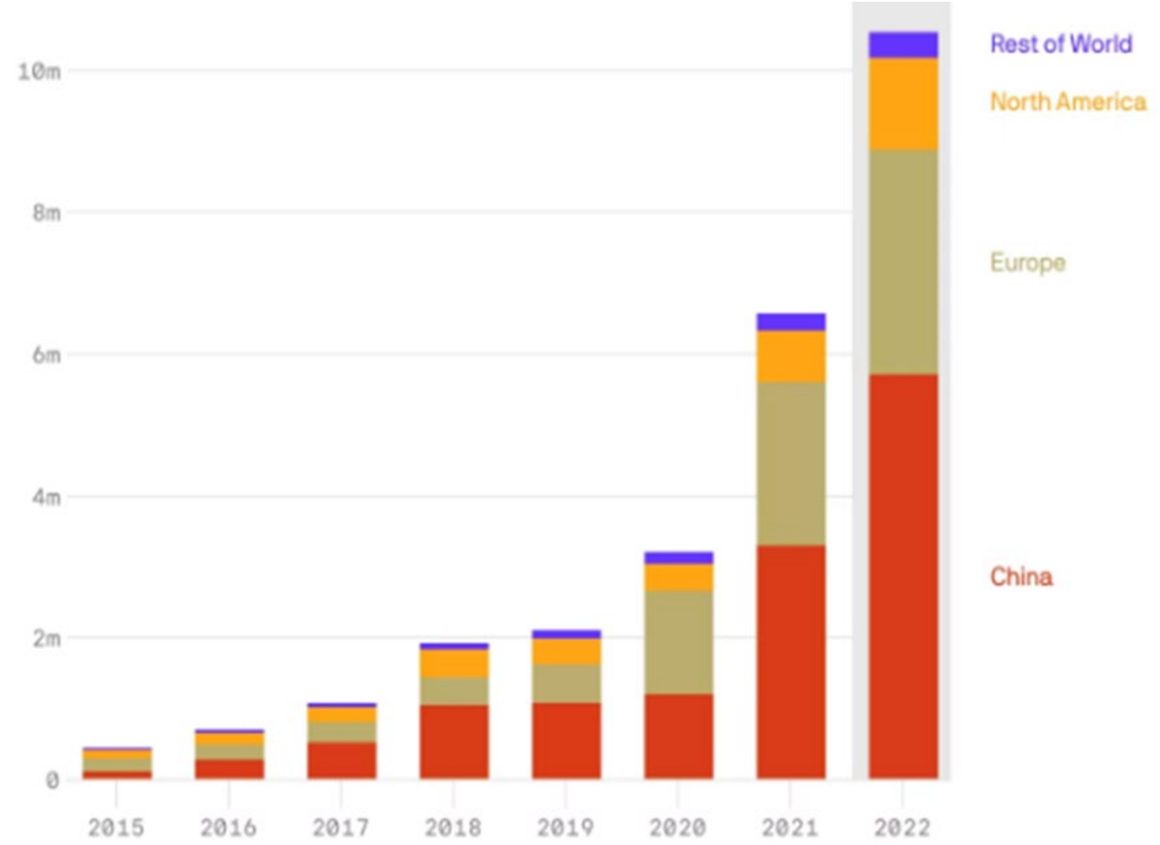
Macro: EV Sales Growth

Worldwide

- 10M+ BEVs & PHEVs sold in 2022 which was 14% of all new auto purchases
- 26.5M EVs are on the roads or 1.8% of the 1.4B total autos

USA

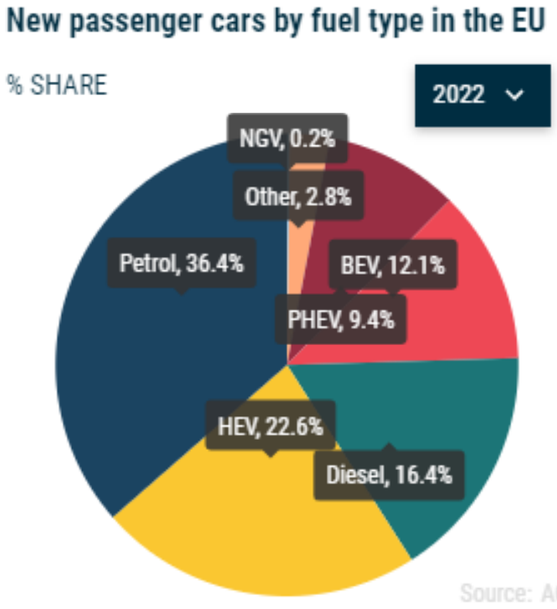
- 807,180 BEVs sold in 2022 which was 5.8% of all new auto purchases
- 2.2M BEVs are on the road or 0.78% of the 290M+ total autos

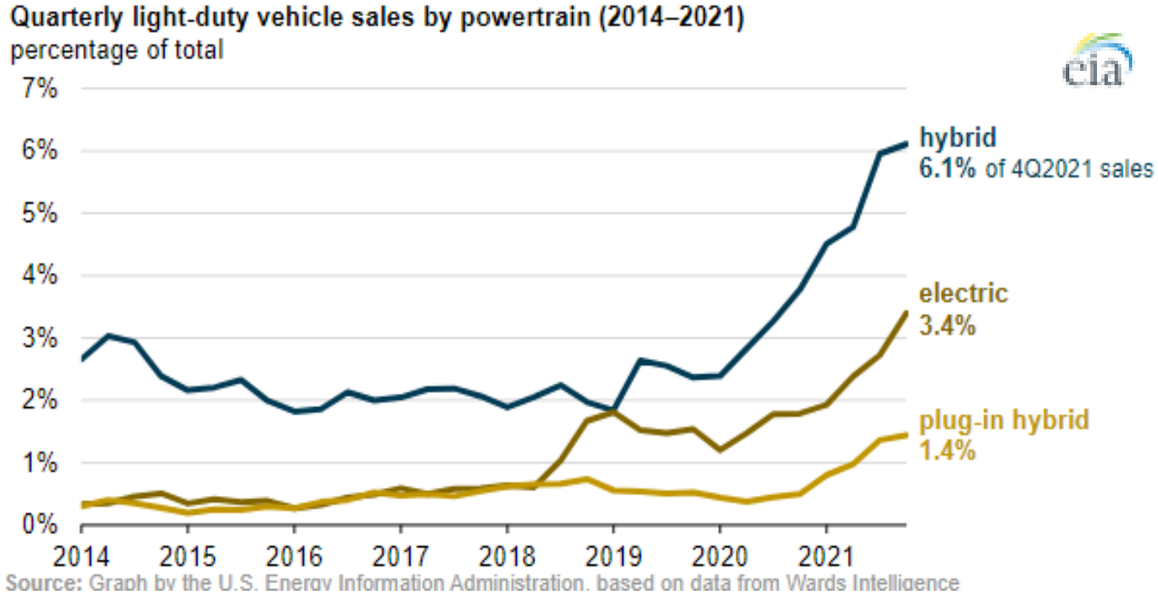


Data: BloombergNEF, MarkLines, Jato, JADA, Motie; Chart: Will Chase/Axios

Macro: EVs & Hybrids

- Hybrids (HEV Hybrid Electric Vehicles) – brake charging electric
- Others

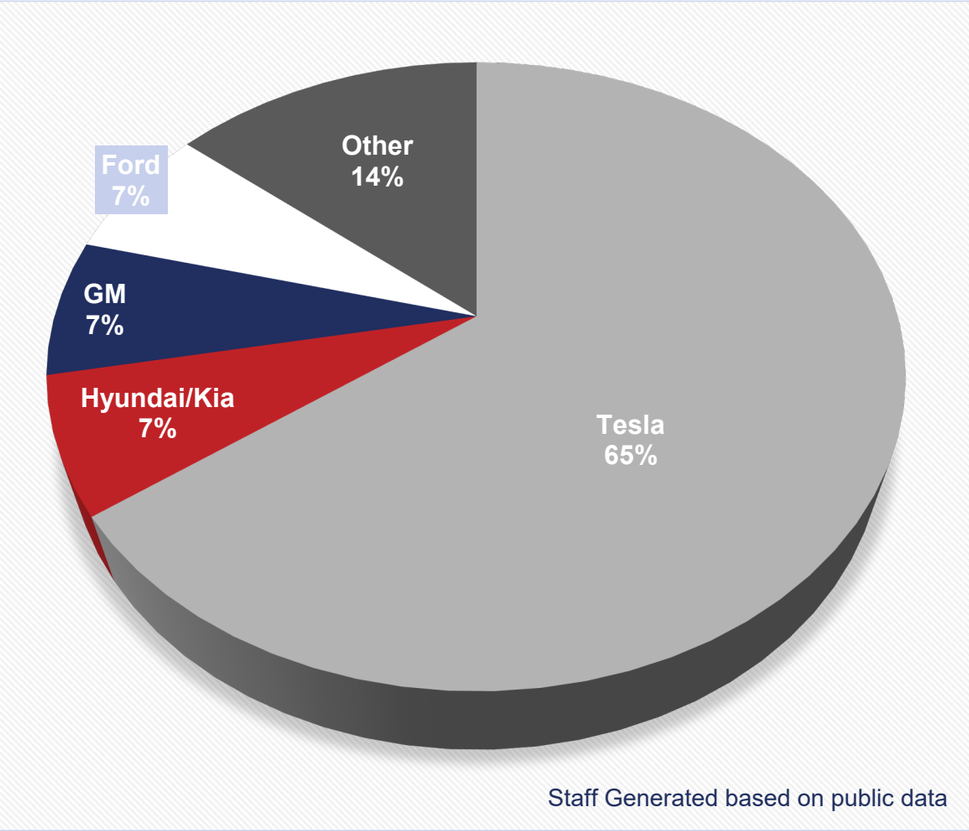




Natural gas (NGV) Other Petrol Diesel
Battery electric (BEV) Plug-in hybrid (PHEV) Hybrid electric (HEV)

Supply and Demand: EV Markets

USA Supply:



Price Average:

- EV $66,000 new (2022)
- ICE $48,000 new
- ICE $31,000 used car

Demand:

- Air Pollution Regs
- HOV Lane Rules
- Tax Credits (State & Fed)
- Charging Station Options
- Urbanization
- Marketing

EV Manufacturers & Derivatives

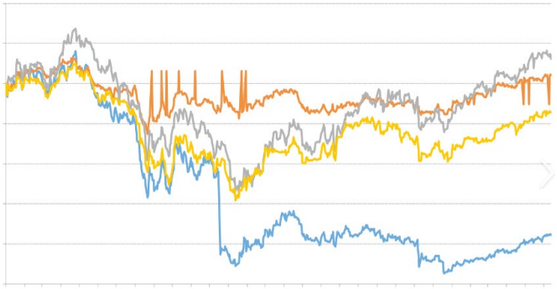
Types of Financial Risk

Foreign Exchange

Interest Rates

Counterparty Credit

Raw Material Prices



EV Manufacturers & Derivatives

Major Types of Financial Risk Continued

Raw Materials
–Financial vs. Physical Settlement

How a Derivatives Market Develop?

- Spot/Cash
- Forwards
- Swaps
- Futures
- Other Sub categories of derivatives (indexes, options, etc.)

EV Manufacturers & Derivatives

Materials	Commodities	Exchange Contract
Plastics	Natural gas, Oil, Ethane, Propane, Ethylene & Propylene	YES
Steel	Hot-Rolled Coil Steel, Iron, Manganese	YES
Aluminum	Aluminum	YES
Rubber	Rubber and Natural Rubber	TOCOM
Graphite	Graphite	NO
Copper	Copper	YES
Cobalt	Cobalt (Fastmarkets Index)	YES
Lithium	Hydroxide Carbonate (Fastmarkets Index)	YES & LME
Lanthanides	REM/REE Elements 57-71 + Sc, Y	NO

EV Regulations & Policy

- EVs are heavily influenced by a regulatory quilt of agencies and departments both Fed & States
- Impacts to and oversight for the various policy touch points impacting EV supply and demand including manufacturing, materials, roads, charging, electricity and more
- Companies also often have self imposed goals for EVs that also must be taken into account

Questions

George Pullen
DMO-PRB
Senior Economist
gpullen@cftc.gov

Closing Remarks

CFTC

COMMODITY FUTURES TRADING COMMISSION

February 28, 2023 Energy and Environmental Markets Advisory Committee

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