POLICY, POLITICS, AND THE MARKET:
IMPACTS ON THE FUTURE OF SOLAR AND THE ENERGY TRANSITION

ALEX WONG, PORTFOLIO MANAGER - RENEWABLES LEAD

AGENDA

- Who is TEA?
- The energy transition and why we are where we are
- Renewables in context
- The messiness of geopolitics
- The Inflation Reduction Act and what it means for public power
- A guide on how to buy renewables right now


MEAG POWER
GRU
More than Energy
santee cooper
TEA
THE EnergyAuthority
Members
JEA
Building Community
City Utilities
Connecting Our Community
AMP
PUBLIC POWER PARTNERS
Nebraska Public Power District
Always there when you need us

~60 Public Power Clients

25,000 MW
of Generation
30,000 MW of
Peak Demand
>375 Bcf of NG/year
~75 Million
MWh/year

30,000 MW

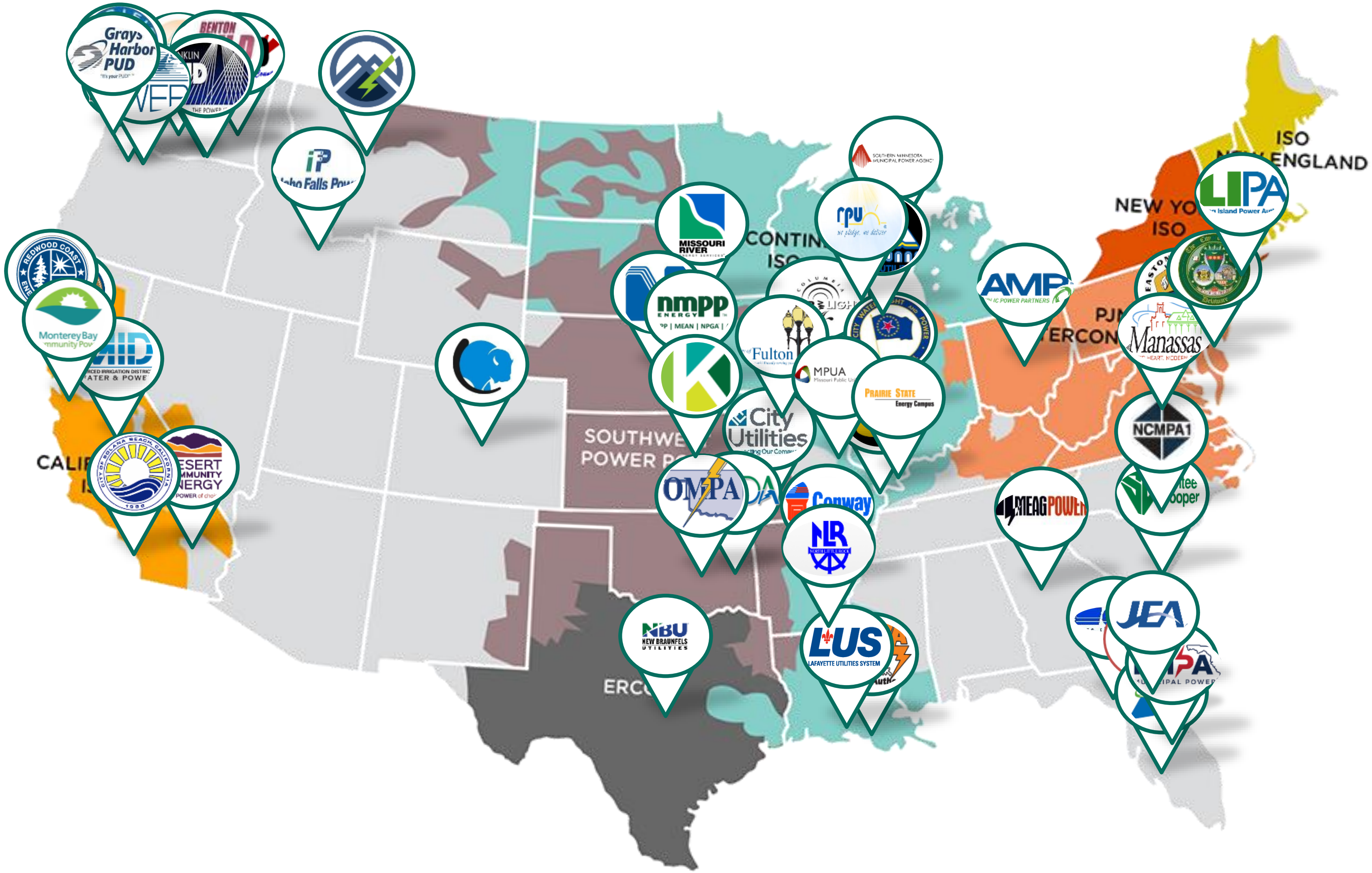
Over
$1.5B in gross
revenues annually
~200 employees
Offices in
Jacksonville, FL
& Seattle, WA

$1.5B

Over 200,000
transactions per year
#1 in volume among
community-owned
entities
Trade across
40 states

#1

ECONOMIES OF SCALE



Grays Harbor PUD
ISO
ENGLAND
ISO
LIPA
MISSOURI RIVER
nmpp ENERGY
AMP
Manassas
NCMPA1
MPUA
PRAIRIE STATE Energy Campus
City Utilities
OMPA
Conway
MEAGPOWER
JEA
LUS
LAFAYETTE UTILITIES SYSTEM
NBU NEW BRAUNFELS UTILITIES
Monterey Bay
rpu

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TEA

Public Power

- Local Ownership, Control, and Governance
- Non-profit
- Physical Complexity
- Public Pressures

TEA serves as a bridge between public power and the ever-changing energy market

Energy Market

- Financial Complexity
- Dynamic
- Competitive
- Data Intensive
- Specialized Skillsets

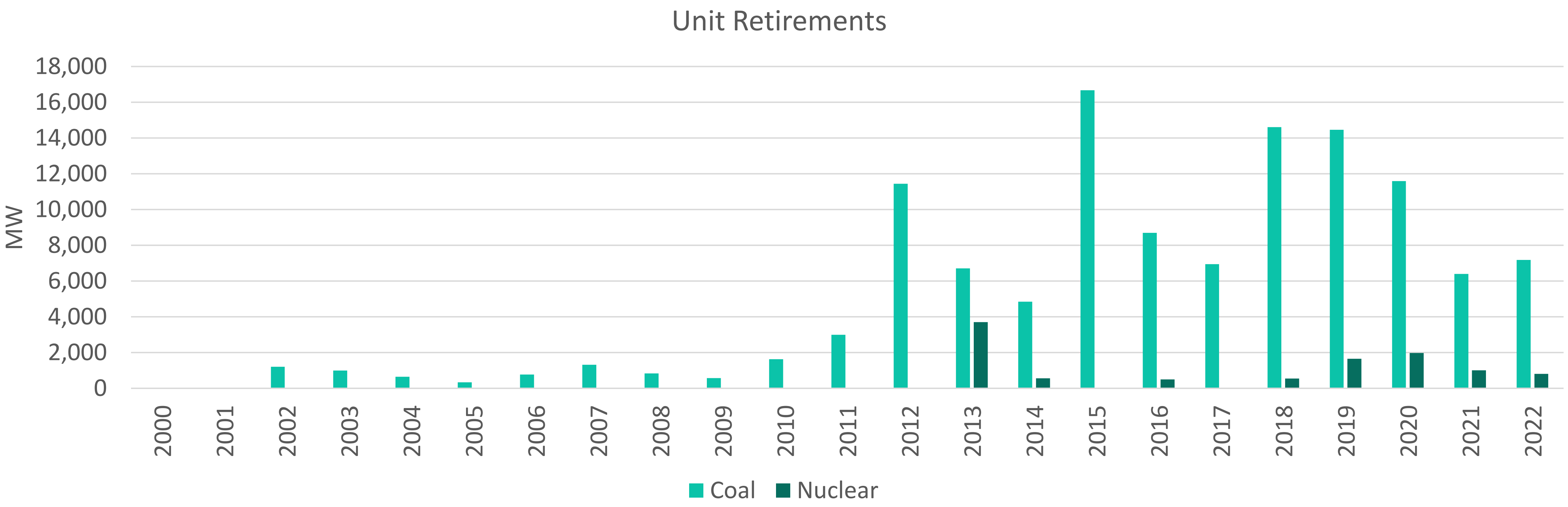
THE ENERGY TRANSITION WILL BE MESSY


stonks
imgflip.com


natural gas


renewables

GOT A BIT AHEAD OF OUR SKIS



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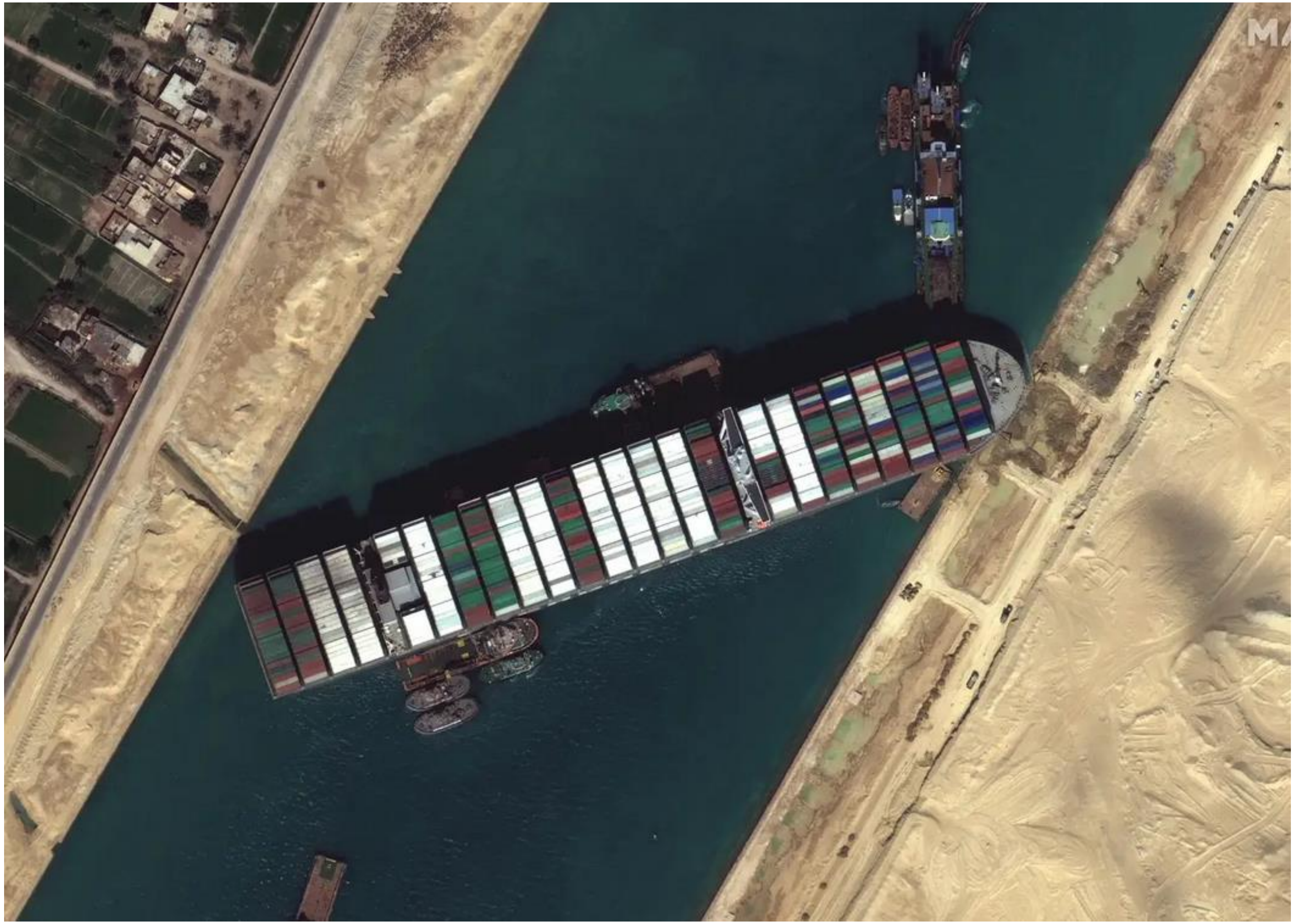
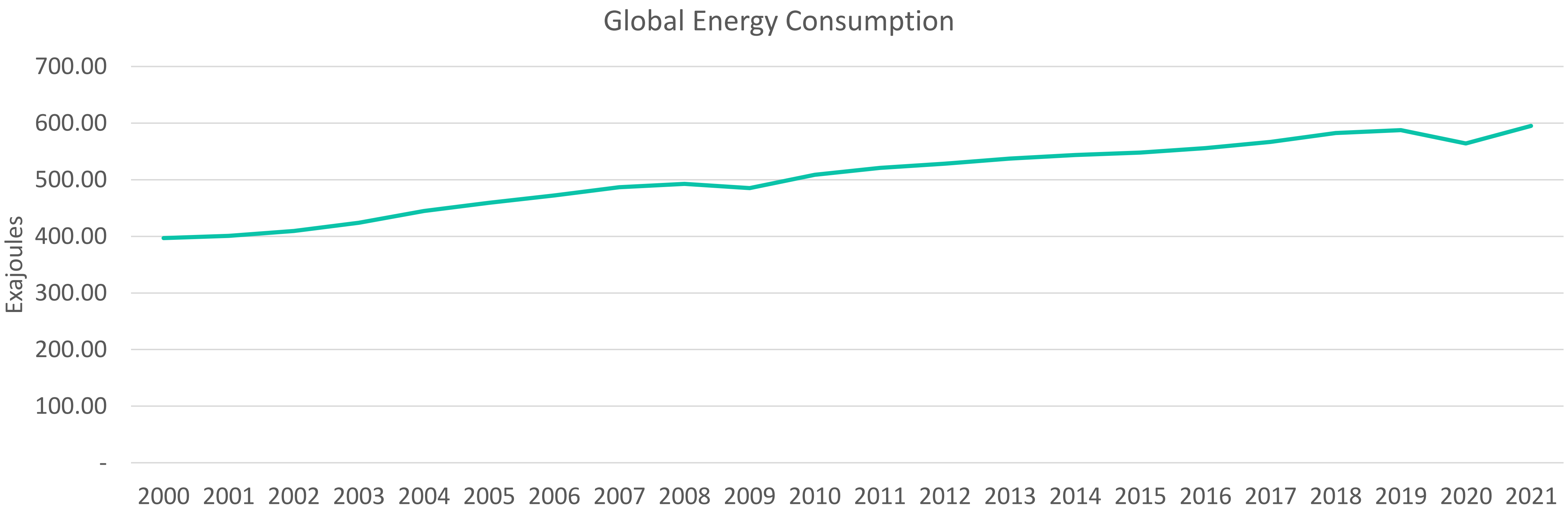
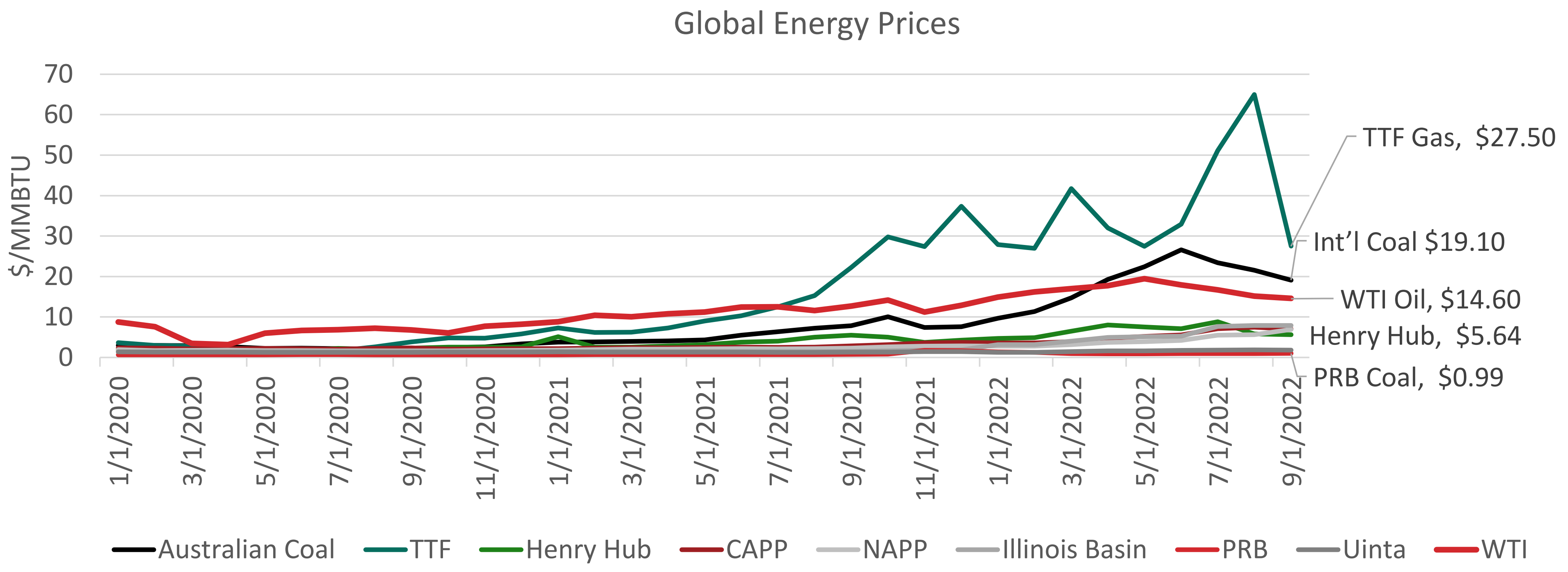


Source: Maxar

GLOBAL ENERGY CONSUMPTION PICKS RIGHT BACK UP



RENEWABLES LOOK ATTRACTIVE WHEN COAL IS $20/MMBTU



RENEWABLES LOOK ATTRACTIVE WHEN A $1 TRILLION BAILOUT IS THE ALTERNATIVE

U.K. Prime Minister to Announce Energy Bailout Funded by Borrowing

By Max Colchester

Sept. 7, 2022 11:24 am ET

THE WALL STREET JOURNAL.

Ms. Truss, who took over from her fellow Conservative Boris Johnson this week, is expected on Thursday to announce a vast package to limit the amount energy companies can charge businesses and households. The bailout, which officials estimate could exceed £100 billion, is aimed at preventing a sharp recession this fall when energy bills are expected to rise 80% in October when a cap on prices was due to increase.

In October, an existing U.K. price cap on energy will be recalibrated to reflect far higher market prices for natural gas. Absent government support, the average household bill would rise to around £3,500 a year for energy, equivalent to $4,000, compared with a current annual average of £1,900, according to a British regulator in charge of setting the cap. The new cap set to be announced Thursday, will likely keep costs at an average of £2,500 a year for households, according to people familiar with the government plan.

RENEWABLES LOOK ATTRACTIVE WHEN OTHER RESOURCES ARE UNAFFORDABLE

Pakistan blackouts choke economy as China power plants go unpaid

ADNAN AAMIR, Contributing writer
June 15, 2022 16:45 JST

NIKKEI Asia

One of the major reasons for the blackouts is that Chinese power producers under the China-Pakistan Economic Corridor (CPEC) initiative have shut down multiple plants because the Pakistani government has failed to pay dues to the tune of 300 billion rupees ($1.5 billion).

Ahmed Naeem Salik, a research fellow at the Institute of Strategic Studies Islamabad, said that current power generation capacity in Pakistan is 41,000 megawatts, while consumption is around 28,000 MW. "We have 13,000 MW of extra electricity capacity, but still there is a lot of load shedding," he said, using industry lingo for supply interruptions. This, he said, "is mainly because we have to pay the loans [to Chinese companies] that we are unable to pay, and hence [Chinese] have stopped power production."

AND IT IS VERY MUCH A RENEWABLES SELLER'S MARKET

Source: Nextera Q2 2022 Earnings

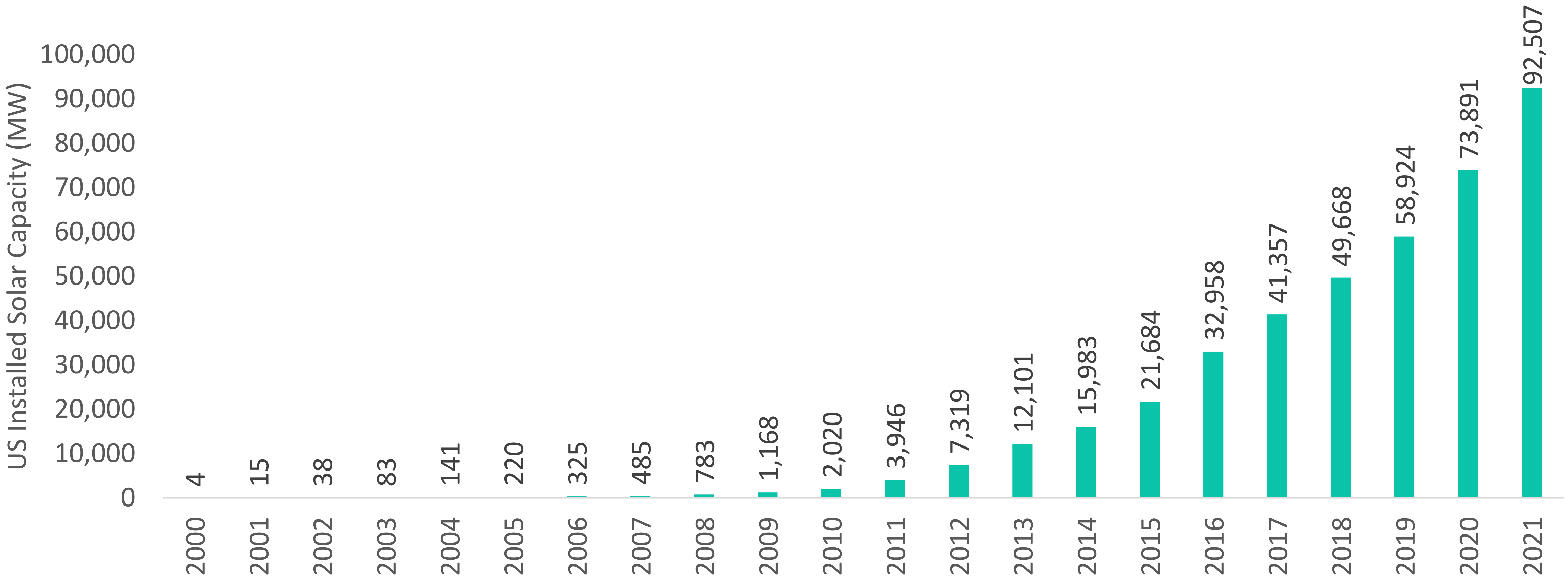
"…the second largest quarter of solar origination in our history…"

"…a number of powerful tailwinds support continued strong renewables demand…"

"…high power prices and high gas prices are helping to make renewables the most economic form of generation"

THE ENERGY TRANSITION WILL BE MESSY

SOLAR CAPACITY WENT ON A TWO-DECADE TEAR



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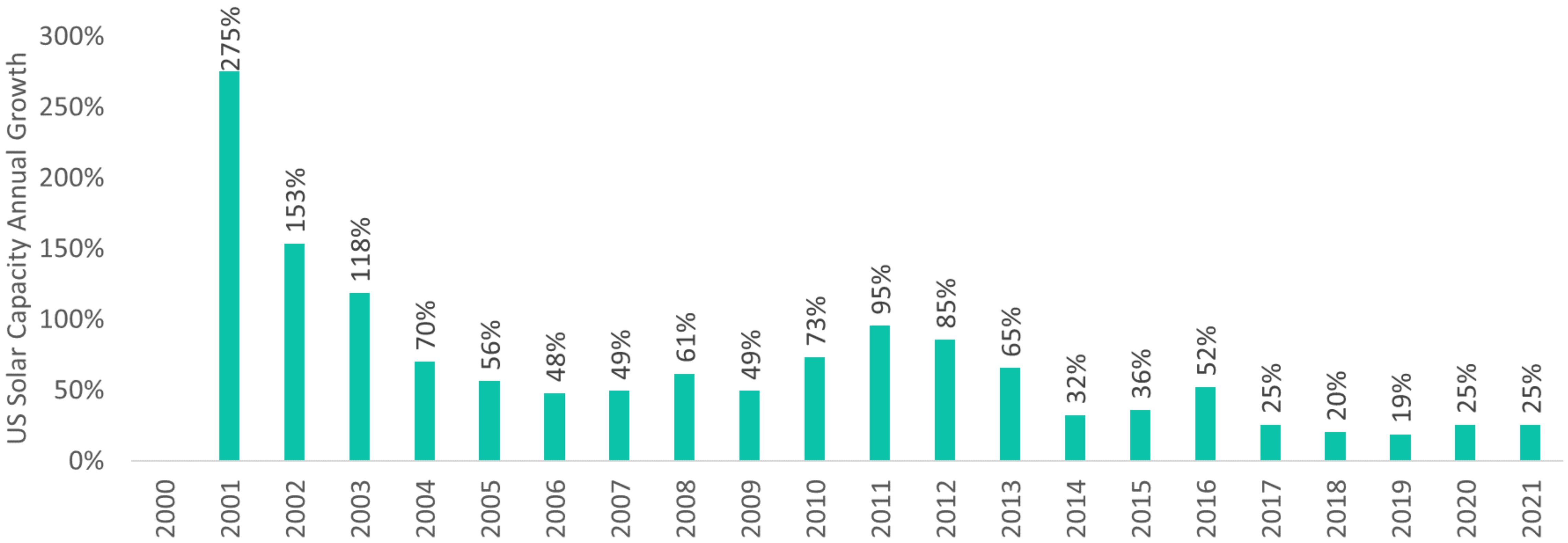

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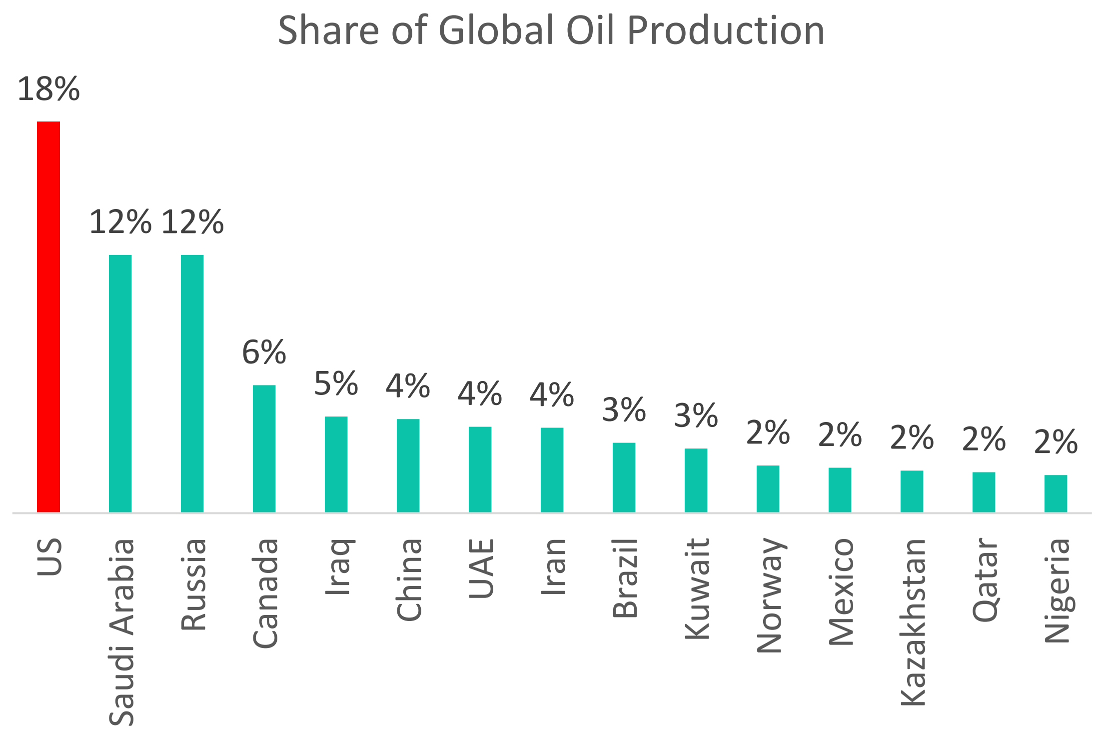
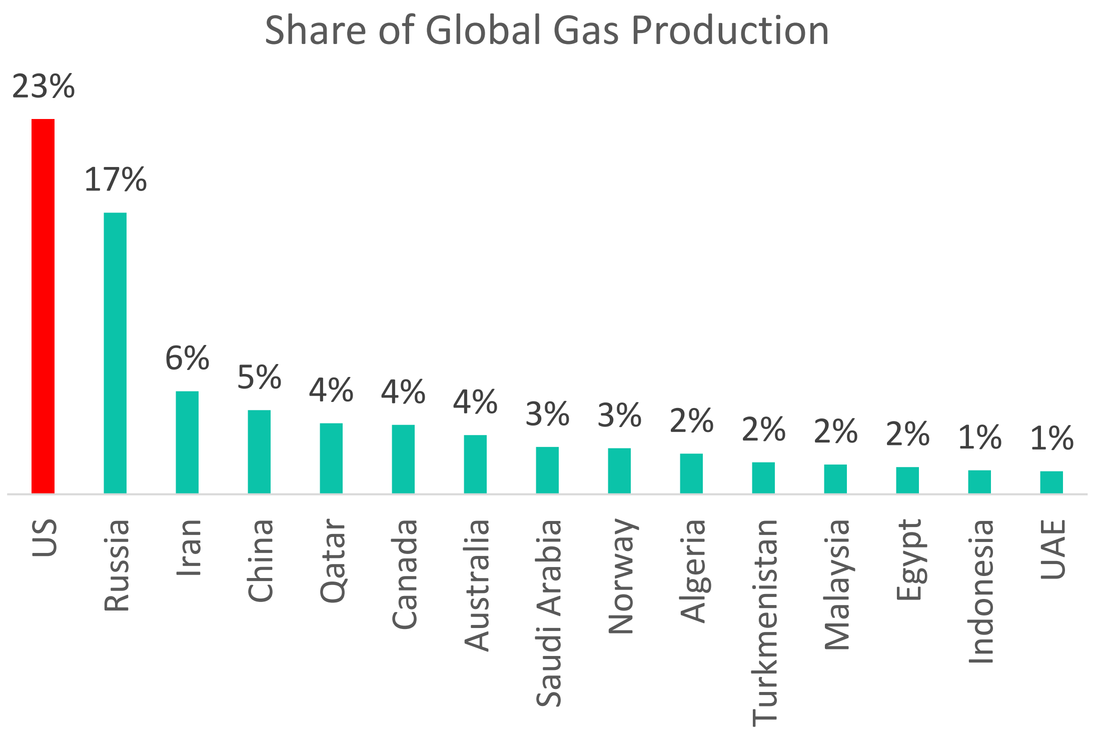
ENERGY TRANSITION GEOPOLITICS ARE HORRIBLE





Source: BP Statistical Review 2021

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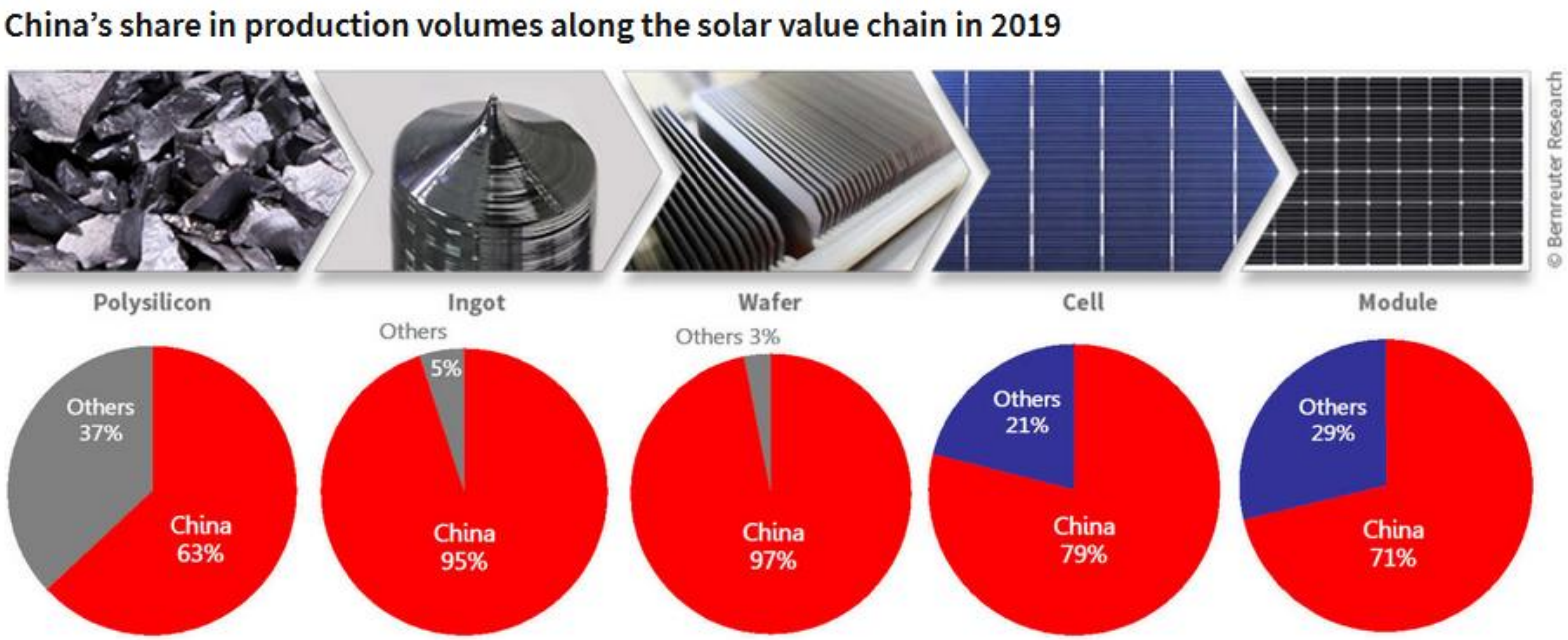

China more or less dominates the solar value chain from polysilicon to panels – Sources: Bernreuter Research (polysilicon), Bloomberg New Energy Finance (ingot), China Photovoltaic Industry Association (wafer/cell/module); Graphic: Bernreuter Research

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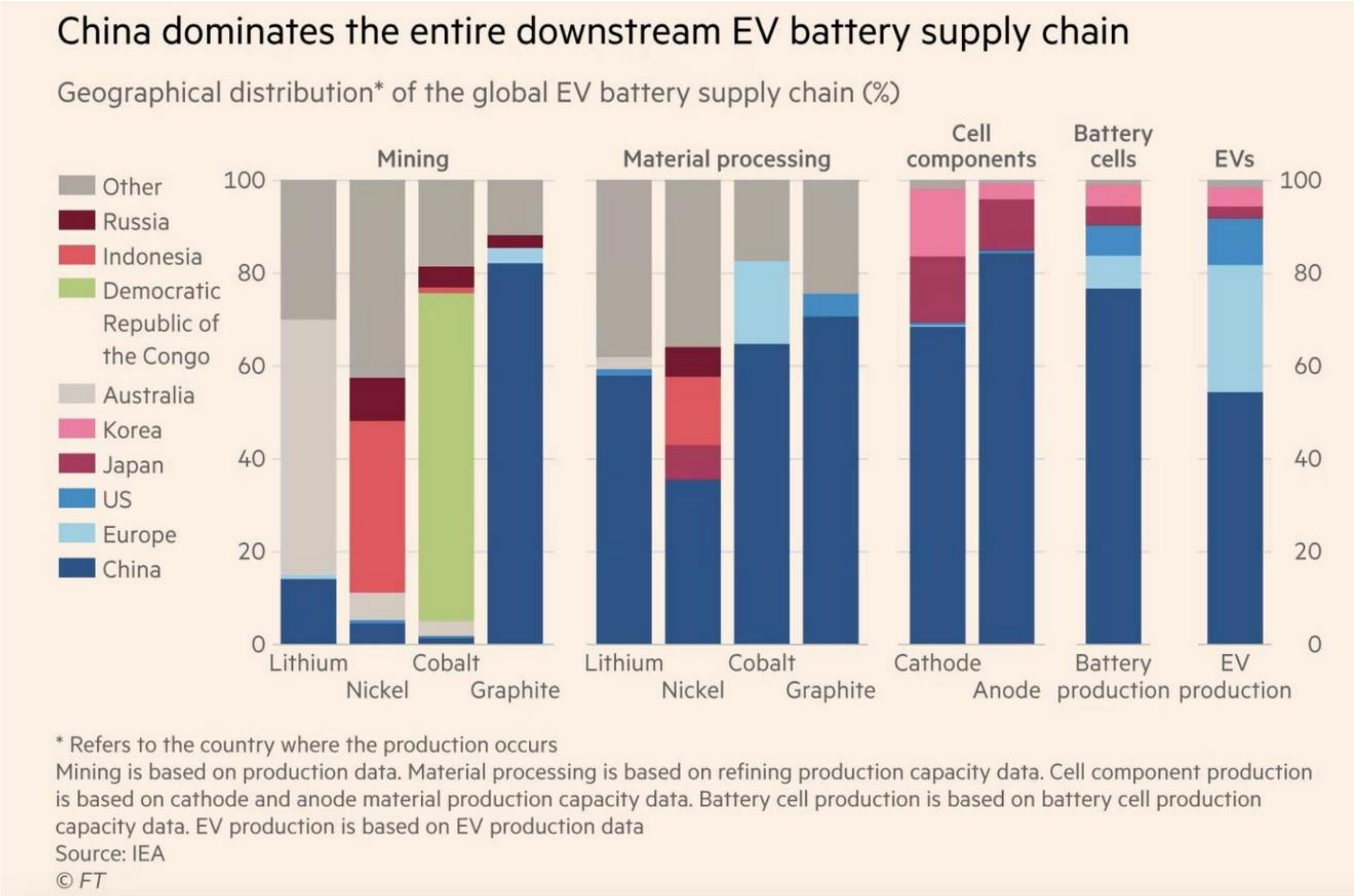

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EUROPE IS ALL-IN ON THE ENERGY TRANSITION

Source: Jinko Solar Q2 2022 Earnings

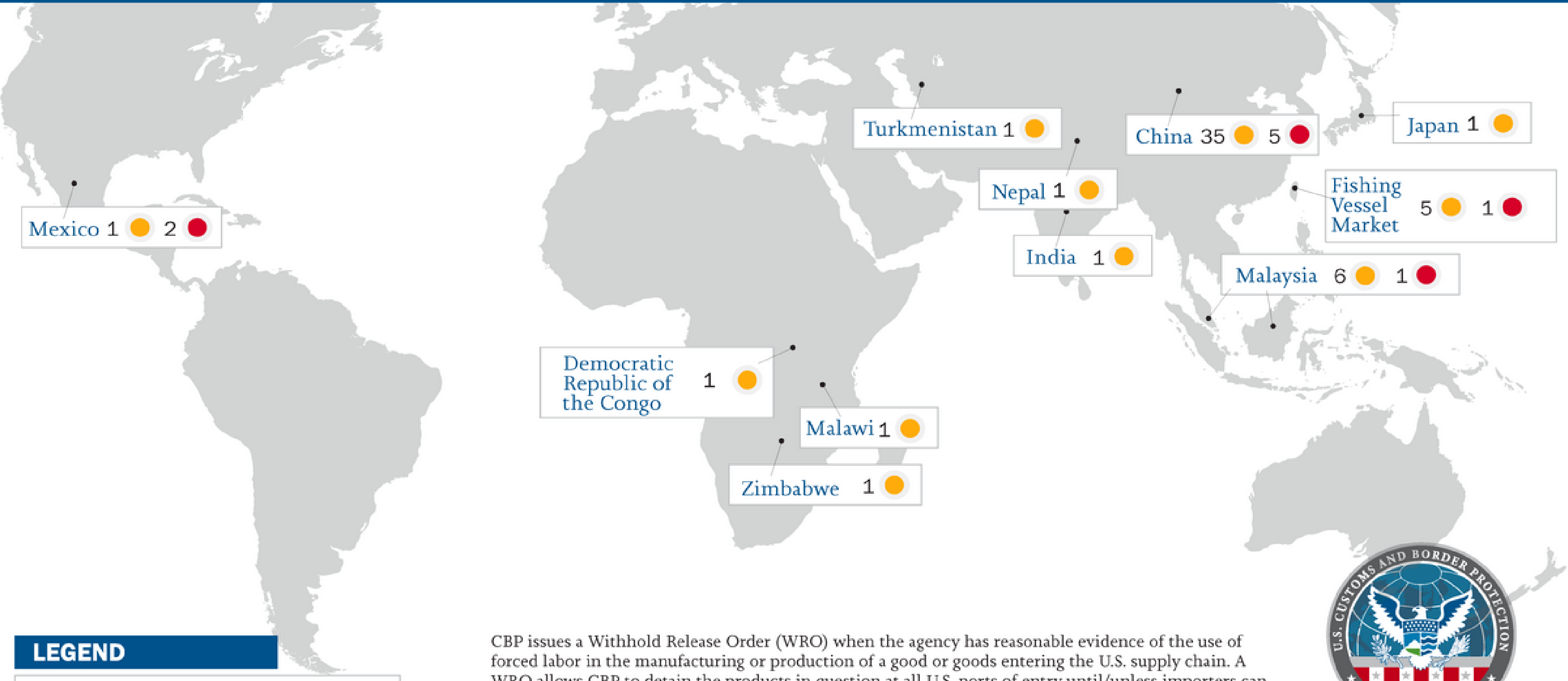
"Europe imported a total of 42.2GW of PV modules, a year-on-year increase of 137%"

"We believe polysilicon prices will…reach their peak in the third quarter. As polysilicon production ramps up in the fourth quarter, polysilicon price increases are expected to moderate, driving a recovery of downstream demand"

THE U.S. ATTEMPTS TO FORGE ITS OWN PATH

Active Withhold Release Orders & Findings

This map provides an overview of all active WROs and Findings around the world. CBP is currently enforcing 54 active WROs and 9 Findings across the globe.



LEGEND

- Withhold Release Order (WRO)
- Finding

CBP issues a Withhold Release Order (WRO) when the agency has reasonable evidence of the use of forced labor in the manufacturing or production of a good or goods entering the U.S. supply chain. A WRO allows CBP to detain the products in question at all U.S. ports of entry until/unless importers can prove the absence of forced labor in their product's supply chain.

CBP issues a finding when the agency has conclusive evidence of the use of forced labor in the manufacturing or production of a good or goods entering the U.S. supply chain. A finding allows CBP to seize the product(s) in question at all U.S. ports of entry.

Office of Trade

THE U.S. ATTEMPTS TO FORGE ITS OWN PATH

President Biden Suspends AD/CVD Duties on Solar Cells and Modules from Cambodia, Malaysia, Thailand, and Vietnam

SheppardMullin

EVERYTHING WENT WRONG FOR SOLAR IN 2022. EVERYTHING.

- Withhold Release Order
- Anti-dumping/countervailing duties investigation
- Uighur Forced Labor Prevention Act
- Supply chain constraints
- Solar commodity price inflation
- Energy commodity price inflation
- Increased global competition
- Labor cost inflation
- Inflation Reduction Act

EVERYTHING WENT WRONG FOR SOLAR IN 2022. EVERYTHING.

- ~~Withhold Release Order~~ superseded by UFLPA
- ~~Anti-dumping/countervailing duties investigation~~ moratorium until Summer 2024
- ~~Uighur Forced Labor Prevention Act~~ may have impact on the margins, developers largely receiving panels
- ~~Supply chain constraints~~ shipping prices much closer to pre-pandemic lows than highs
- ~~Solar commodity price inflation~~ polysilicon prices expected to peak before EOY 2022
- ~~Energy commodity price inflation~~ …for now
- Increased global competition
- Labor cost inflation
- Inflation Reduction Act

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THE U.S. ATTEMPTS TO FORGE ITS OWN PATH

Source: Businessweek

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INFLATION REDUCTION ACT HAS NOT BEEN INFLATION REDUCING. YET.

- Wage & apprenticeship requirements to receive full PTC/ITC (subsidies reduced by 80% if provisions aren't met)
- Carbon-free PTC beginning Jan 1, 2025
  - All technologies eligible, more valuable for solar in CO
  - Indexed at 1992 dollars, roughly $35/MWh in 2025
  - Bonus incentives for meeting domestic content requirements or Energy Community status.
- Direct pay to tax-exempt entities
  - Subsidy reduced to 85% if tax-free bonds are used for financing
- Standalone storage ITC
- Developers and suppliers exploit inefficiency of generous subsidies

INITIAL RESULTS ARE POSITIVE

Panasonic in Talks for $4 Billion Battery Plant in US: WSJ

- Facility would be on top of another plant planned for Kansas

By Yuki Furukawa

August 26, 2022 at 12:05 AM PDT *Updated on August 26, 2022 at 12:43 AM PDT*

Bloomberg

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Honda and LG Chem will build a $4.4 billion EV battery factory in the US

The latest move to shore up the US's domestic battery production to comply with new tax rules

By Andrew J. Hawkins | @andyjayhawk | Aug 29, 2022, 10:43am EDT |

THE VERGE

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Mark Williams
The Columbus Dispatch
Published 4:04 p.m. ET Sept. 9, 2022

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First Solar announces new U.S. panel factory following the Inflation Reduction Act

PUBLISHED TUE, AUG 30 2022•5:45 AM EDT | UPDATED TUE, AUG 30 2022•8:44 PM EDT

Pippa Stevens
@PIPPASTEVENS13
CNBC

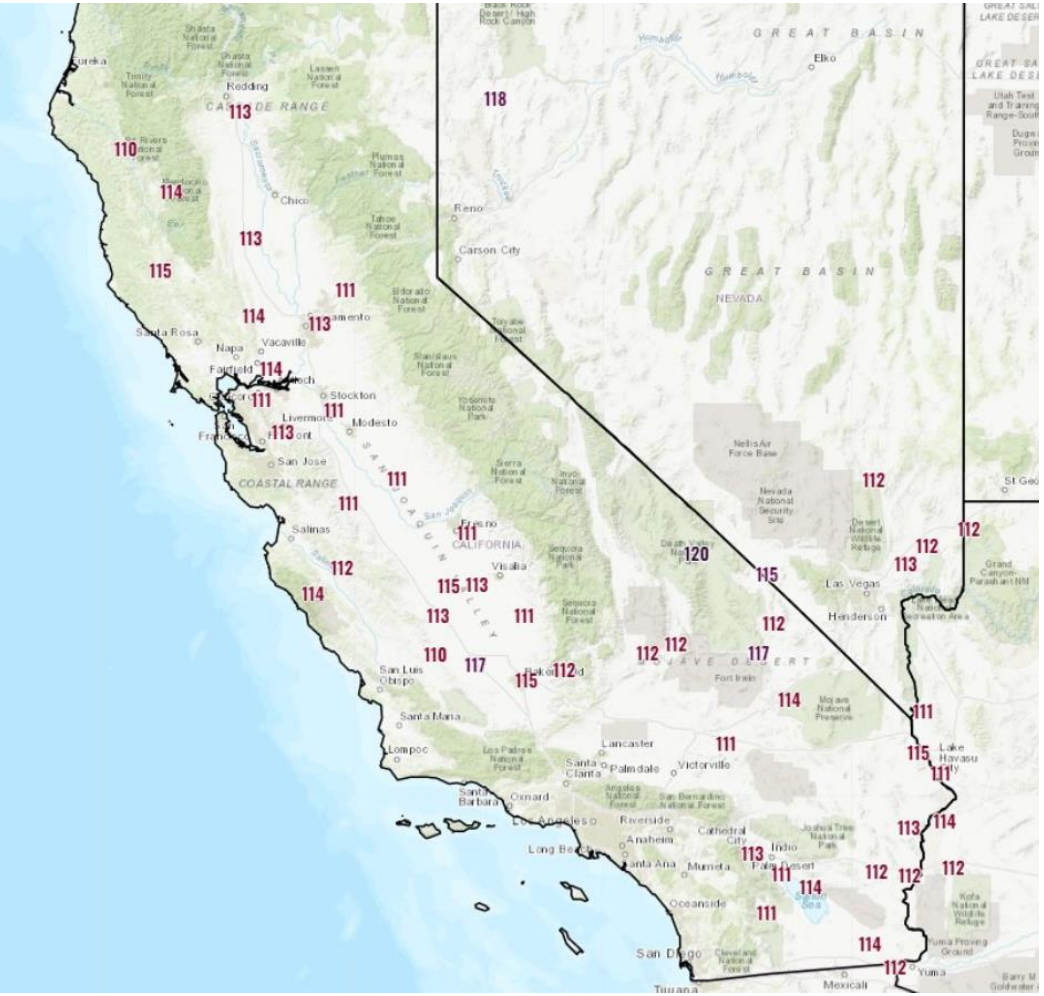
SUBSIDY STACKING

-$12/m^2$ wafer
-$3/kg polysilicon
-$0.40/m^2$ polymeric backsheet
-$0.07/W_{dc}$
-$0.015/W inverter
-$0.87/kg torque tube
-$2.28/kg structural fastener

-30% ITC (or PTC)
-10% Made in USA
-10% Energy Community

THE ENERGY TRANSITION WILL BE MESSY

CLIMATE CHANGE PUSHING A STATE TO THE BRINK



NOTABLE CALIFORNIA HEAT RECORDS ON TUESDAY

ALL-TIME HIGHS

Ukiah (117, tie) | Downtown Sacramento (116) | Livermore (116, tying Monday)

King City (116) | Santa Rosa (115) | Stockton (115, tie) |

Napa (114) | Redwood City (110) | San Jose (109)

SEPTEMBER (MONTHLY HIGHS)

Death Valley (125 – one degree from Sept. world record) | Bakersfield (115 tie) | Marysville (115) |

Hanford (114) | Fresno (114) | Modesto (111)

Source: Washington Post

38

CLIMATE CHANGE PUSHING ANOTHER STATE TO THE BRINK

Texas' grid operator told a power plant to delay repairs ahead of a May heat wave. It was among six that crashed. THE TEXAS TRIBUNE

BY **MITCHELL FERMAN** MAY 17, 2022 9 AM CENTRAL

Resource	Performance (% of installed as of 4:00 p.m.)
Thermal	50,703 (66%)
Wind	5,859 (17%)
Solar	8,333 (73%)

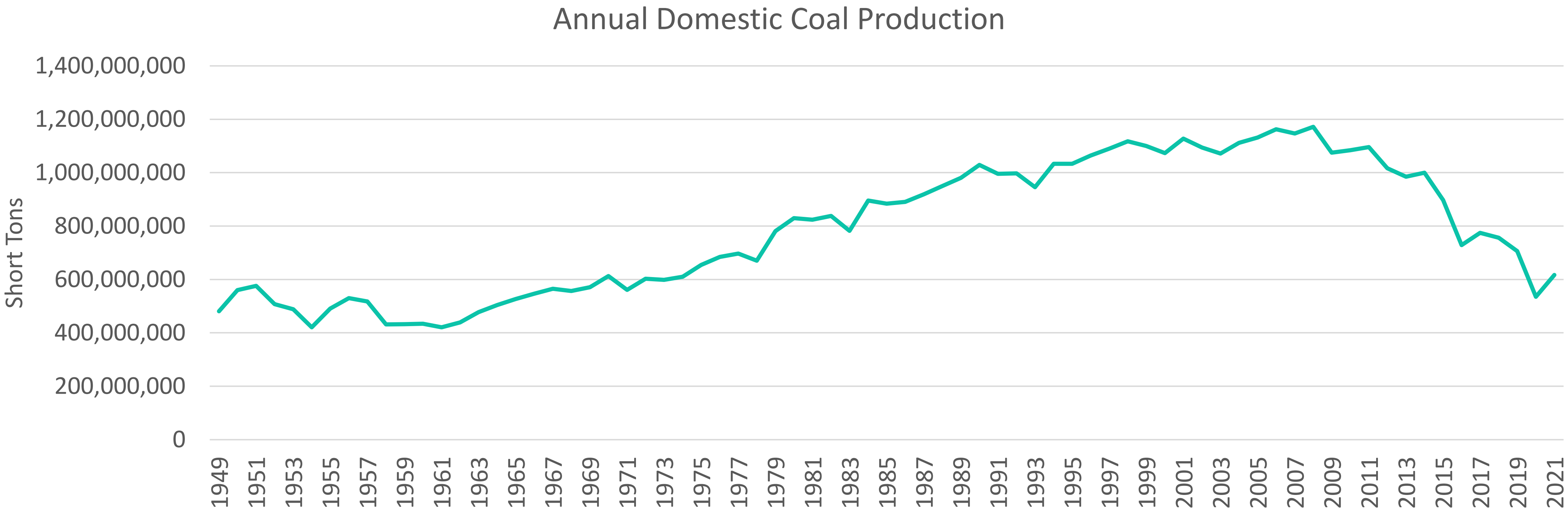
THE ENERGY TRANSITION IS ONGOING. IN THE MEANTIME…

Source: Peabody Q4 2020 Earnings Transcript

"…there is no question that US thermal coal is a challenged market, and one that is in secular decline."

40

DOMESTIC COAL PRODUCTION IS IN DECLINE



Source: EIA

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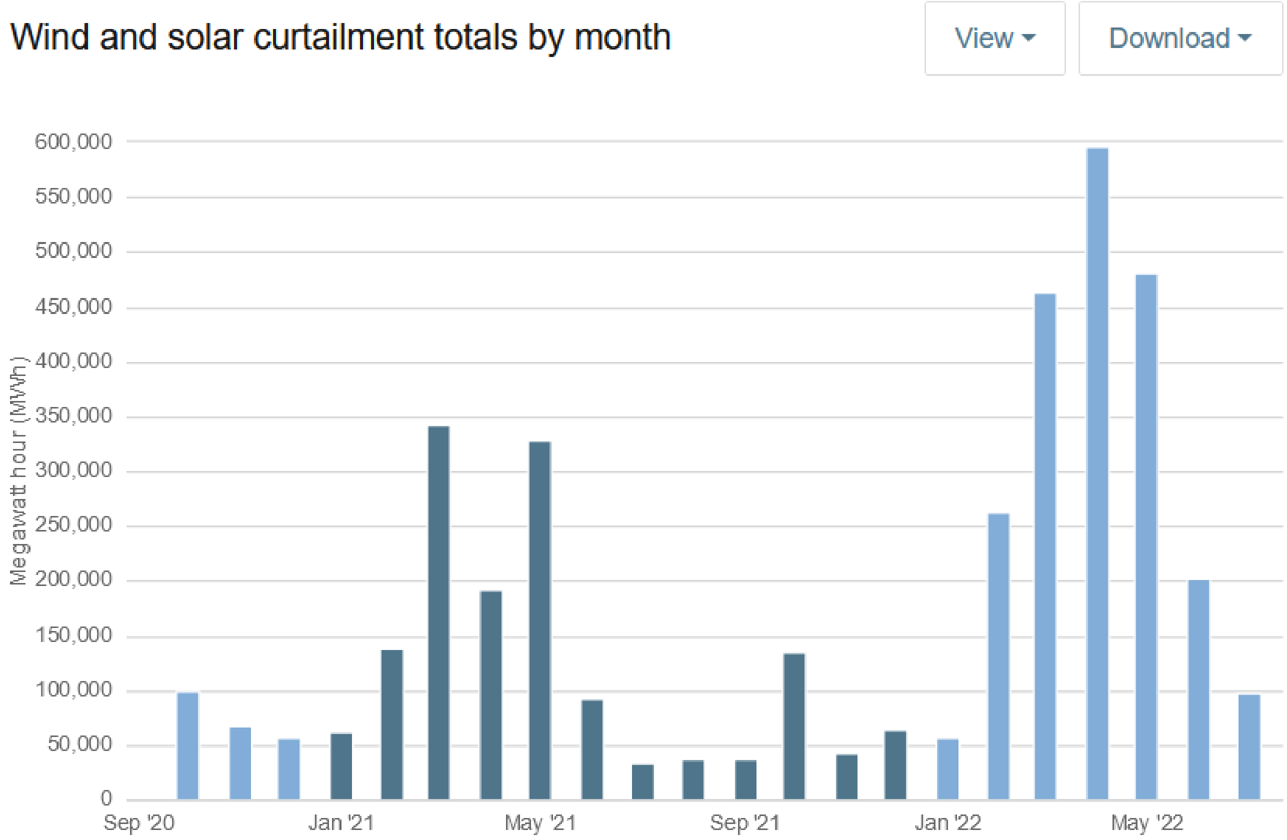
41

CURTAILMENTS ARE GETTING WORSE



Source: CAISO

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WE HAVE PLENTY OF ENERGY TO GO AROUND. TOO MUCH ACTUALLY.

2,192,349

MWh renewable gen curtailed in 1H 2022

325,371

EVs that can be powered with curtailed gen

145,000,000

Gallons of gas needed to drive those miles

15,000,000,000,000

BTUs needed to replace curtailed gen

4,300,000,000

Miles a light duty car can drive with curtailed gen

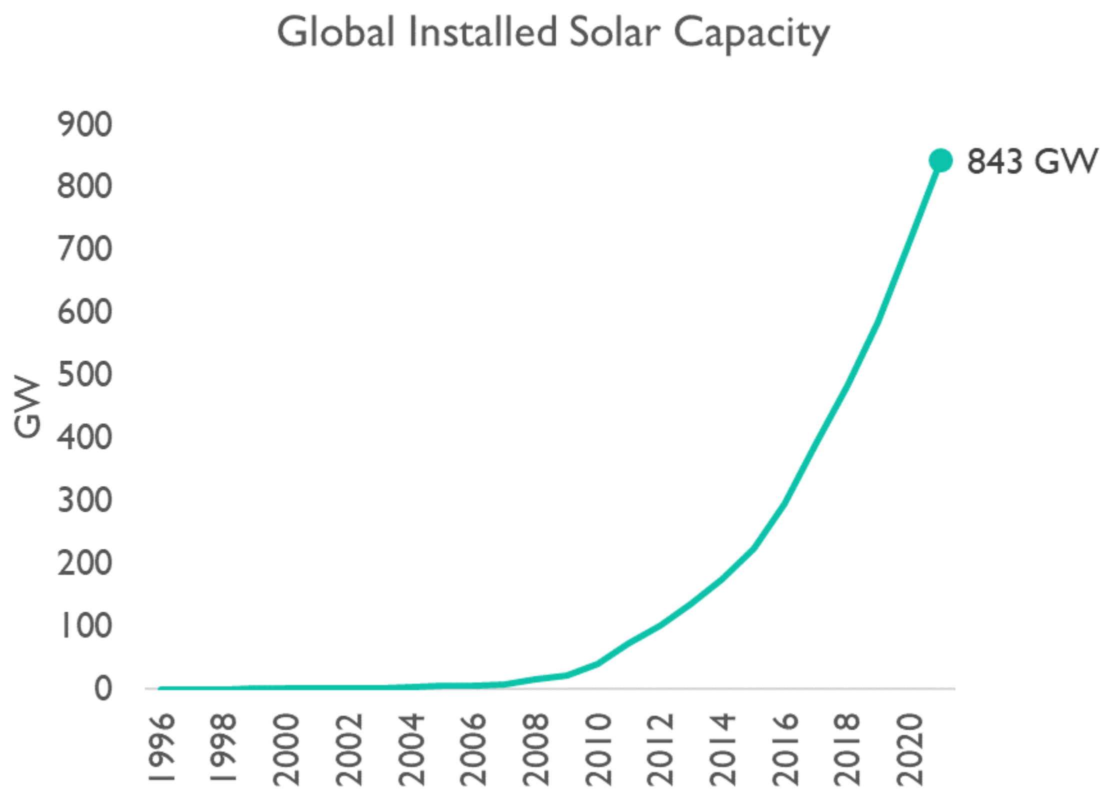
AND IT WILL CONTINUE TO GET WORSE

The Supply Chain to Beat Climate Change Is Already Being Built

David Fickling

Bloomberg

Solar polysilicon – the semiconductor from which photovoltaic panels are made – is growing even faster. Existing and planned manufacturing capacity will amount to about 2.5 million metric tons by 2025, according to research last week from BloombergNEF's Yali Jiang. That's sufficient to build *940 gigawatts* of panels every year.



Source: BP Statistical Review 2021

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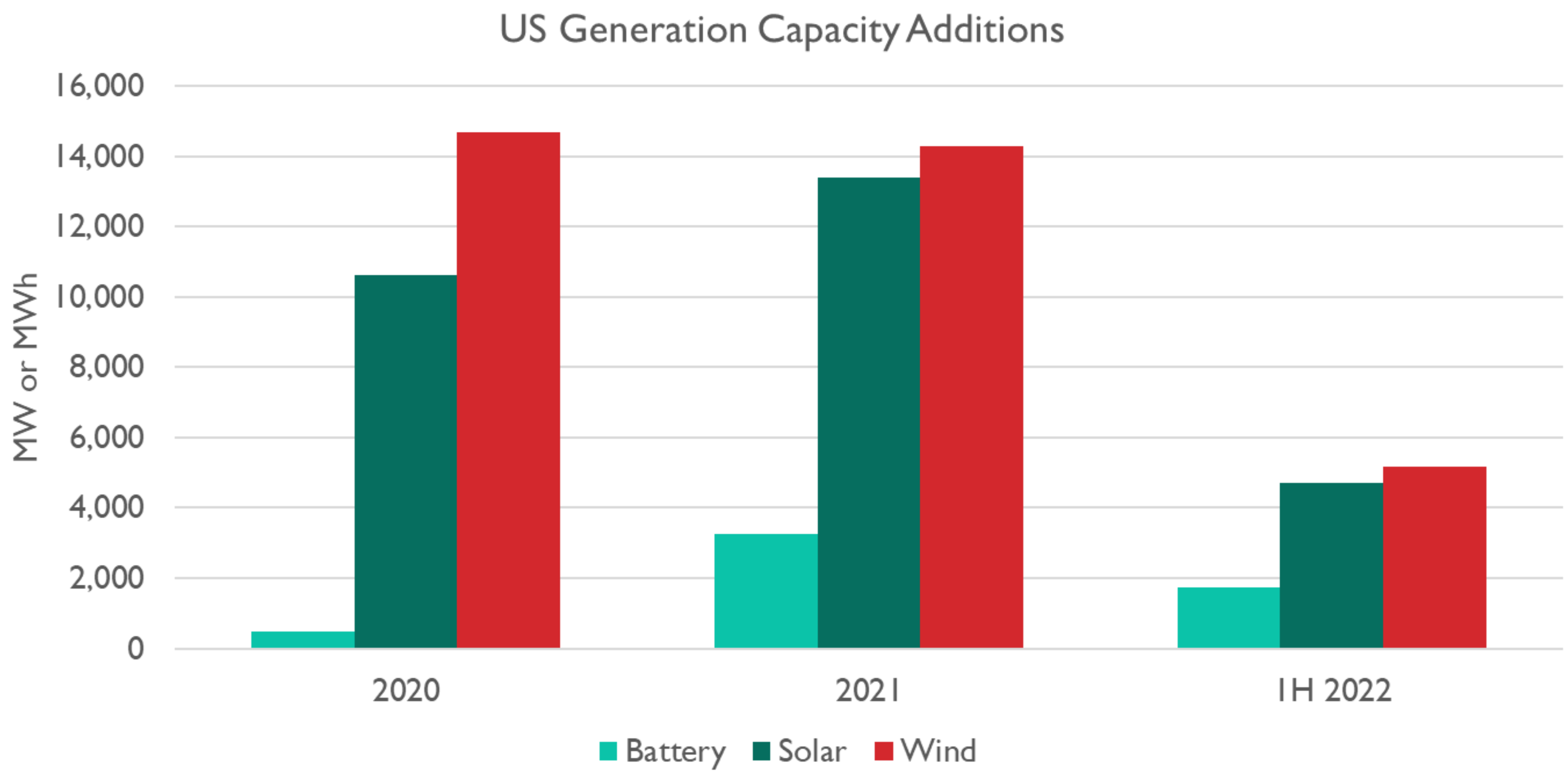
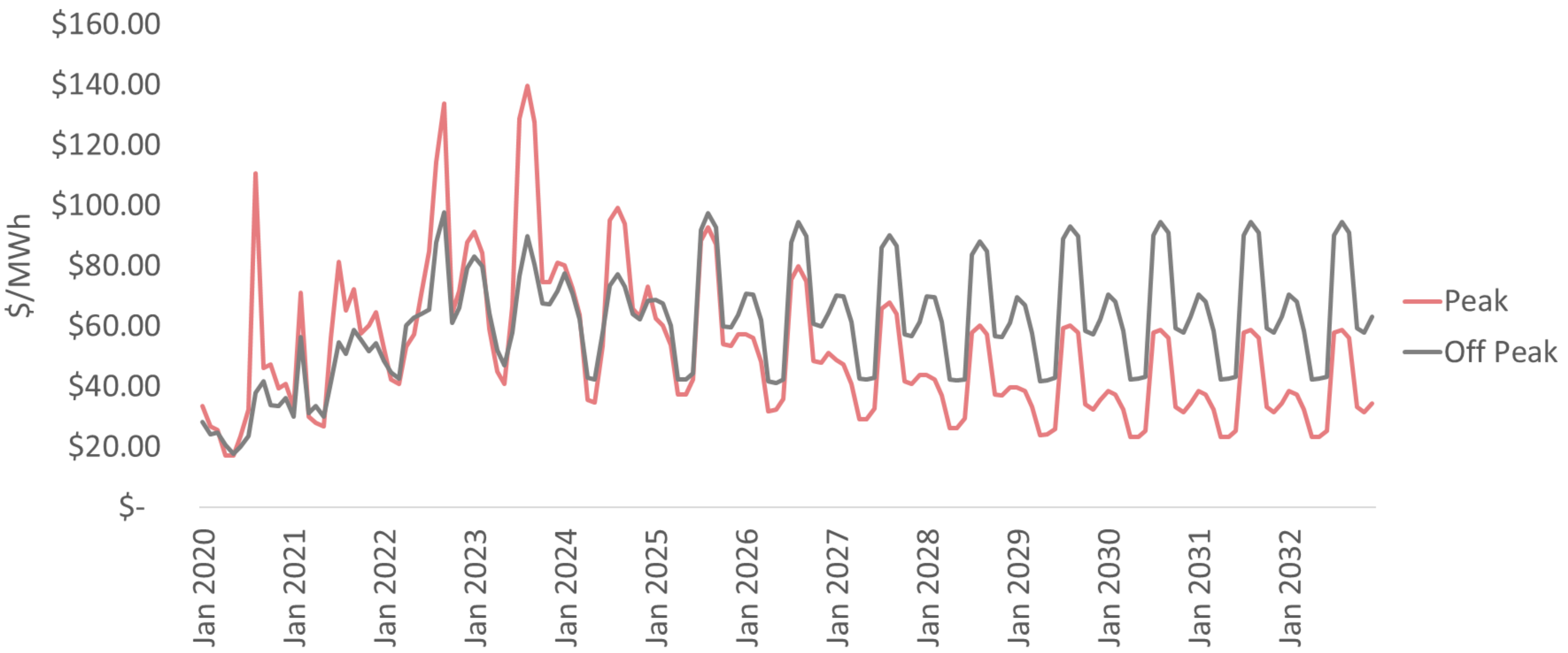
THE US PRO-RATA SHARE OF SOLAR WOULD BE 120GW PER YEAR

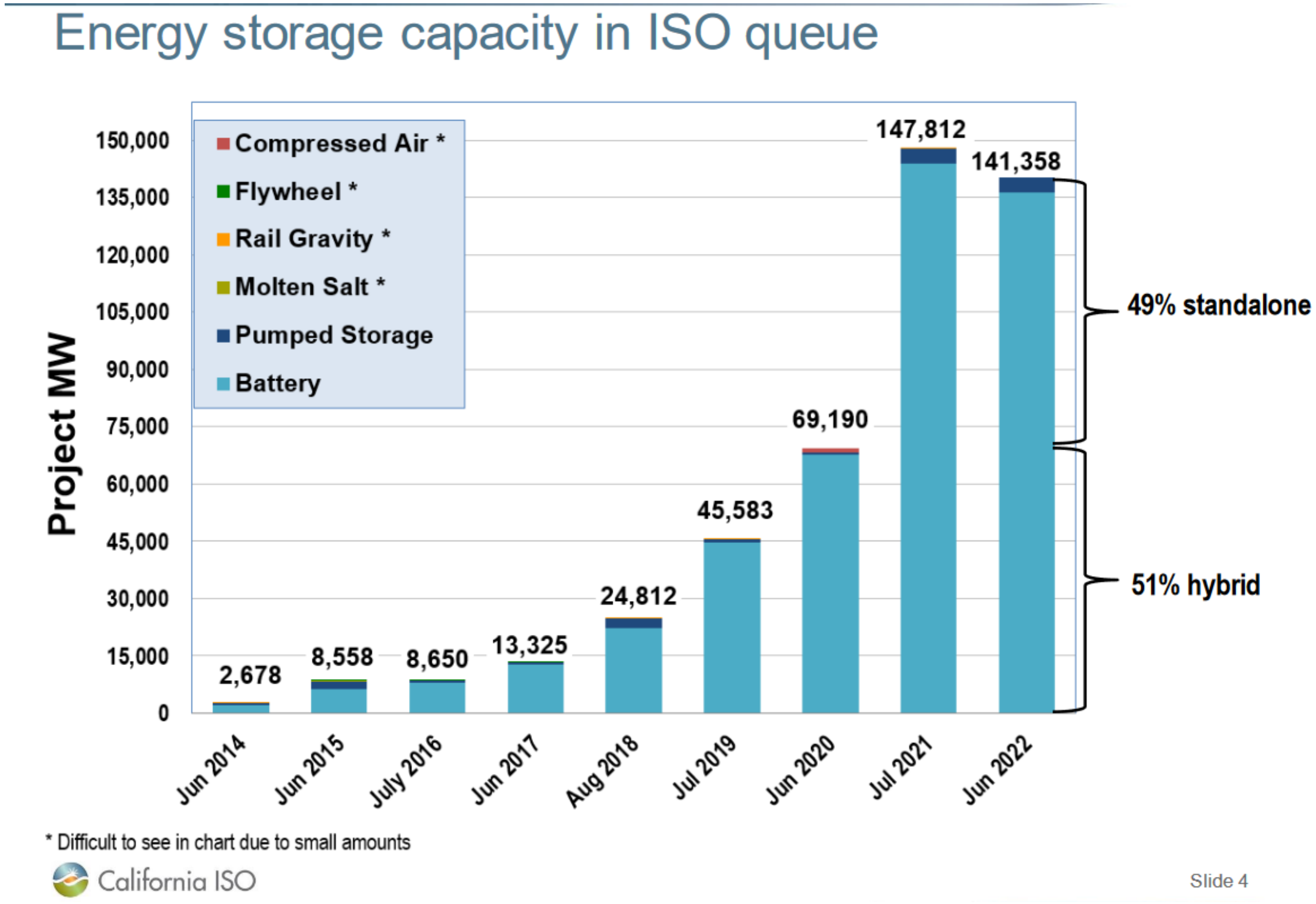


Source: EIA

CAISO FORWARDS ARE WILD



CAN BATTERIES TURN SOLAR ENERGY INTO CAPACITY?



Source: July 21, 2022 CAISO briefing on renewable and energy storage in the ISO generator interconnection queue

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SO YOU WANT TO BUY SOME RENEWABLES

1. Information is you friend. Information asymmetry is not.
2. All of this stuff we talked about…it's really the developer's problem. But…
3. Their problems can quickly become your problems though. See: anyone that signed a solar PPA post-2019
4. Developers are still skittish about signing fixed-price contracts. They're avoiding development risk.
5. It's a buyer's market and difficult to extract concessions from developers right now. But it can be done!
6. Unlikely that full benefit of IRA subsidies will be passed onto buyers
7. PTC/ITC direct pay opens up a new option to muni's, it's impact is TBD

30 MINUTES IN 5 SENTENCES

1. The energy transition will be messy.
2. Policymakers must figure out how to keep the lights on through the transition.
3. Let's try to avoid creating a clean energy petrostate in the process.
4. Solar components are expensive today, but not for long. Assuming geopolitics doesn't get in the way. But for solar to be cheap again the industry needs to solve all shortages.
5. IRA is a windfall for everyone along the renewables value chain. Consult an expert to make sure your utility is capturing every available revenue stream.

Alex Wong
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425-460-1109

APPENDIX

IRA 2022

Relevant IRA 2022 loans and grant funding

$44 billion in grant & loan funding for public sector

…for qualifying clean energy and carbon reducing projects

$1 billion RD funding for electric loans for renewable energy	**$9.7 billion** USDA assistance for rural electric cooperatives	**$1 billion** State, local, tribal and NFPs for zero building energy code adoption	**$2 billion** Electric transmission facilities financing
$760 million Siting of interstate electricity transmission lines	**$1 Billion** SLG grants and rebates to replace vehicles with zero emission vehicles	**$2.6 billion** Climate resistance for coastal communities	**$3 billion** Reduce air pollution in ports
$7 billion Greenhouse gas reduction fund	**$250 million** Develop greenhouse gas reduction plans	**$4.75 billion** Implement greenhouse gas reduction plans	**$3 billion** Environmental justice block grants to reduce pollution
$3.155 billion Neighborhood access and equity grant	**$550 million** Bureau of reclamation domestic water supply projects	**$4 billion** Drought mitigation projects in reclamation states	**$411.5 million** Tribal & Hawaiian climate resilience

INFLATION REDUCTION ACT OF 2022 (IRA 2022)

Direct Pay Tax Credits

"Base Credit" + "Bonus Criteria" is the overriding theme of the new credit regime

Base Credit - e.g. 6% - for Qualifying Energy Projects

* Base credit w/ prevailing wage and apprenticeship (5x multiplier) — 30%

  Or if you meet "Begun Construction" within 60 days of publication of applicable compliance guidance

+ Domestic content — 10%
+ Energy community — 10%
+ Environmental justice (for solar and wind) — 10% or 20%

- Use of tax-exempt funding for project – tax credit — 15%

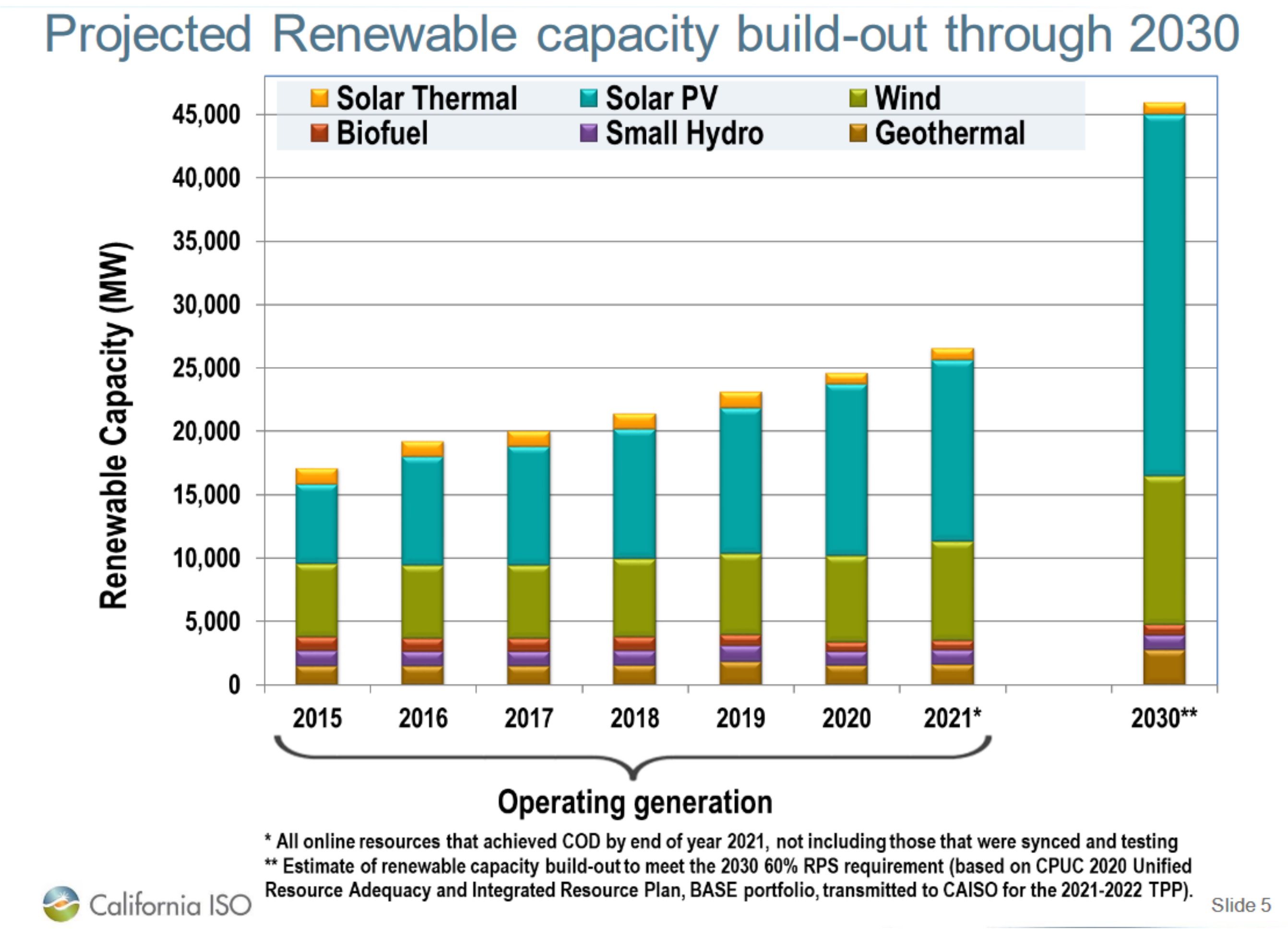
Not all credits apply to all projects

Same bonus construct applies to PTC ($/kWh) and clean fuels ($/gallon)

CONSIDERATIONS

Tax credits/public sector

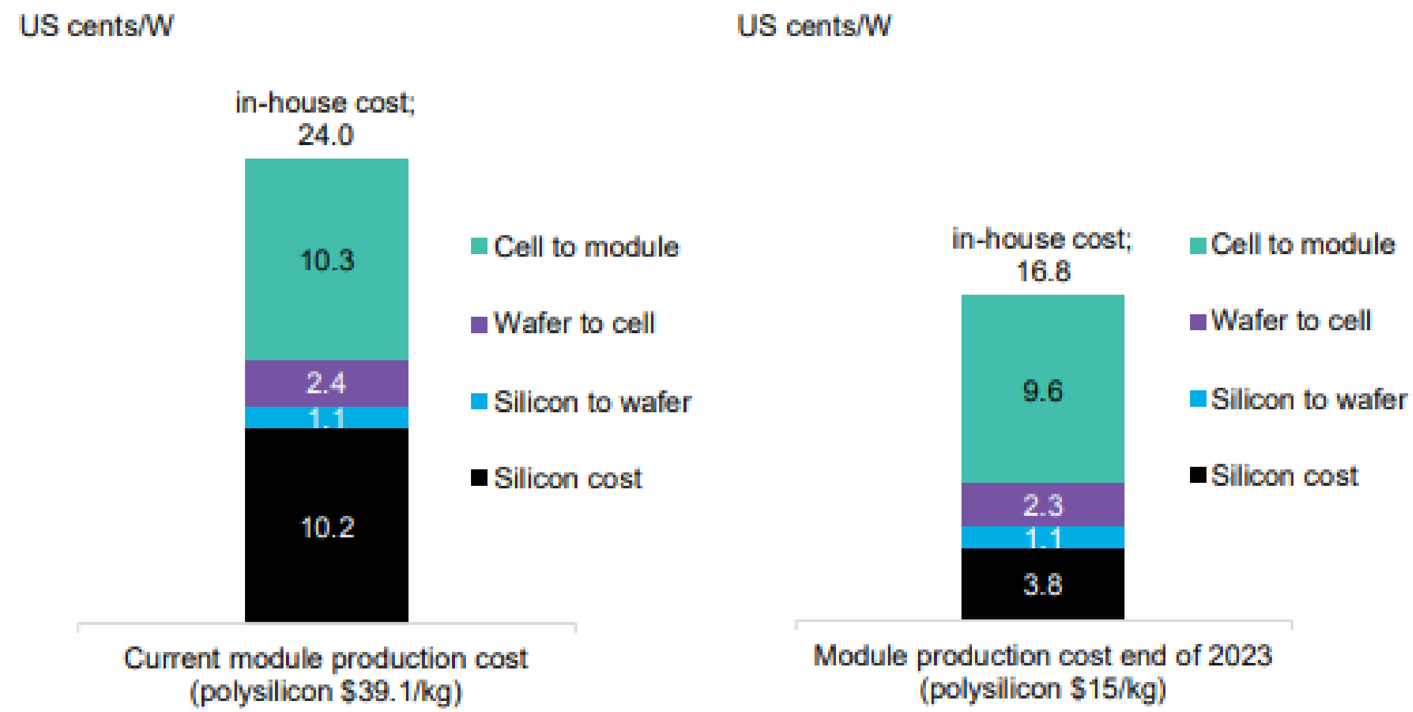
- Projects and many variables relating to projects need analyzing to determine optimal loan, grant, or tax credit available under the Act for qualifying projects.
  - ✓Assessment of project components
  - ✓Tax review
- How do qualifying projects under the Act qualify for assistance under state-level programs and incentives.
- How do the qualifying projects address ESG initiatives of the entity; determination of designation/label for any capital market funding for balance of project after receipt of all possible awards under the Act.



Source: July 21, 2022 CAISO briefing on renewable and energy storage in the ISO generator interconnection queue

ANALYSTS THINK SOLAR MANUFACTURING COSTS WILL FALL. HARD.

Figure 8: Estimated best in-house module production cost, now and end 2023



Source: BloombergNEF. Note: $1=6.8 yuan when convert from Chinese yuan to US dollar. Polysilicon price assumed $39.1/kg and $15/kg respectively, polysilicon use 2.6g/W now and 2.55g/W in 2023 as this is best-in-class. A 6% estimated per-watt wafer cost reduction is not shown in the chart due to rounding.

ARE BATTERIES ECONOMICALLY COMPETITIVE?

2.1.2.1 Demand Rate

Month	Rate in $/kW
October	9.87
November	10.46
December	12.78
January	11.31
February	11.47
March	9.09
April	6.83
May	5.36
June	5.65
July	12.14
August	11.83
September	9.29

LMS100 Average Expense $/kW/mo[/6] $9.67

Source: Bonneville Power Administration BP-22 Rate Case

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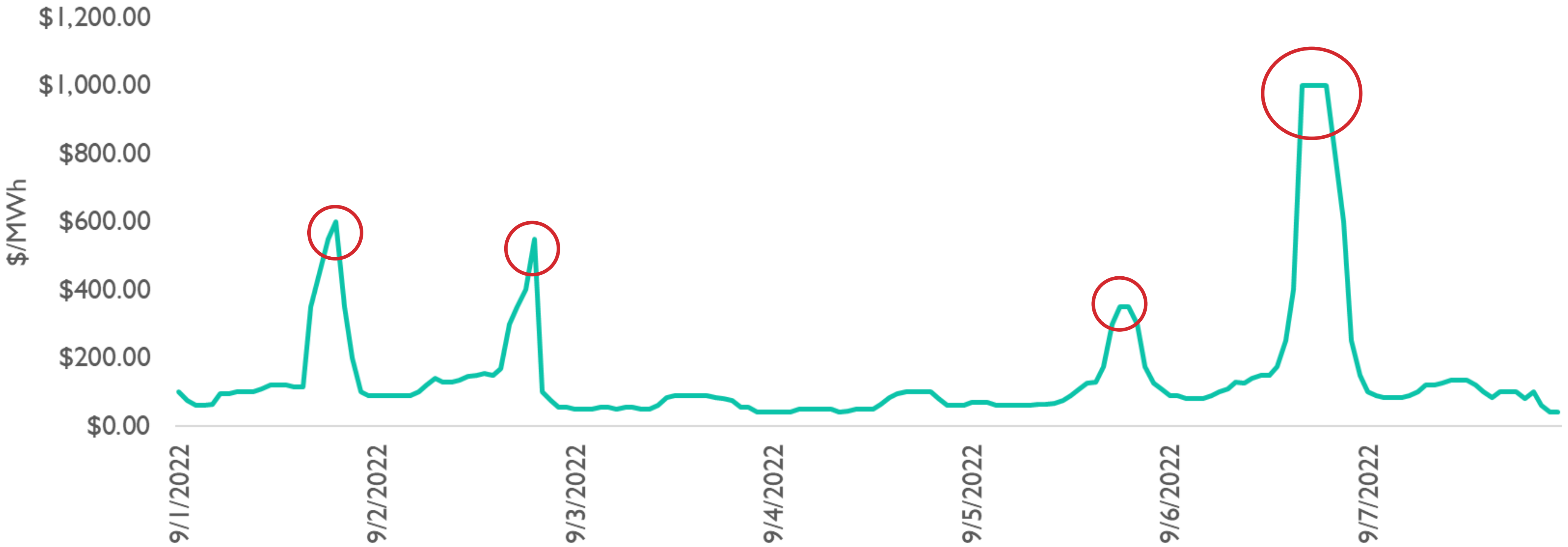
BATTERY MATH

$$\frac{\$10}{kW-mo} * \frac{1000kW}{MW} * \frac{1mo}{30\ days} * \frac{1\ day}{4\ hrs} = \frac{\$83}{MWh} + \text{charging costs}$$



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