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April 5, 2022

MEMORANDUM

TO: **Council Members**

FROM: **John Ollis, Manager of Planning and Analysis**

SUBJECT: **Current Electricity Market Conditions**

BACKGROUND:

Presenters: John Ollis and Ben Kujala

Summary: This presentation will review some recent market information in the Western wholesale electricity markets, implications for the regional hydro system operation and reflect on plan observations about market fundamentals.

Relevance: Wholesale power markets outside the region were highlighted as a key data point to monitor coming out of the 2021 Power Plan in which policy changes throughout the western states impacted not just wholesale power markets in the long term, but also in the short term. This update reviews market conditions to set the stage for discussions about the next wholesale power price forecast study for which some work has already commenced.

Workplan: B.5 Complete Wholesale Electricity Price and Avoided Emissions Rate Study

Background: The Council has periodically updated its wholesale electricity price study using the AURORA model to help inform Council staff and regional stakeholder analysis.

The Council's forecast is a fundamentals-based forecast that reflects actual power system operation, relationships of supply and demand for, and transmission of electricity. In addition, underlying a wholesale electricity price forecast in this region would be an understanding of the operating characteristics of future and existing supply and demand-side resources, as well as unit commitment, ancillary services, fuel prices, hydro, wind and solar conditions. The AURORA software captures many of these characteristics of the power system well and has a periodically updated WECC database, and thus, AURORA has been the Council's wholesale market electricity price forecasting model.

Due to significant clean and RPS policies and less dependence on new baseload generation to meet growing loads, the market price forecast studies from the 2021 Power Plan scenarios consistently showed extremely large buildouts of new resources, especially solar generation outside the region. These buildouts implied a persistence of market fundamentals that seemed to be just emerging at the time of the plan's development, like significant renewable generation curtailment and negative pricing mid-day. This market update is an early look at how the plan work compares to current market behavior and highlights some of the data sources the staff uses to monitor this behavior for reference.

More Info: Wholesale Power Price Forecast from the 2021 Plan

EIA website with market information throughout US markets
Hourly Electricity Grid Monitor

CAISO website with public west-wide market data, but focused mostly on California
Today's Outlook
Open Access Same-time Information System (OASIS)

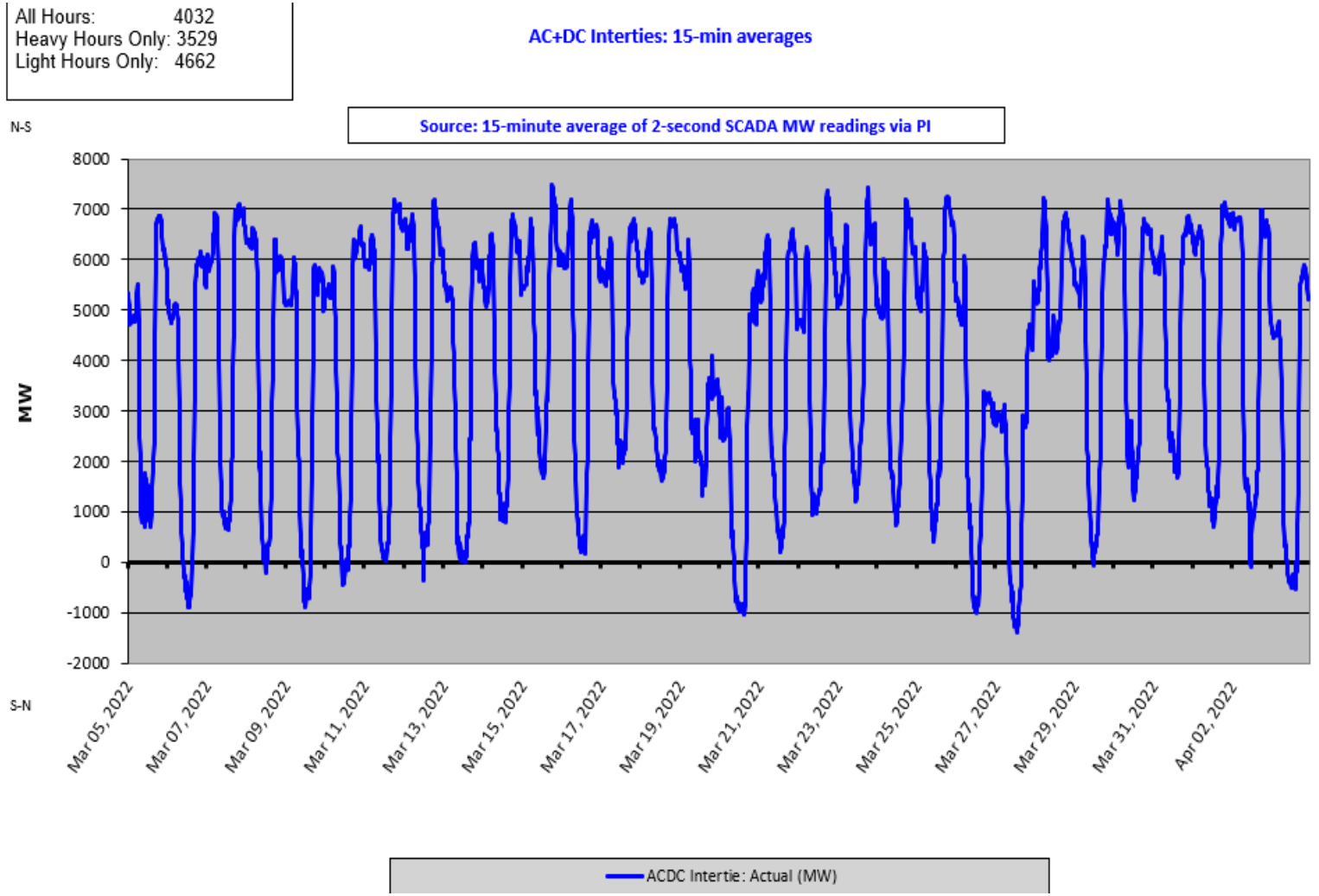
BPA Operations Information
Operations Information

Current Electricity Market Conditions

John Ollis, Ben Kujala

Power Committee

April 12, 2022



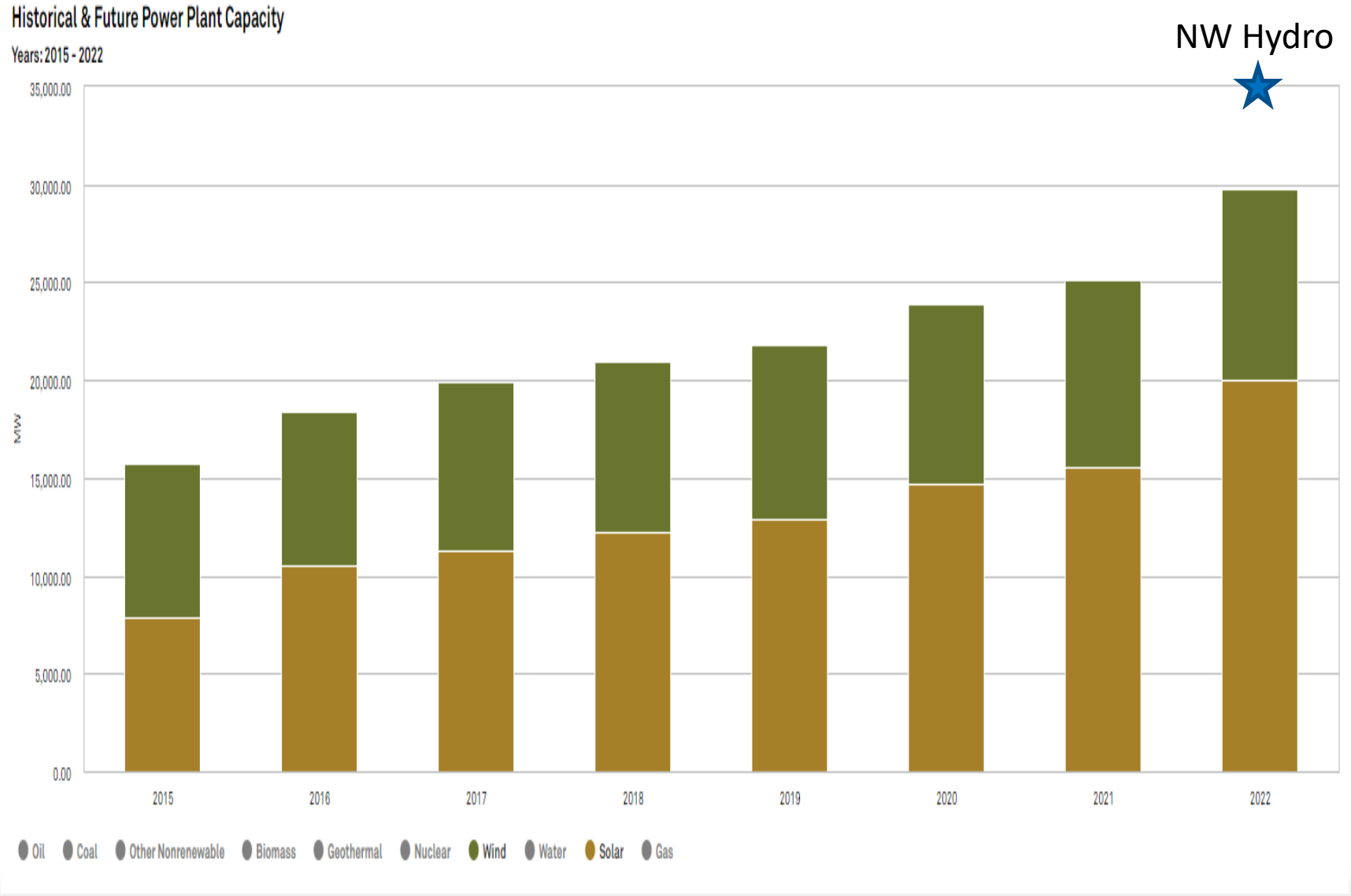
Average Power Flow Across AC and DC Transmission Lines from Northwest to California in March 2022 from BPA Operations Information Site

Themes

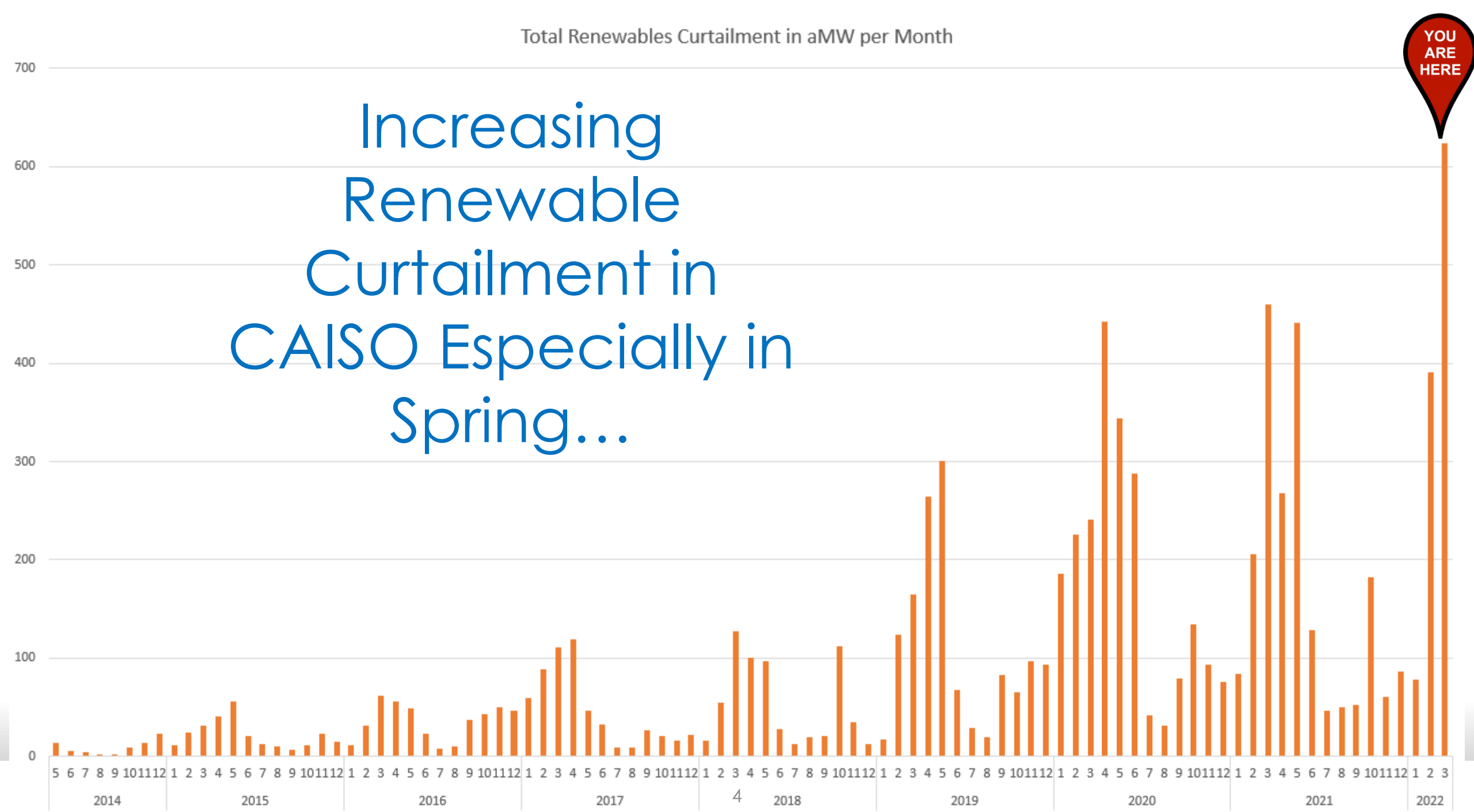
- Forecasted market fundamentals in the plan starting to appear consistently in market data
  - Springtime midday solar surpluses from southwest heading north
  - Negative pricing consistently during spring
  - Northwest flexing hydropower into ramping periods to accommodate local wind generation and imported solar generation
- Collaborative market processes taking advantage of resource diversity progressing

Renewable Buildout Throughout the WECC

- Wind and solar buildout in WECC increasingly larger driver of prices
- Northwest hydro conditions still a big driver



Increasing Renewable Curtailment in CAISO Especially in Spring…



Northwest Hydro Conditions

- NOAA Site – Water Supply forecasts
- 2022 seems to be a slightly below average year so far
- 2017 had high runoff
- 2021 had low runoff

Choose Date: 04/04/2022 Archive: Water Year

COLUMBIA - THE DALLES DAM (TDAO3)
Forecasts for Water Year 2022

Official Water Supply

ESP with 10 Days QPF ***Ensemble:*** 2022-04-04 ***Issued:*** 2022-04-04

Forecast Period	Forecasts Are in KAF 90 %	50 %	% Average	10 %	30 Year Average (1991-2020)
APR-SEP	84758	90772	96	100997	94166
APR-JUL	71231	77756	95	87115	81933
APR-AUG	79373	85346	96	95422	89196
JAN-SEP	103146	109160	94	119385	115946
JAN-JUL	89619	96144	93	105503	103714
OCT-SEP	121211	127225	96	137450	132314

Experimental Water Supply

HEFS with 15 days EQPF ***Ensemble:*** 2022-04-04 ***Issued:*** 2022-04-04

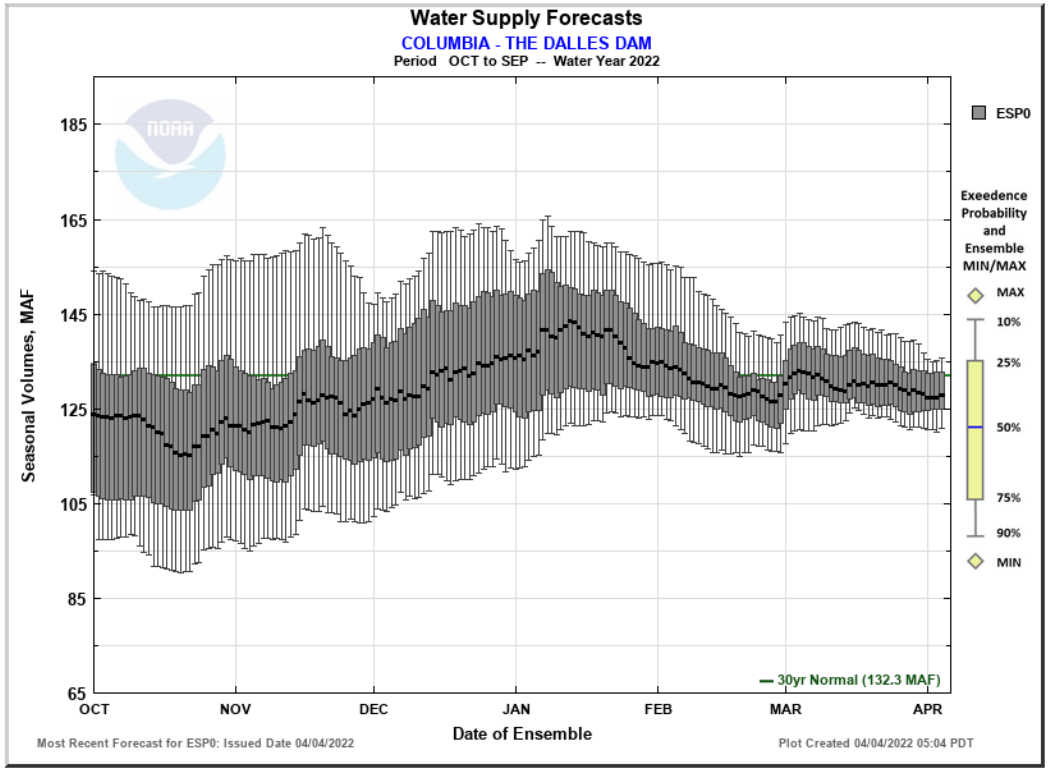
APR-SEP	85224	92617	98	100702	94166
APR-JUL	72667	79601	97	88022	81933
APR-AUG	79849	86933	97	95442	89196
JAN-SEP	103612	111005	96	119090	115946
JAN-JUL	91055	97989	94	106410	103714
OCT-SEP	121677	129070	98	137155	132314

Reference

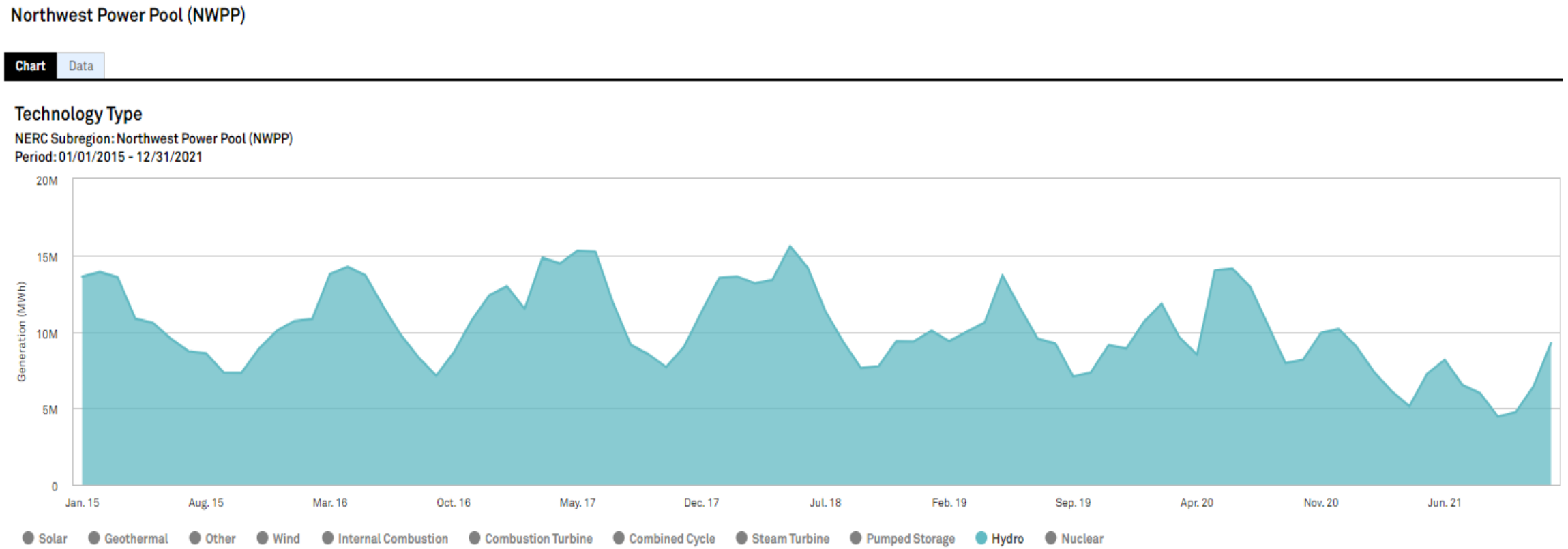
ESP with 0 Days QPF ***Ensemble:*** 2022-04-04 ***Issued:*** 2022-04-04

APR-SEP	84775	91883	98	99596	94166
APR-JUL	72391	79910	98	86763	81933
APR-AUG	79725	87118	98	94572	89196
JAN-SEP	103163	110271	95	117984	115946
JAN-JUL	90779	98298	95	105151	103714
OCT-SEP	121228	128336	97	136049	132314

Move the mouse over the desired "Forecast Period" to display a graph.

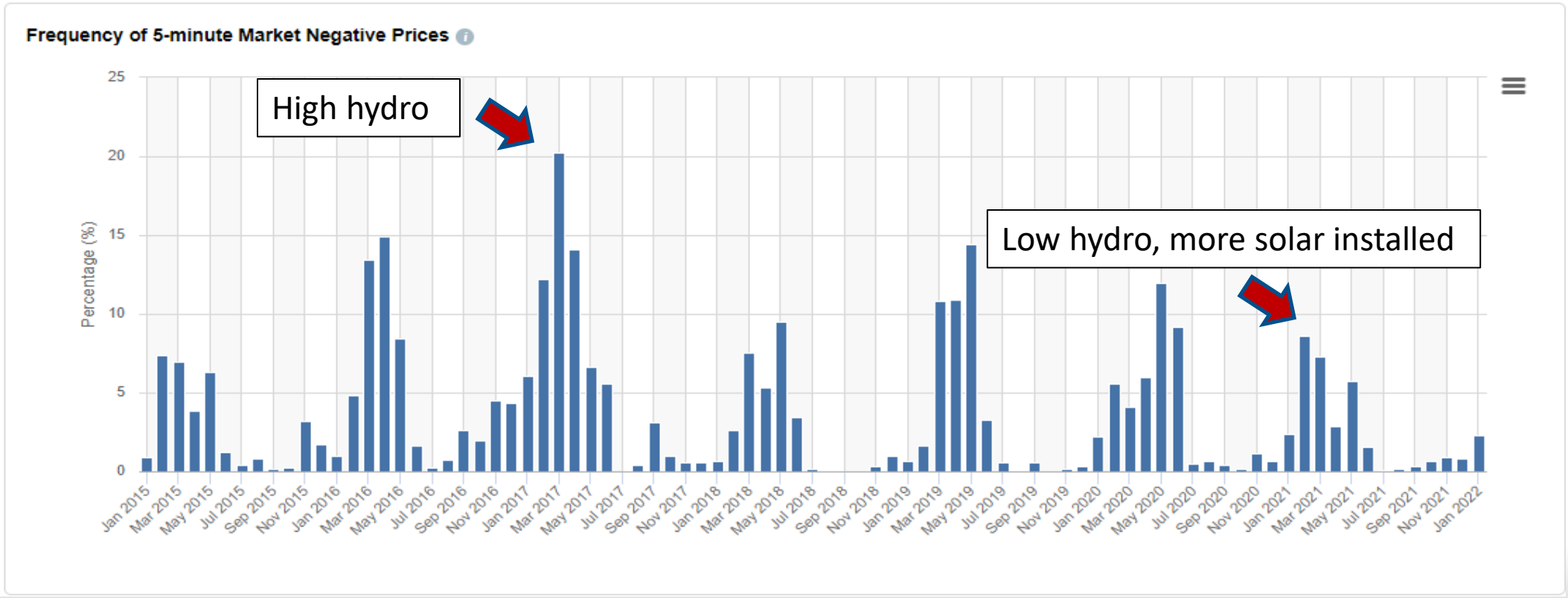


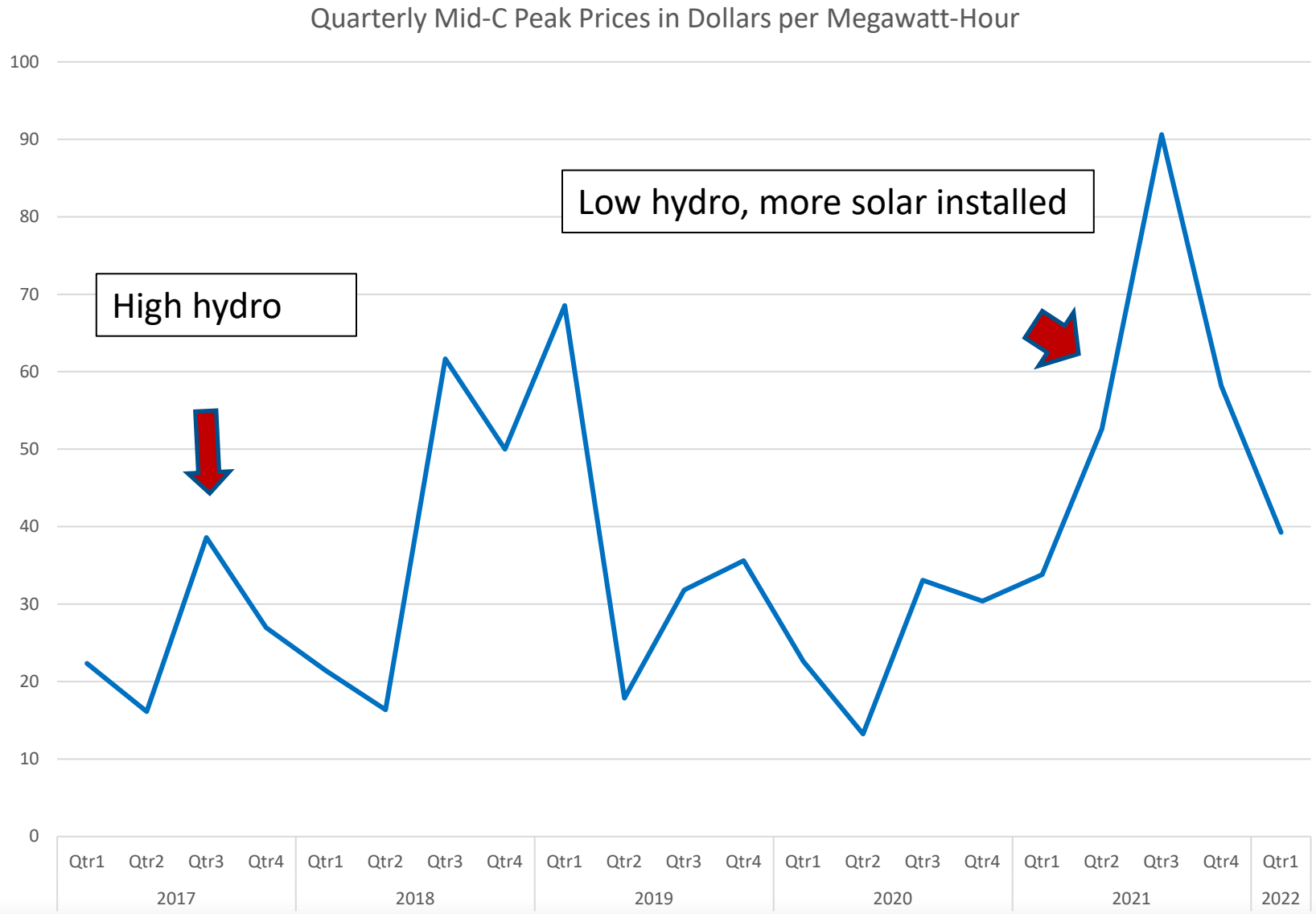
Monthly NW Hydro Generation Varies By Runoff Condition



Frequency of Negative Pricing follows Seasonality and Timing of Renewables Curtailment But Also NW Hydro Runoff

Negative Prices



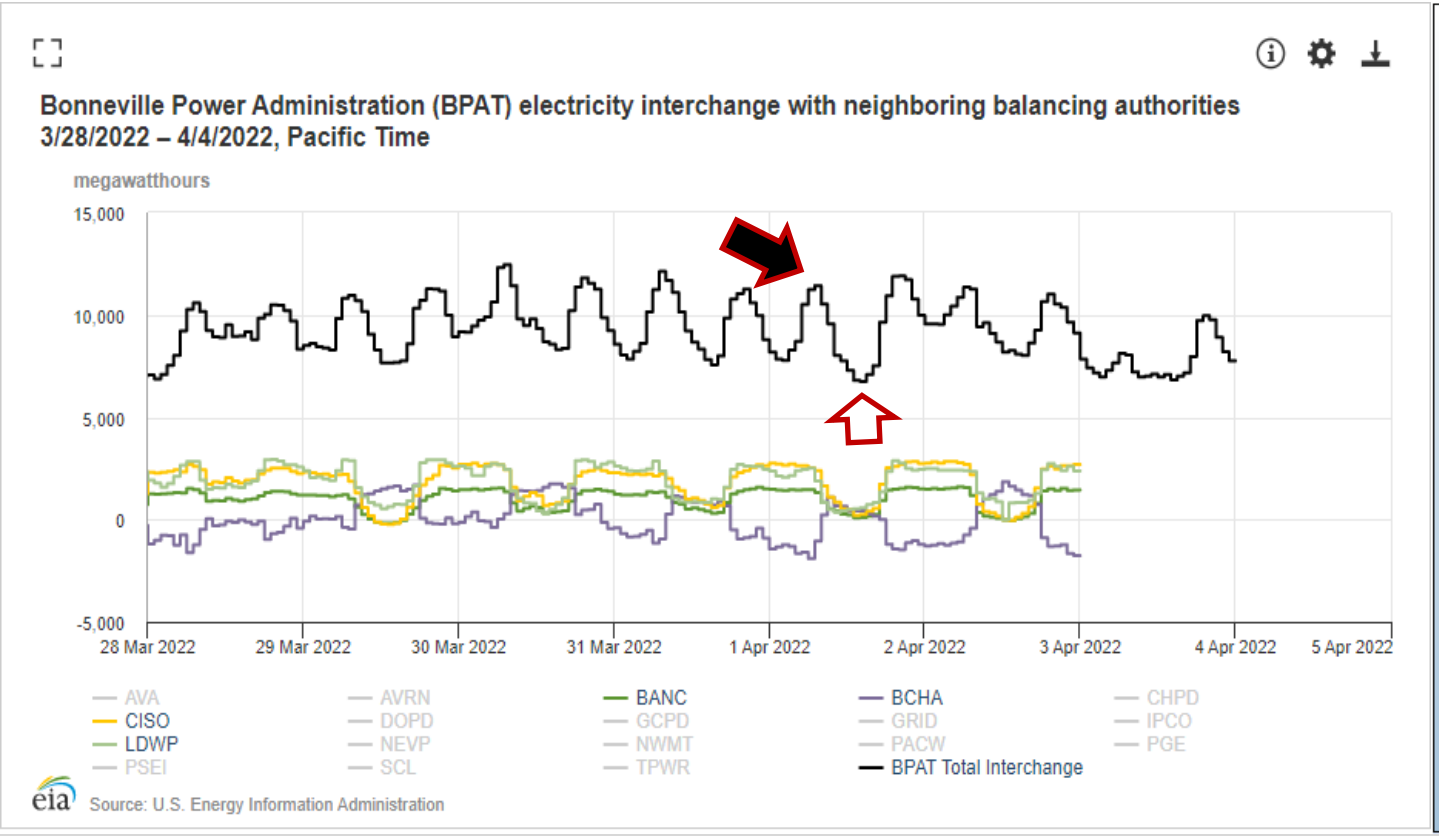


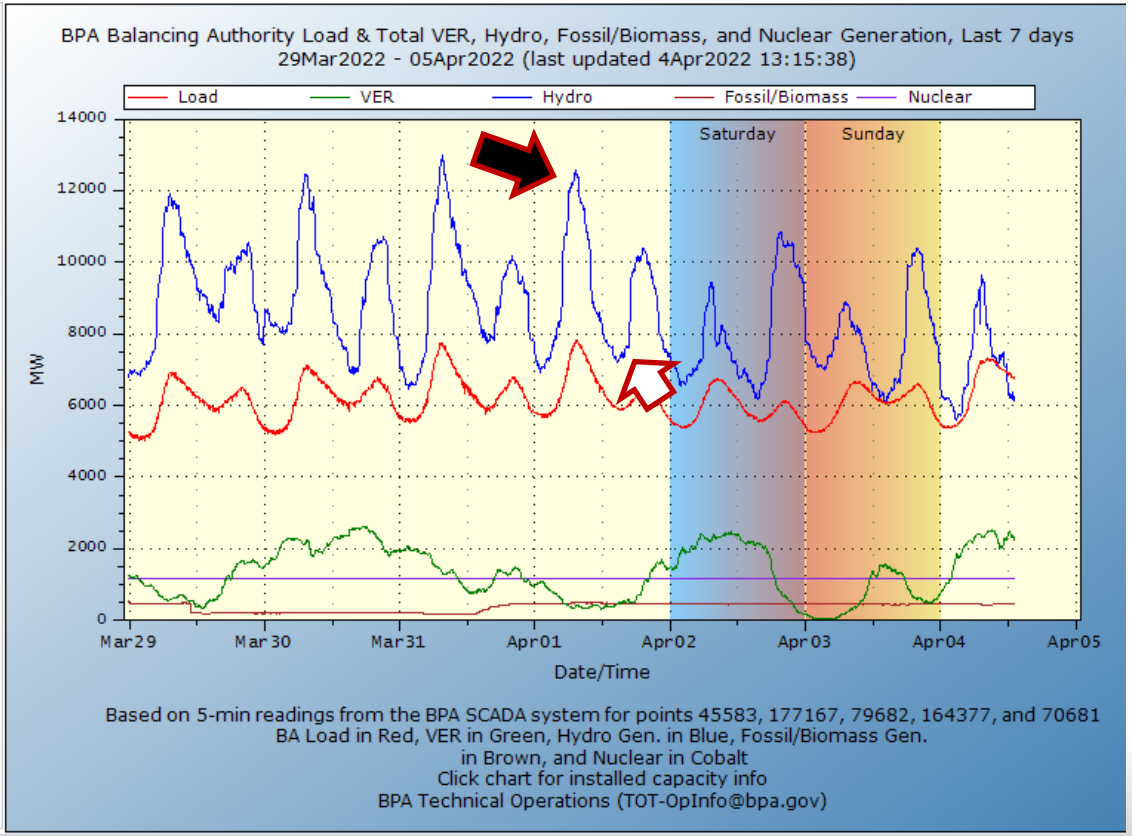
Short Term Price Volatility Due to Year-to-Year Changes in Northwest Hydro Runoff Can Hide Longer Term Fundamental Changes

BPA Daily Hydro Generation Shape and Interchange in Spring

EIA - Hourly Electricity Grid Monitor

BPA - Operations Information

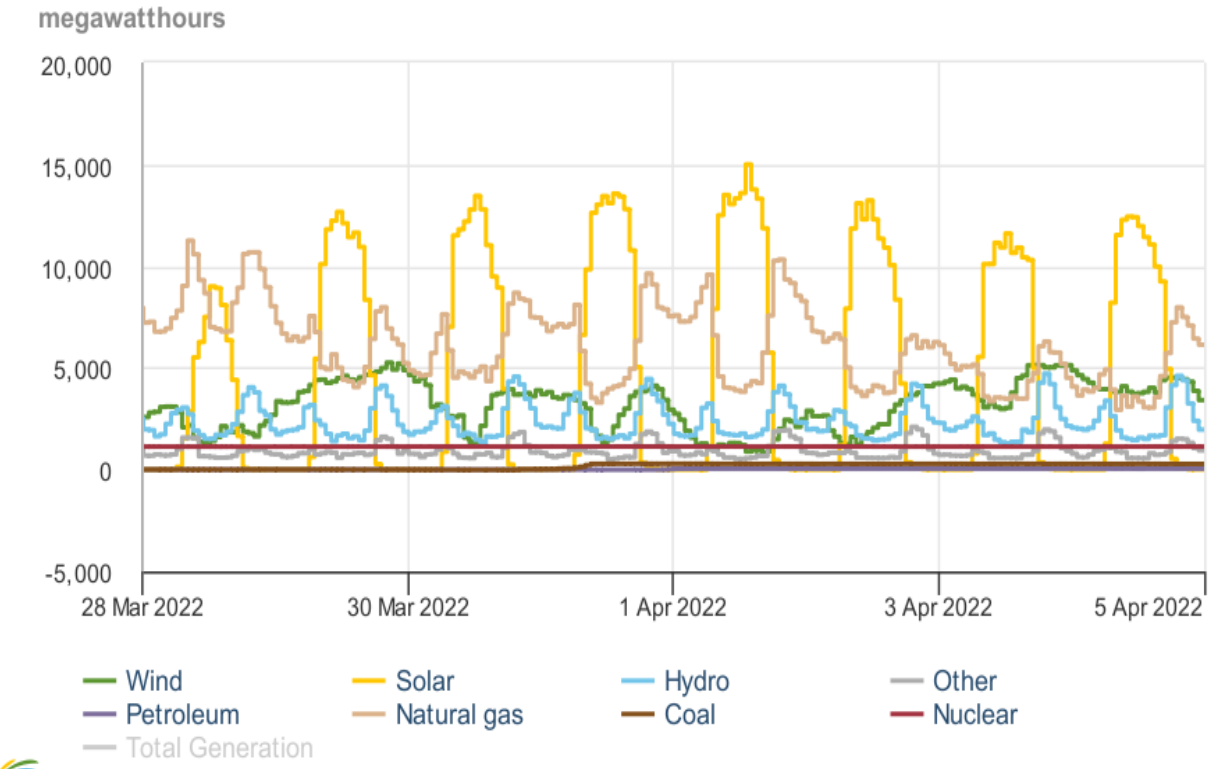




California Resources in Spring

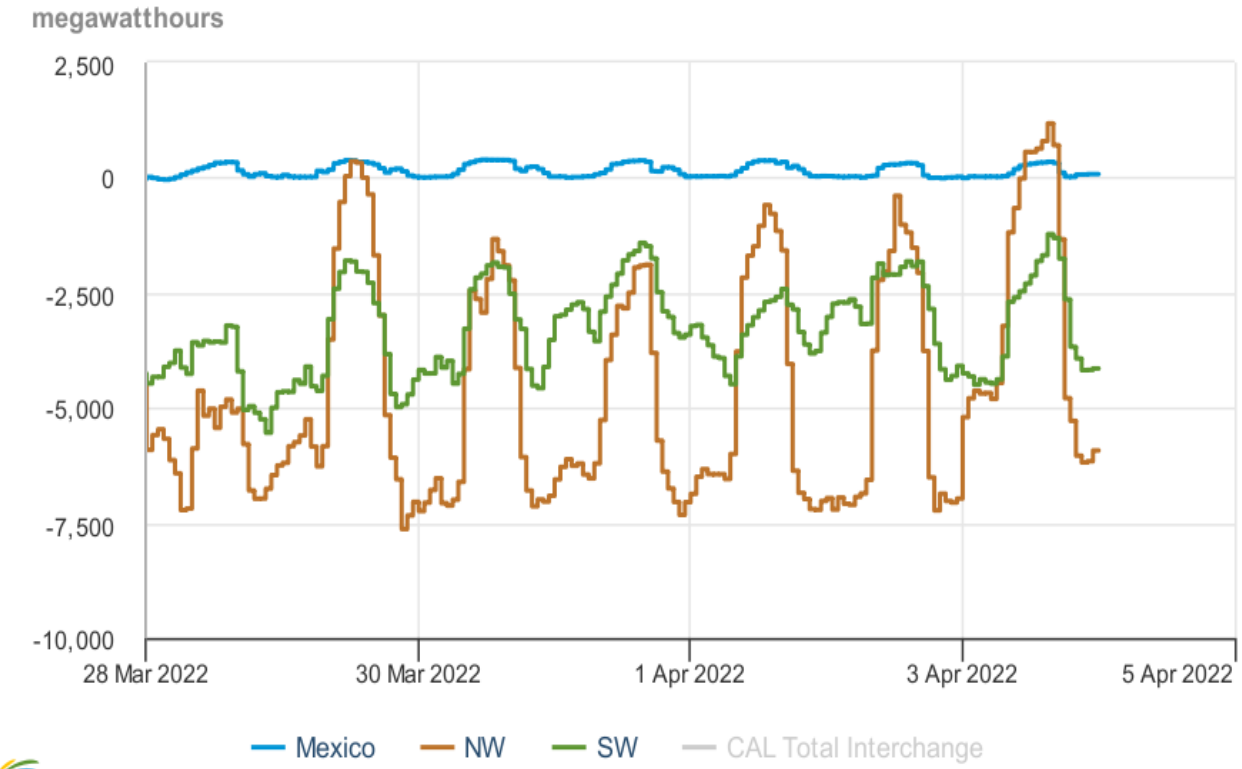
Using NW and SW resources to flex around CA Solar

California (CAL) region electricity generation by energy source 3/28/2022 – 4/4/2022, Pacific Time



eia Source: U.S. Energy Information Administration

California (CAL) region electricity interchange with neighboring regions 3/28/2022 – 4/4/2022, Pacific Time

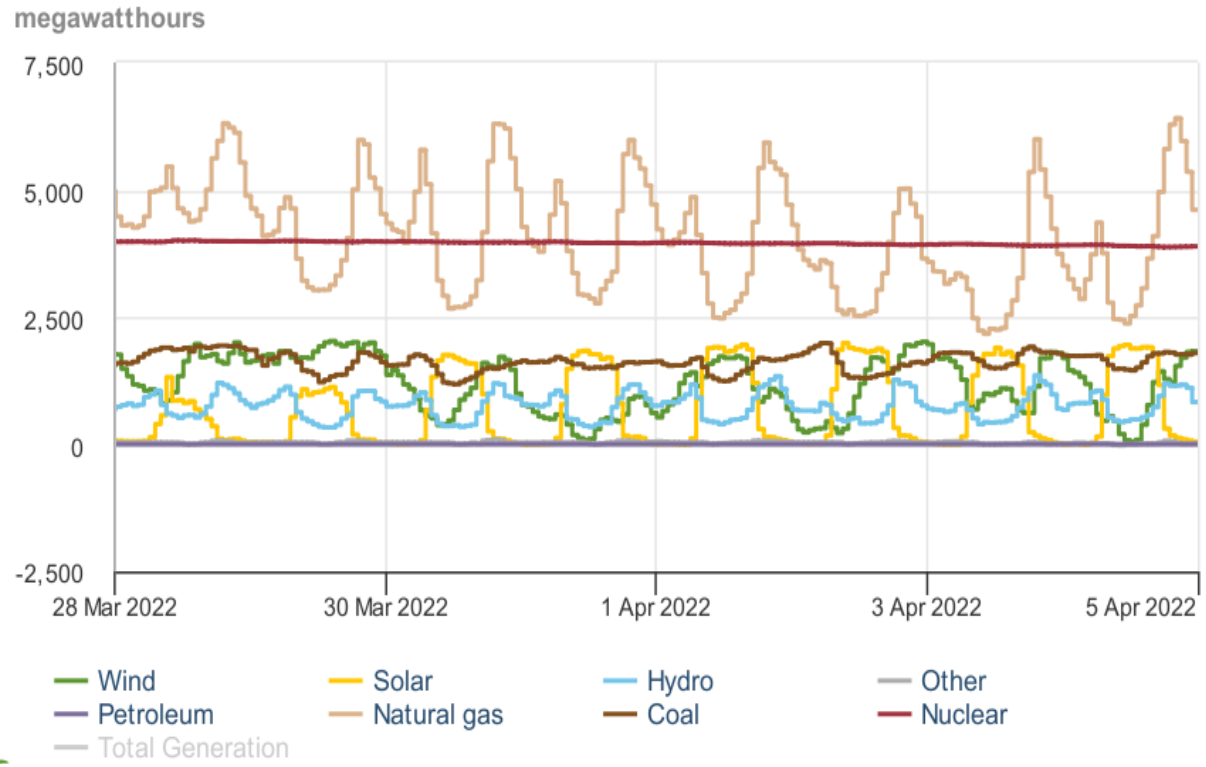


eia Source: U.S. Energy Information Administration

Southwest Resources in Spring

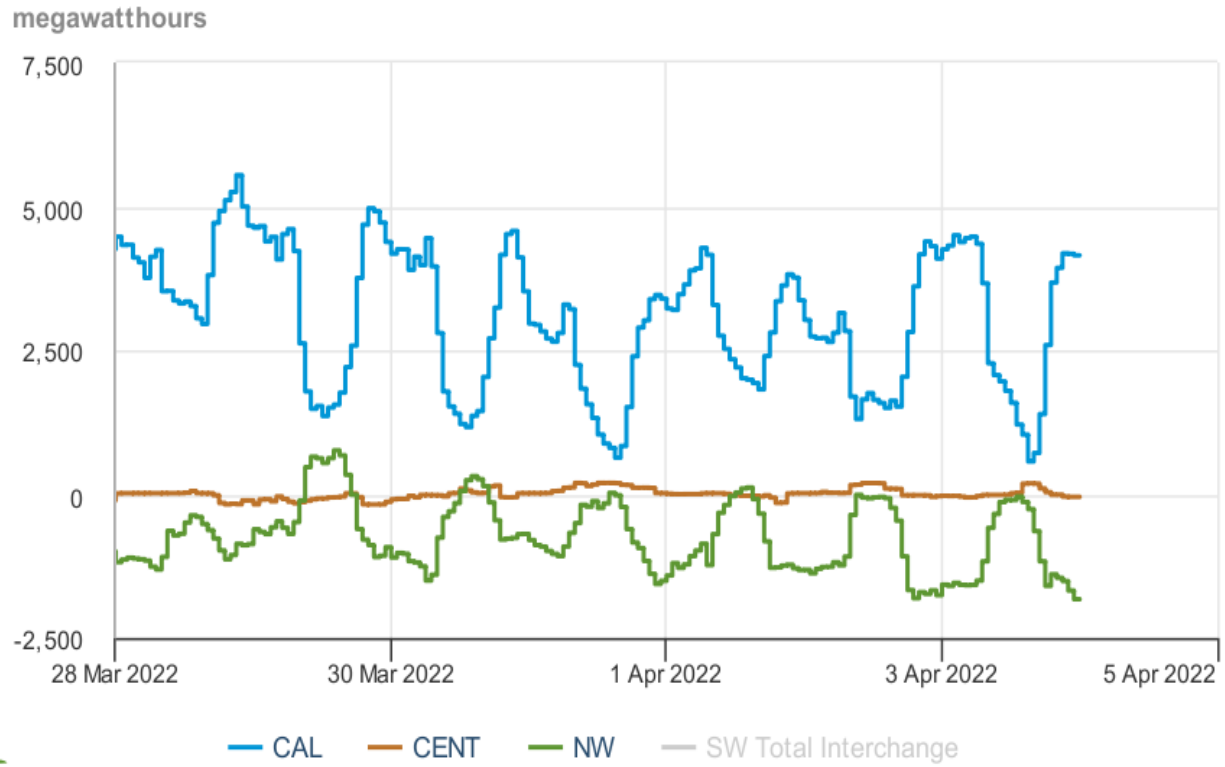
Using gas fleet to assist CA ramping

Southwest (SW) region electricity generation by energy source 3/28/2022 – 4/4/2022, Arizona Time



Source: U.S. Energy Information Administration

Southwest (SW) region electricity interchange with neighboring regions 3/28/2022 – 4/4/2022, Arizona Time

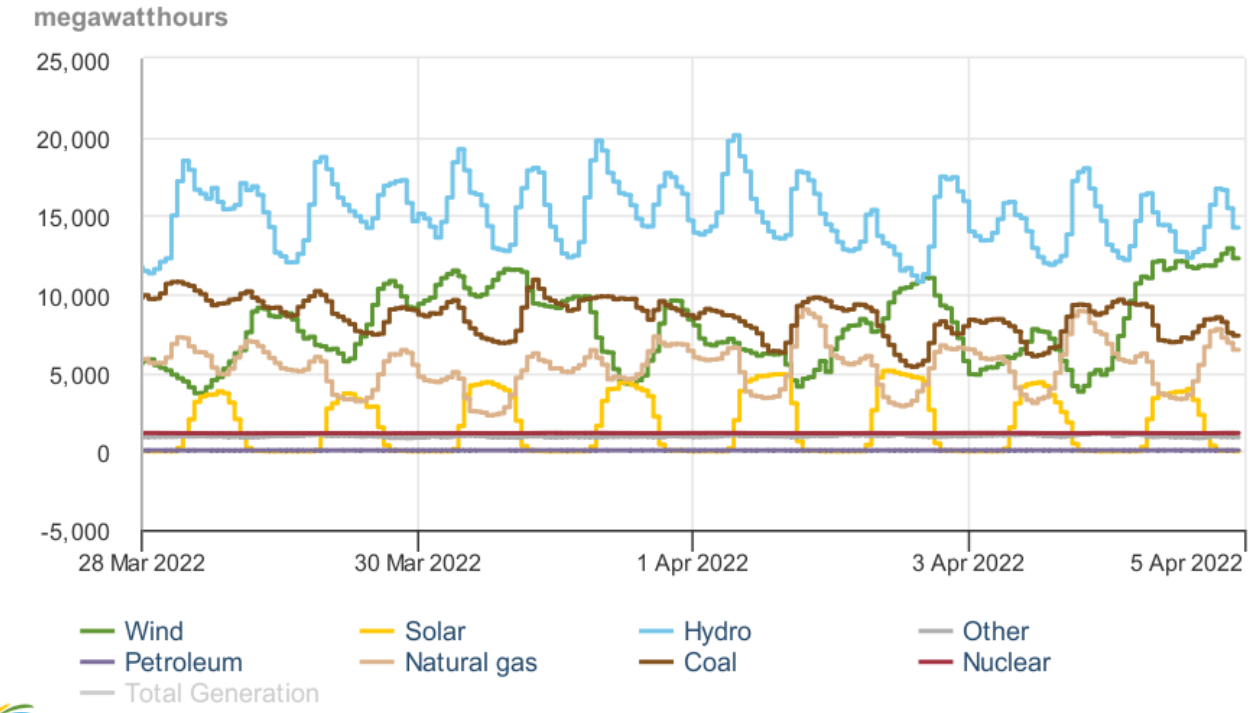


Source: U.S. Energy Information Administration

Northwest and Mountain West Resources in Spring

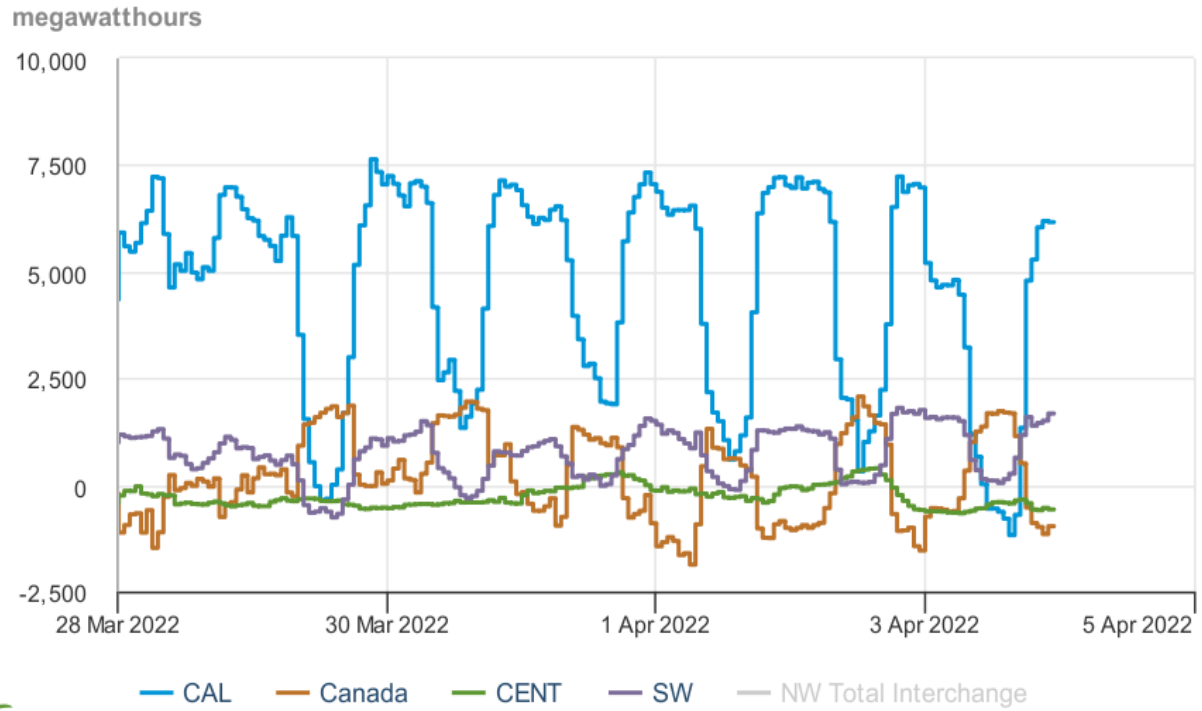
Using regional hydro and thermal to assist CA ramping

Northwest (NW) region electricity generation by energy source 3/28/2022 – 4/4/2022, Pacific Time



eia Source: U.S. Energy Information Administration

Northwest (NW) region electricity interchange with neighboring regions 3/28/2022 – 4/4/2022, Pacific Time

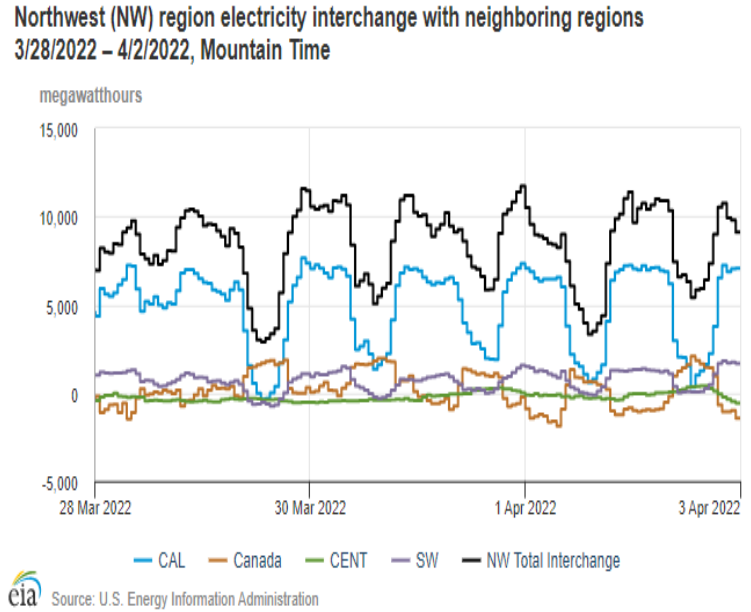


eia Source: U.S. Energy Information Administration

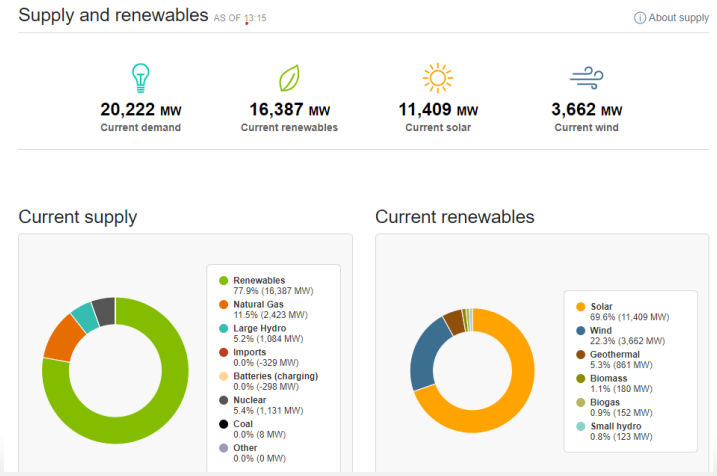
Reference Resources

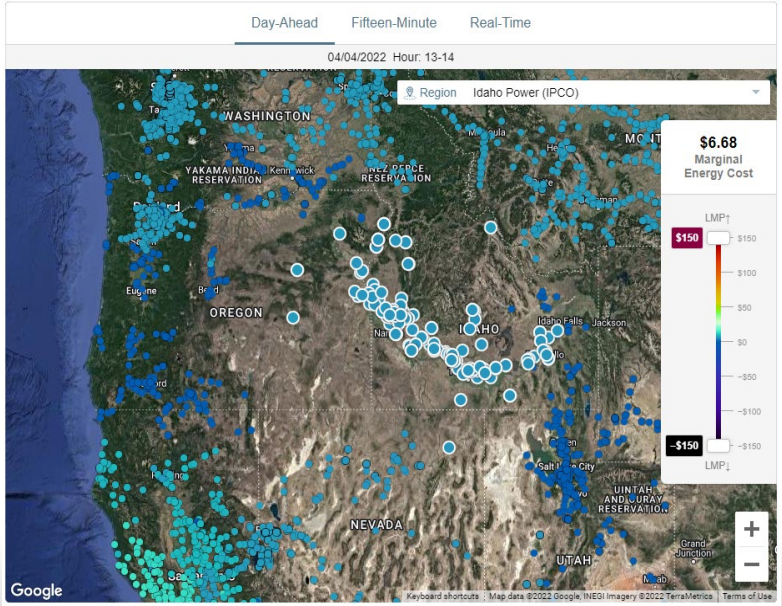
- EIA

  Hourly Electricity Grid Monitor



- CAISO
  - Today's Outlook
  - Open Access Same-time Information System (OASIS)





Questions?

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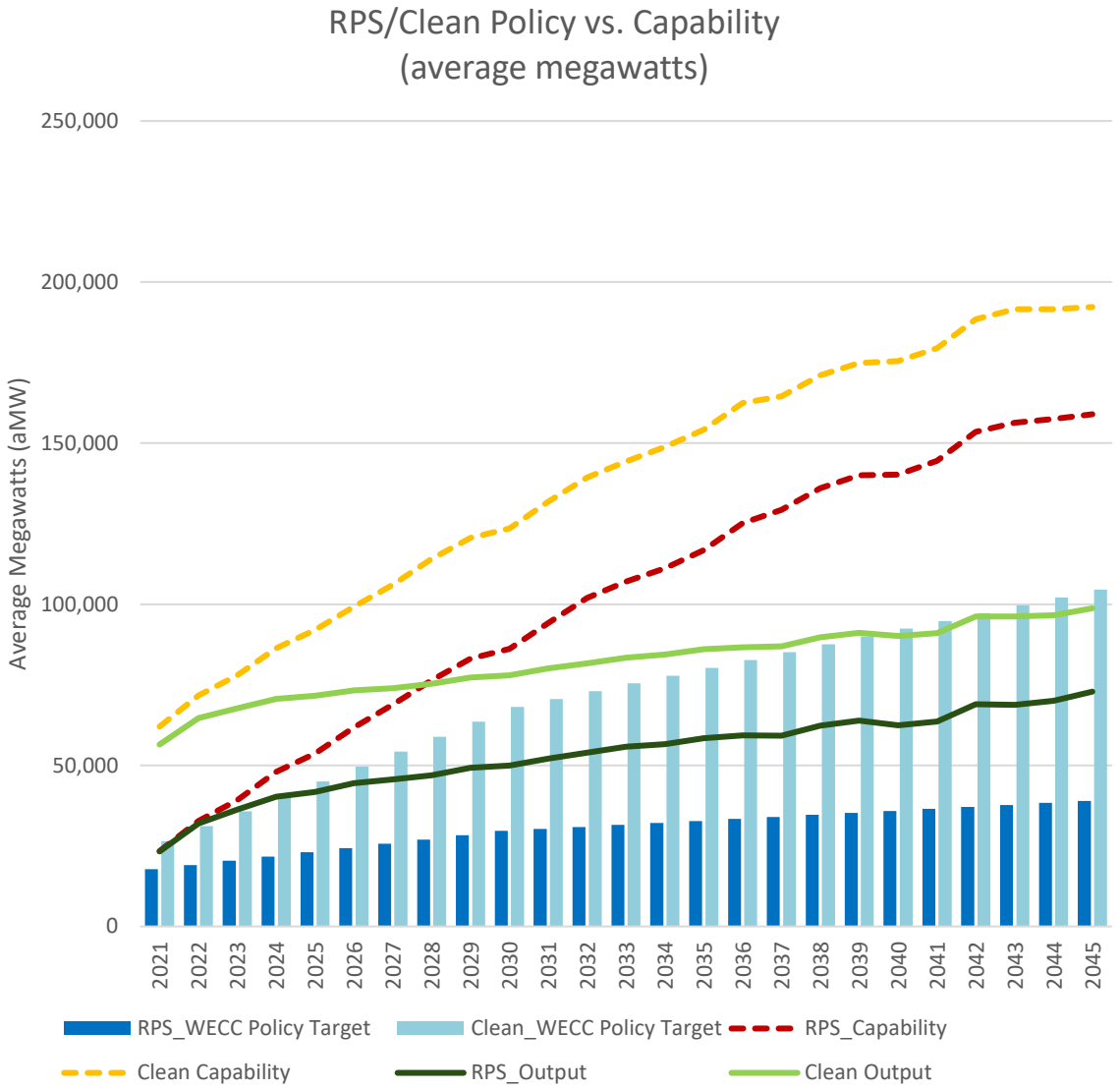
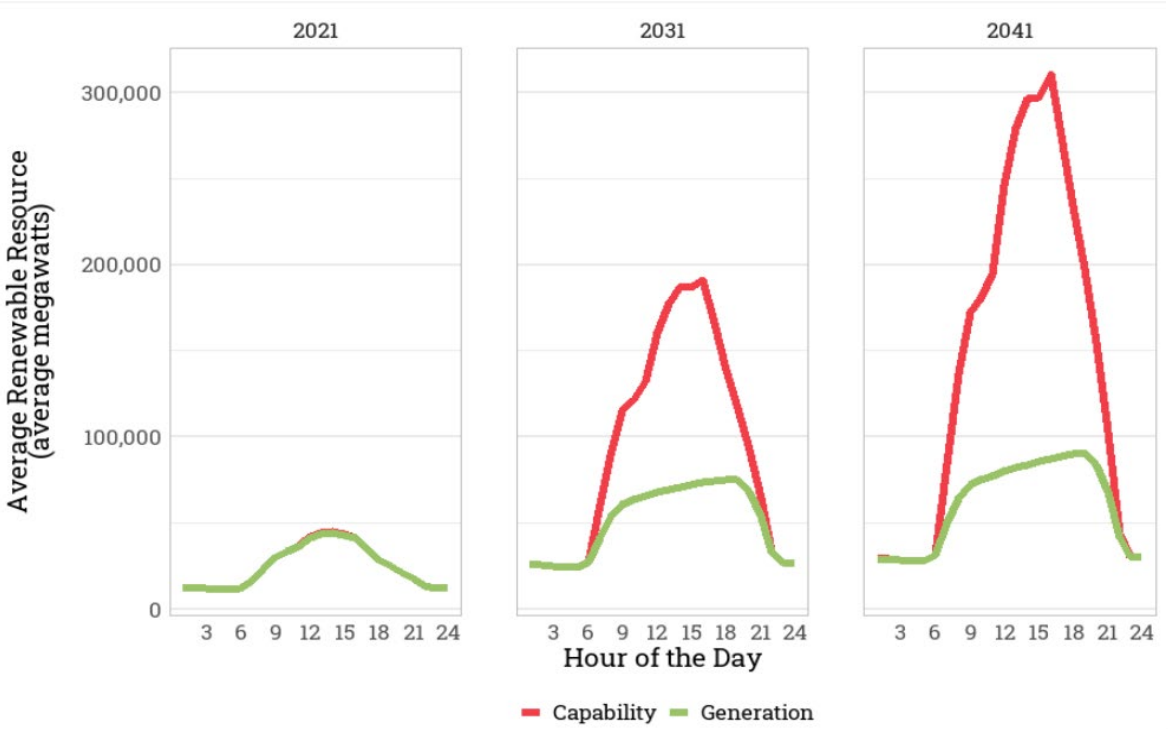
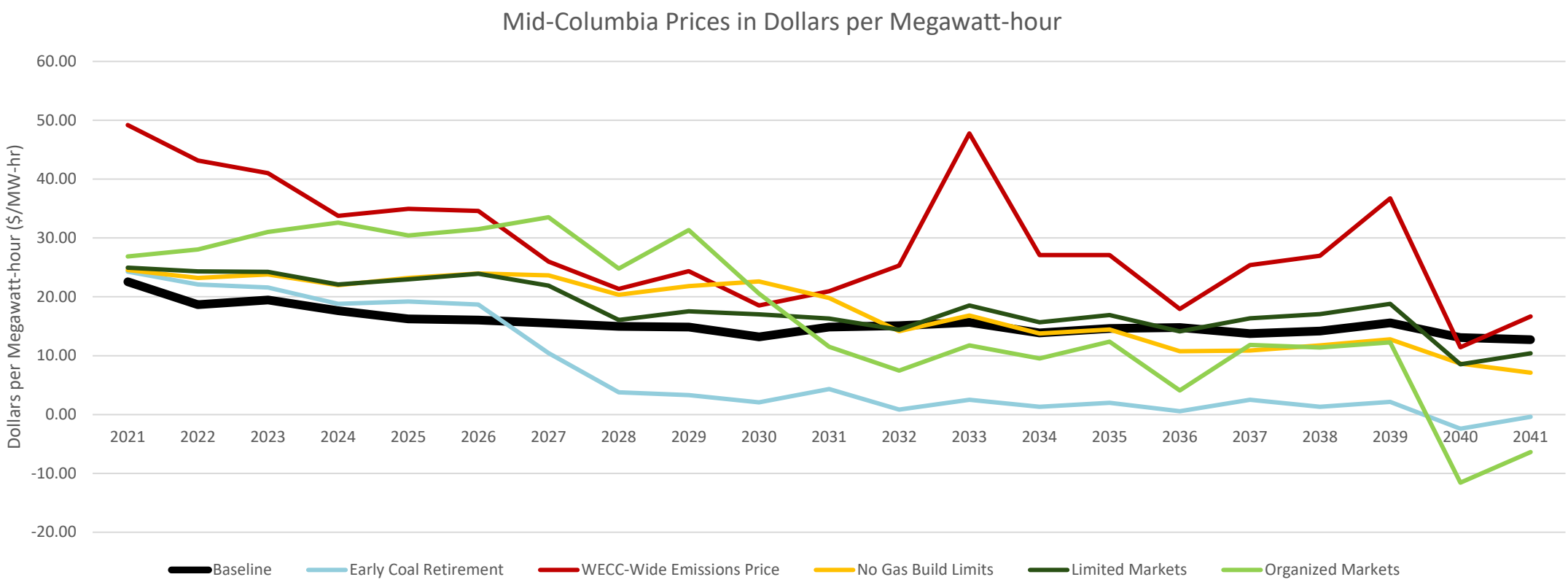


Clean policies based on annual targets drive renewable builds throughout WECC creating surplus generation, renewable curtailment mid-day, low prices due to foregone credits for clean generation and subsequent operational challenges.

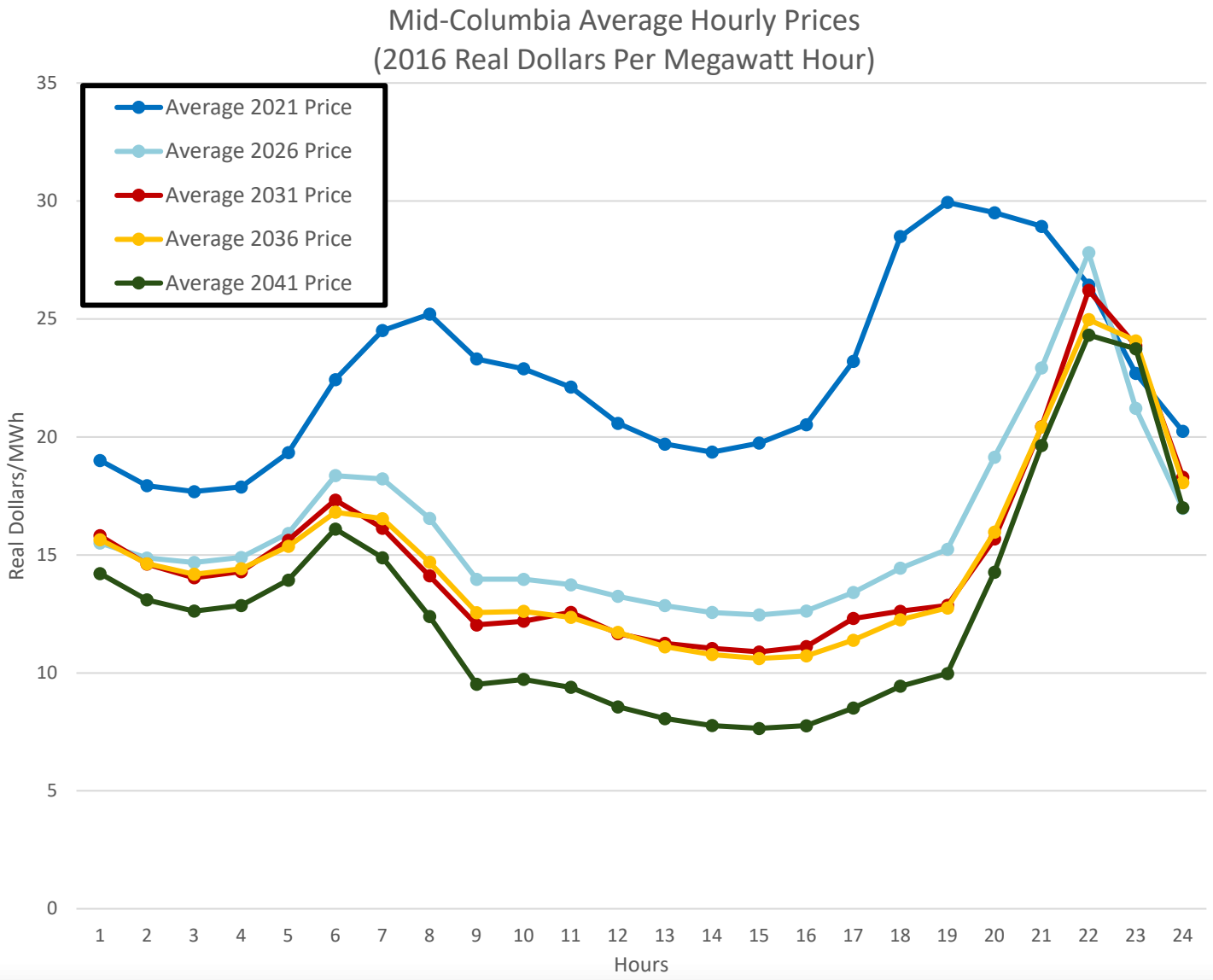


Supporting Materials: Baseline Conditions, WECC

Annual Mid-Columbia Prices Decrease Over Time In All Scenarios



Supporting Materials: Production Cost Simulation Results

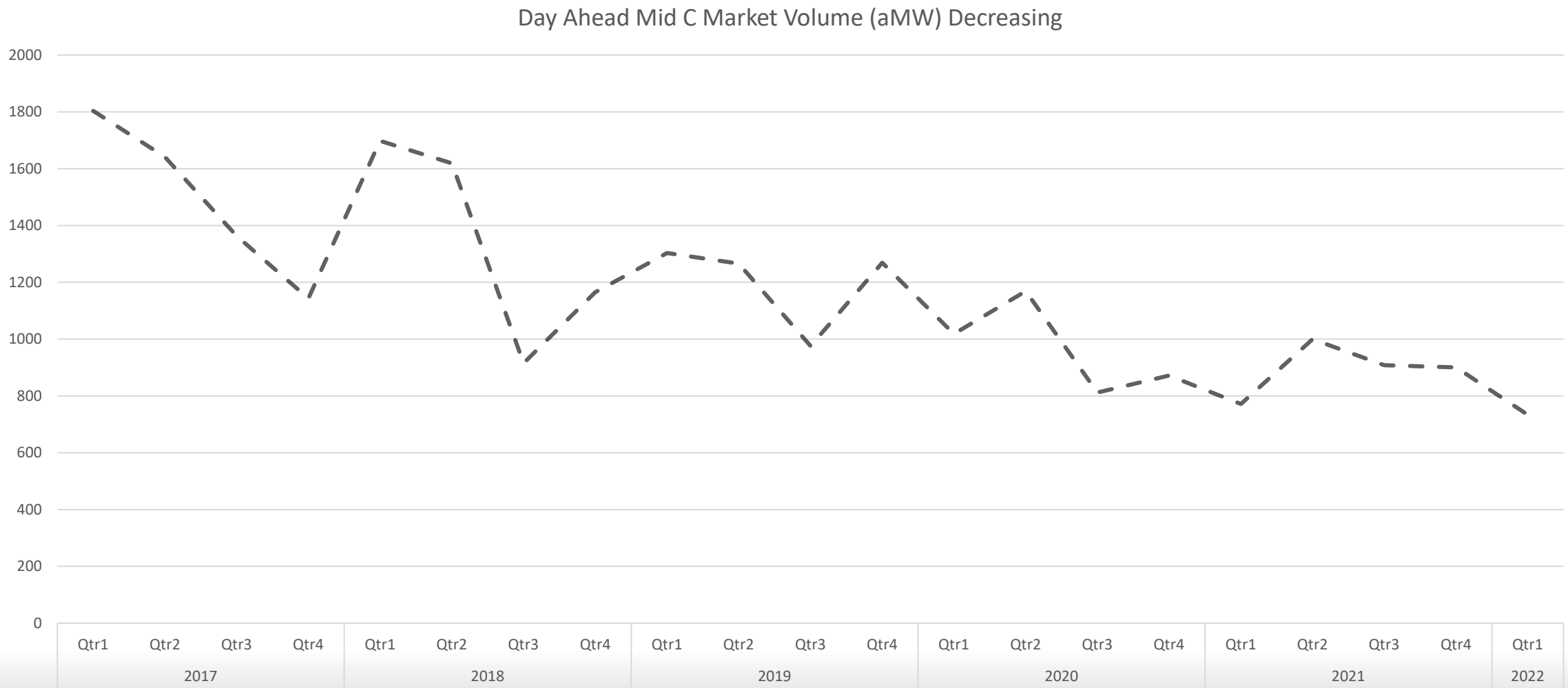


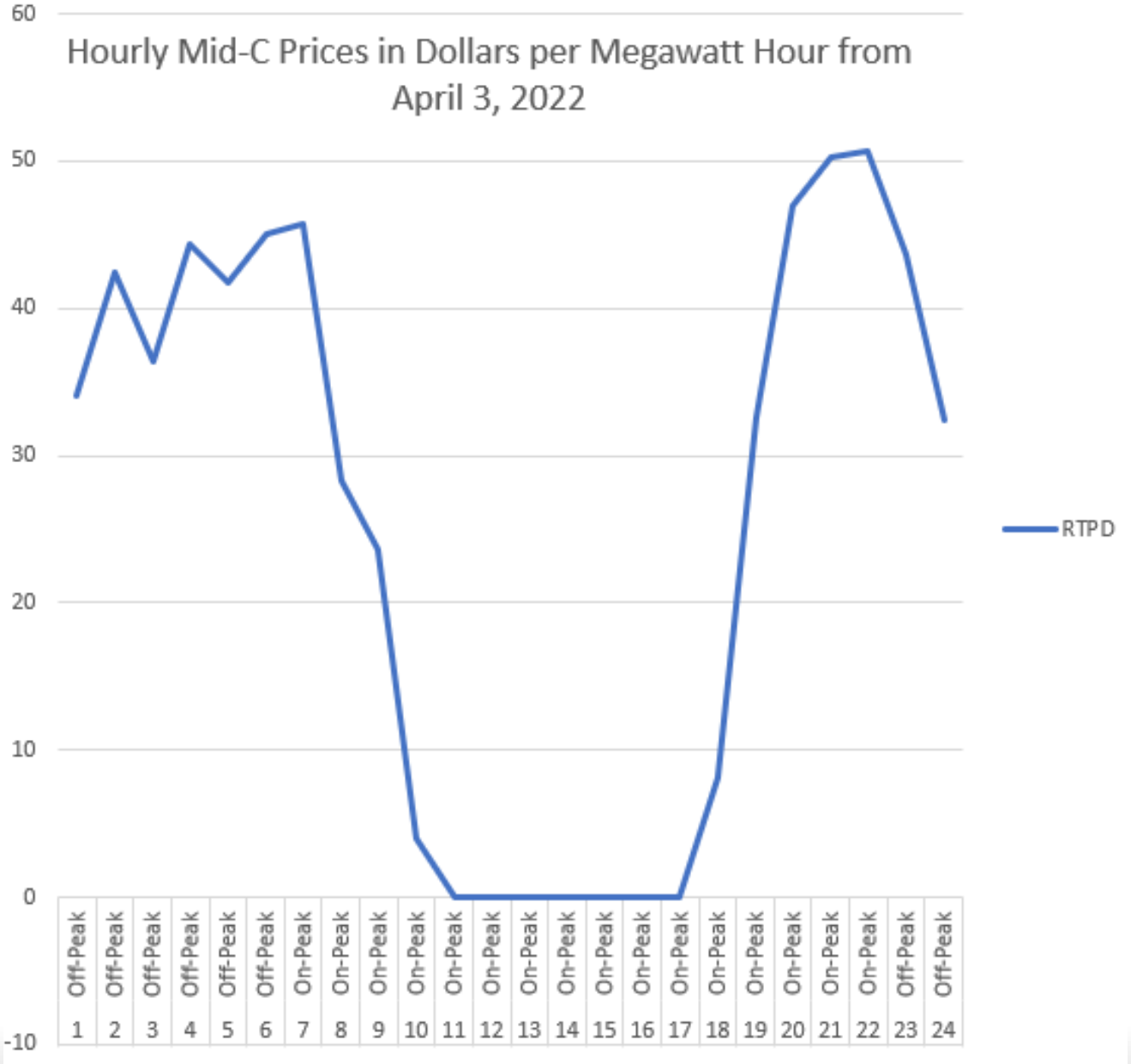
Gas and Coal Plants Consistently Setting Market Price During Morning and Evening Ramp Hours.

Renewables Often Marginal During Midday and Overnight by 2040's

Supporting Materials: Production Cost Simulation Results

Trading Volume Seems to be shifting from traditional day ahead market transactions to nearer term markets

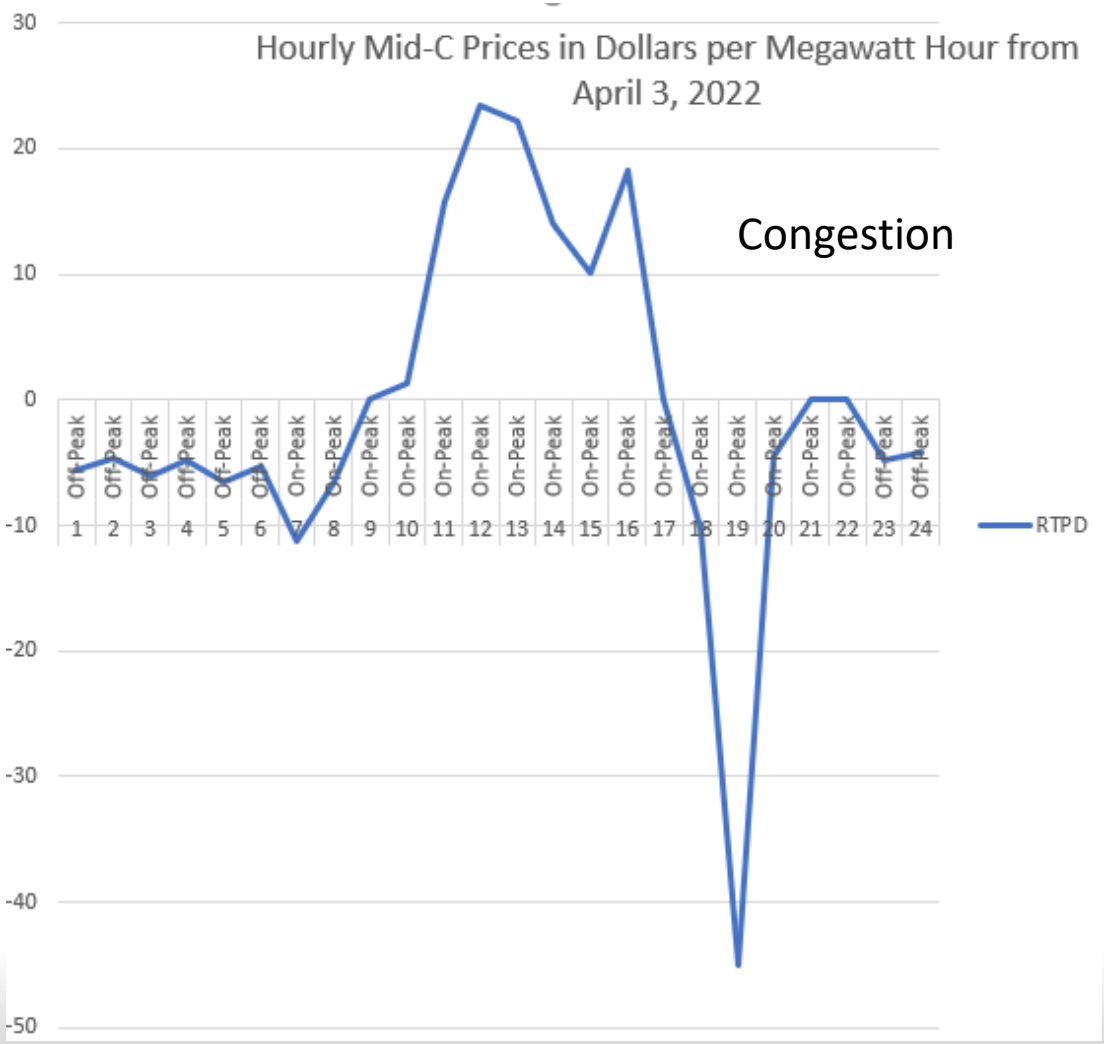


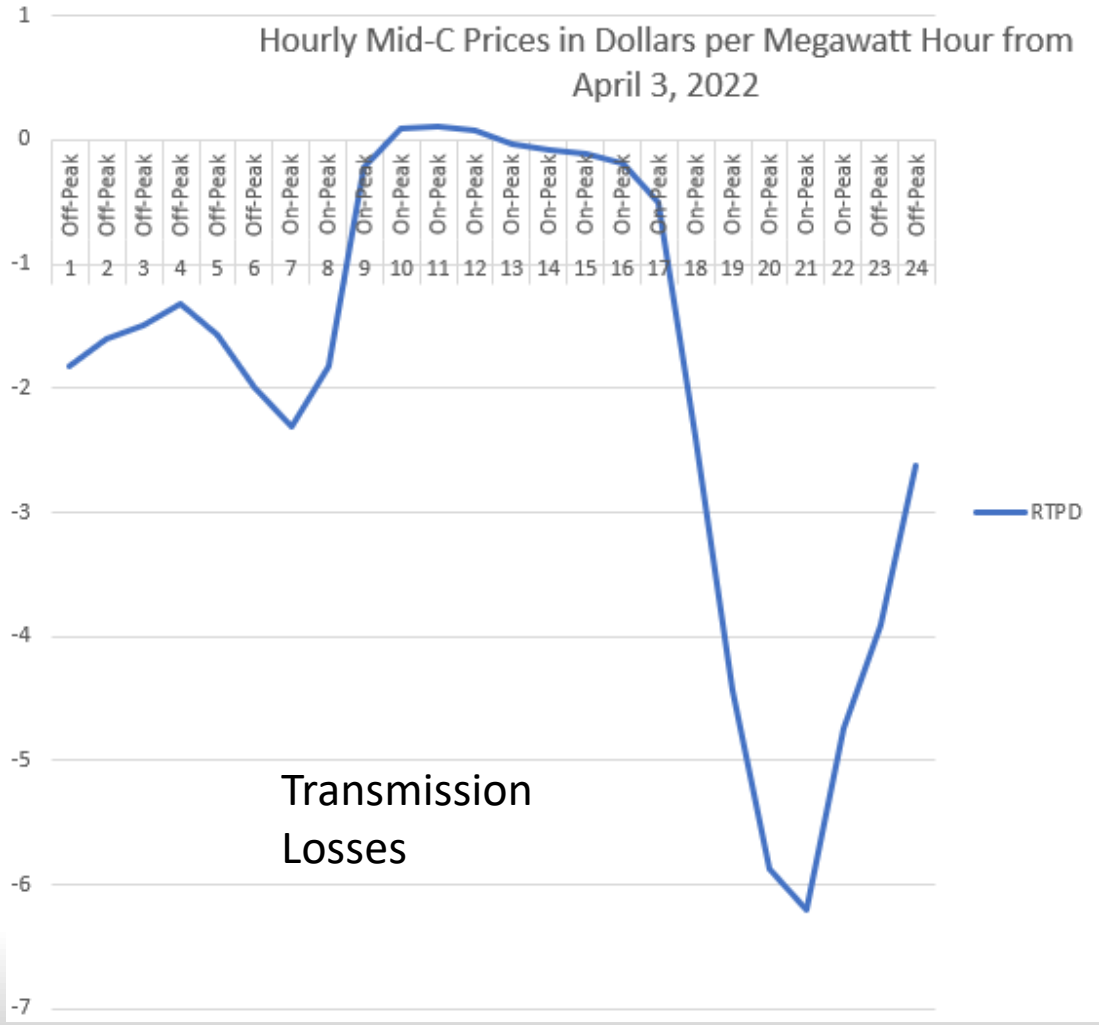


Real Time/Energy Imbalance Market

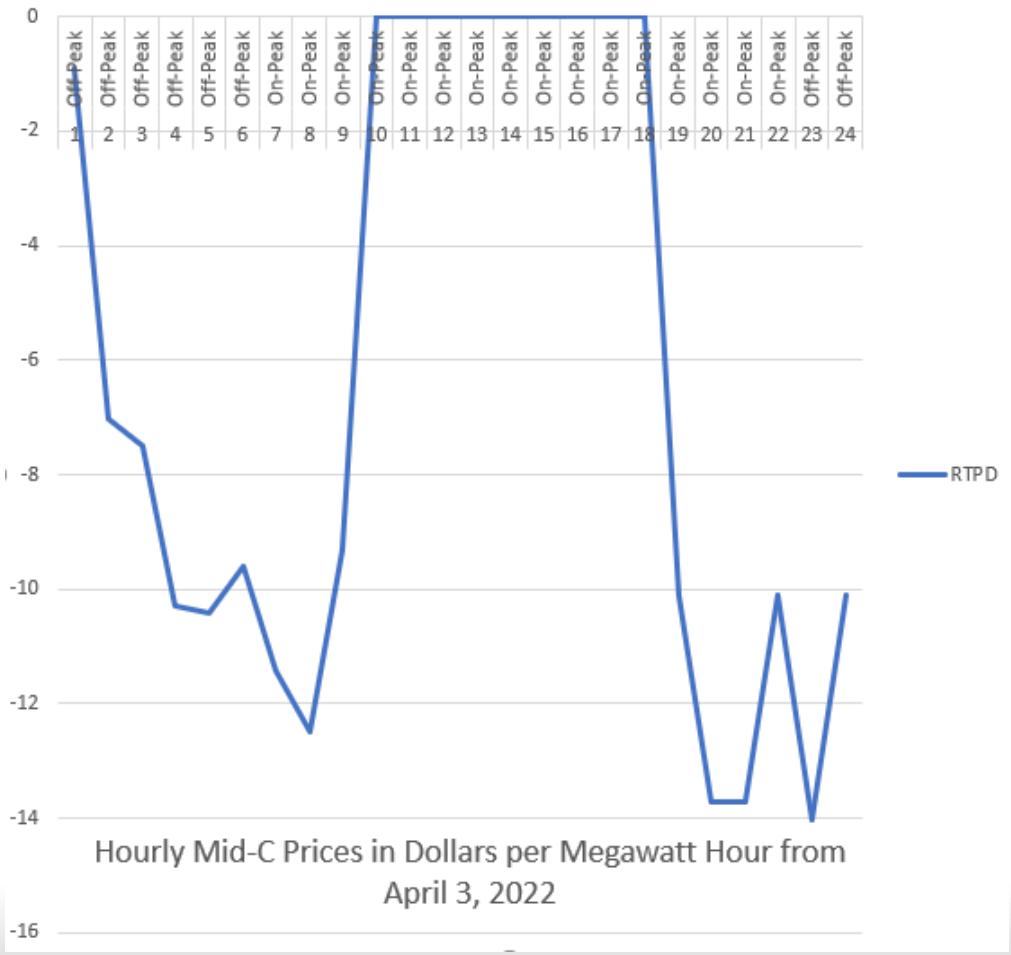
Reported LMP energy Prices at Mid-C from the CAISO

Transmission congestion and losses

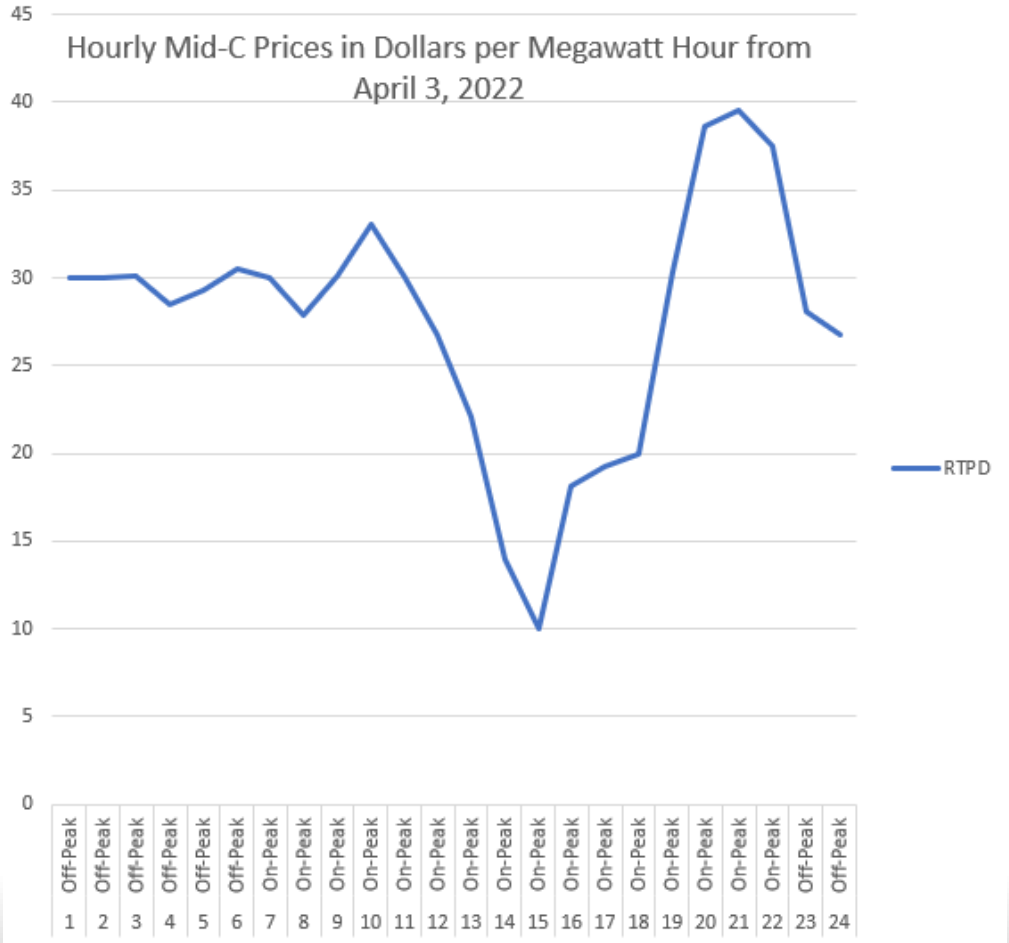




Greenhouse Gas Emissions Pricing



Reported LMP Prices at Mid-C from the CAISO



WECC-wide Buildout