



**Southwest Power Pool
Economic Studies Working Group
July 30th, 2019
Conference Call
• SUMMARY OF ACTIONS TAKEN •**

2020 ITP:

1. Approved 2020 ITP Market Economic Model Benchmarking

**Southwest Power Pool
ECONOMIC STUDIES WORKING GROUP**

July 30th, 2019

Conference Call

• MINUTES •

Agenda Item 1 – Administrative Items

Agenda Item 1a - Call to Order, Introductions

Chair Alan Myers (ITC) called the meeting of the Economic Studies Working Group (ESWG) to order at 9:00 a.m.

There were 53 web conference participants, representing 14 of 16 ESWG members. (Attachment 1 – July 30, 2019 ESWG Attendance)

Agenda Item 1b – Receipt of Proxies

Juliano Freitas (SPP) asked for any proxy statements; one proxy was identified. (Attachment 2 – Proxy Statements)

Agenda Item 1c – Review of Agenda

Chair Alan Myers (ITC) presented the agenda for review and asked for any additions or corrections. (Attachment 3 – July 30, 2019 ESWG Agenda)

Kurt Stradley (LES) made a motion; seconded by Zac Hager (OGE) to adopt the agenda. The motion was approved unanimously.

Agenda Item 1d – Antitrust Reminder

Juliano Freitas (SPP) provided an antitrust reminder to the group.

Agenda Item 2 – Market Economic Model Benchmarking

Juliano Freitas (SPP) gave an updated presentation on benchmarking of the model. Two issues were discussed during this presentation. First, the peak load date, and second the wind capacity factors to be used during the 2020 ITP Assessment.

During the peak load discussion, ESWG members requested SPP Staff to use the 2019 load shapes to verify how it affects the peak load hour; members are not comfortable with the peak load staff presented using the 2020 load shapes.

Staff will re-run the numbers using the 2019 load shapes and post the results by Friday 8/2 and seek an email vote by Monday 8/5.

For the wind capacity factor discussion, staff showed the ESWG members that adjusting the tower height of existing wind to 80 meters would cause a minimum impact on annual energy production numbers (around 3%) (Attachment 4 – 2020 ITP Benchmarking_Updated)

Calvin Daniels (WFEC) made a motion; seconded by Tim Owens (NPPD) to approve the 2020 ITP Market Economic Model Benchmarking. The motion passed with one abstention: Zac Hager (OGE)

Closing Items

The ESWG identified three action items during the meeting:

1. Address load shape issues provided by ABB
2. Review interchange methodology for ITP Assessment



3. Reevaluate existing wind hub heights for the 2021 ITP Scope

The meeting was adjourned at 11:35 AM.

Respectfully Submitted,

Amber Greb

ESWG Secretary

| Name | Company/Email | Attendance |
|------------------------------|----------------------------------|------------|
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| Member | Proxy | Note |
|-----------------|----------------|-------------|
| Gayle Nansel | Chris Colson | |
| Jeremy Severson | Jason Mazigian | |
| | | |

Amber:

I give my proxy to Chris Colson for this call.

Thanks.

Gayle...



ECONOMIC STUDIES WORKING GROUP MEETING

July 30th, 2019

Conference Call

• A G E N D A •

Tuesday, 9:00a.m. - 11:00a.m.

1. Administrative Items
 - a. Call to Order, Introductions..... Alan Myers (5 minutes)
 - b. Receipt of Proxies Juliano Freitas (1 minute)
 - c. Review of Agenda¹ Alan Myers (1 minute)
 - d. Antitrust Reminder Juliano Freitas (1 minute)
2. 2020 ITP Items SPP Staff (110 minutes)
 - a. Market Economic Model Benchmarking¹ (Approval Item)
3. Closing Items All (10 minutes)
 - a. Summary of Action Items (Juliano Freitas)
 - b. August ESWG Agenda Items
 - c. Future Meetings
 - i. August 13-14, 2019: ITC Offices, Novi, MI
 - ii. September 5-6, 2019: 41st floor AEP Office, Dallas Texas
 - iii. October 9-10, 2019: SPP Offices, Little Rock, AR
 - iv. November 6-7, 2019: 41st floor AEP Office, Dallas Texas
 - v. December 11-12, 2019: 41st floor AEP Office, Dallas Texas

¹ Background Material Included

Antitrust: SPP strictly prohibits use of participation in SPP activities as a forum for engaging in practices or communications that violate the antitrust laws. Please avoid discussion of topics or behavior that would result in anti-competitive behavior, including but not limited to, agreements between or among competitors regarding prices, bid and offer practices, availability of service, product design, terms of sale, division of markets, allocation of customers or any other activity that might unreasonably restrain competition.



HELPING OUR MEMBERS WORK TOGETHER
TO KEEP THE LIGHTS ON... TODAY AND IN THE FUTURE.

2020 ITP MEM Benchmarking

July 30, 2019

Objective

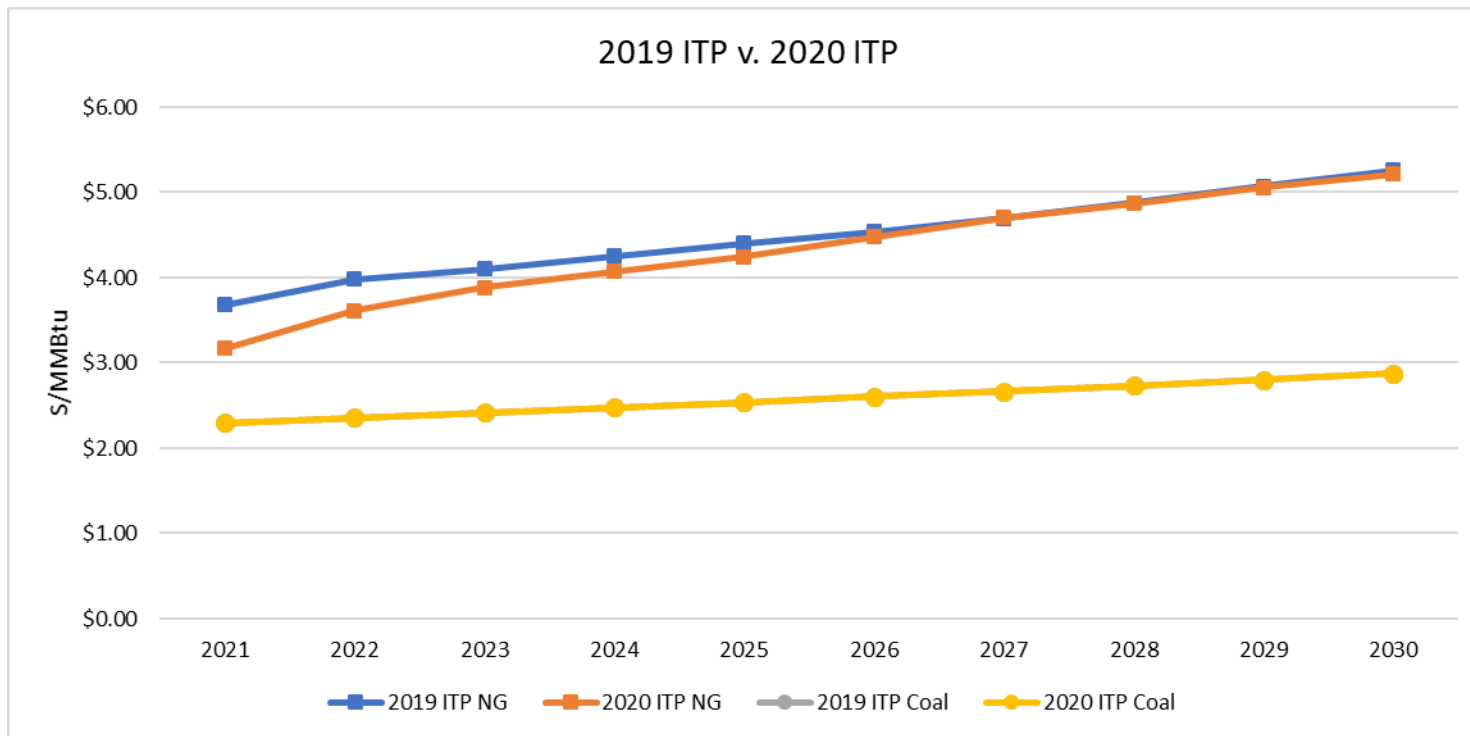
- Provide results of 2020 ITP MEM Benchmarking milestone
- Seek ESG approval for incorporation of model updates and completion of the 2020 ITP MEM Benchmarking milestone

2020 ITP MEM Benchmark Results

Benchmarking Results

- Results include recommended MEM updates
- Natural Gas and Coal Price
- Annual Energy
- Annual Capacity/Energy by Fuel Type
- Capacity Factors & Average Energy Costs
- Capacity Factors by Unit Type
- Renewable Output
- LMPs
- Interchange
- Adjusted Production Cost
- Generator Outages
- Operating & Spinning Reserves

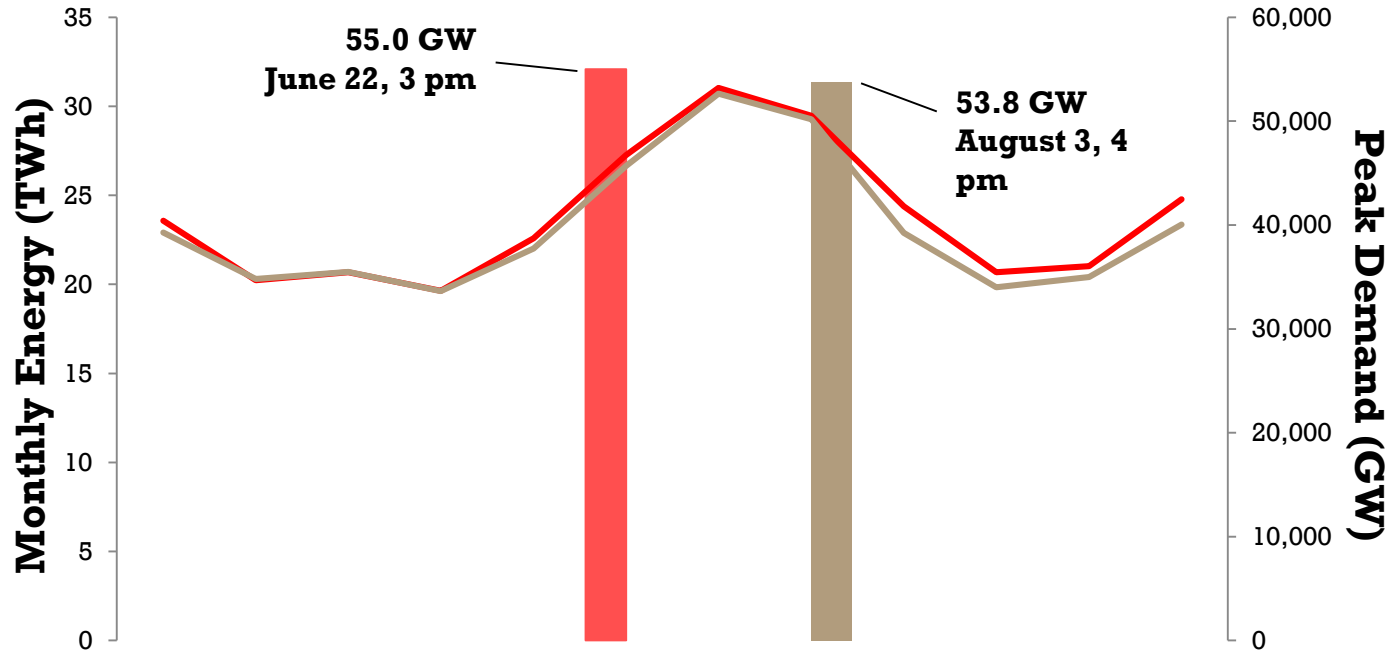
Natural Gas and Coal Price Comparison



- Coal prices stayed the same between the models where a drop in prices was seen in the 2020 ITP, which used an updated forecast price based on current NYMEX trends.

Annual Energy Comparison

2019 ITP Y2 v. 2020 ITP Y2

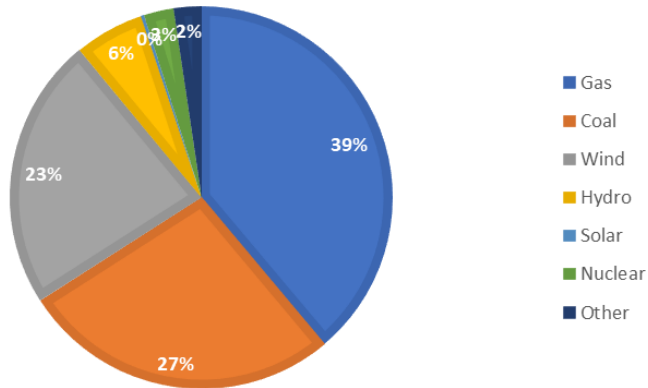


■ 2020 ITP Peak
 ■ 2019 ITP Peak
 — 2020 ITP Energy
 — 2019 ITP Energy

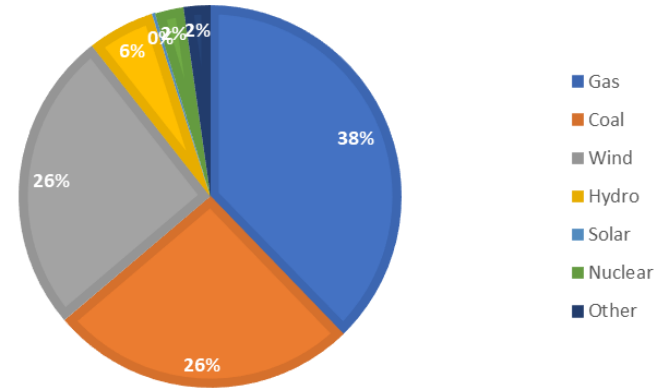
| Model | Year 2 Coincident Peak Load (GW) | Year 2 Annual Energy (TWh) |
|----------|---|-------------------------------------|
| 2019 ITP | 53.7 | 278.7 |
| 2020 ITP | 55.0 | 285.4 |

Energy and Capacity Comparison

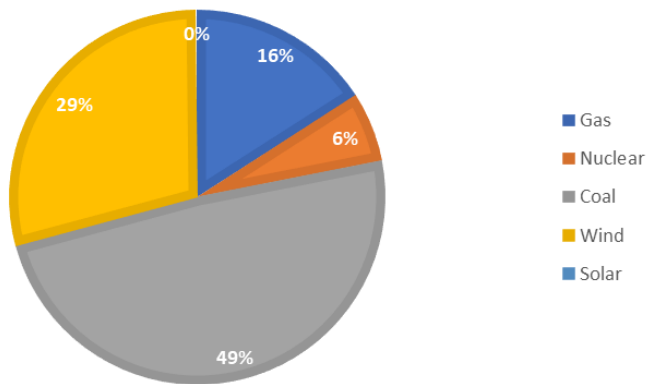
2019 ITP Y2 CAPACITY



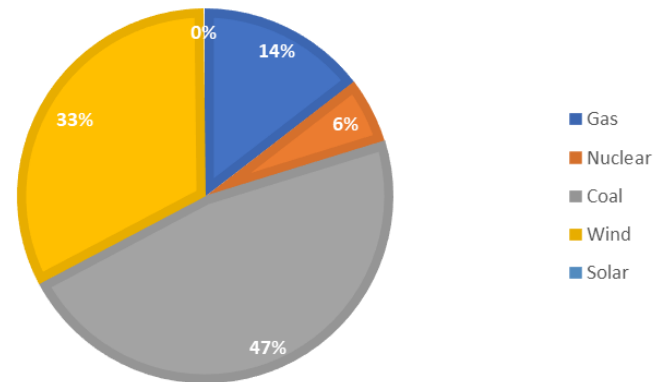
2020 ITP Y2 CAPACITY



2019 ITP Y2 ANNUAL ENERGY BY FUEL TYPE



2020 ITP Y2 ANNUAL ENERGY BY FUEL TYPE



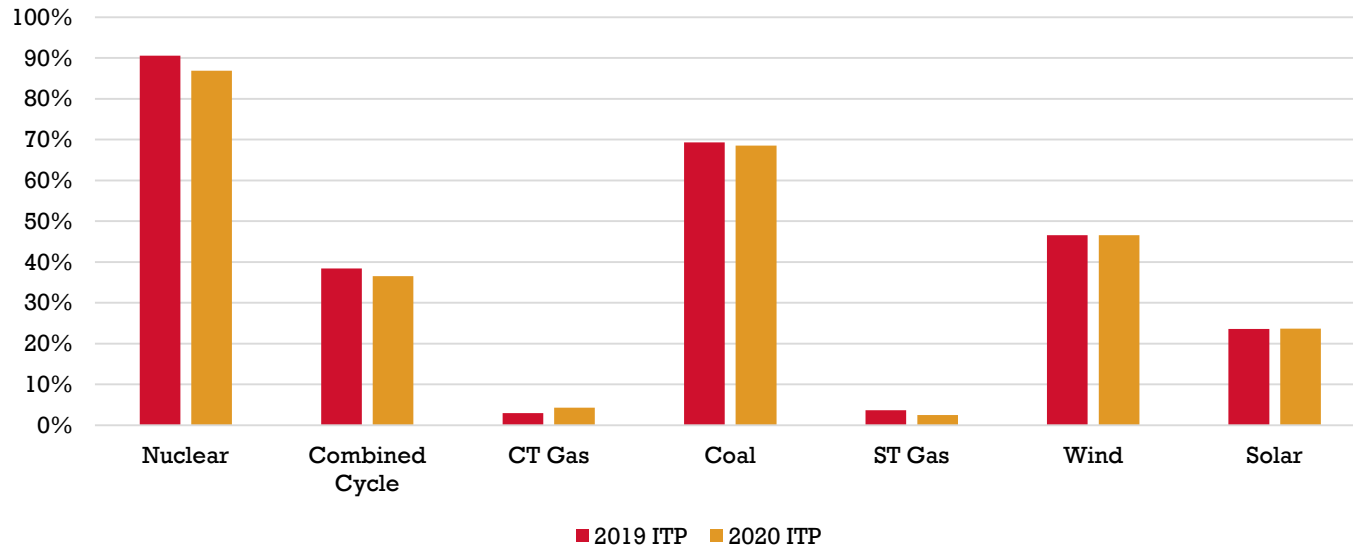
Capacity Factors and Average Energy Costs

| Unit Type | Capacity Factor (Average) | | | | Average Energy Cost (\$/MWh) | |
|----------------|---------------------------|----------|-------------|-------------|------------------------------|-------------|
| | 2017 EIA | 2018 EIA | 2019 ITP Y2 | 2020 ITP Y2 | 2019 ITP Y2 | 2020 ITP Y2 |
| Nuclear | 92% | 93% | 91% | 87% | \$16 | \$16 |
| Combined Cycle | 51% | 57% | 38% | 37% | \$31 | \$30 |
| CT Gas | 7% | 12% | 3% | 4% | \$44 | \$43 |
| Coal | 54% | 54% | 69% | 69% | \$23 | \$23 |
| ST Gas | 10% | 14% | 4% | 3% | \$41 | \$45 |
| Wind | 35% | 37% | 47% | 47% | | |
| Solar | 26% | 26% | 24% | 24% | | |

- Results shown are comparing unconstrained model simulations
- EIA capacity factors are taken from the Electric Power Monthly report published by EIA, and include resources outside of the SPP footprint
- The price of natural gas in the 2020 ITP MEM is slightly less than the natural gas in the 2019 ITP MEM

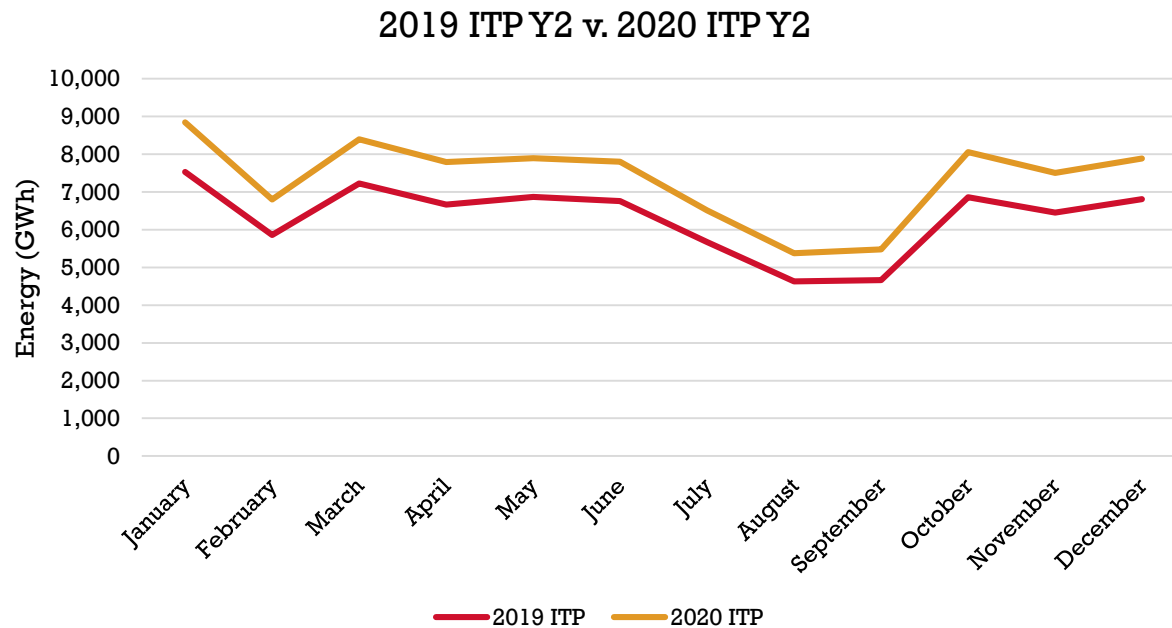
Capacity Factors by Unit Type

2019 ITP Y2 (2021) v. 2020 ITP Y2 (2022)



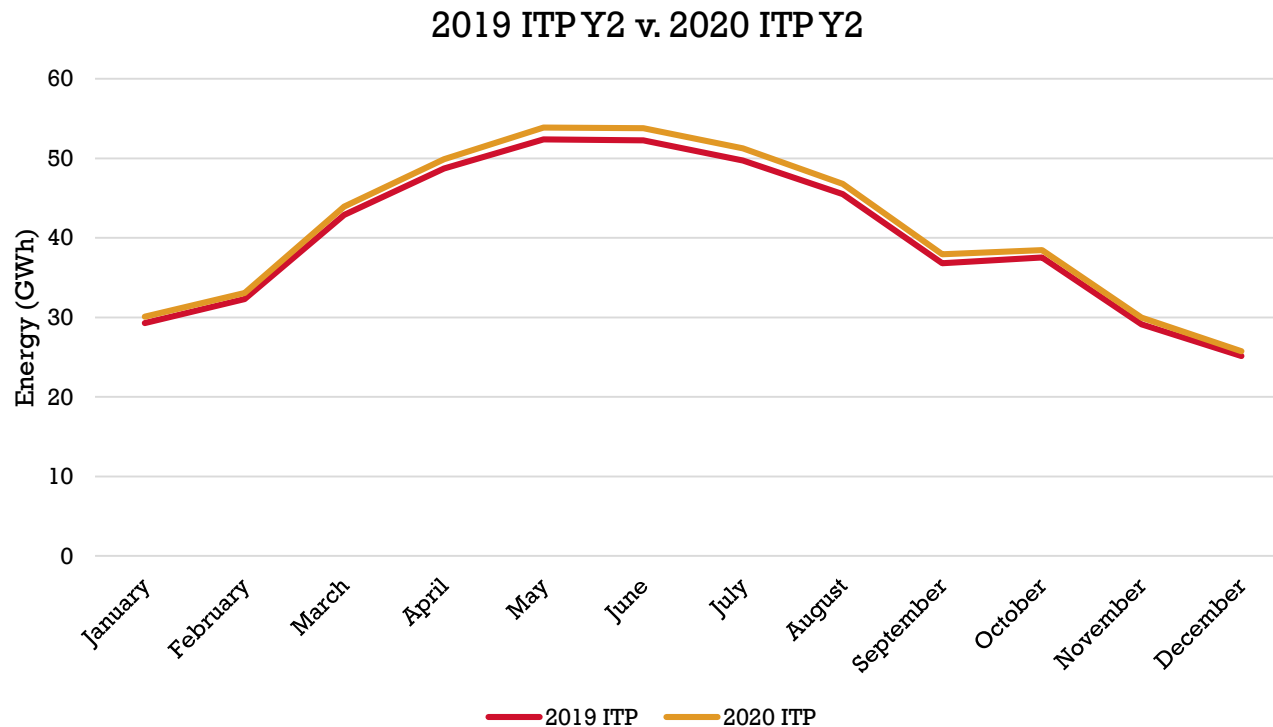
- Results shown are comparing unconstrained model simulations
- The price of natural gas in the 2020 ITP MEM is slightly less than the natural gas in the 2019 ITP MEM

SPP Wind Energy



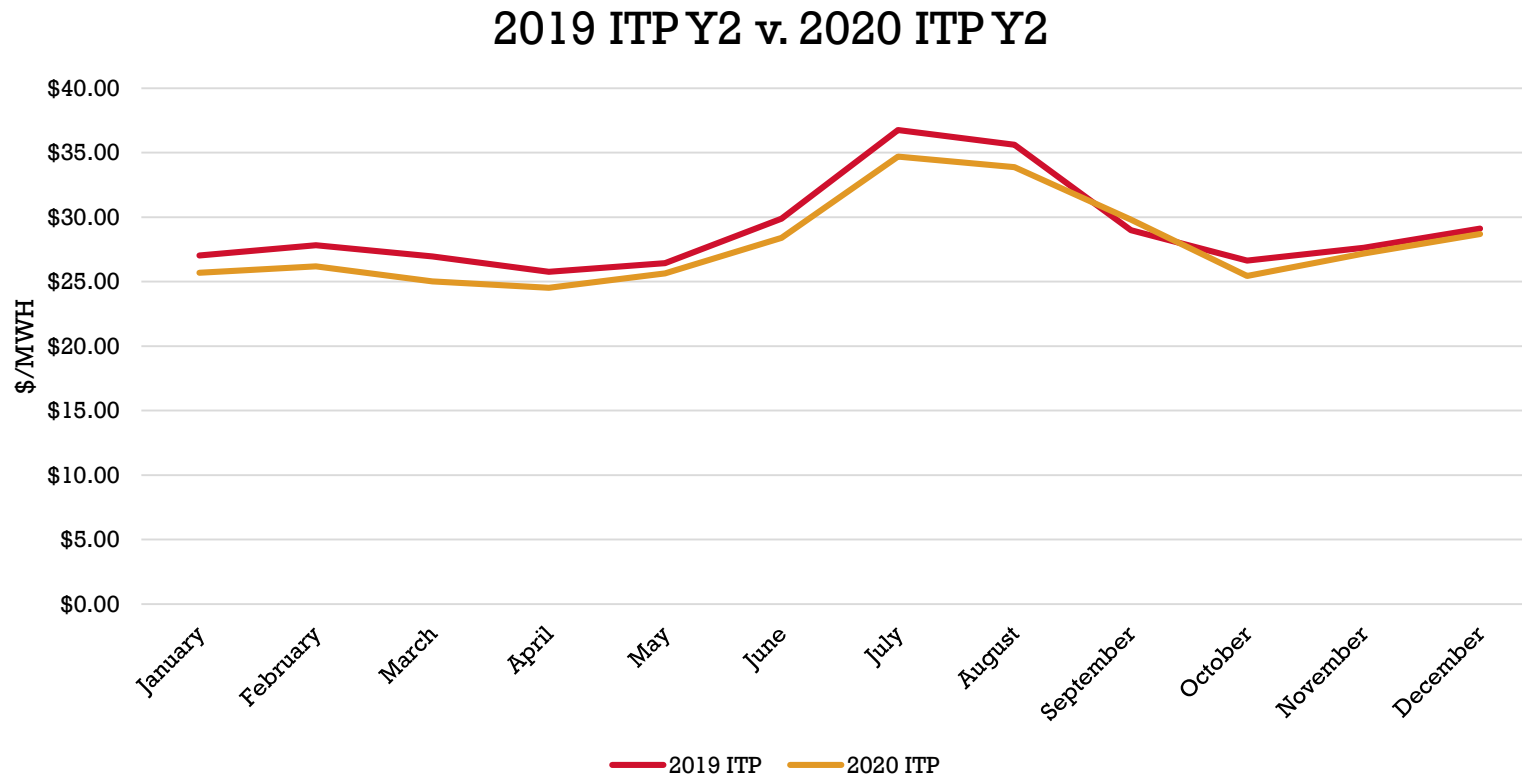
- Results shown are comparing unconstrained model simulations
- The wind energy increase is expected due to increased wind additions that have come in-service since the 2019 ITP MEM model as well as through the ITP Waiver and RAR processes.

SPP Solar Energy



- Results shown are comparing unconstrained model simulations
- The solar energy is consistent between the 2019 and 2020 ITP MEMs due to the small amount of solar added to SPPs footprint since the 2019 ITP MEM.

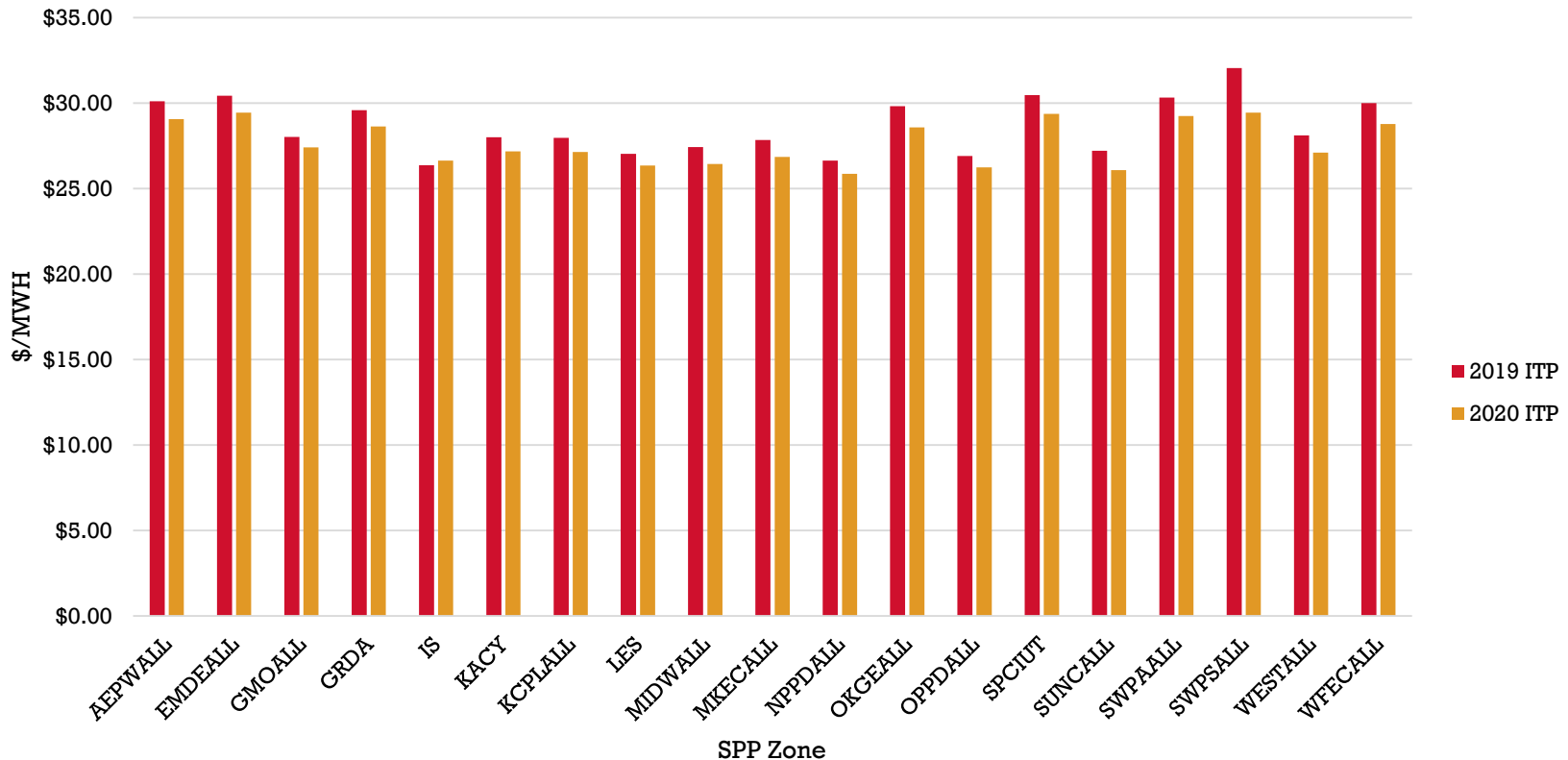
Monthly SPP Average LMP



- Results shown are comparing unconstrained model simulations
- The decrease in the SPP average LMP in the 2020 ITP models is expected due to:
 - Lower natural gas price
 - Increase in renewables

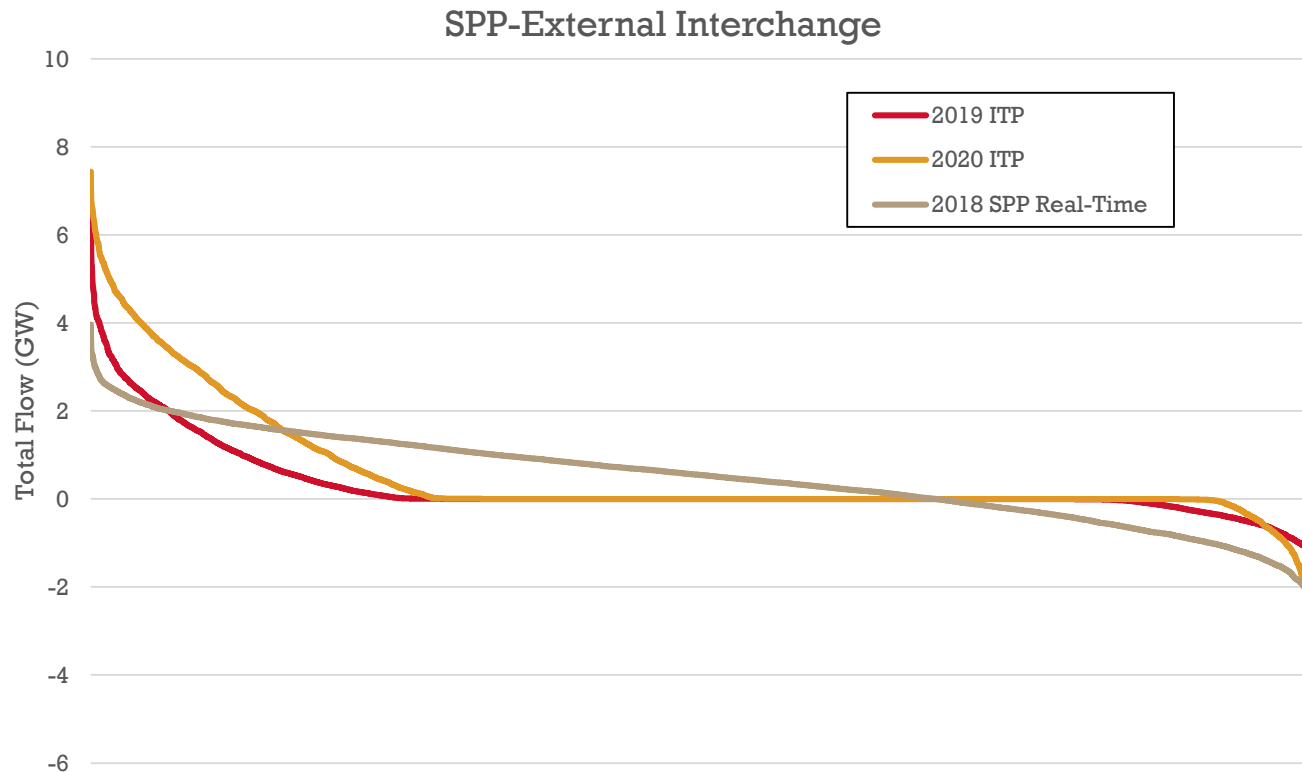
Annual Average LMP by Zone

2019 ITP Y2 v. 2020 ITP Y2



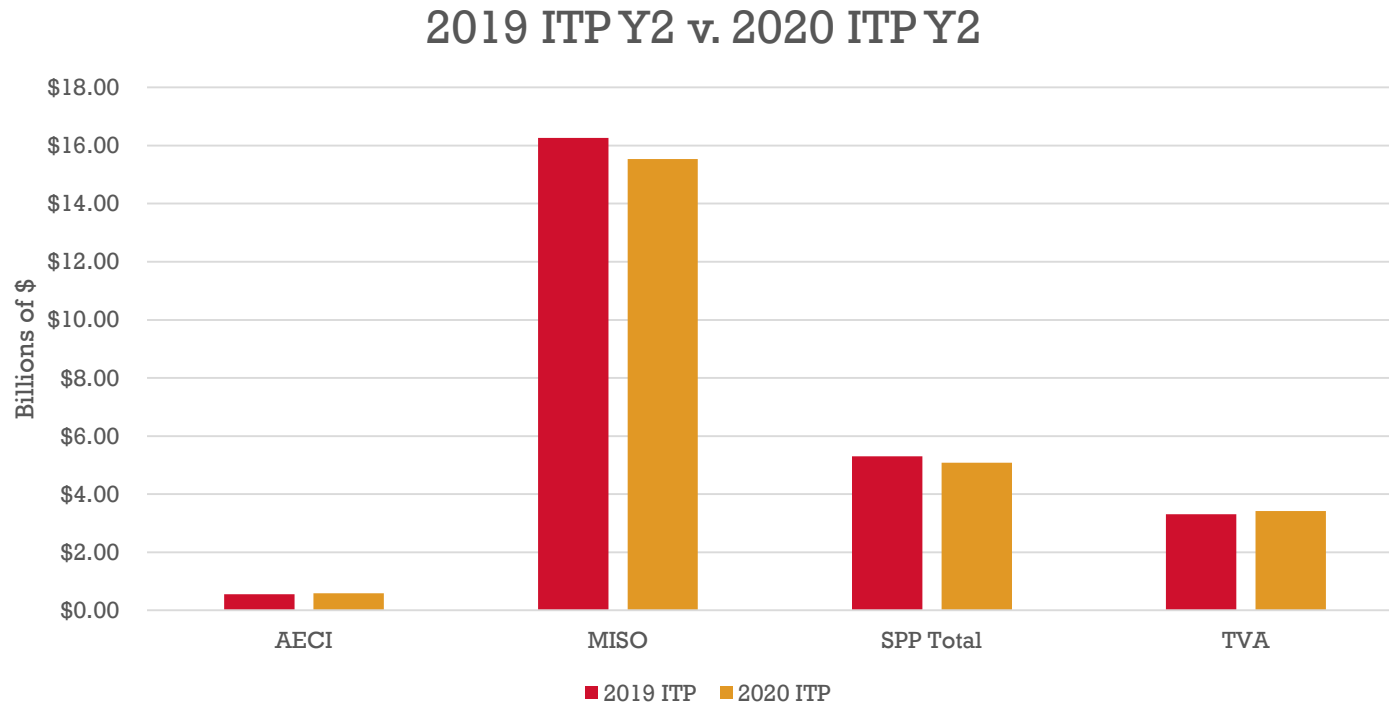
- Results shown are comparing unconstrained model simulations
- The decrease in the SPP average LMP in the 2020 ITP models is expected due to:
 - Lower natural gas price
 - Increase in renewables

Interchange



- The graph depicts hourly interchange plotted in order of magnitude.
- Results shown are on a unconstrained model
 - The positive values represent hours that have more generation than load (export)
 - The negative values represent hours that have more load than generation (import)
- Operations data is reflective of 2018 SPP Net Actual Interchange and DC Ties.
- SPP is a net exporter in all instances plotted above.

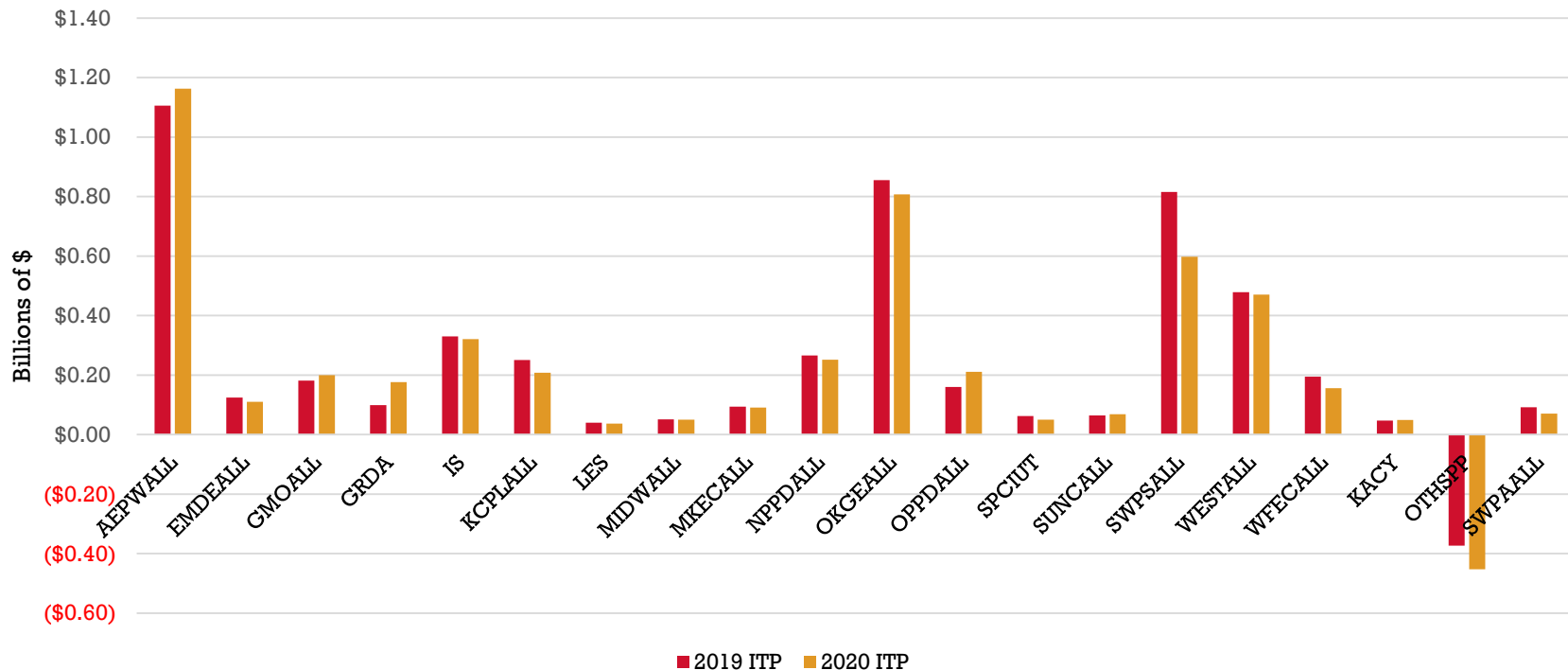
Adjusted Production Cost



- Results shown are comparing unconstrained model simulations
- The decrease in APC in the 2020 ITP models for all regions as shown above is expected due to:
 - Lower natural gas price
 - Increase in renewables

Adjusted Production Cost by Zone

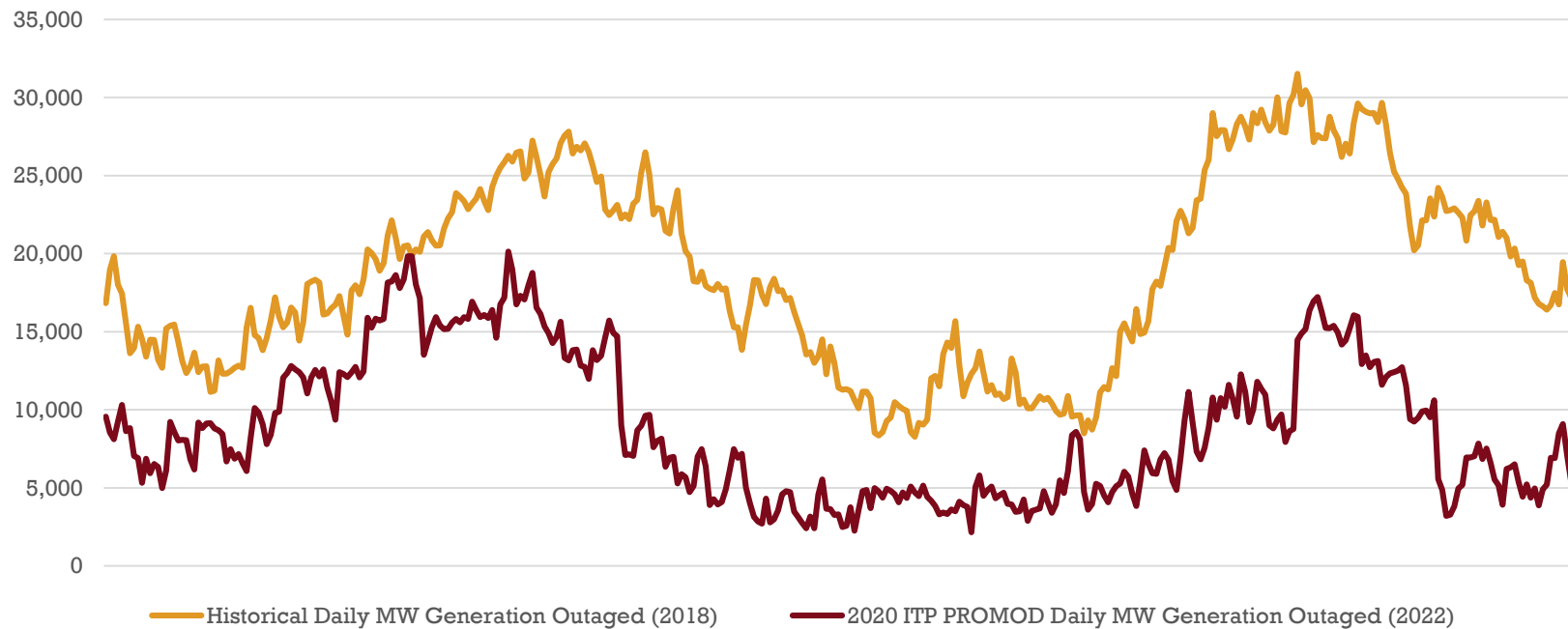
SPP Zonal APC Comparison



- Results shown are comparing unconstrained model simulations
- “Other SPP” is negative due to the zone having sales and no purchases (all generation, no load).
- The decrease in APC in the 2020 ITP models for all regions as shown above is expected due to:
 - Lower natural gas price
 - Increase in renewables

Generator Outages

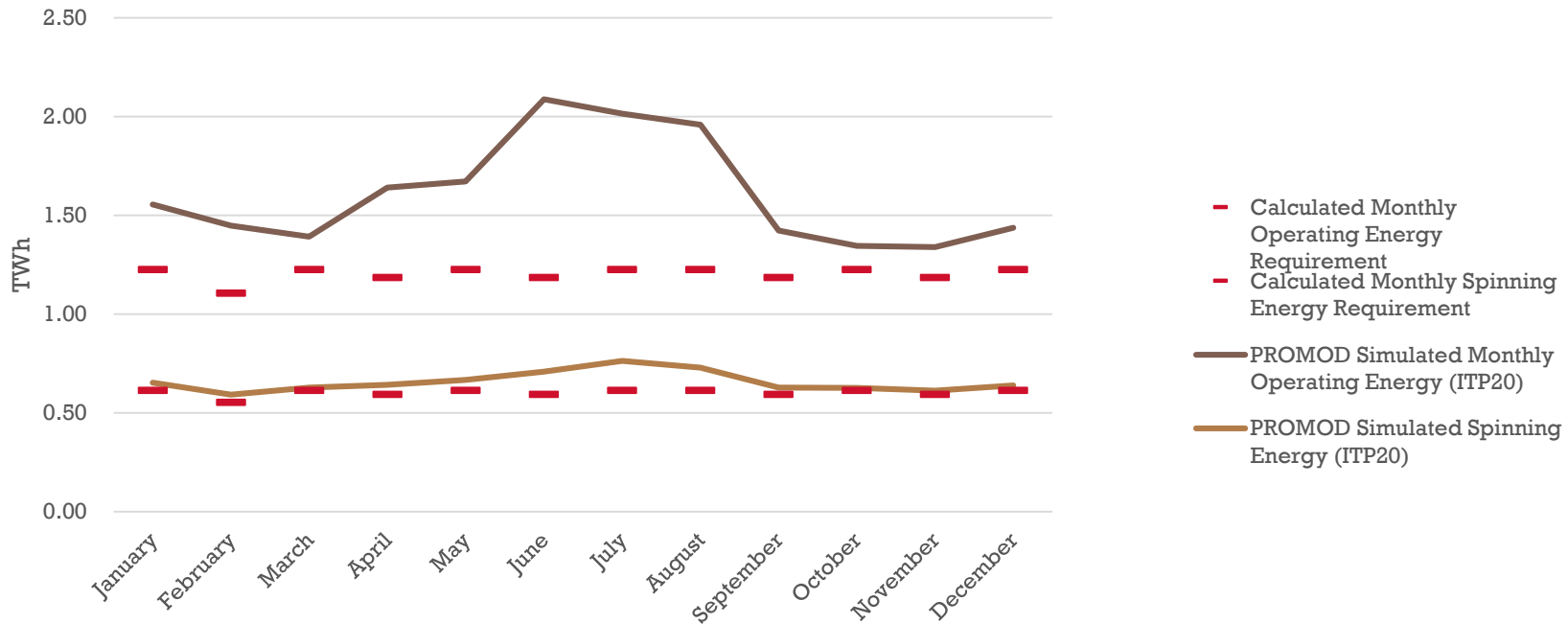
Historical Outages v. PROMOD Simulated Outages



- Results shown are comparing unconstrained model simulations
- The 2018 Historical Outages are based on outage data from SPP Operations, and are generally higher in magnitude than historical outage data evaluated in previous study Benchmarking efforts. Operations data also includes additional outage types that are difficult to remove from the historical dataset.
- PROMOD simulated outages include automatic maintenance and forced outages.
- Although the magnitudes are different, the basic shape is similar between the two datasets, and the PROMOD simulated outages for the 2020 ITP Y2 model are comparable to the simulated outages for previous ITP studies.
- The distribution of outages by fuel type is consistent between SPP operations and the 2020 IPT Y2 PROMOD simulation.

Operating and Spinning Reserves

2020 ITP Y2 Operating and Spinning Reserves



- Results shown are comparing unconstrained model simulations
- Monthly Reserve Calculations based on SPP Criteria:
 - Operating Reserve Requirement (GWh) = Sum of Capacity of Largest Unit and $\frac{1}{2}$ Capacity of 2nd Largest Unit)*Hours in the Month
 - Spinning Reserve Requirement (GWh) = Half of Operating Reserve Requirement*Hours in the Month
- The constraint violation file from the PROMOD output files does not show any spinning reserve violations for SPP.

2020 ITP MEM Benchmark Approval

Recommendation

- SPP recommends that the 2020 ITP MEM Benchmarking milestone be approved as complete for the 2020 ITP.
 - Will set up a conference call