2018 Annual Review of Availability Assessment Hours

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What's the purpose of this call?

- To discuss the input assumptions, methodology, and results of the annual CAISO's Availability Assessment Hours

Agenda/Overview

- High level look at RAAIM and components within RAAIM.
- BPM Changes
- Evolution of Load Shape
- Overview of methodology used for system/local availability assessment hours
- 2018 availability assessment hours
- 2019-2020 draft availability assessment hours

Availability Assessment Hours- Background and Purpose

- Concept originally developed as part of the ISO standard capacity product (SCP)
  - Maintained as part of Reliability Service Initiative – Phase 1 (i.e. RA Availability Incentive Mechanism, or RAAIM)
- Determine the hours of greatest need to maximize the effectiveness of the availability incentive structure
  - Resources are rewarded for availability during hours of greatest need
  - Hours determined annually by ISO and published in the BPM
    - See section 40.9 of the ISO tariff

Availability incentive mechanism assesses availability based on market offers.

- Mechanism penalizes low performance and rewards high performance for system, local, and flexible capacity:
  - Captures flexible resource adequacy economic bidding must-offer obligations.
  - Enhances assessment of availability of use-limited resources.
  - Assesses availability of proxy demand and non-generator resources (storage resources not subject to bid insertion).

Wind, solar, combined heat and power, and grandfathered resources exempt from availability incentive mechanism.

BPM CHANGES

Proposed BPM Changes – Reliability Requirements; Section 7

2018 System and Local Resource Adequacy Availability Assessment Hours

Analysis employed: Top 5% of load hours using average hourly load

Summer – April 1 through October 31
Availability Assessment Hours: 4pm – 9pm (HE17 – HE21)

Winter – November 1 through March 31
Availability Assessment Hours: 4pm – 9pm (HE17 – HE21)

2018 Flexible Resource Adequacy Availability Assessment Hours and must offer obligation hours

Flexible RA Capacity Type	Category Designation	Required Bidding Hours	Required Bidding Days
January – April October – December			
Base Ramping	Category 1	05:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	2:00pm to 7:00pm (HE15-HE19)	All days
Super-Peak Ramping	Category 3	2:00pm to 7:00pm (HE15-HE19)	Non-Holiday Weekdays*
May – September			
Base Ramping	Category 1	05:00am to 10:00pm (HE6-HE22)	All days
Peak Ramping	Category 2	3:00pm to 8:00pm (HE16-HE20)	All days
Super-Peak Ramping	Category 3	3:00pm to 8:00pm (HE16-HE20)	Non-Holiday Weekdays*

*Non-Holiday Weekdays are any day of the week from Monday through Friday that is not a FERC holiday

Proposed Revision Request (PRR) 986 on the Reliability Requirements BPM – Update resource adequacy availability incentive mechanism assessment hours

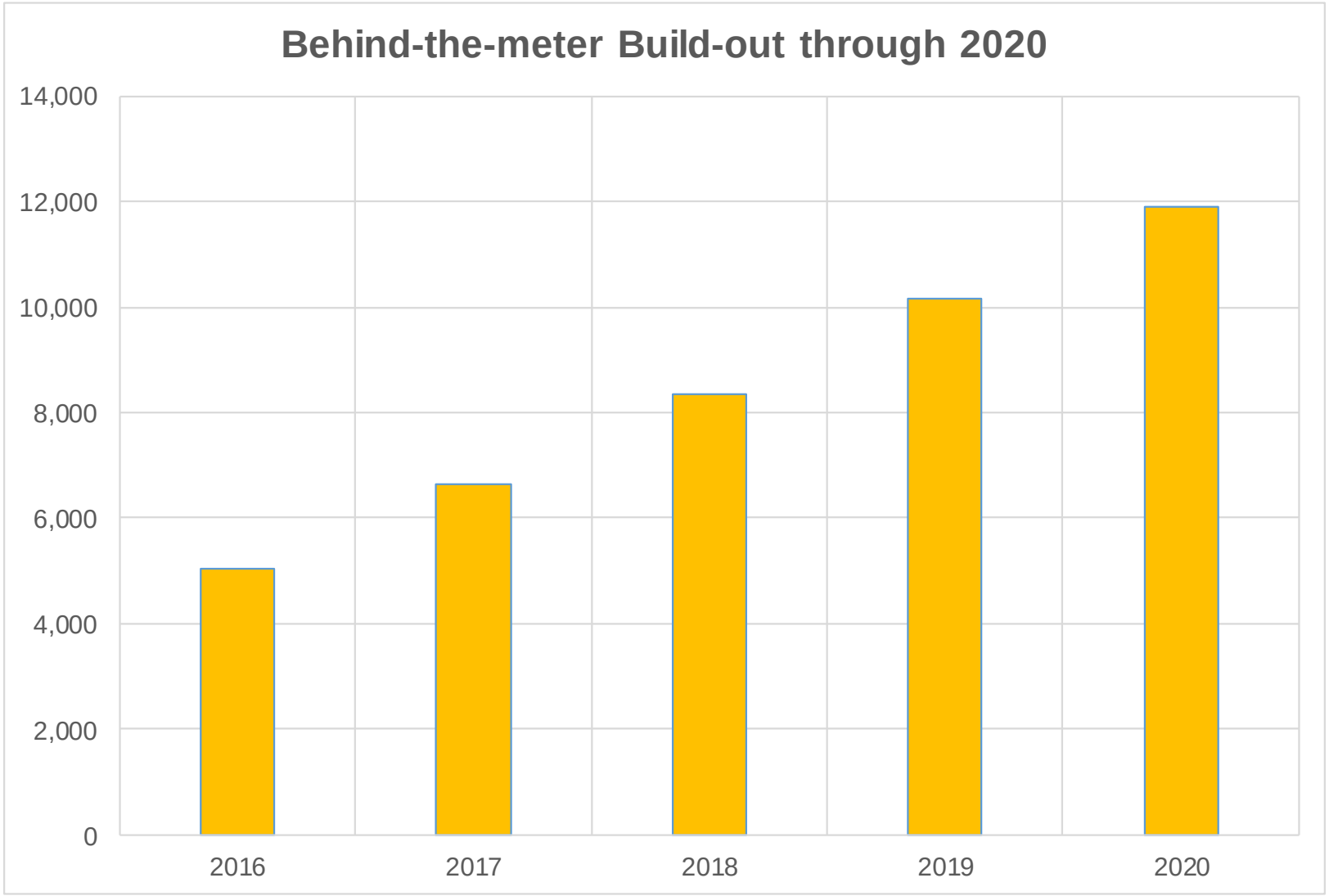
- **Reason for revision:** The change is due to the flex assessment study.
- **Stakeholder comments:**
  - Pacific Gas & Electric Company 4/25/17 and 6/5/17
  - California Large Energy Consumers Association 5/16/17 and 5/31/17
  - San Diego Gas & Electric Company 5/23/17
  - California Public Utilities Commission 6/5/17
  - Joint Demand Response Parties 6/5/17
  - Southern California Edison Company 6/5/17
- **PRR Status:**
  - PRR was submitted by ISO on 4/10/17
  - Initial comment period 4/10/17 through 4/24/17
  - Initial stakeholder meeting 4/25/17
  - ISO Recommendation posted on 5/2/17
  - Recommendation comment period 5/2/17 through 5/16/17
  - Recommendation comment period was reopened 5/22/17 to allow comments on the revised Redlined Reliability Requirements BPM, version 3 which includes the availability assessment hours for generic and flexible RA for 2017 and 2018
- **Next Step: ISO will review all comments and post the Final Decision**

DATA COLLECTED

What data did the ISO collect?

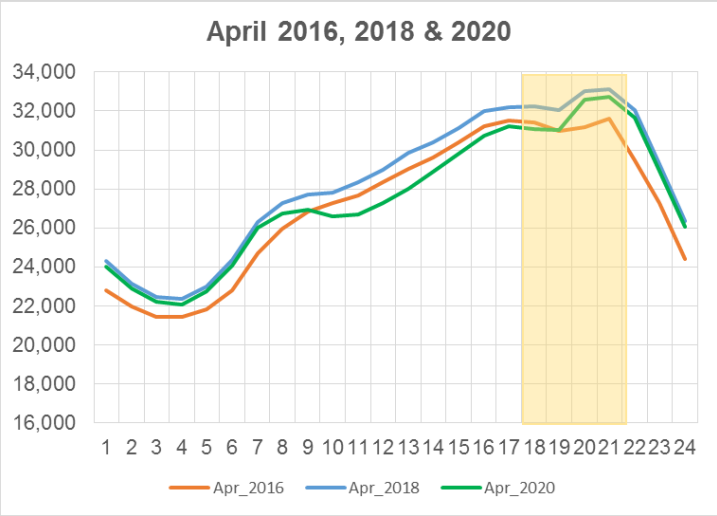
- CEC's monthly peak demand forecast (e.g. 2017-20 demand forecast)
- LSE SCs updated renewable build-out for 2016 through 2020
- The data included:
  - Installed capacity by technology and expected operating date (e.g. Solar thermal, solar PV tracking, solar PV non-tracking, estimate of behind-the-meter solar PV etc.) for all variable energy resources under contract
  - Operational date or expected on-line date
  - Location of CREZ latitude and longitude coordinates
  - Resources located outside ISO's BAA indicated if the resources are firmed or non-firmed

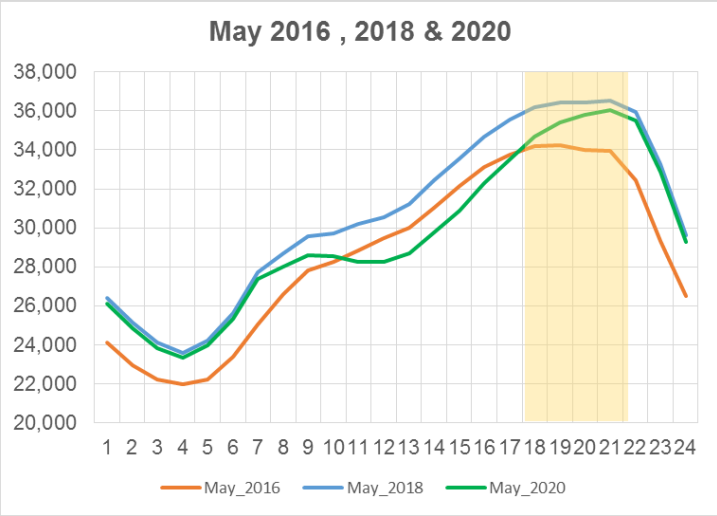
Behind the meter solar PV build-out through 2020

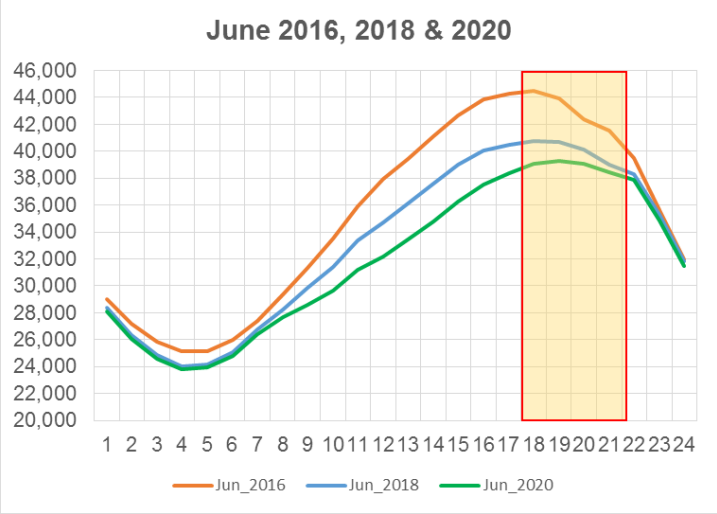


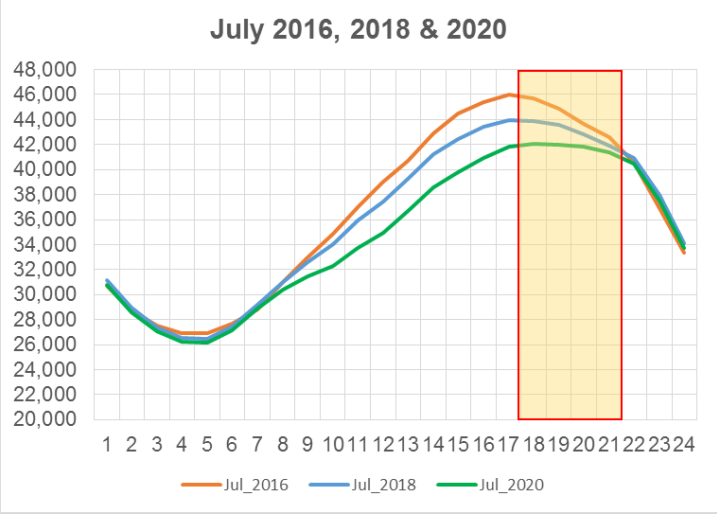
EVOLUTION OF LOAD SHAPE

Expected Load Shape Evolution:
Summer Season: April, May, June, July



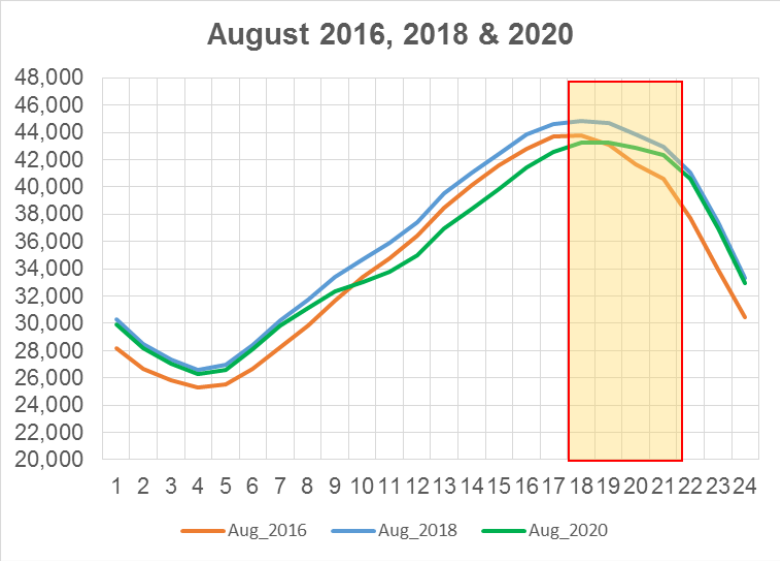


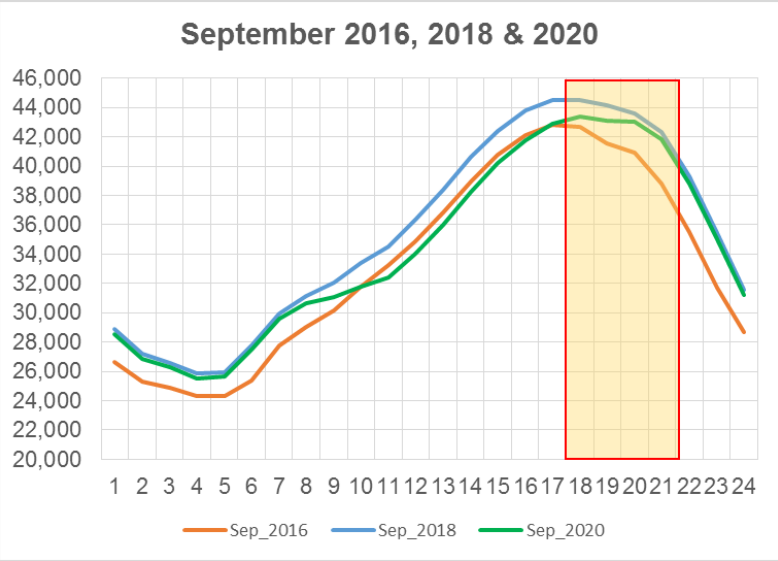


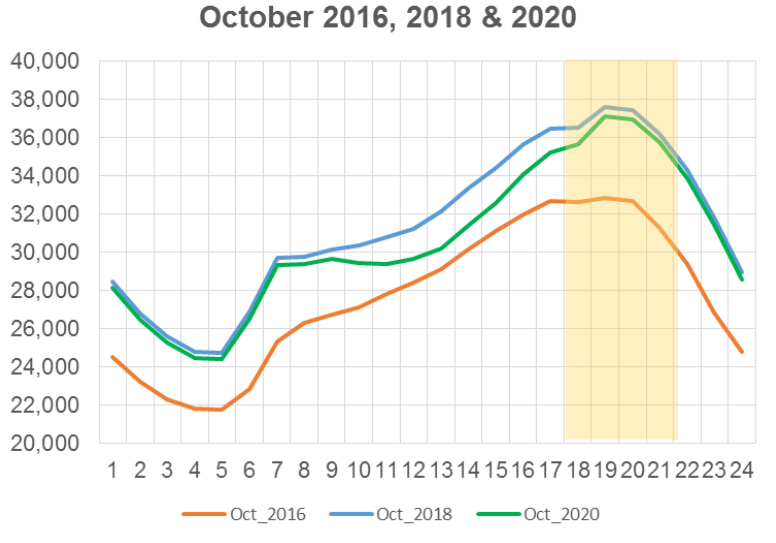


*Note: Graphs developed using max of hour by month

Expected Load Shape Evolution:
Summer Season: August, September, October

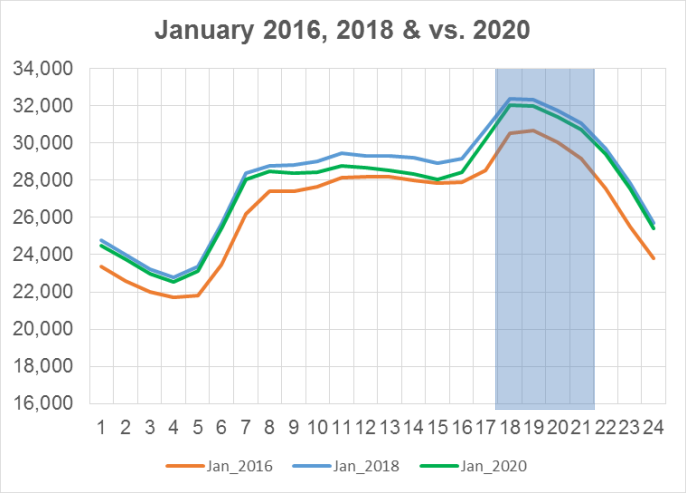


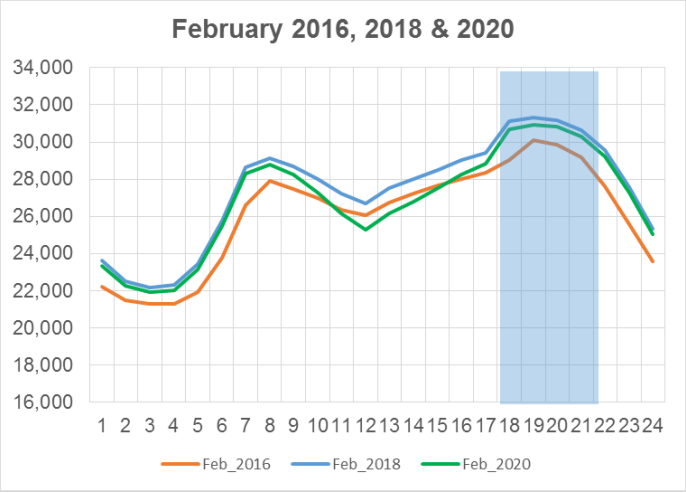


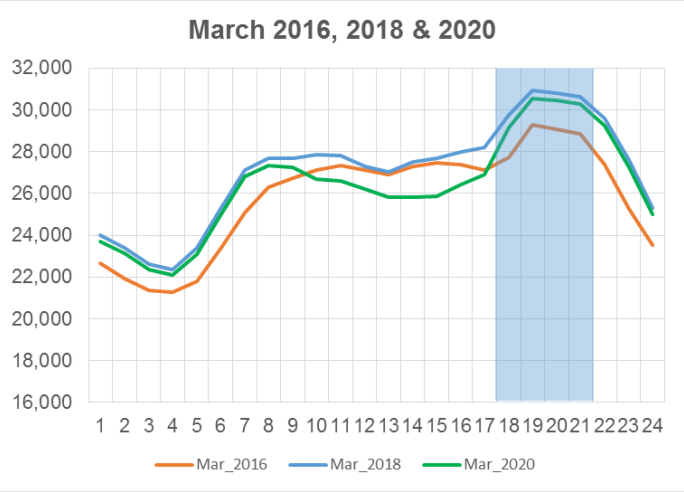


*Note: Graphs developed using max of hour by month

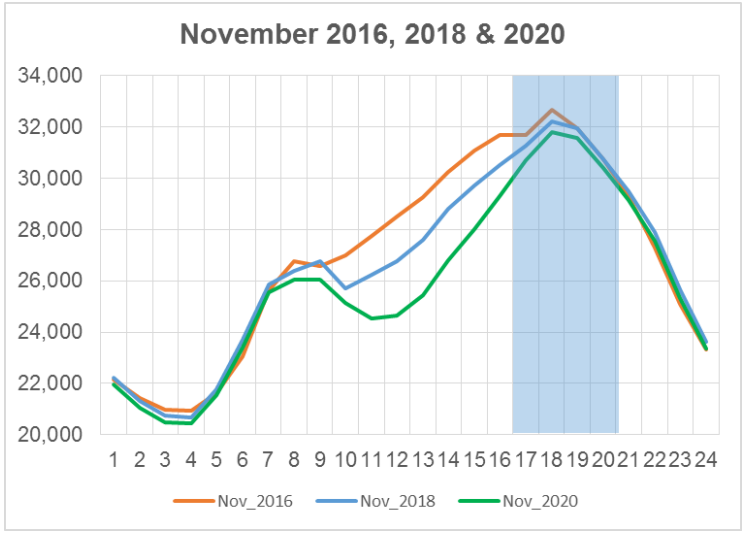
Expected Load Shape Evolution:
Winter Season: January, February, March

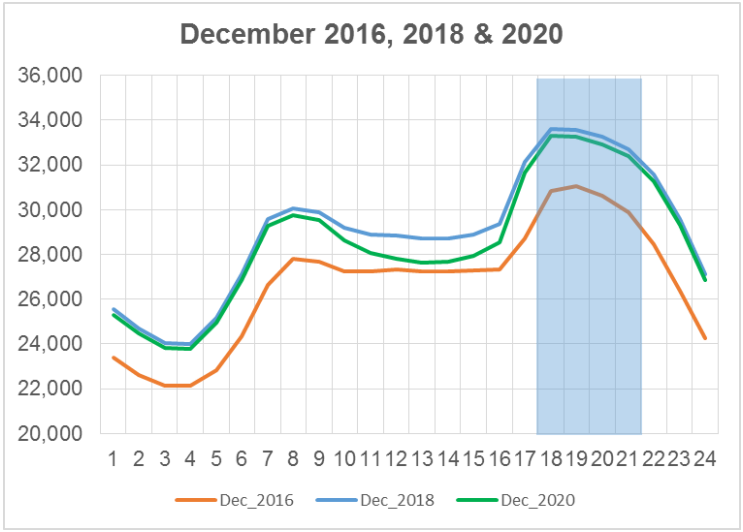






Expected Load Shape Evolution:
Winter Season: November, December



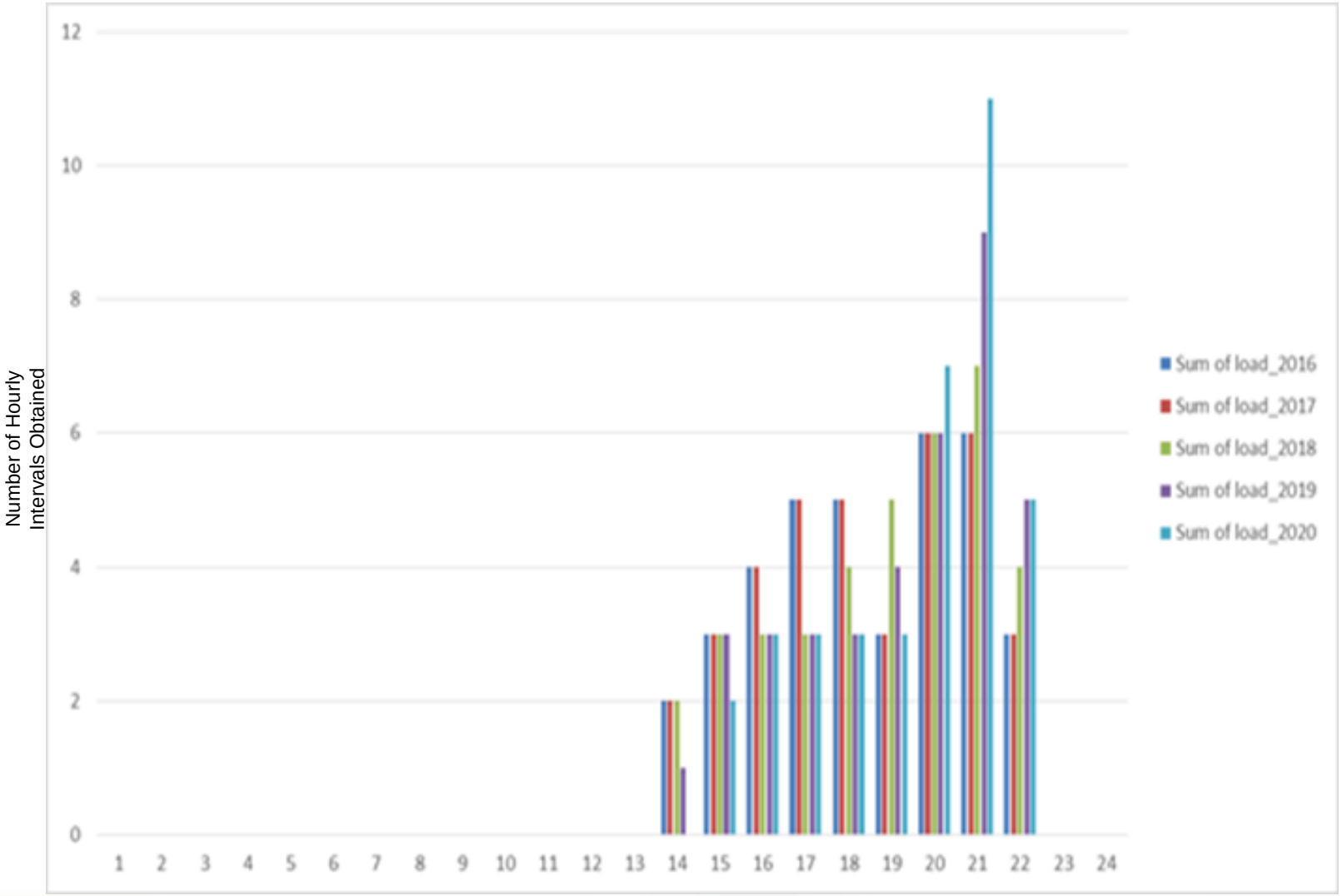


METHODOLOGY OVERVIEW

Methodology Overview of System/Local Availability Assessment Hours

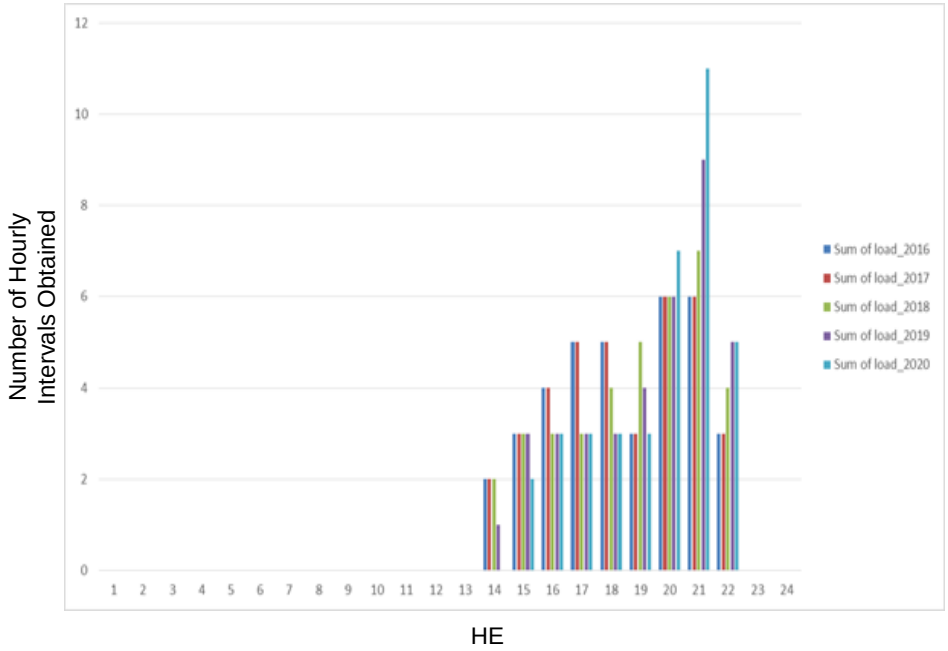
- Used data described in previous slides to obtain:
  - Hourly Average Load
    - By Hour
    - By Month
    - Years 2016-2020
- Calculated:
  - Top 5% of Load Hours within each month using an hourly load distribution
  - Years 2016 through 2020

Observations in the Month of April

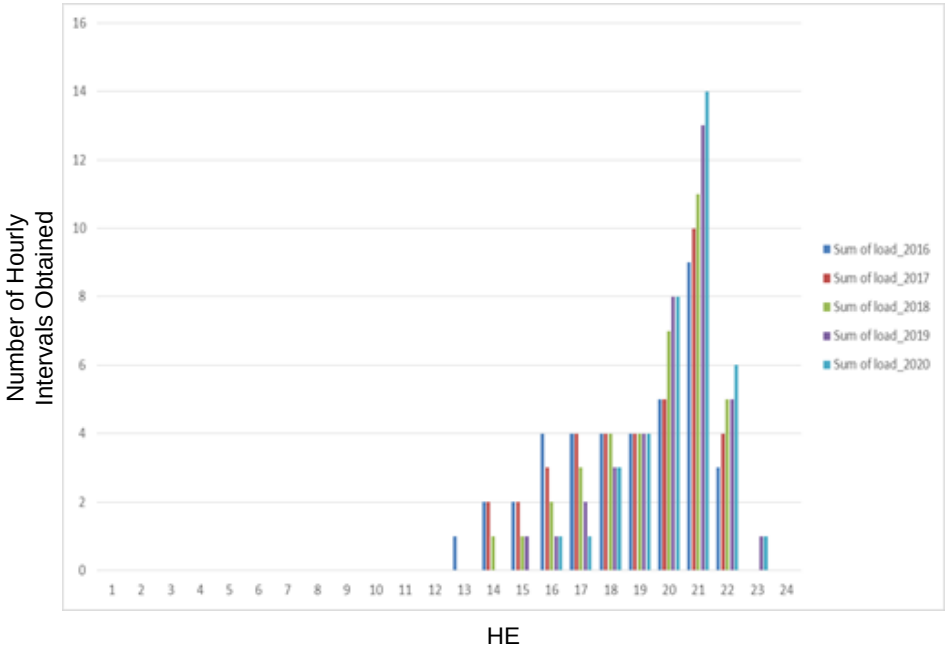


Observations in the Month of: April – May
Summer

April

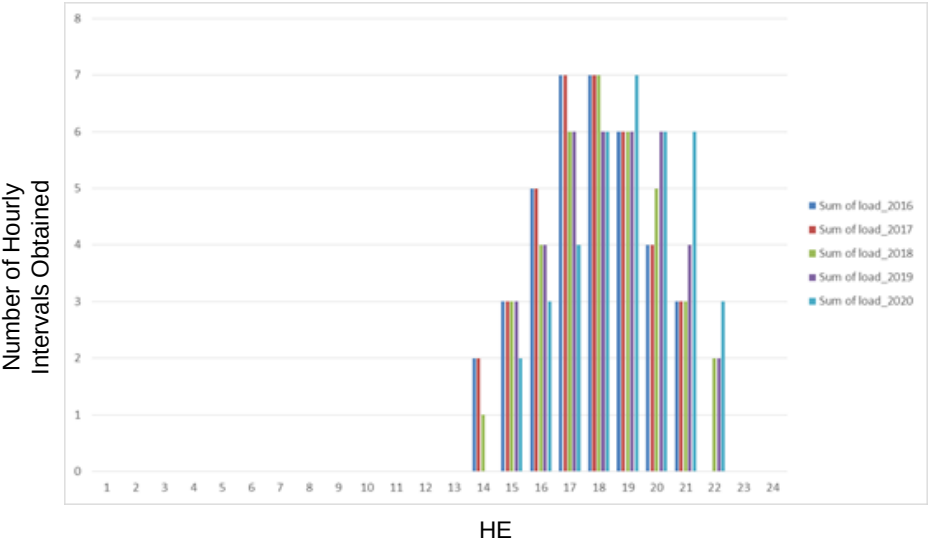


May

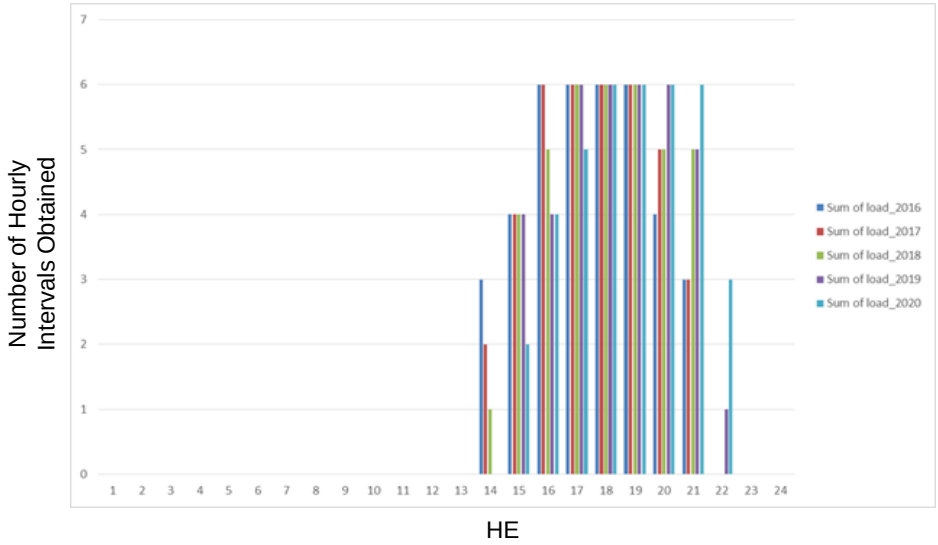


Observations in the Month of: June - July
Summer

June



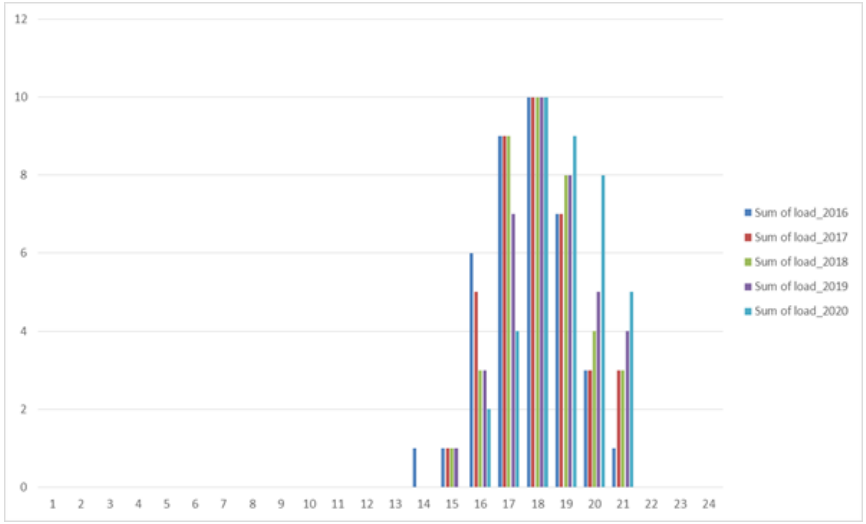
July



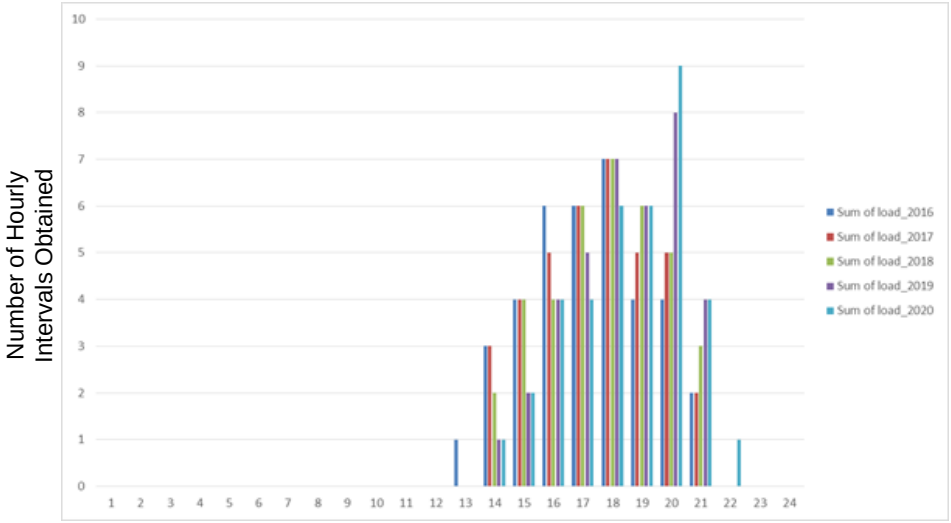
Observations in the Month of: August –Sept.

Summer

August

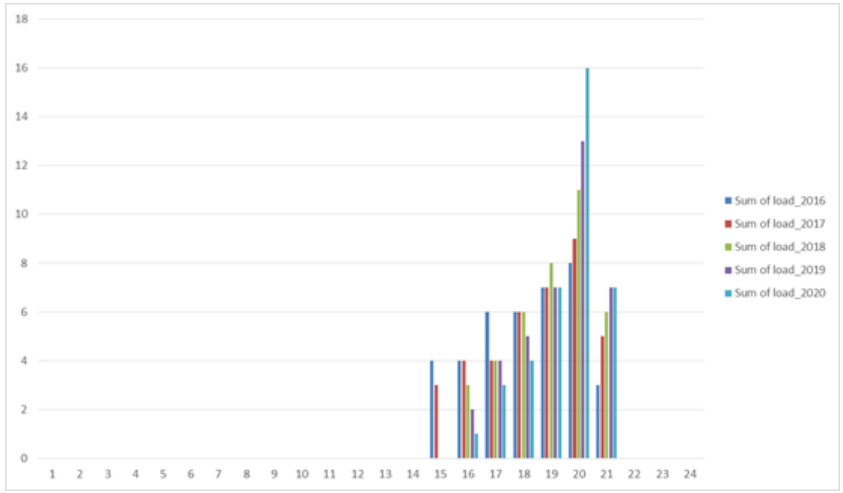


September



Summer Season

October

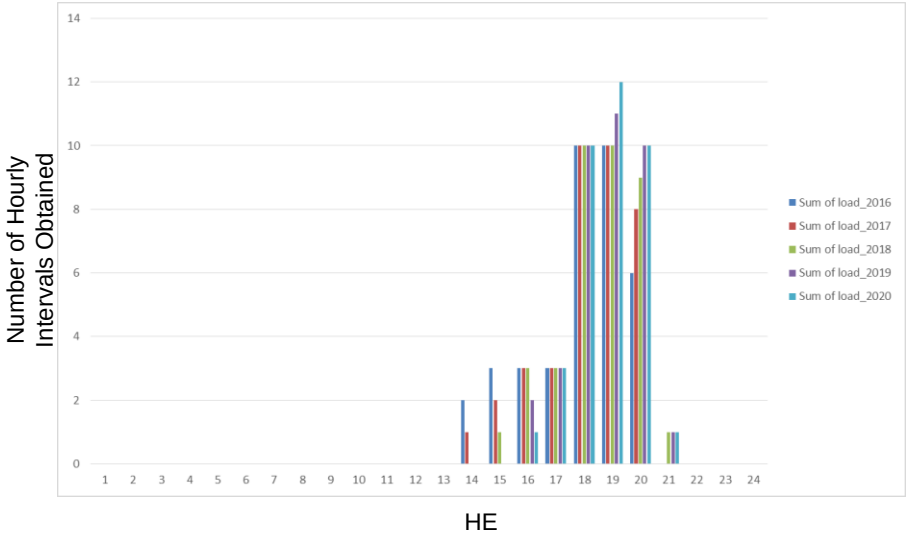


Summer Season Final Recommendation:

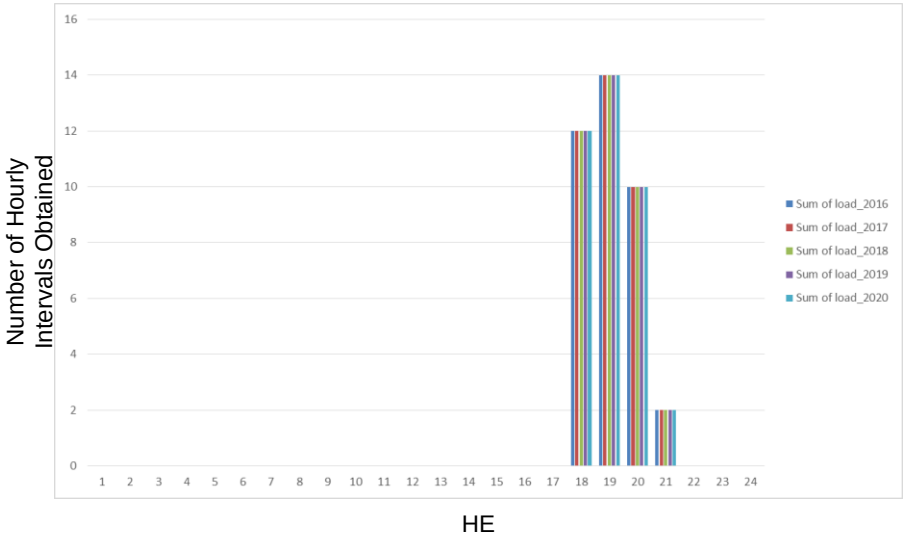
Year	Start	End
2016	HE14	HE18
2017	HE14	HE18
2018 (Final)	HE 17	HE 21
2019 (Estimate)	HE 17	HE 21
2020 (Estimate)	HE 17	HE 21

Observations in the Month of: Nov - Dec
Winter

November

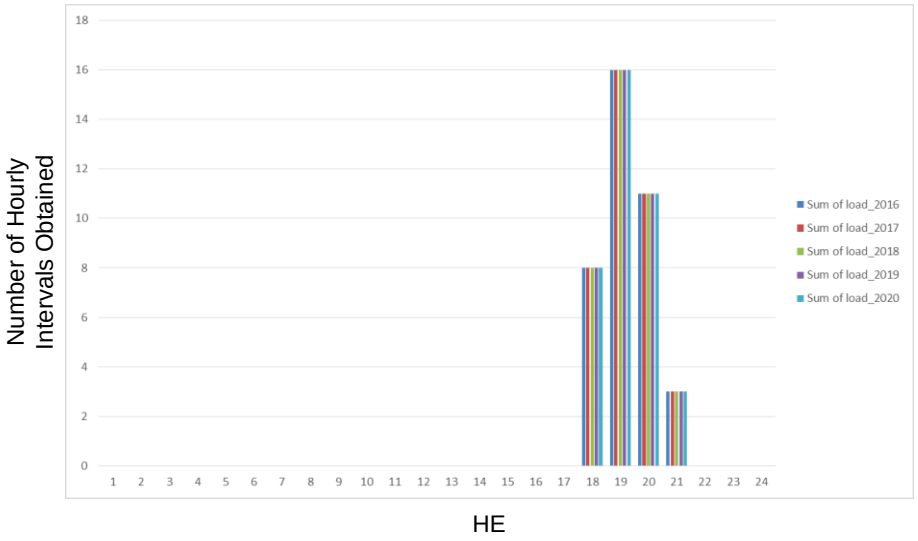


December

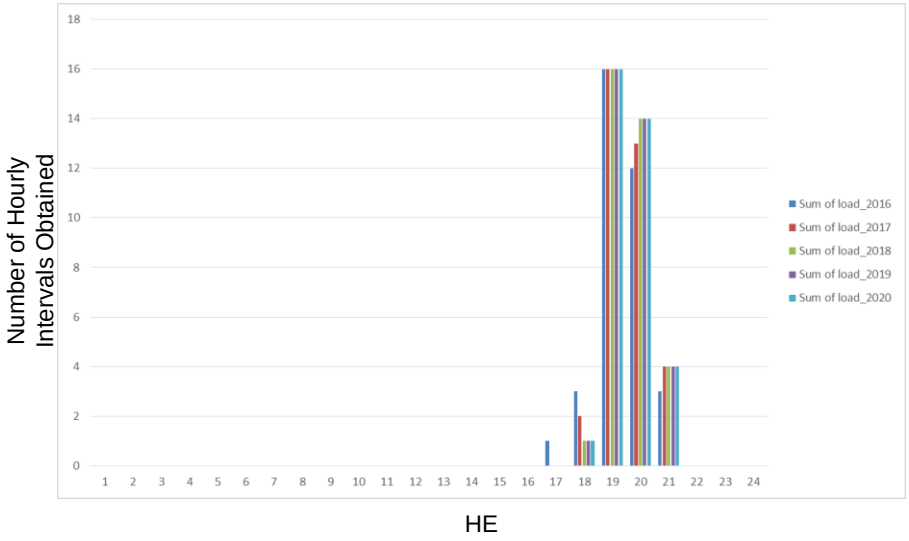


Observations in the Month of: Jan. – Feb.
Winter

January

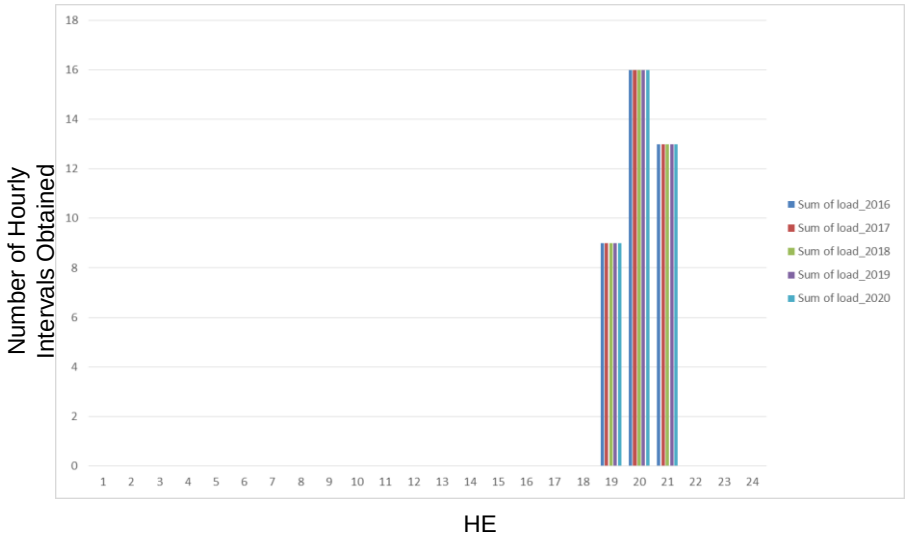


February



Winter Season

March



Winter Season Final Recommendation:

Year	Start	End
2016	HE 17	HE 21
2017	HE 17	HE 21
2018 (Final)	HE 17	HE 21
2019 (Estimate)	HE 17	HE 21
2020 (Estimate)	HE 17	HE 21

QUESTIONS?

- To submit written comments to this revised redlined BPM, version 3, please register on the BPM change management site: https://bpmcm.caiso.com/Pages/default.aspx
  - Click “Login” and then “Register”
  - Must be registered to submit comments (registration is one-time only)
  - Please submit by COB 6/13, as ISO has re-opened the 10-day recommendation comments period following today’s call

- Link to BPM PRR 986: https://bpmcm.caiso.com/Pages/ViewPRR.aspx?PRRID=986&IsDlg=0

APPENDIX

Flexible Resource Adequacy 2018 Data and Spreadsheet Information

- 2018 Flexible RA data and related information can be found on our Flexible Capacity Needs Technical Study Process page:

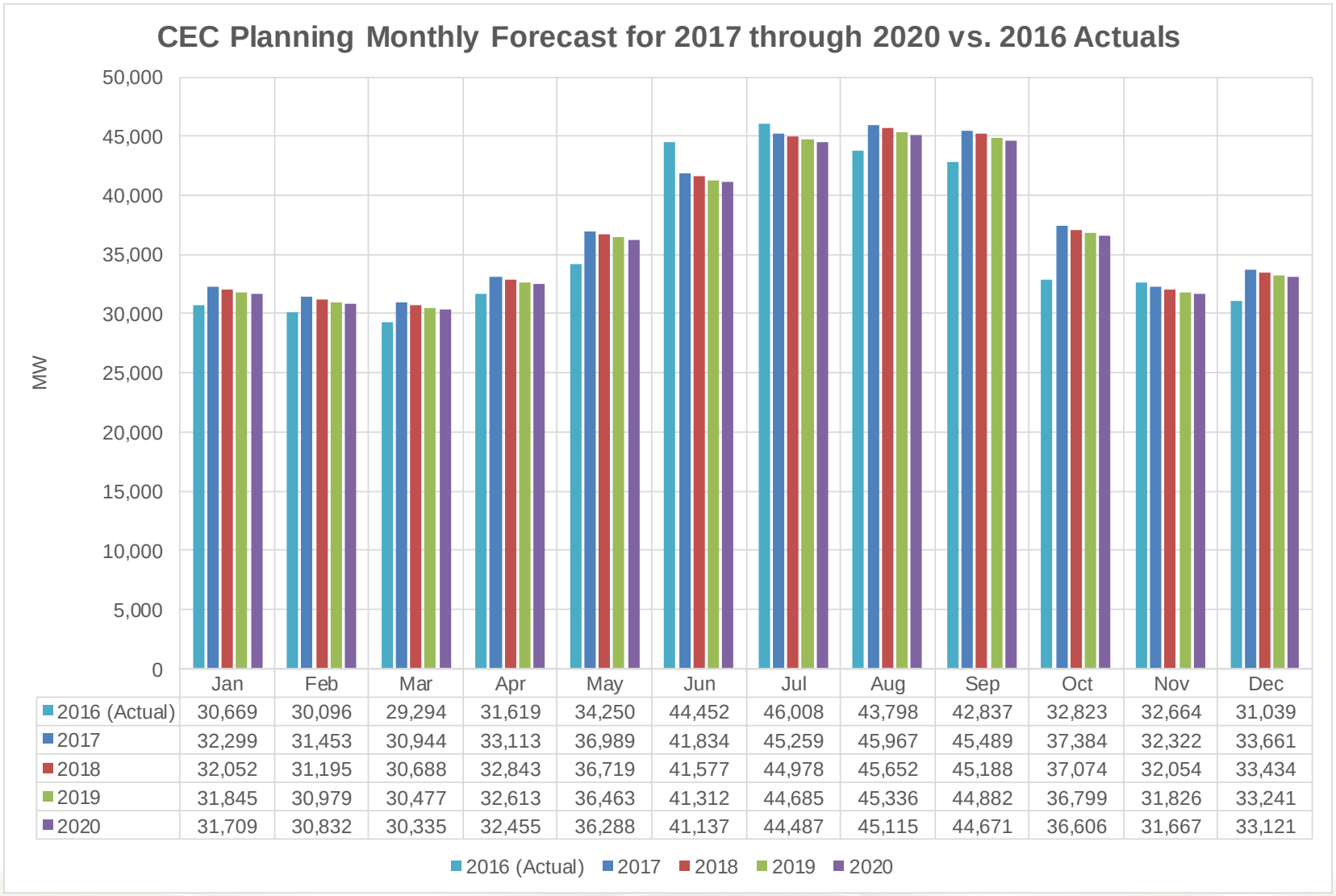
  http://www.caiso.com/informed/Pages/StakeholderProcesses/FlexibleCapacityNeedsTechnicalStudyProcess.aspx

DATA COLLECTED AND USED

The ISO annual hour availability assessment is based on current LSE's RPS build-out data

- Uses most current data available for renewable build-out obtained from all LSE SCs
- For new renewable installation scale 2016 actual production data based on installed capacity in subsequent years
- For new BTM use NEXANT production data located in close geographic proximity
- Generate gross-load profiles for 2017 through 2020

Projected 1 in 2 CAISO coincident peak, CEC Planning Forecast (Mid Baseline, Mid AAEE)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2016 (Actual)	30,669	30,096	29,294	31,619	34,250	44,452	46,008	43,798	42,837	32,823	32,664	31,039
2017	32,299	31,453	30,944	33,113	36,989	41,834	45,259	45,967	45,489	37,384	32,322	33,661
2018	32,052	31,195	30,688	32,843	36,719	41,577	44,978	45,652	45,188	37,074	32,054	33,434
2019	31,845	30,979	30,477	32,613	36,463	41,312	44,685	45,336	44,882	36,799	31,826	33,241
2020	31,709	30,832	30,335	32,455	36,288	41,137	44,487	45,115	44,671	36,606	31,667	33,121

The ISO used the CEC's 1-in-2 monthly peak load forecast to develop the load forecast

- Used 2016 actual 1-minute load data to build 1-minute load profiles for 2017 through 2020
- Scaled the actual 1-minute load value of each month of 2016 using a load growth factor of monthly peak forecast divided by actual 2016 monthly peak

2017 Load Growth Assumptions

- Scale the actual 1-minute load value of each month of 2016 by the fraction $(Monthly_{2017\_Peak\_Load\_Forecast}/Monthly_{2016\_Actual\_Peak\_Load})$

2018 Load Growth Assumptions

- Scale each 1-minute load data point of 2017 by the fraction $(Monthly_{2018\_Peak\_Load\_Forecast}/Monthly_{2016\_Peak\_Load})$

2020 Load Growth Assumptions

- Scale each 1-minute load data point of 2018 by the fraction $(Monthly_{2020\_Peak\_Load\_Forecast}/Monthly_{2016\_Peak\_Load})$

1-minute behind the meter solar PV data was developed using the methodology outlined below

TRACK I DIRECT TESTIMONY OF MARK ROTHLEDER ON BEHALF OF THE CALIFORNIA INDEPENDENT SYSTEM OPERATOR CORPORATION (Rulemaking 10-05-006)

Located at:

https://www.caiso.com/Documents/2011-08-10_ErrataLTPPTestimony_R10-05-006.pdf