BP-20 Rate Case Workshop: Generation Inputs

May 30, 2018

Agenda

- GARD Model
- Renewable Generation Forecast
- Balancing Reserve Capacity Forecast

Generation And Reserves Dispatch (GARD) Model: A Pricing Methodology for Within-Hour Balancing Service

Outline

- Describe the variable cost of reserves: overview, purpose and method.
- Describe the specific costs associated with standing ready to provide as well as deploying reserves.
- Describe the allocation of the variable cost of reserves.

Variable Cost of Reserves: Overview

- Costs associated with setting up the system to stand ready and respond to reserve need.
- All reserves are referred to as “inc” or “dec” obligations.
  - **Inc Reserve:** ability to increase generation in order to maintain load-resource balance in the Balancing Authority Area (BAA).
  - **Dec Reserve:** ability to decrease generation in order to maintain load-resource balance in the BAA.
- All costs are operations related and do not include items such as O&M.
- There are two broad categories of cost:
  1. Stand Ready
  2. Deployment

Variable Cost of Reserves: Purpose and Method

- The goal is to determine the cost of carrying reserves in a robust fashion by capturing the impact of carrying and deploying balancing reserves.

- General method is to model the dispatch of controller projects over the 80 water year data set for each month.

  1. Start with the rate case model run for generation allocation (HYDSIM).
  2. Make unit commitment and dispatch calculation to meet generation request and total reserve obligation while minimizing water consumption.
  3. Deploy balancing reserves in response to an error signal.

Variable Cost of Reserves: Stand Ready

- Stand ready: Those costs associated with making the reserve available such that the system is capable of instantaneously maintaining load-resource balance at the specified probability. Stand ready costs consist of:

  1. Energy shift.
  2. Efficiency loss.
  3. Base cycling loss.
  4. Spill Loss.

- For each stand ready component, the impact of providing dec, non-spinning and spinning reserves are presented by month and diurnal period (note: Spill is loss only associated with non-spinning and spinning resreves).

Variable Cost of Reserves: Deployment

- Deployment: Those costs associated with using the balancing reserve in response to the system's need to maintain load-resource balance. Deployment costs consist of the following:

  1. Response losses.
  2. Incremental cycling loss.
  3. Incremental spill.

- For each deployment component, the impact of deploying dec and inc balancing reserves are presented by month and diurnal period.

- Spinning impacts are associated with inc response losses, non-spinning impacts are associated with incremental cycling losses, and dec impacts are associated with dec response losses, dec incremental cycling losses, and incremental spill.

Allocation of Variable Costs

- After Total Variable Costs have been calculated, they are allocated to load regulation, load following and load imbalance, Variable Energy Resource Balancing Service (VERBS), Dispatchable Energy Resource Balancing Service (DERBS), and Operating Reserves.
- Variable costs are allocated proportional to the quantity and type (both inc and dec amounts for regulation, following, and imbalance) as calculated in the Balancing Reserve Capacity Quantity Forecast.
- The Variable Costs are therefore allocated per the Incremental Standard Deviation (ISD) methodology.

Questions?

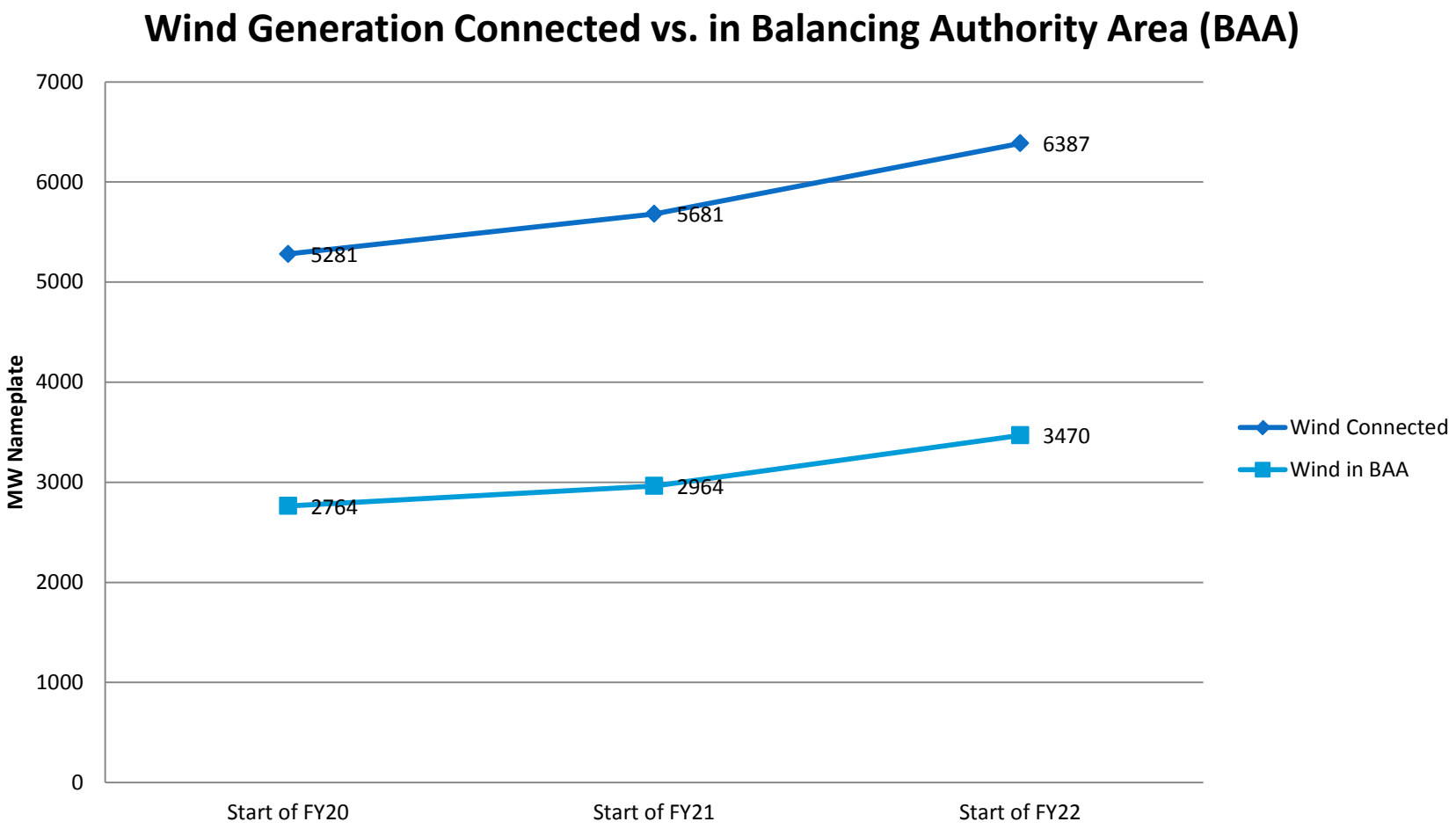
Renewable Generation Forecast

Cherilyn Randall, TPCV

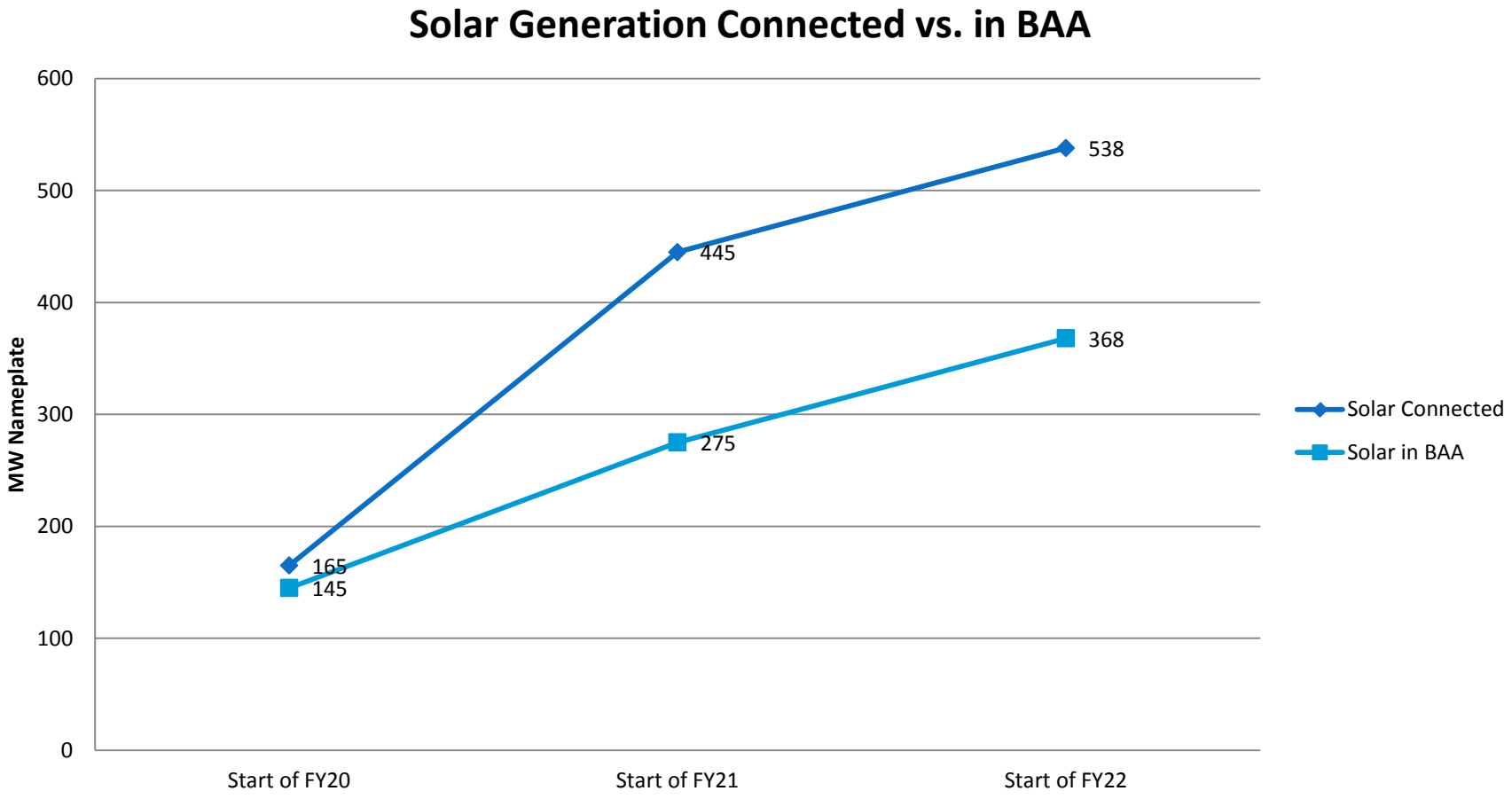
Forecasted Generation

- Generation in forecast is deemed “high” likelihood
- Likelihood determined by assessing various factors
  - Construction contract signed
  - in preliminary engineering or design
  - Signed Power Purchase Agreement
  - transmission service acquired
  - BPA project manager has given a confirmed schedule
- Other projects that are “low” or “medium” likelihood may still come online during the rate period
- Even “high” likelihood projects can be delayed or cancelled

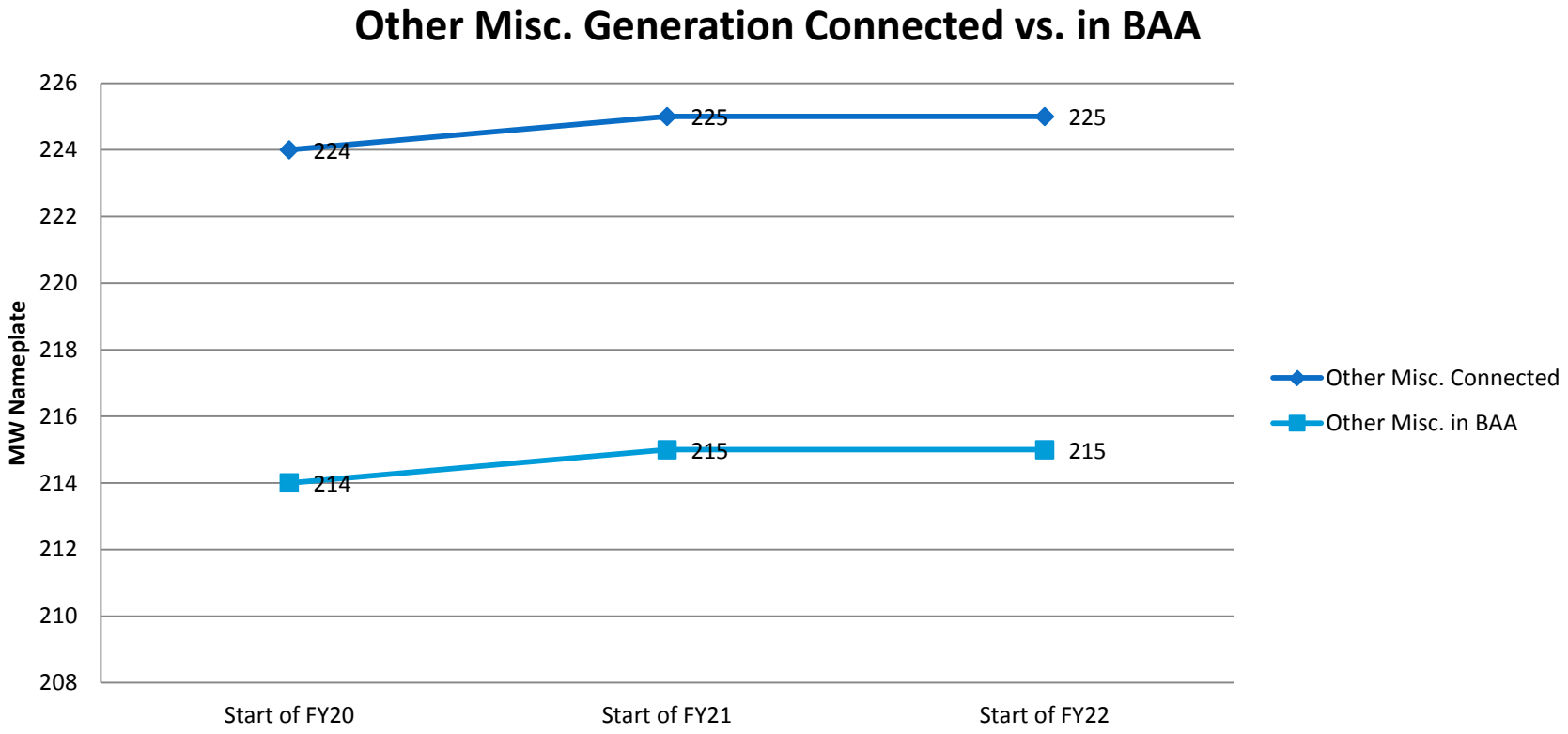
WIND Generation



SOLAR Generation



OTHER MISC. Generation



*Other Misc. Generation includes small hydro, biomass, biogas, wave energy, waste heat recovery, geothermal, and some co-gen.

Balancing Reserve Capacity Forecast

Libby Kirby, TOOC
Frank Puyleart, TOOC

BP-18 Balancing Reserve Forecast

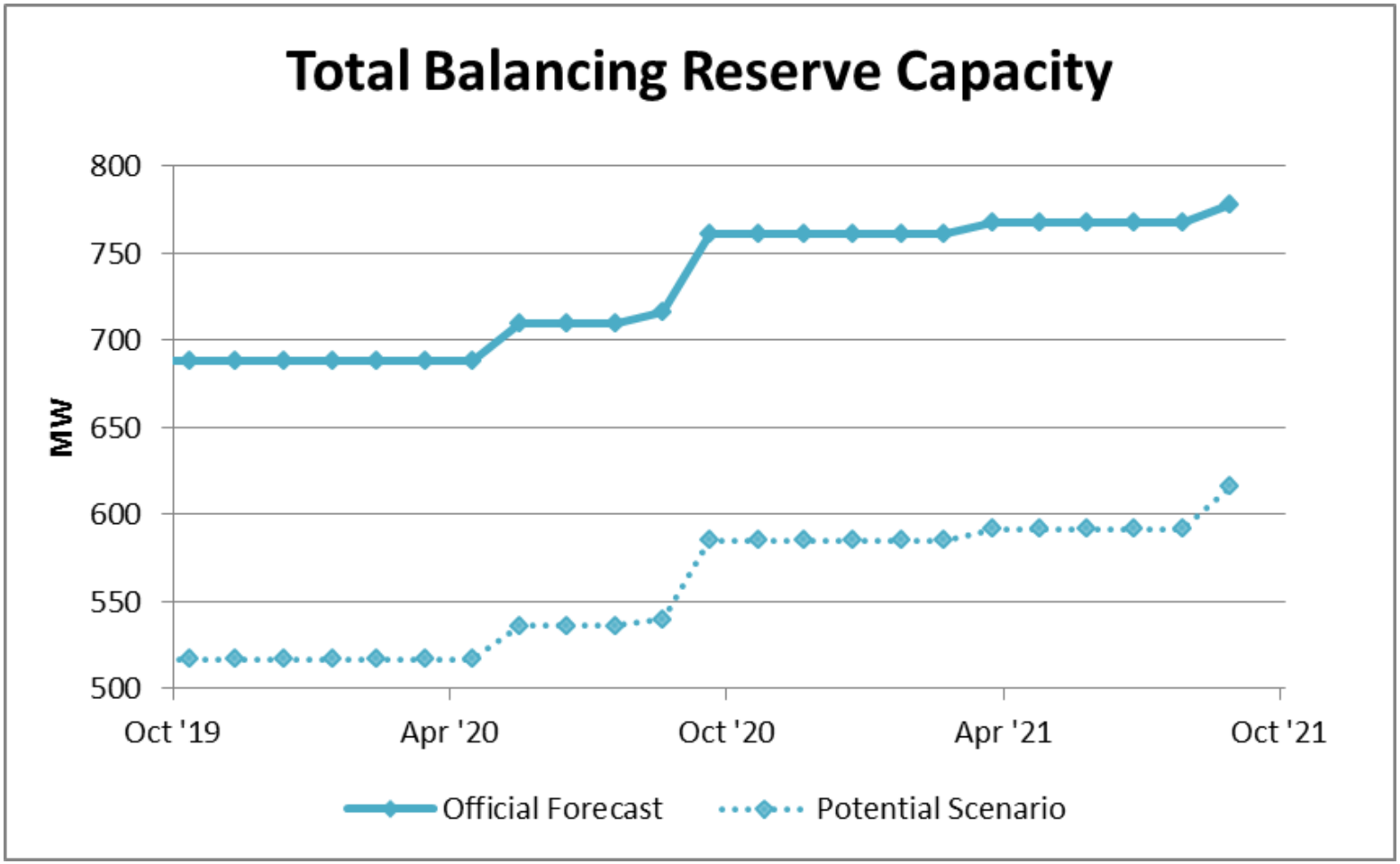
Month	Wind Capacity (MW)	Solar Capacity (MW)	DERs Capacity (MW)	Total Bal. Reserves (INC - MW)	Total Bal. Reserves (DEC - MW)
…	…	…	…	…	…
Jun ’19	2787	26.2	2339	619	-745
Jul ’19	2787	26.2	2339	619	-745
Aug ’19	2287	26.2	2339	579	-695
Sept ‘19	2481	26.2	2339	602	-729

Note: Data taken from Table 9.10 of BP-18 Rate Proceeding Final Proposal Power Rates Study Documentation (BP-18-FS-BPA-01A)

Forecasted Generation Profile

Month	Wind	Solar*	DERs	CGS	Hydro
Oct '19	2767	148	1608	1230	2527
…	…	…	…	…	…
Jun '20	2967	148	1608	1230	2527
…	…	…	…	…	…
Sept '20	2967	248	1608	1230	2527
Oct '20	3269	268	1608	1230	2527
…	…	…	…	…	…
Apr '21	3269	361	1608	1230	2527
…	…	…	…	…	…
Sept '21	3473	361	1608	1230	2527

*Solar capacity used in Balancing Reserve Forecast does not include plants less than 3 MW for which we do not have data

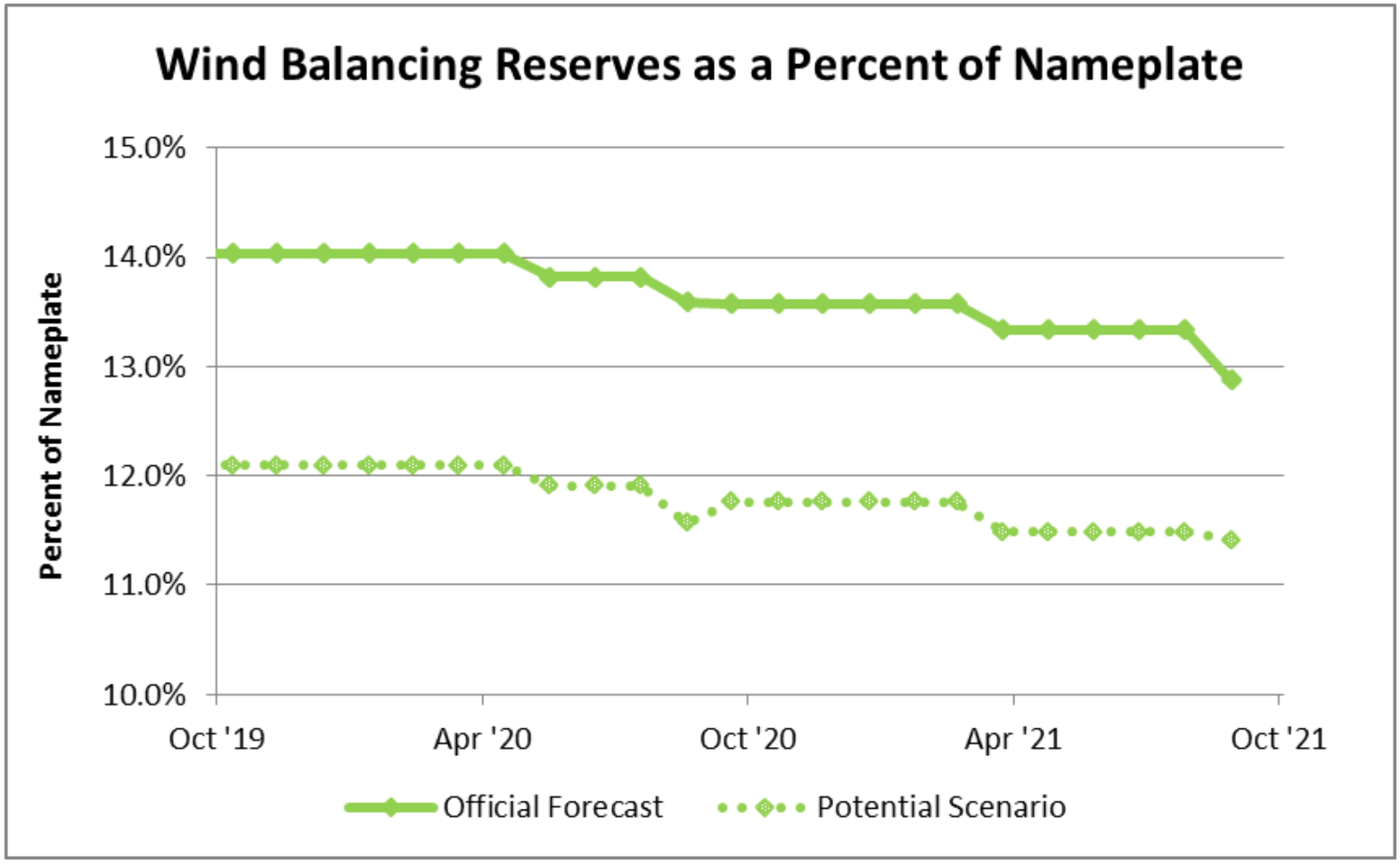

Total Balancing Reserve Capacity
800
750
700
650
600
550
500
MW
Oct '19
Apr '20
Oct '20
Apr '21
Oct '21
Official Forecast
Potential Scenario

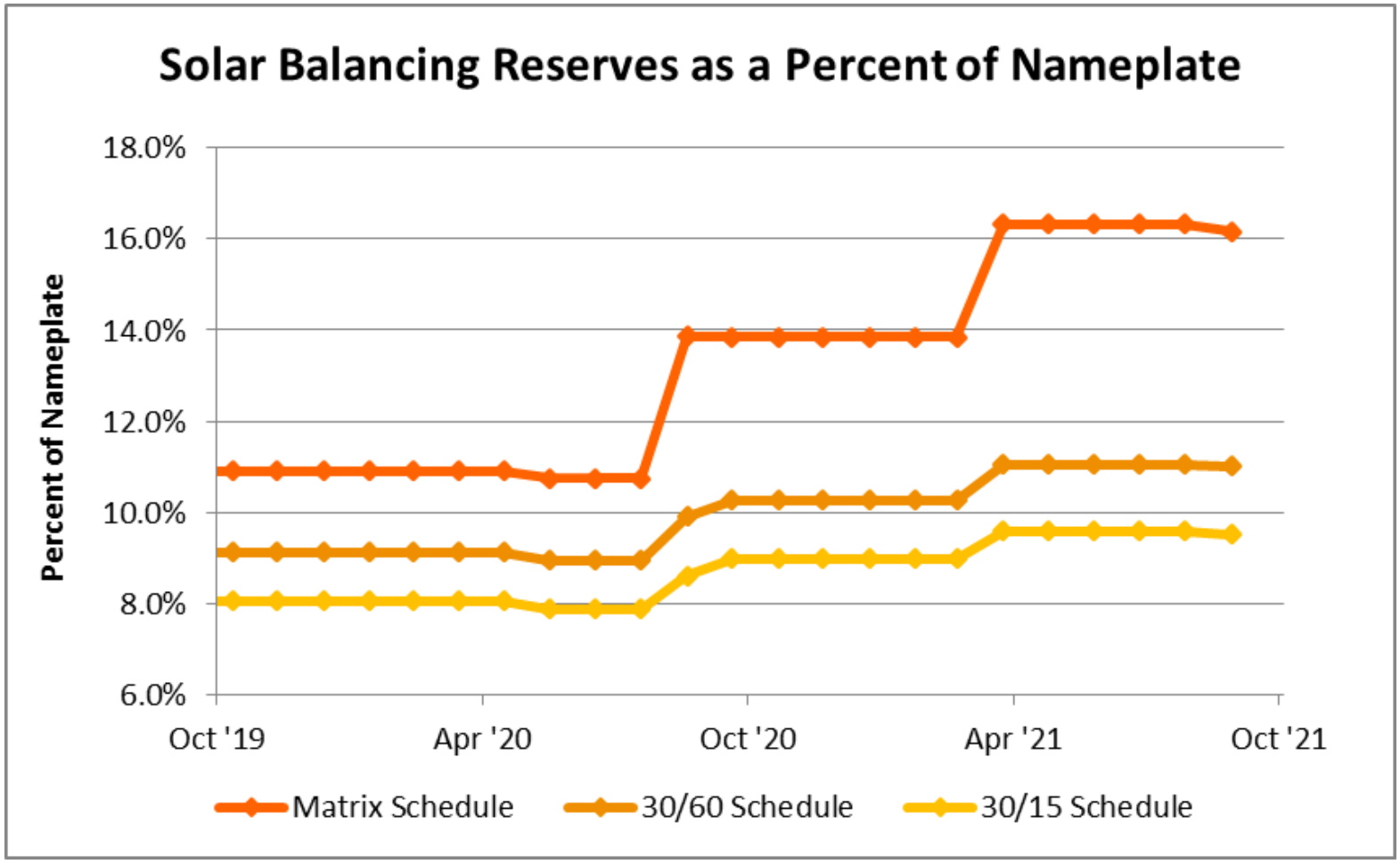
Total Reserve Capacity by Type (INC)

Month	Total	Load	Wind	Solar	DERs	Fed Hydro + CGS
Oct '19	688	259	388	16.2	15.5	8.2
…	…	…	…	…	…	…
Jun '20	709	260	410	15.9	15.2	8.0
…	…	…	…	…	…	…
Sept '20	716	256	403	34.4	14.8	7.7
Oct '20	761	258	444	37.2	14.4	7.5
…	…	…	…	…	…	…
Apr '21	768	252	436	59.0	13.7	7.2
…	…	…	…	…	…	…
Sept '21	778	251	447	58.4	13.9	7.2

Total Reserve Capacity by Type (DEC)

Month	Total	Load	Wind	Solar	DERs	Fed Hydro + CGS
Oct '19	-834	-290	-495	-19.7	-19.0	-9.6
…	…	…	…	…	…	…
Jun '20	-859	-290	-521	-19.4	-18.6	-9.4
…	…	…	…	…	…	…
Sept '20	-857	-283	-504	-42.8	-17.9	-8.9
Oct '20	-930	-286	-570	-46.7	-17.8	-8.8
…	…	…	…	…	…	…
Apr '21	-925	-278	-548	-73.9	-16.6	-8.3
…	…	…	…	…	…	…
Sept '21	-948	-277	-571	-74.2	-17.0	-8.3


Wind Balancing Reserves as a Percent of Nameplate
Percent of Nameplate
15.0%
14.0%
13.0%
12.0%
11.0%
10.0%
Oct '19
Apr '20
Oct '20
Apr '21
Oct '21
Official Forecast
Potential Scenario


Solar Balancing Reserves as a Percent of Nameplate
Percent of Nameplate
18.0%
16.0%
14.0%
12.0%
10.0%
8.0%
6.0%
Oct '19
Apr '20
Oct '20
Apr '21
Oct '21
Matrix Schedule
30/60 Schedule
30/15 Schedule