BPA's Non-Wires SOA Pilot Summary Results

December 10, 2018

Agenda

1. Review objectives of the SOA Pilot
2. Discuss BPA's internal forecasting and event trigger deployment tool
3. Share performance results and key findings
4. Discuss next steps for non-wire development

Pilot objectives

1. Secure a non-wires portfolio to reduce flows on SOA flowgate during summer peak periods

2. Measure and validate post-event data to determine amount of flow reduction

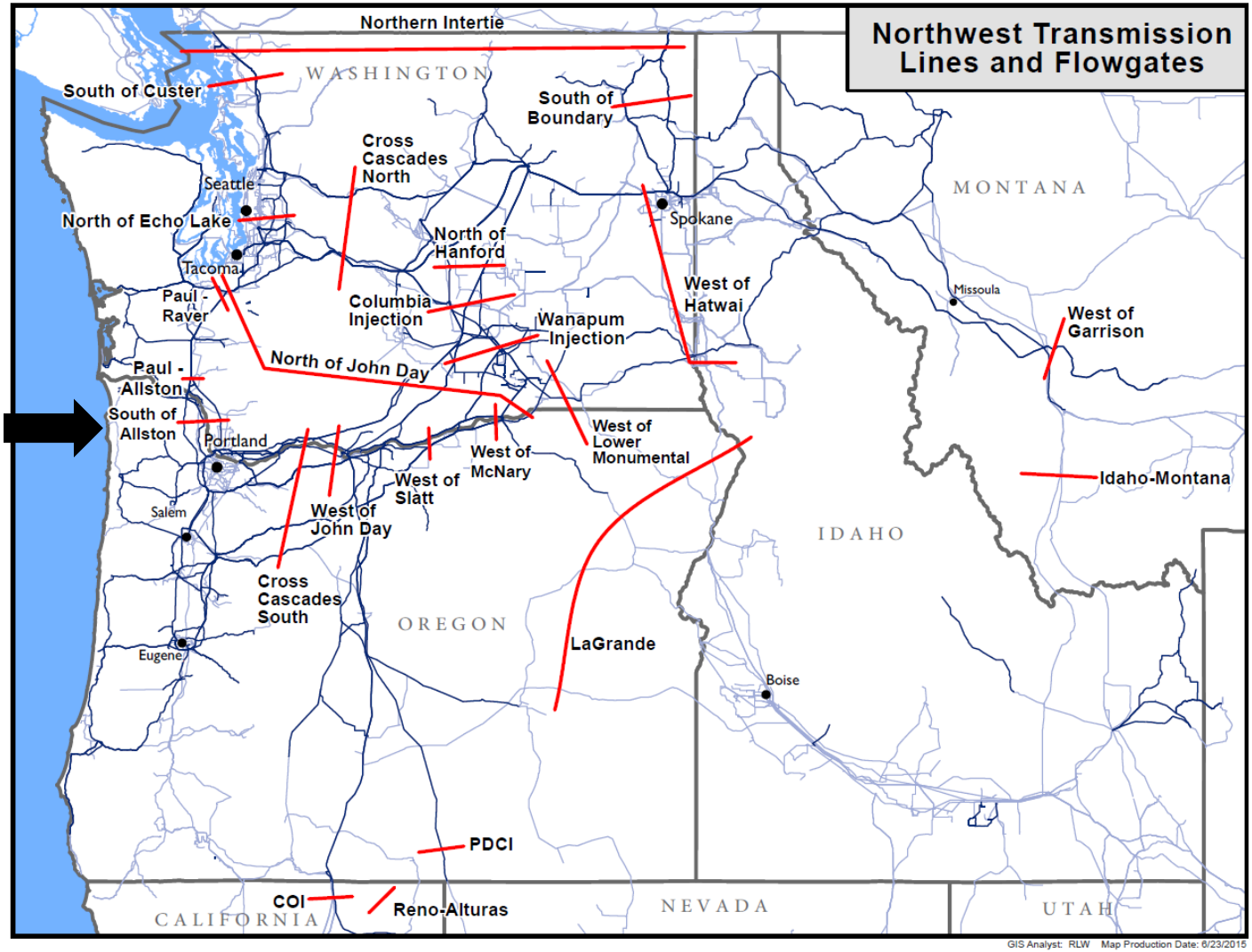
3. Leverage learning to inform future non-wires program design choices

SOA Pilot refresher

- BPA acquired two years of incremental and decremental capacity and energy (deployed with day ahead notice) to reduce flows on SOA flowgate during summer peak periods
- Annual transmission budget to fund SOA Pilot program was $5M/year
- Non-wires portfolio balances 200 MW of incremental capacity with 200 MW of decremental capacity to provide counter flow
- SOA Pilot runs weekdays and was deployed as a total portfolio in four hour blocks, during late afternoon through early evening, for up to 40 hours per summer
- Third-party suppliers were notified of the need to dispatch on a pre-schedule day-ahead basis
- An event notice was posted day-ahead on OASIS for each event

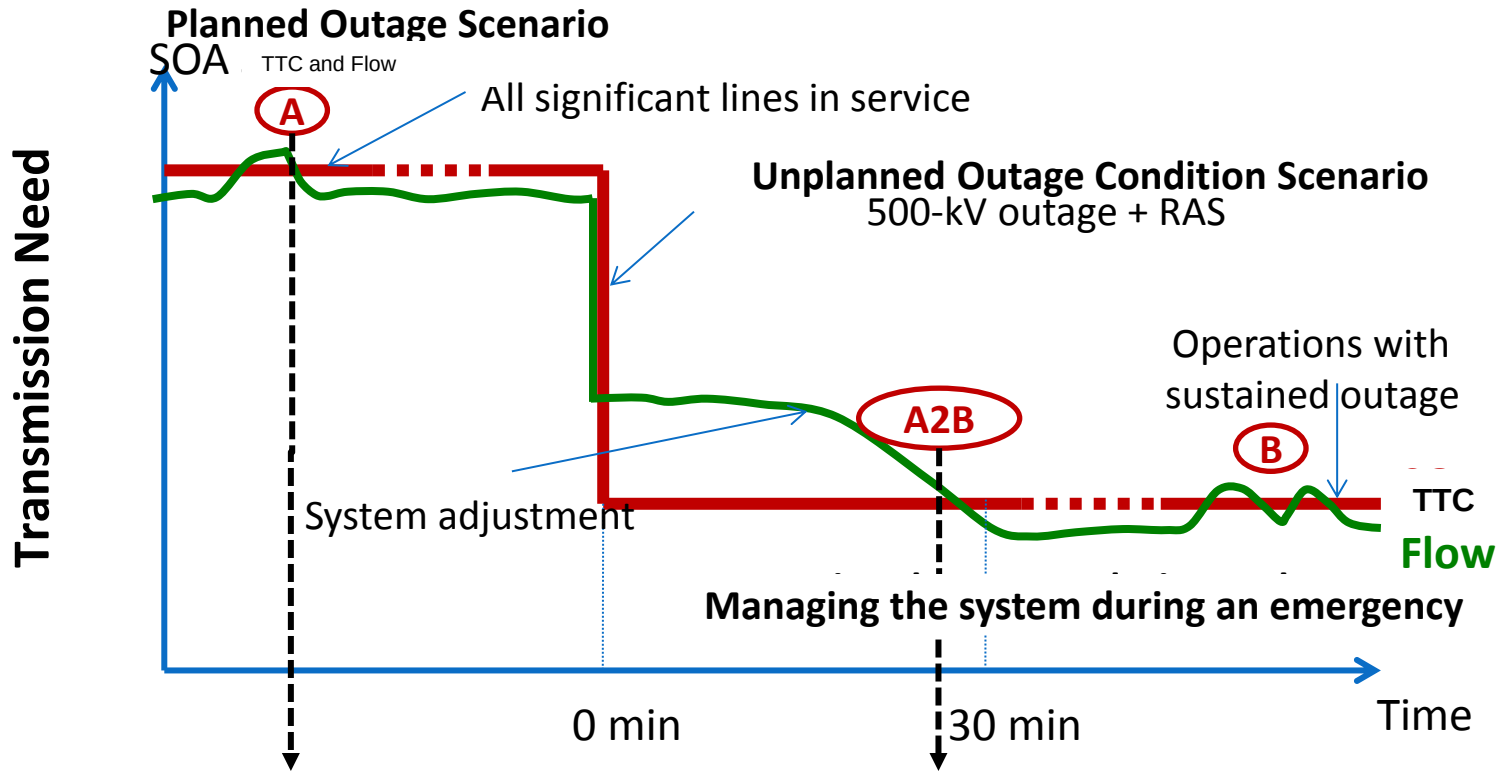
PNW transmission paths

The relevance of SOA to the I-5 Reinforcement Project is that it represents a cut-plane between Longview, Washington and the Portland metro area which is used to monitor the reliability of the I-5 Corridor.



Map of flow gates highlighting SOA used by operations to monitor Portland metro area

Scope of need

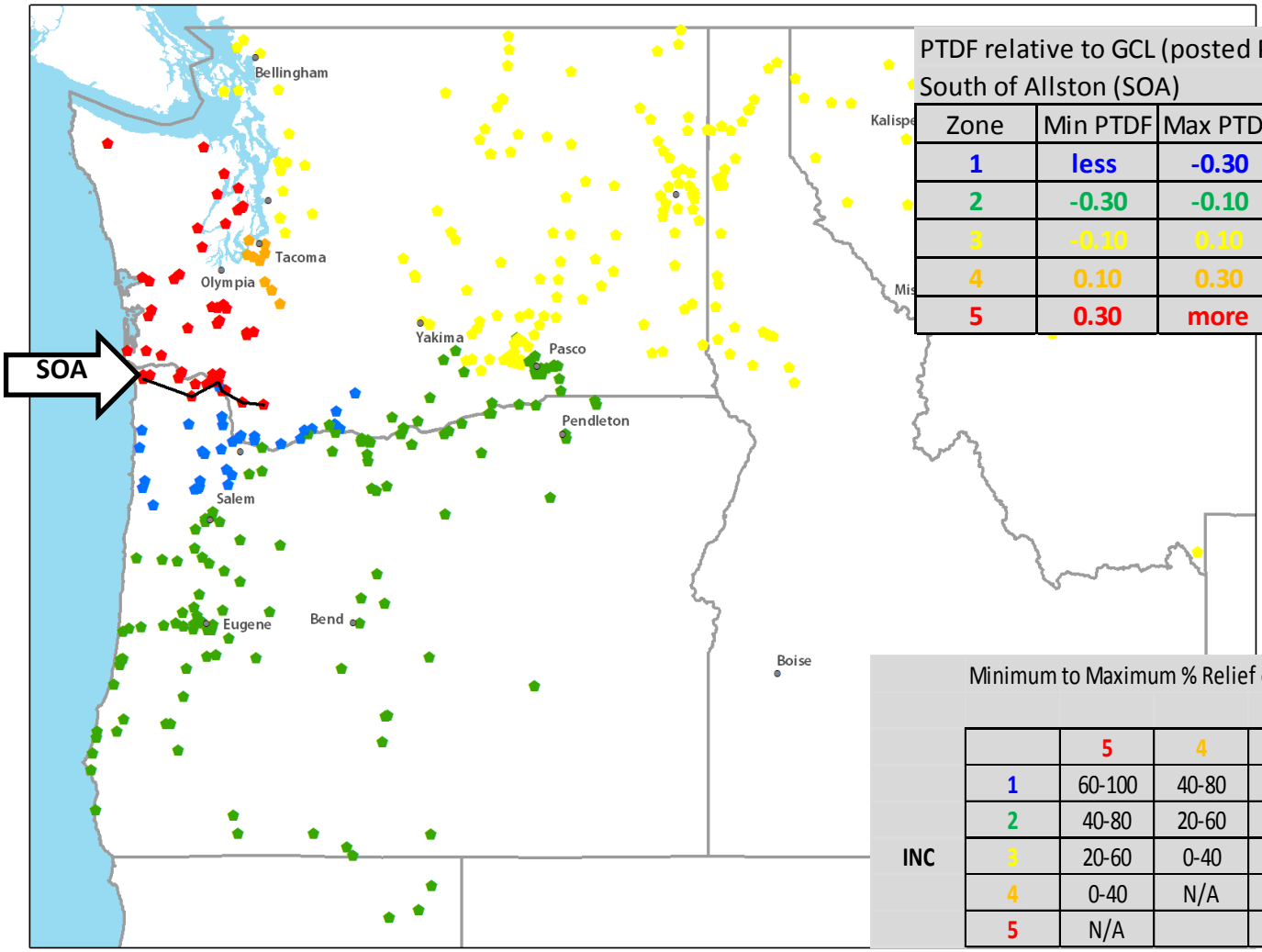


Non-Wires

Non-Outage (A)	Outage (A2B)
Day Ahead Notice Incremental capacity Decremental capacity DSM/Demand Response	**Within Hour notice** used to manage the transmission system post contingency. This is outside of the scope of BPA's SOA Pilot.

Scope of RFO on "A problem" to mitigate high flow risk (preventative, pre-contingency focus)

Congestion map



PTDF relative to GCL (posted PTDFs)
South of Allston (SOA)

Zone	Min PTDF	Max PTDF	INC/DEC
1	less	-0.30	Best INC
2	-0.30	-0.10	Good INC
3	-0.10	0.10	Potential INC or DEC
4	0.10	0.30	Good DEC
5	0.30	more	Best DEC

Minimum to Maximum % Relief on SOA by INC and DEC Zone

		DEC				
		5	4	3	2	1
INC	1	60-100	40-80	20-60	0-40	N/A
	2	40-80	20-60	0-40	N/A	
	3	20-60	0-40	N/A		
	4	0-40	N/A			
	5	N/A				

This map was created by BPA for prospective bidders to respond to BPA's RFO seeking non-wires

Forecasting tool background

- BPA designed, developed and implemented an internal trigger tool that generates daily peak flow forecasts on the SOA flowgate during summer months
  - The daily forecast indicates when to deploy an event based on the next day's forecasted flow relative to forecasted TTC
- The forecasting model utilizes historical data dating back to 2012. The statistical method is a ridge regression model and the predictor variables include:
  - Portland area Load Forecasts
  - California Load Forecasts
  - Generation forecasts of generators located near the SOA flowgate
  - BPA total wind generation forecasts
  - Lower Columbia river hydro generation forecasts (BON, TDA, JDA, MCN)
  - Total Transmission Capacity (TTC) from OATI web data

Forecasting challenges

- The SOA flow forecast was calculated at 04:05 on preschedule day for an eight hour window (14:00-22:00)
  - After considering system conditions and outages, BPA Dispatcher decided whether or not to deploy an event
- There were times when the tool forecasted high flows and the pilot was not implemented
- There were other times when the tool did not forecast high flows that did end up materializing
- The methodology was updated in 2018 to add feedback and self-correcting model input data to increase forecasting accuracy

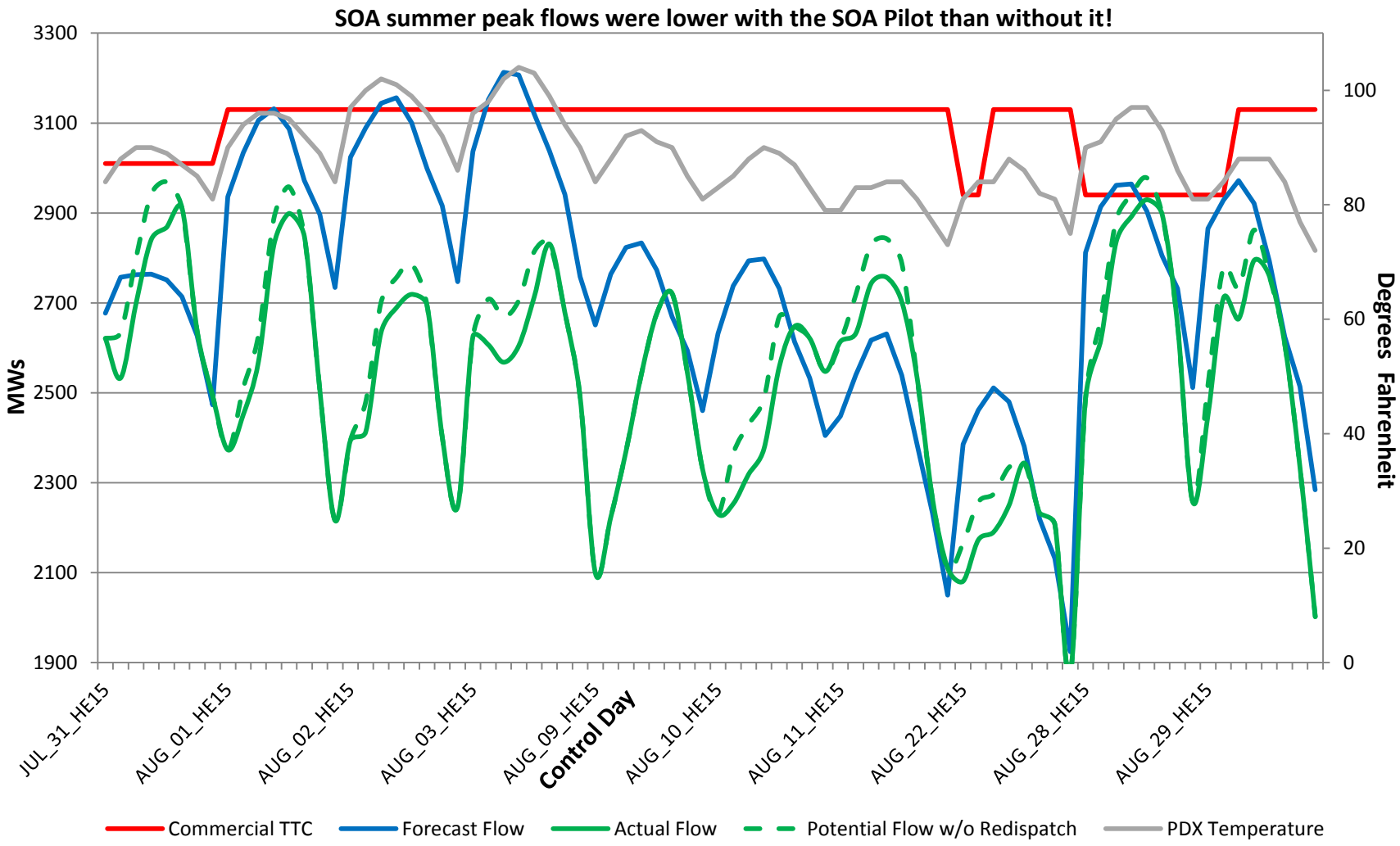
SOA Pilot performance summary

- Analysis shows repeatability and reliability in performance across two years:
  - flow reduction goals were met under different operating conditions
  - solid performance results were measured, validated, and repeatable
  - targeted load reduction played a key role in lowering summer peak flows
  - redispatching a portfolio of geographically targeted non-wires adds-value
  - In aggregate, the average flow relief slightly increased in the second year

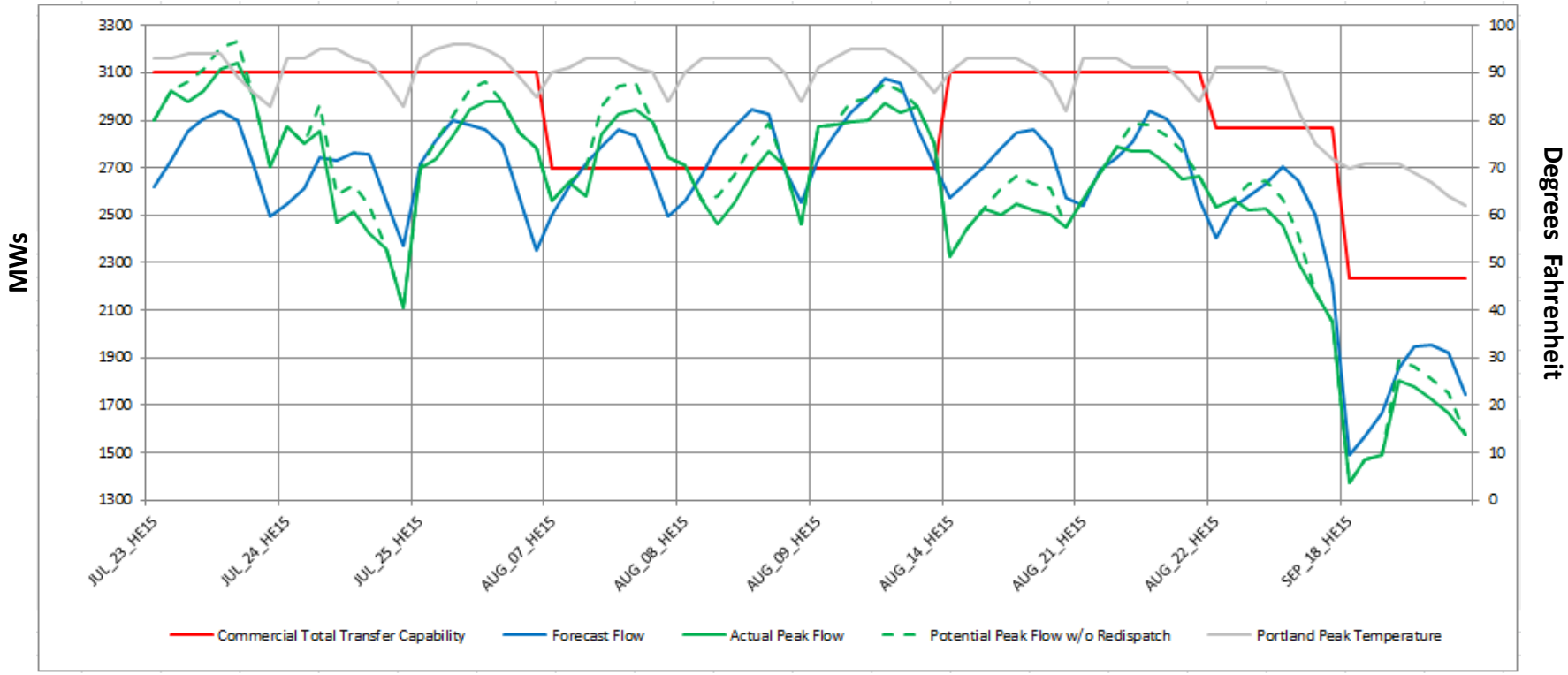
	Summer 2017 Relief			Summer 2018 Relief		
	Max	Avg	Min	Max	Avg	Min
Full Portfolio	-112	**-105**	-101	-117	**-109**	-85
Partial Portfolio	-82	**-75**	-71	-87	**-85**	-83

Note: relief is defined as "schedule informed" where impacts on flow reduction are calculated based on schedules before and during SOA Pilot events, including resupply schedules

Summer 2017 measured flow relief



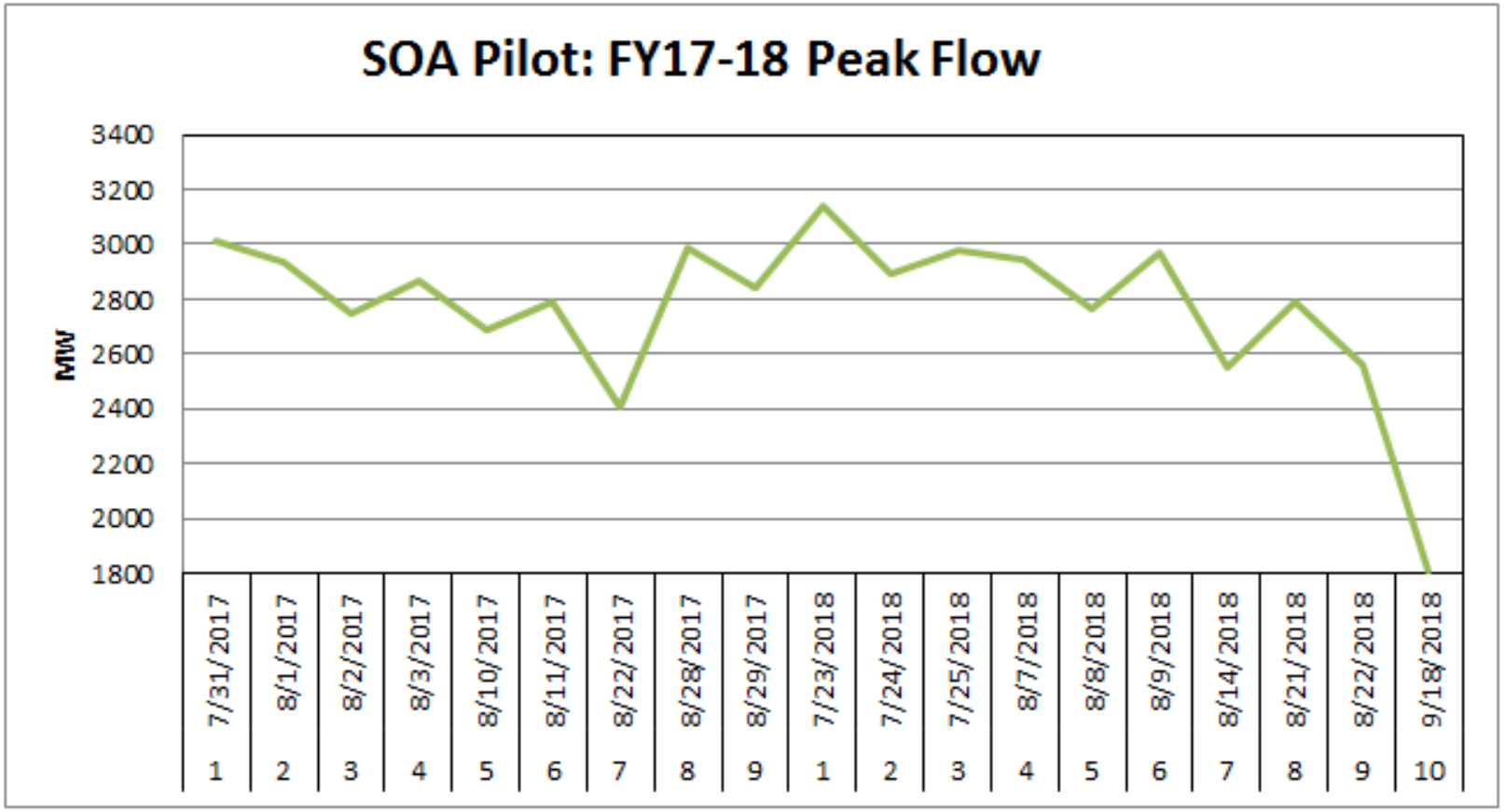
Summer 2018 measured flow relief



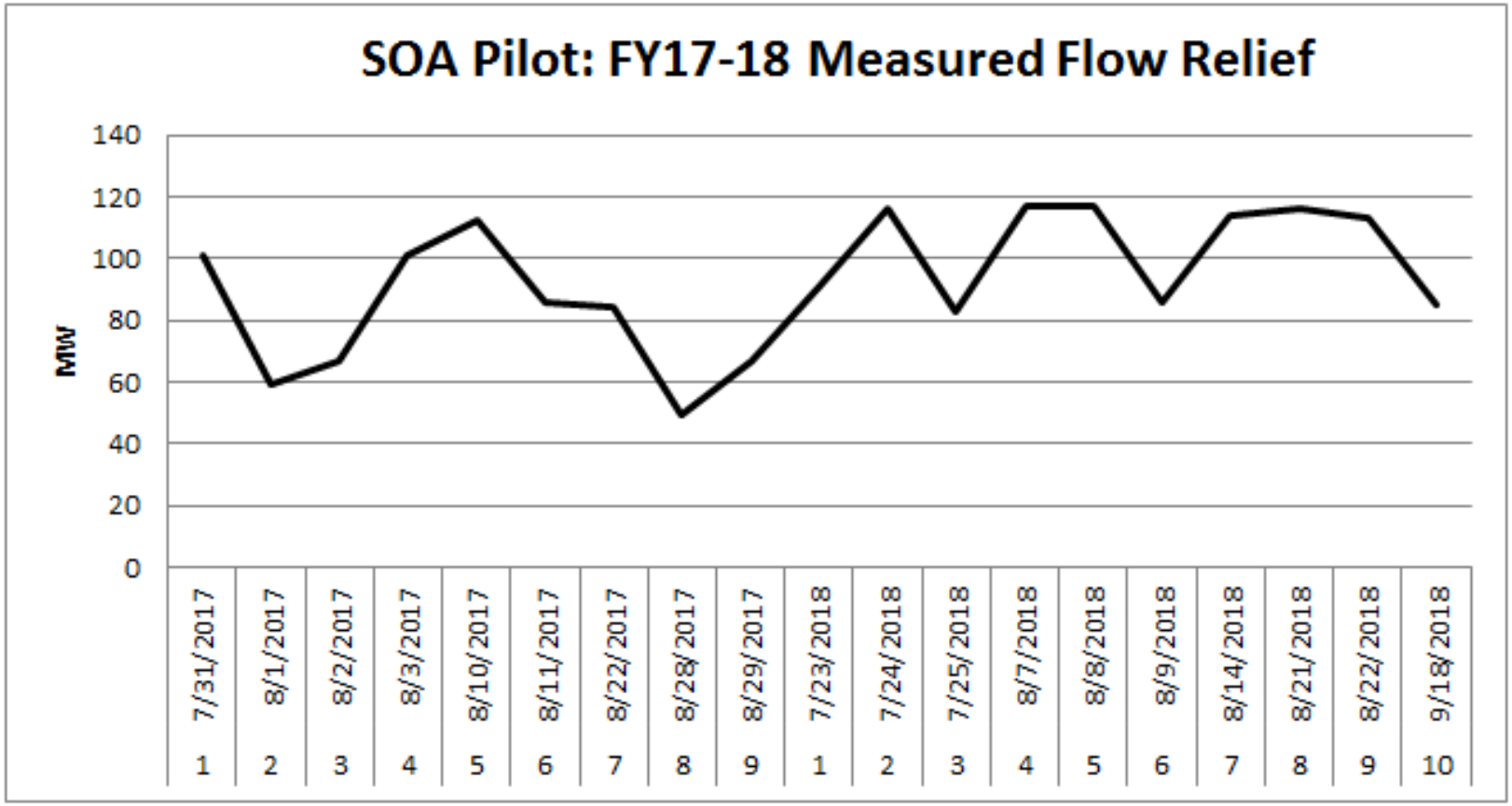
Note: The Commercial TTC (red line) dip from Aug. 7 – Aug. 14 is due to a planned outage that was canceled on Aug. 6th and did not get reflected in the Commercial TTC calculation, until a few days later. On Sept. 18 Commercial TTC dipped again due to a one-day planned outage.

Repeatable results, again SOA summer peak flows were lower with the SOA Pilot than without it!

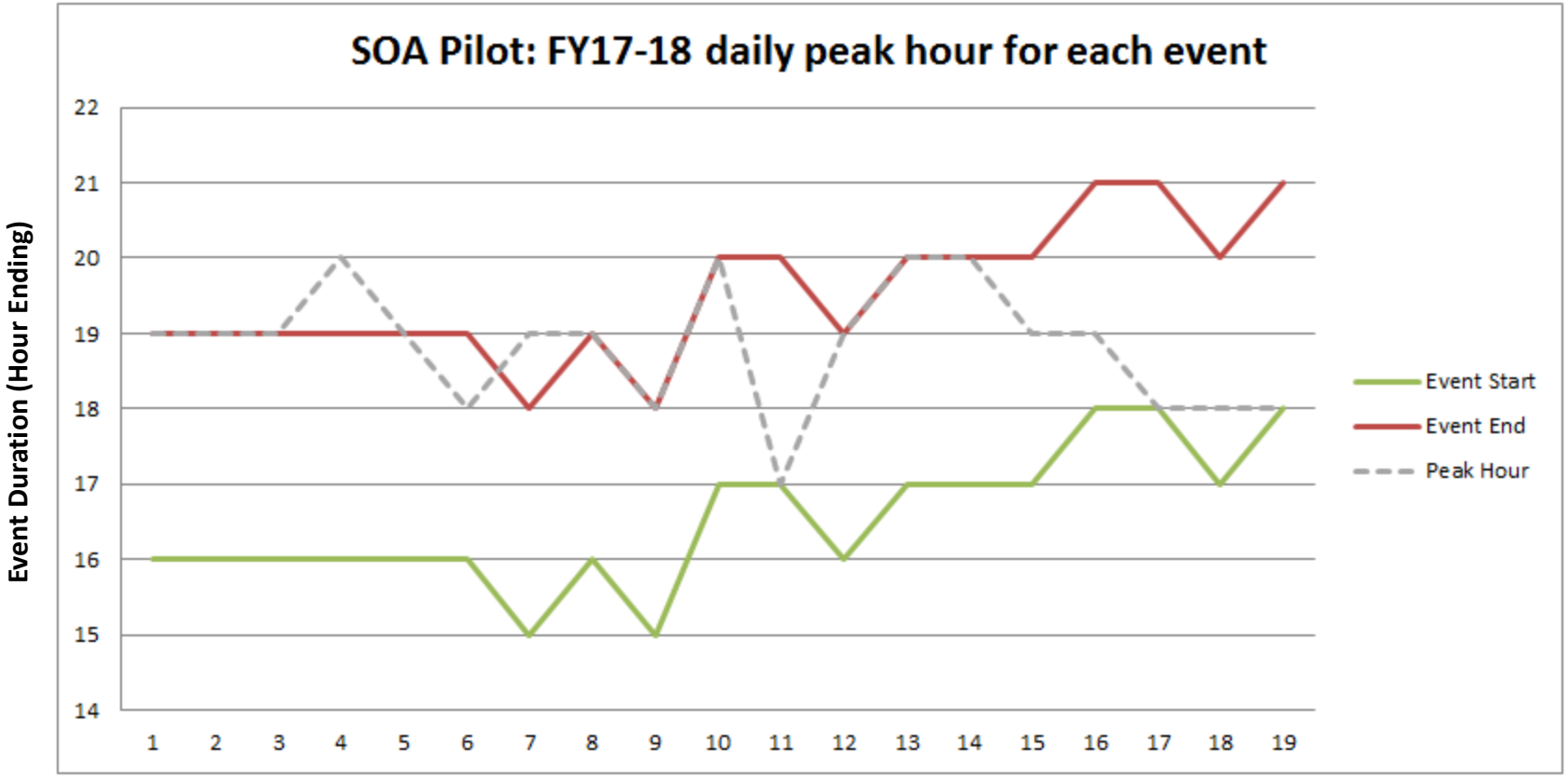
Event performance – peak flows (across both summers)



Event performance – flow relief (across both summers)



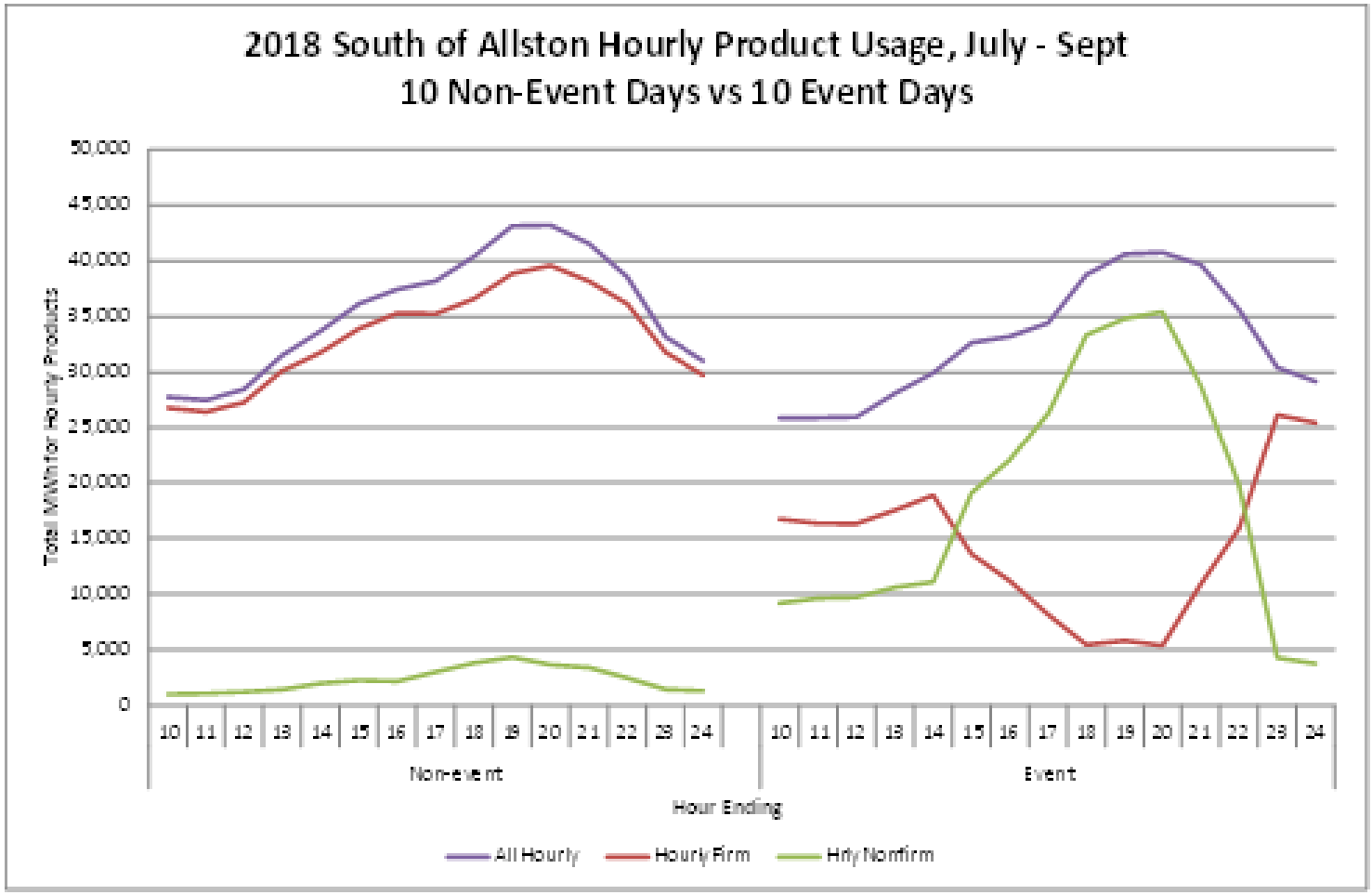
Most events hit the peak hour for the day (across both summers)



Events 1-9 = Summer 2017 and Events 10-20 = Summer 2018

Transmission product usage

Similar to Summer 2017, hourly non-firm transactions replaced hourly firm transmission during SOA Pilot events



Key findings

Overall, the SOA Pilot met all program objectives and advanced our understanding of how to:

- Translate technical planning and operational transmission requirements into commercial term sheets (eg. capacity, energy, and demand-side)
- Establish a baseline and apply performance metrics to measure and evaluate flow relief
- Develop a new flow prediction ridge regression model to inform optimal timing of event deployments

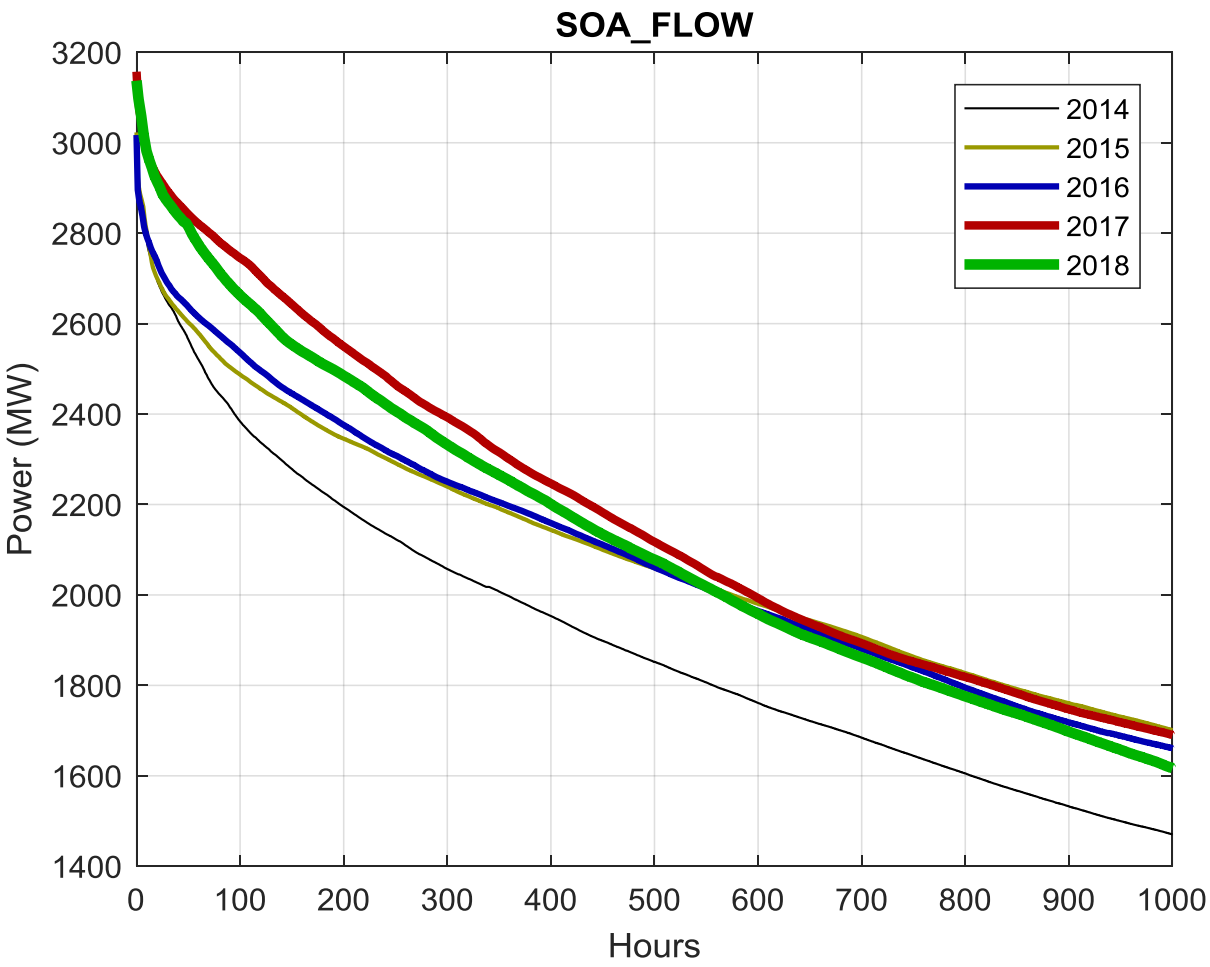
Key findings - continued

- Non-wires are affordable; we spent *slightly* less than the $5M per year budget
- Our internal bidding evaluation and procurement was more complex and took more time than expected
- Build in more response time for bidders to price multiple offers and for the buyer to evaluate multiple offers
- Relying on a single demand response measure can present a challenge when faced with multiple day deployments
- Plan and budget for internal tool development and system integration to operationalize your program

Key findings - continued

- Establish baseline measurement and data retention requirements before the project starts and data is lost
- Need changes, buy as many hours as you can afford
- Stack assets year-round to maximize long-term value
- Plan for more providers, technological advancements, economically driven deployment logic, operate on shorter notice, and extend longer-term
- Exploring how to modernize the traditional rate-based cost recovery model to promote non-wire development and cost recovery
- Document lessons learned along the way . . .

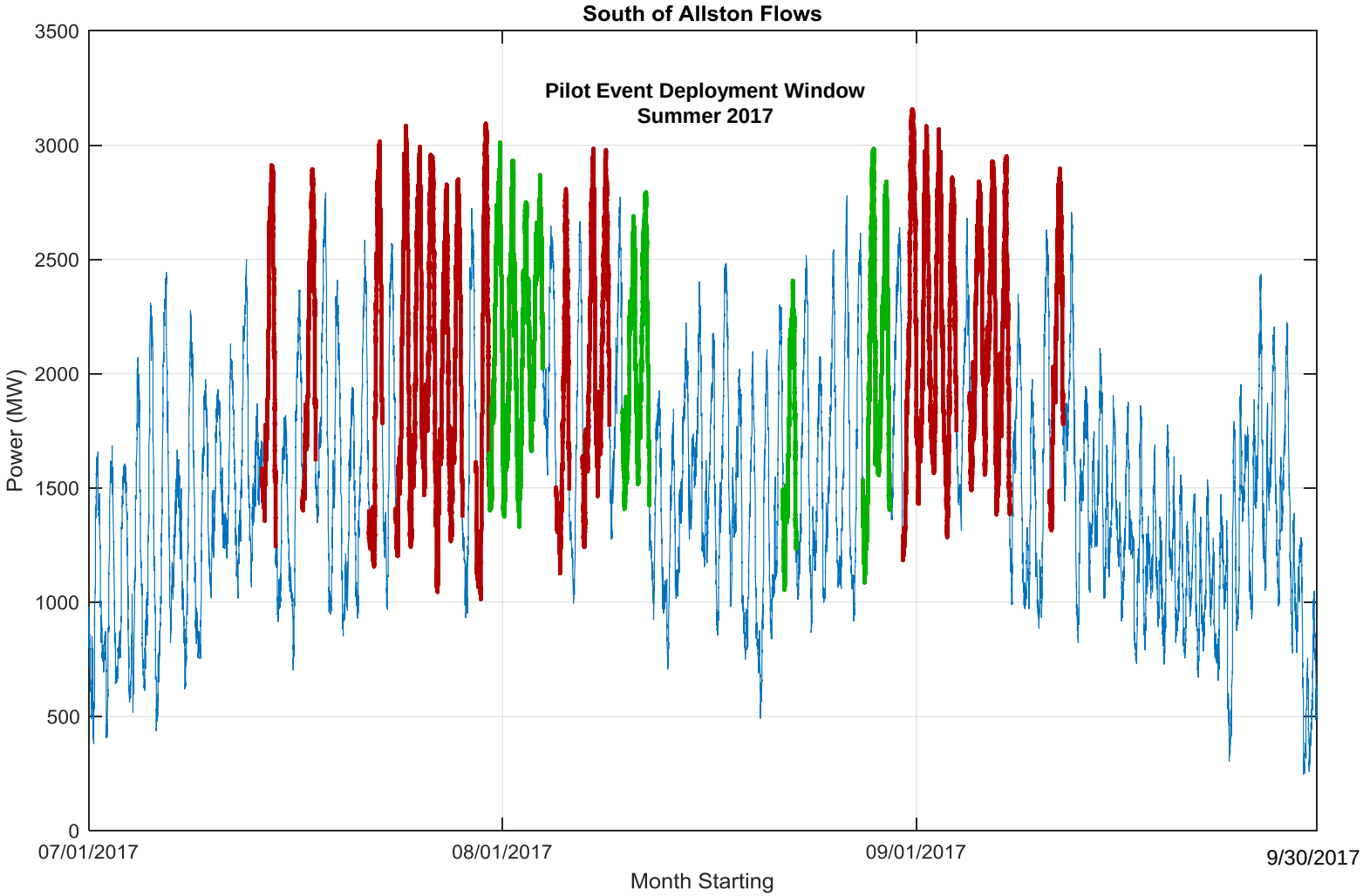
SOA flow persistence curve



Flow persistence chart shows more hours of higher SOA flows in 2017 and 2018

2017 high flow days

Red = SOA pilot not deployed (actual flows over 2800MW)
Green = SOA pilot deployed



Summer 2017 highlights the need for more hours of relief needed, should high SOA flows persist in out years

2018 high flow days

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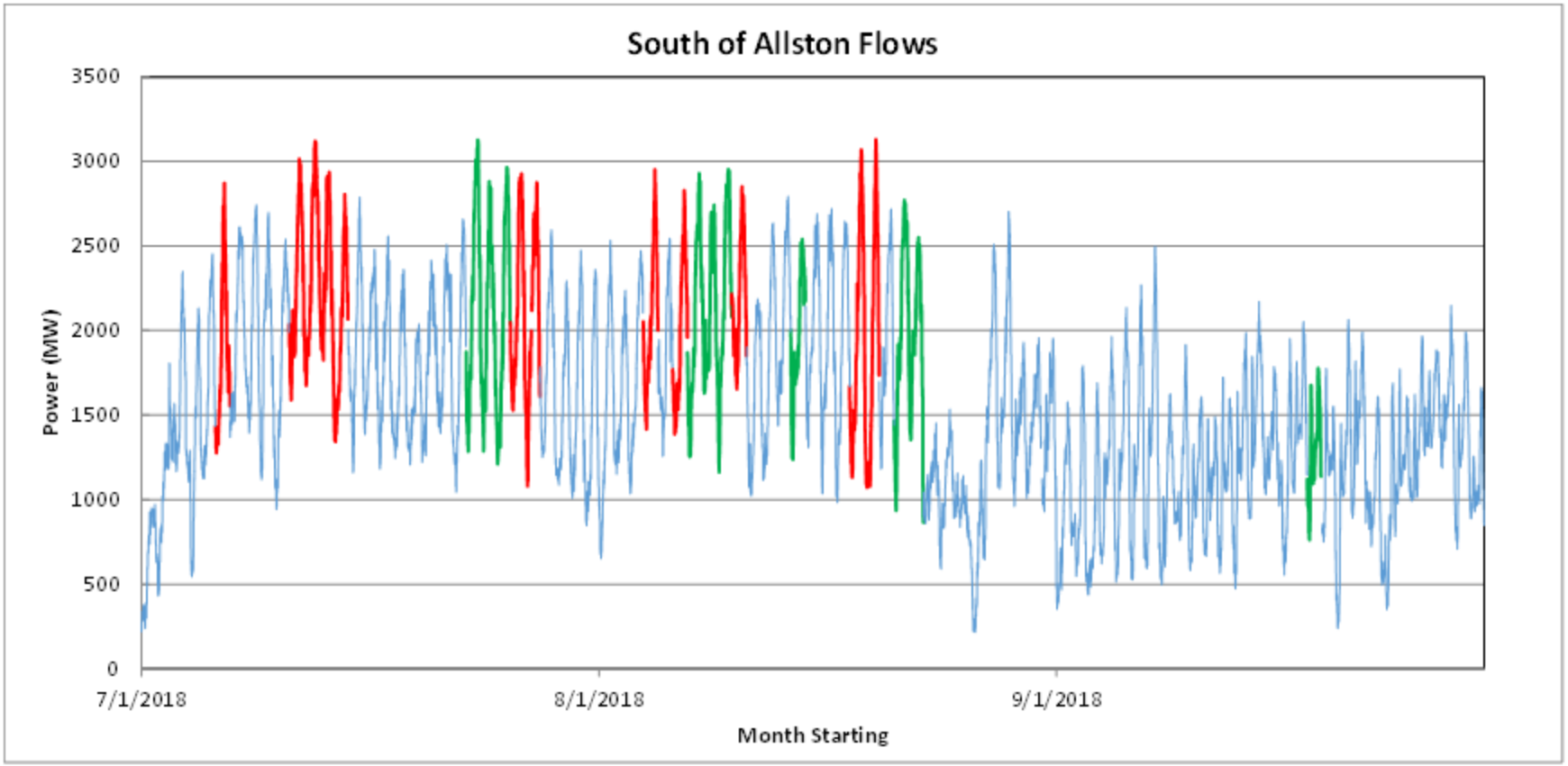

Summer 2018 had slightly lower flows than last summer but still greatly benefited from the SOA Pilot

Next steps

- Exploring how non-wire options can support BPA's ongoing cluster study and commercial assessment efforts that inform transmission plan(s) of service
- You can find more information about TSEP at: https://www.bpa.gov/transmission/CustomerInvolvement/TSRStudyExpansionProcess/Pages/default.aspx
- You can find more information about the SOA Pilot at: https://www.bpa.gov/transmission/CustomerInvolvement/Non-Wire-SOA/Pages/default.aspx