

EIM Go- Live Update From APS

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October 5, 2016



PINNACLE WEST: WHO WE ARE

We are a vertically integrated,
regulated electric utility in the
growing southwest U.S.

Principal subsidiary:  **aps**

- Arizona Public Service Company, Arizona's largest and longest-serving electric utility

Customers: 1.2 million (89% residential)

Service Territory:

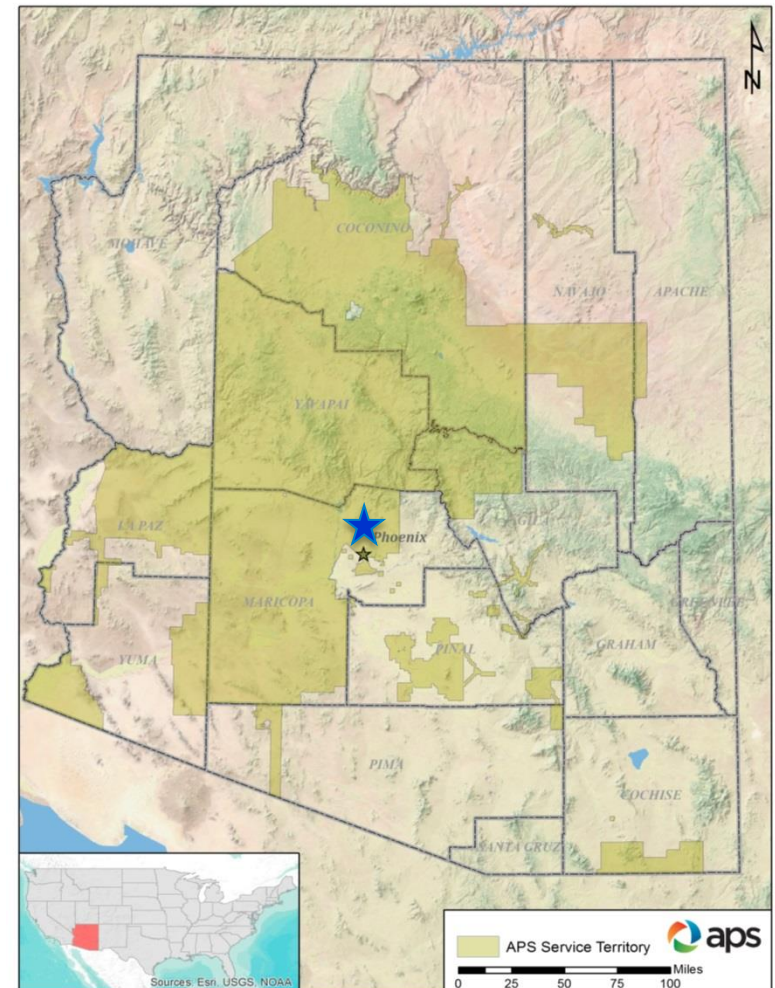
- 34,646 square miles
- 11 of the 15 Arizona counties

2015 Peak BAA Demand: 7,318 MW

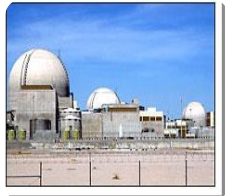
Generation Capacity: Over 6,000 MW of owned or leased capacity (~8500 MW with long-term contracts)

Transmission & Distribution: 34,937 miles

- Transmission: 5,958 miles
- Distribution: 28,979 miles



Resources



Nuclear

1,150 MW

Coal

1,670 MW

Natural Gas

3,150 MW
Owned
1070 MW
Tolled

Energy Efficiency

400 MW

Solar

480 MW
Utility Scale
~550 MW
Distributed
Rooftop

Wind

290 MW

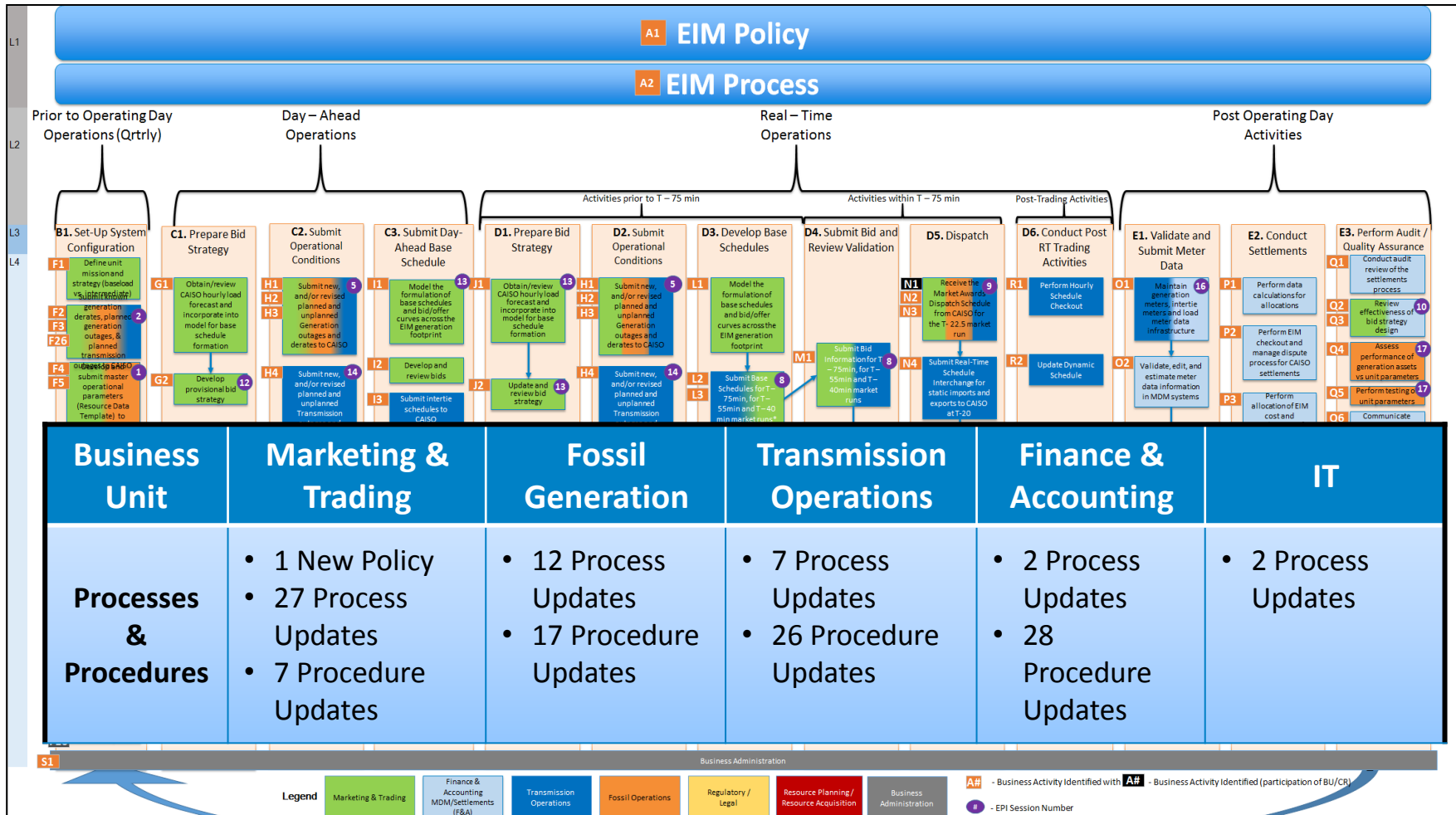
EIM Milestones

Milestone	Original Schedule	Actual	
Implementation Agreement	28 May 2015	28 May 2015	☑
Detailed Project Plan	1 July 2015	1 July 2015	☑
Requirements Complete	30 June 2015	8 July 2015	☑
Design Complete	30 October 2015	15 November 2015	☑
Budget Approved at CMC	23 November 2015	23 November 2015	☑
Connectivity Testing begins	1 April 2016	7 March 2016	☑
Day In the Life testing	1 June 2016	1 May 2016	☑
Market Simulation	1 August 2016	1 July 2016	☑
Parallel Testing	1 September 2016	1 August 2016	☑
Go-live	1 October 2016	1 October 2016	☑

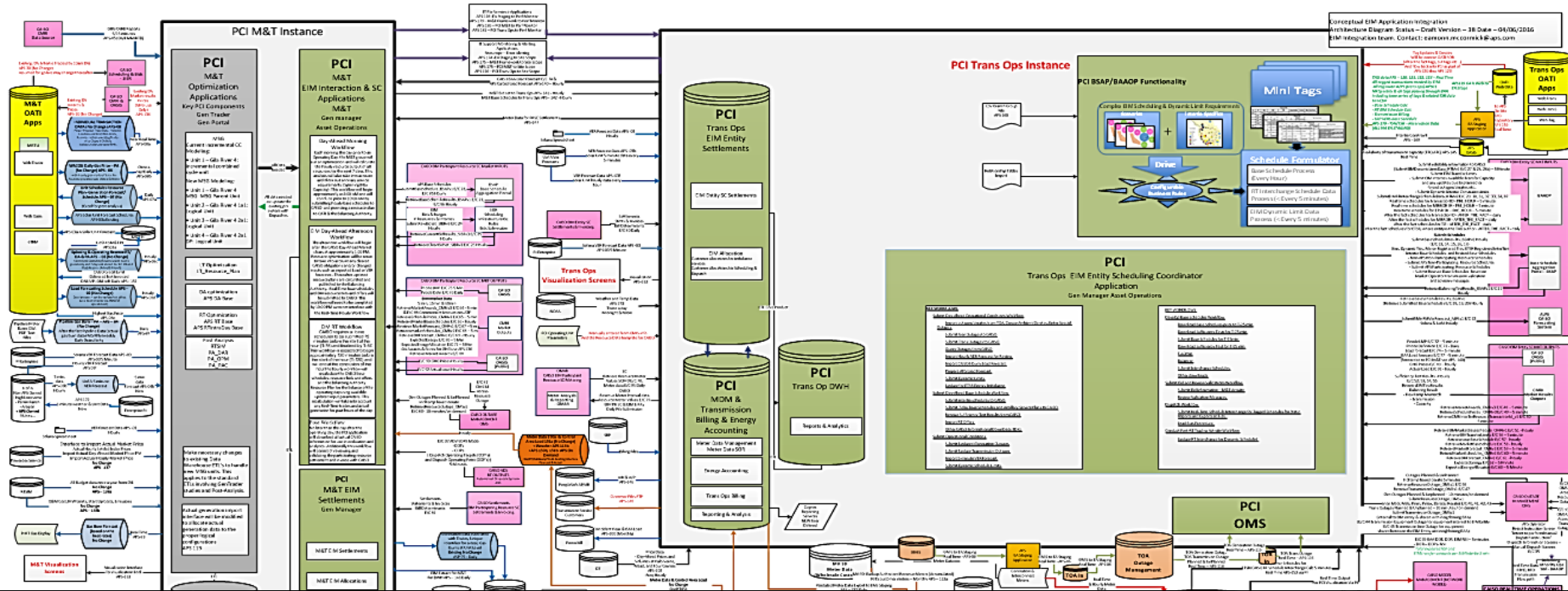
- ☑ On schedule
- ☑ Behind schedule
- ☑ Ahead of schedule

APS had 492 days from implementation agreement date for project execution;

Cross Functional Process



Technology



Business Unit	Marketing & Trading	Fossil Generation	Transmission Operations	Finance & Accounting	IT
<p>Technology</p>	<ul style="list-style-type: none"> Marketing & Trading Tools Outage Management Analzers 	<ul style="list-style-type: none"> Outage Management Automatic Generation Control for Sundance and Yucca 5-6 Visualization Meter upgrades 	<ul style="list-style-type: none"> Transmission Operations Tools Modify systems to automatically adjust generation Outage Management 	<ul style="list-style-type: none"> Shadow Settlement Energy Accounting Analzers 	<ul style="list-style-type: none"> Support of New Functionality ICCP upgrade Infrastructure

People Statistics

- 16 new hires directly related to EIM
- 8900 Man-Hours classroom training
- 192 Qualification cards
- 4 New EIM desks (primary and backup)
- 300 APS employees from 42 departments to implement EIM.
- 46 Contractors on-boarded



Process Statistics

- 21 Enterprise Process Improvement sessions
- 1 policy, 73 process, 78 procedure new or updated
- 41 EIM Change Management initiatives
- 34 APS internal Readiness Criteria



Project Statistics

- 386 Functional Requirements; 268 Non-Functional Requirements
- 690 pages of detailed design
- 60 Contracts and Agreements
- 19 Companies/Organizations involved

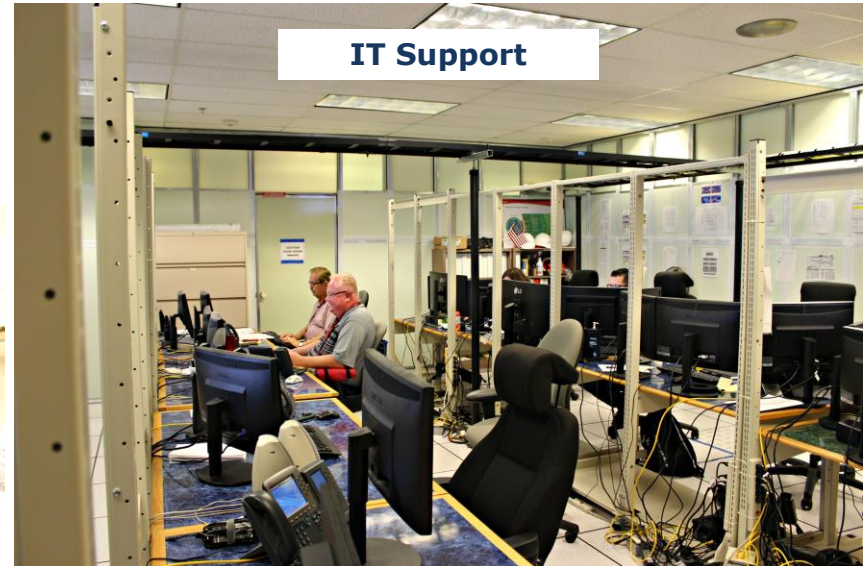
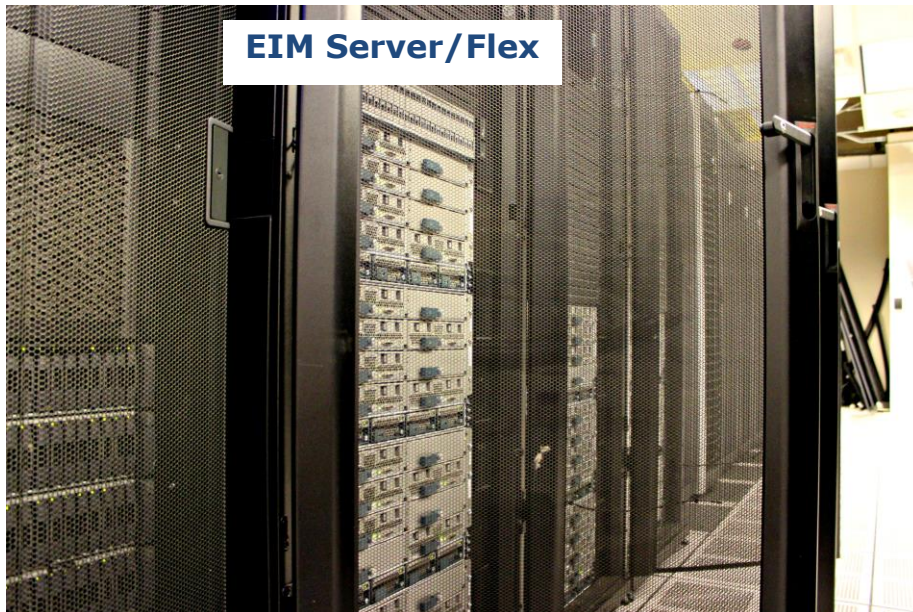
Testing Statistics

- 3,000 Test Cases developed from Requirements
- Over 2,000 Defects Created between March to September
- 173 CAISO CIDI tickets



Technology Statistics

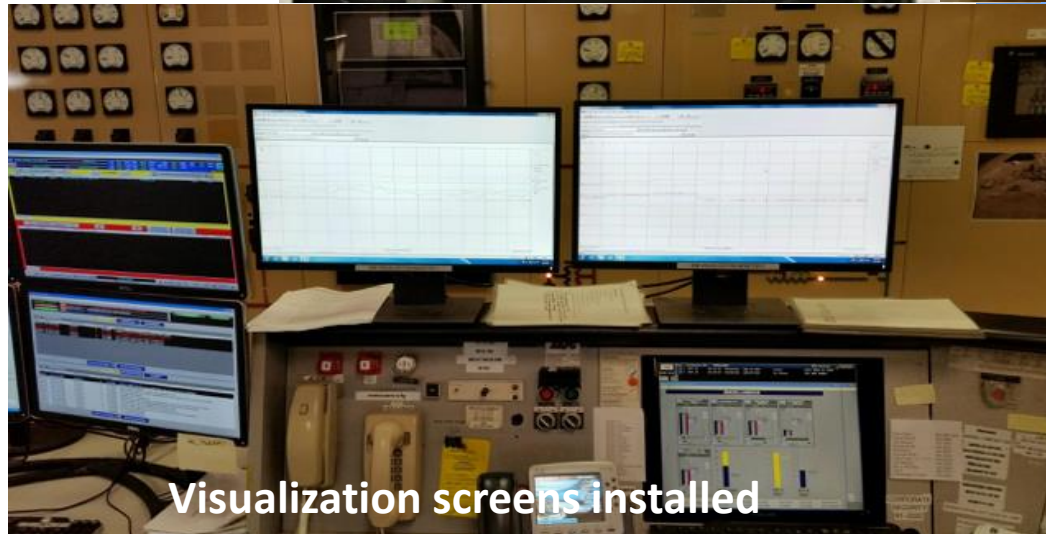
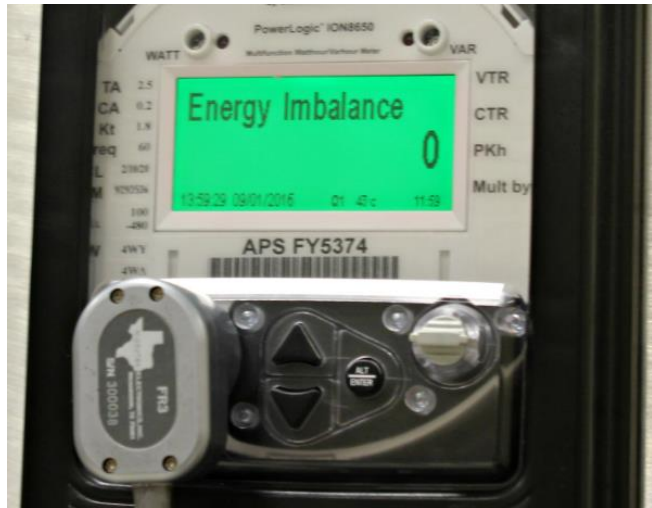
- 200 interfaces connecting 52 different systems
- 60% of IT teams worked on project
- 77 virtual servers



- ICCP modernized and made redundant. Increased points from 2000 to 14000.
- Average of 2 releases/patches per week over last 6 months resulting in 50+ releases

Field Statistics

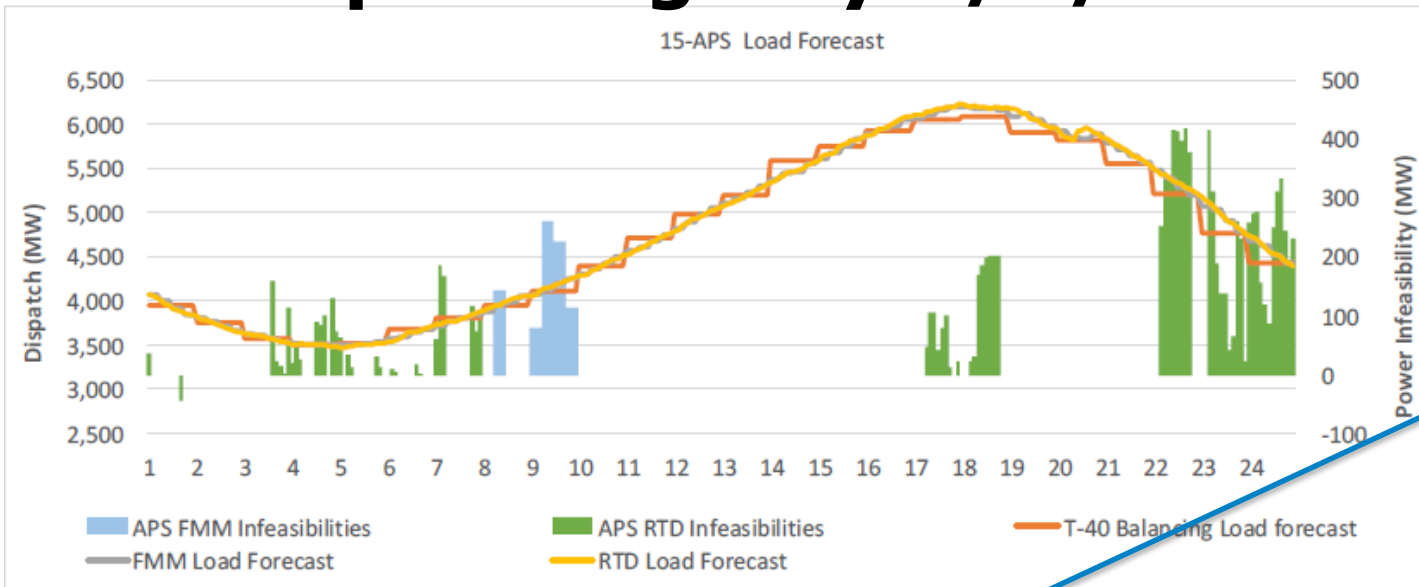
- 565 Meter Data Points
- AGC upgrades at Sundance and Yucca 5 and 6
- Visualization screens for TO, RM and Fossil



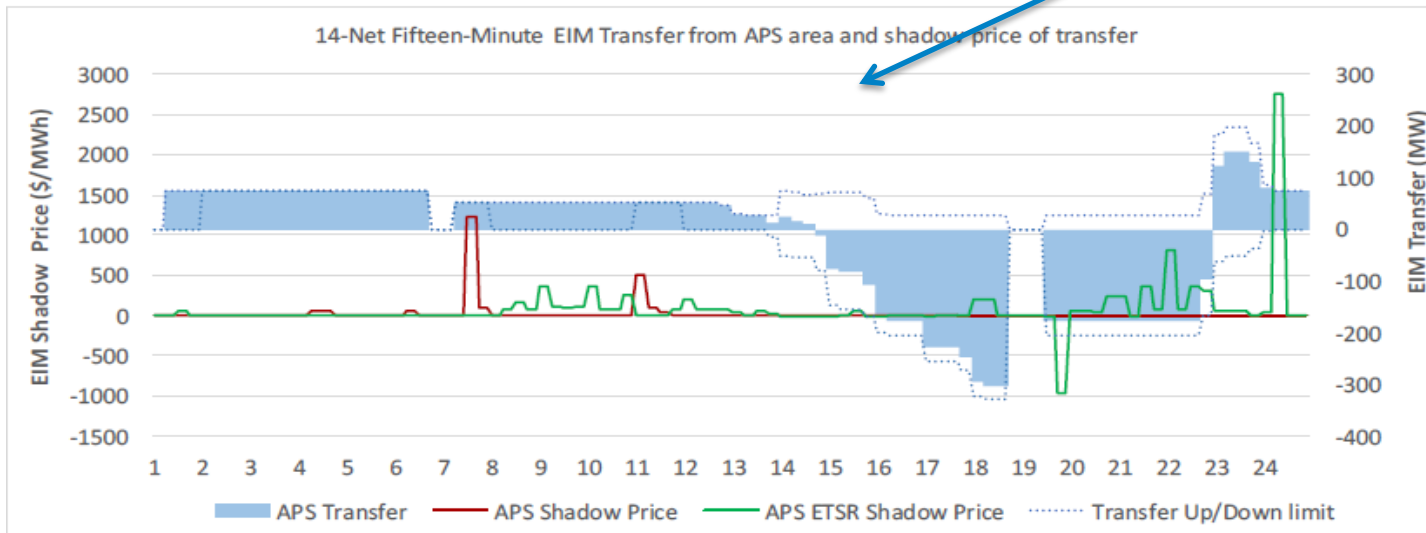
Visualization screens installed



Parallel Operating Day 9/1/16

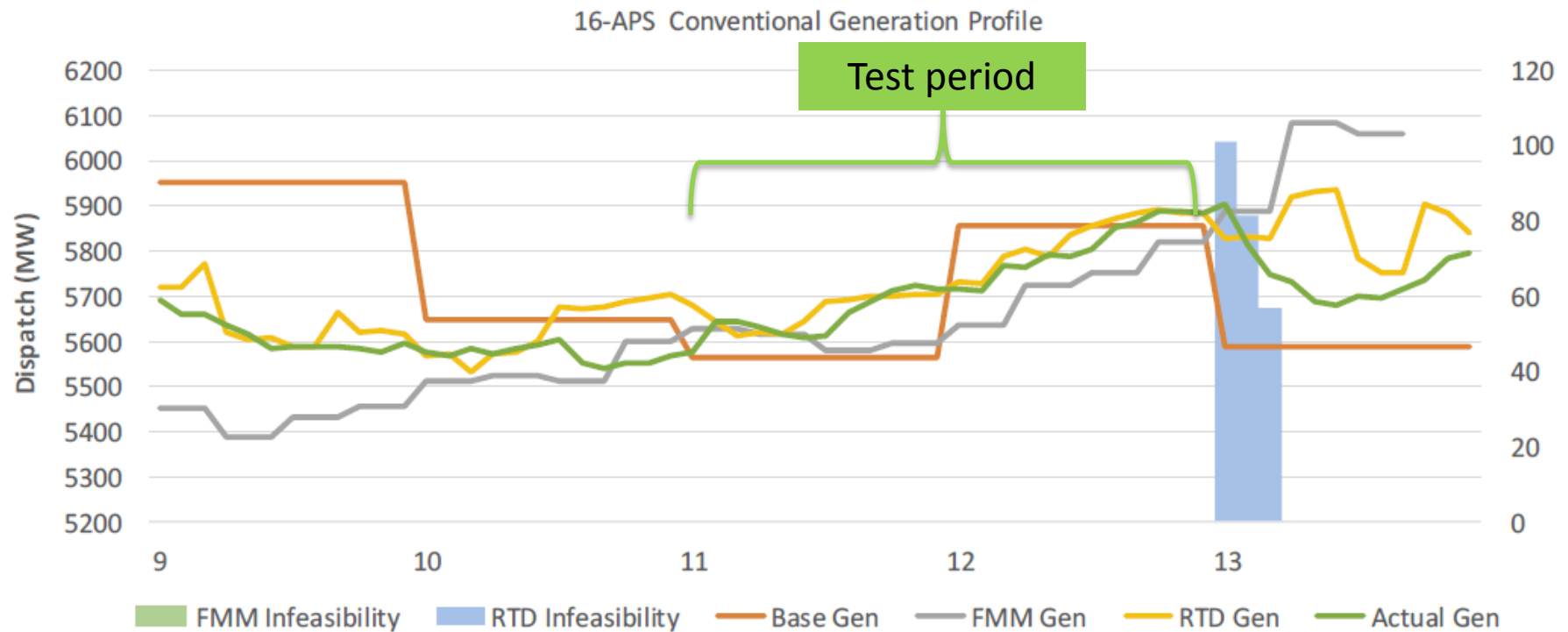


EIM transfers opened



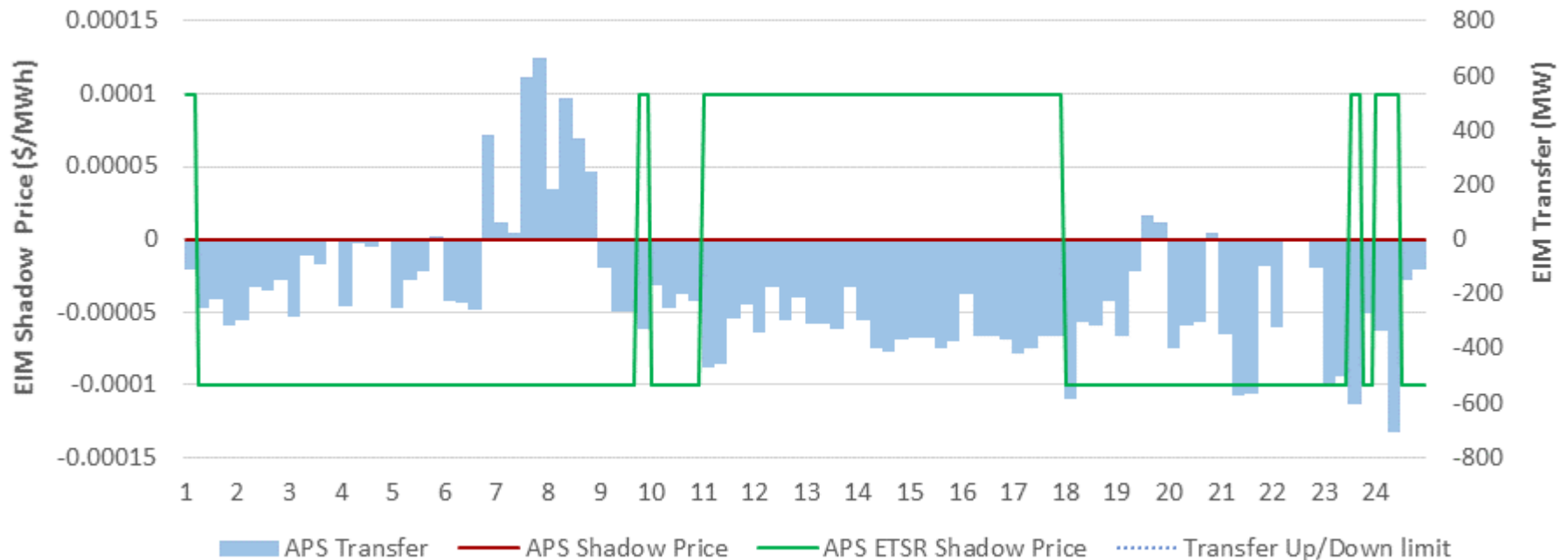
Balancing Authority Area Deployment test 9/15

- For 2 hours dispatched fossil units in market mode
- Rehearsed go-live up to beginning to open transfers in EIM



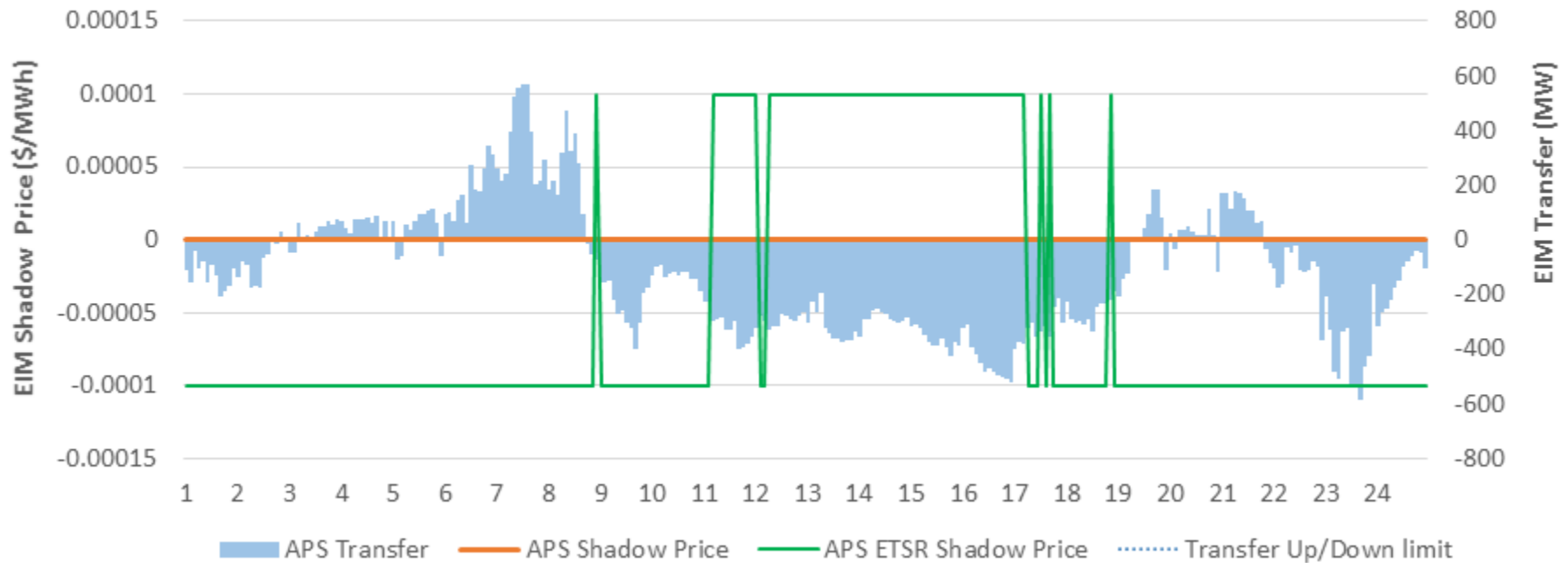
Operating Day 10/3/16

14-Net Fifteen-Minute EIM Transfer from APS area and shadow price of transfer



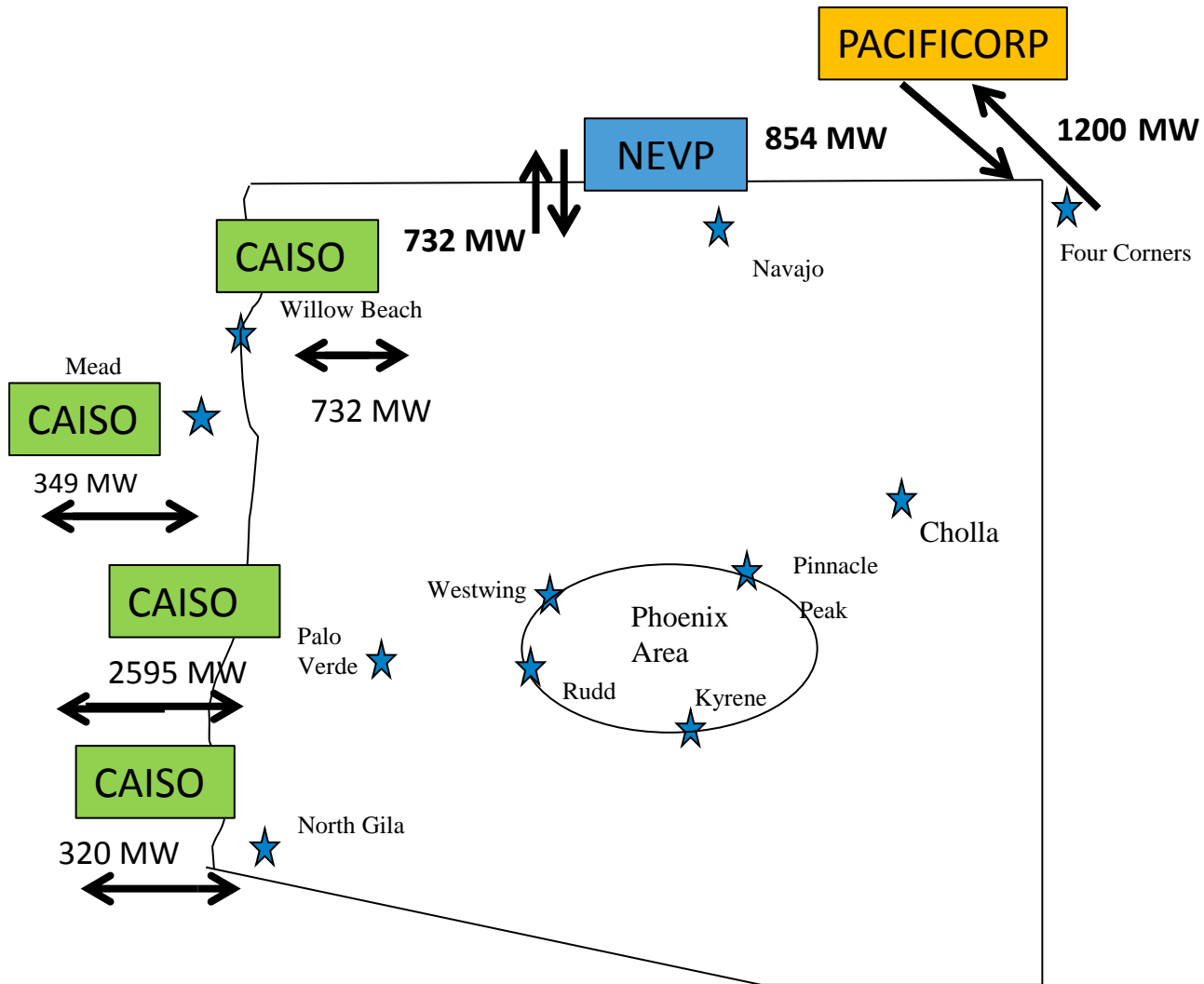
Operating Day 10/3/16

14b- Net Five-Minute EIM Transfer from APS area and shadow price of transfer





EIM APS Transfer Limits

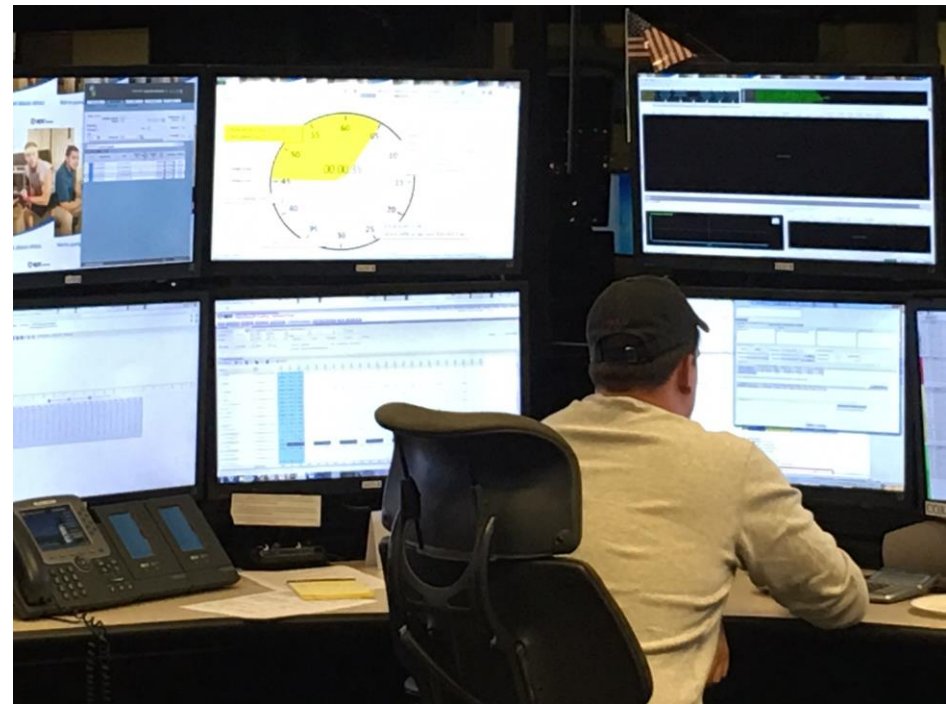


Problems and lessons learned

Timeframe for completion of project was compressed (15-16 months)

Some initial internal struggles to do business unit projects separately

Very wise decision to maintain one project team and to choose one software vendor

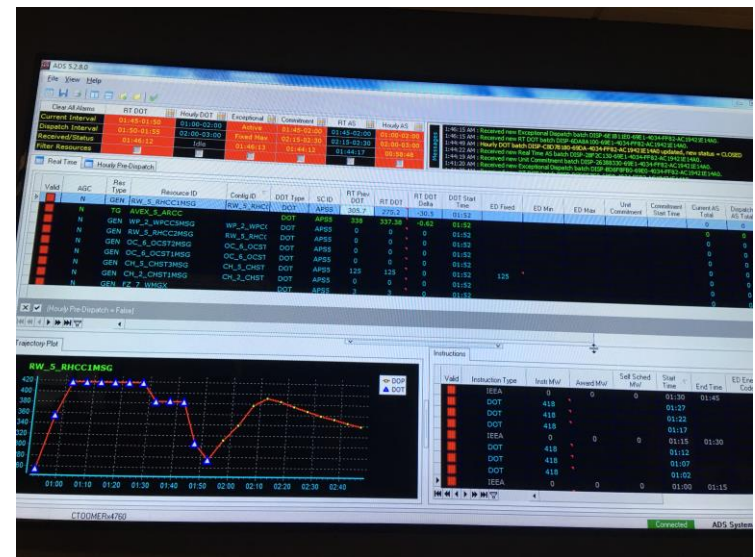


What went well

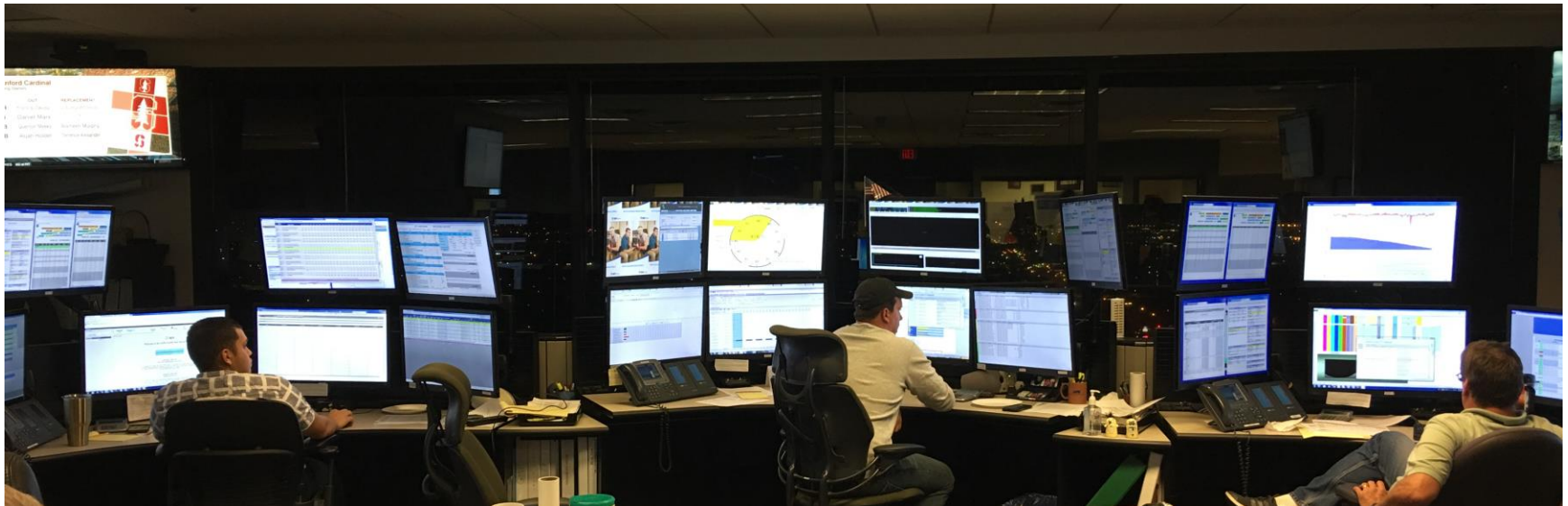
APS set up dedicated project teams for each of the key work streams

The project team managed the Transmission Operations, Marketing and Trading and Energy Accounting aspects as one project

We hired good vendors that had organized market experience and completed similar projects elsewhere

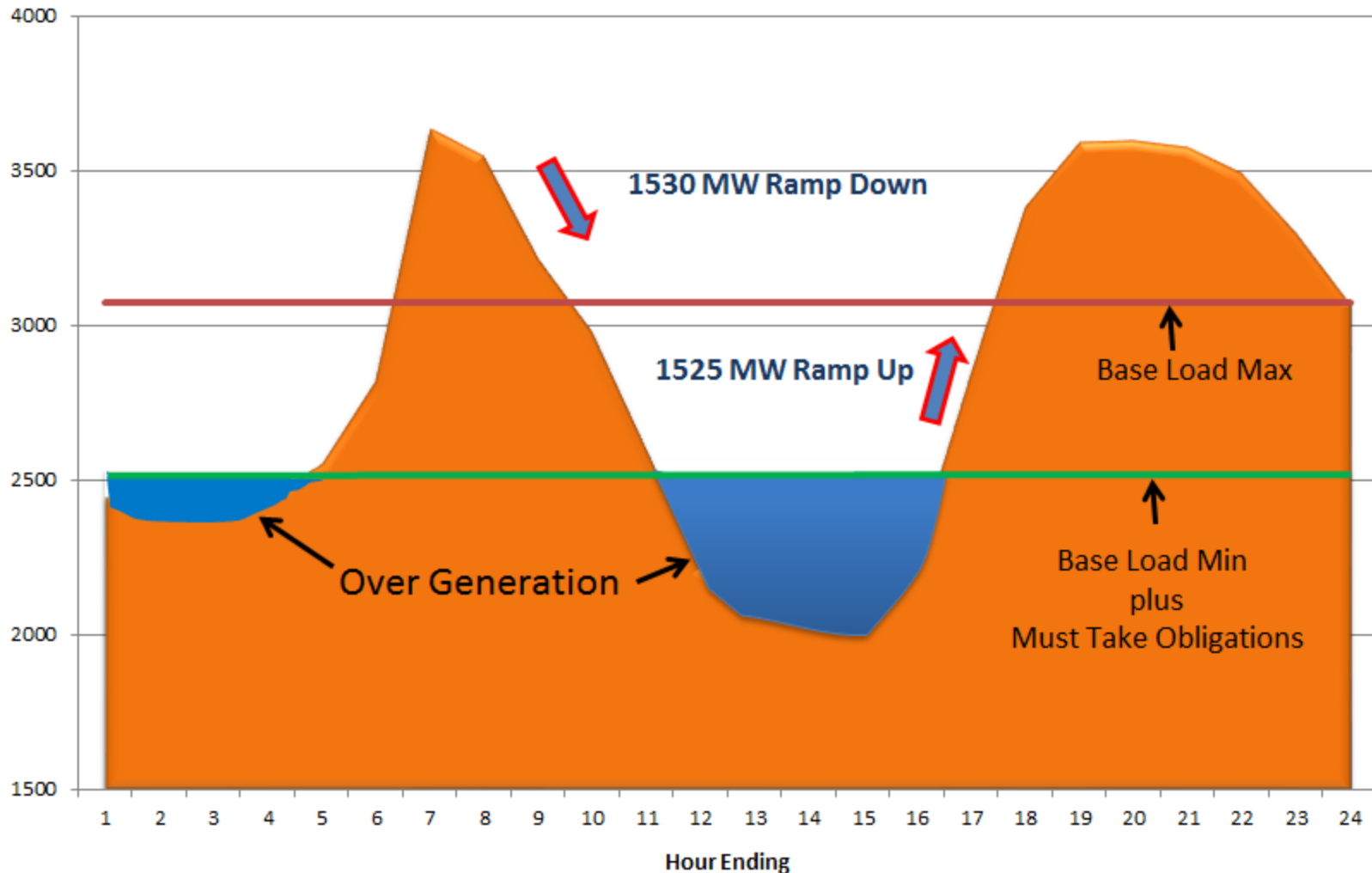


Looking toward the future

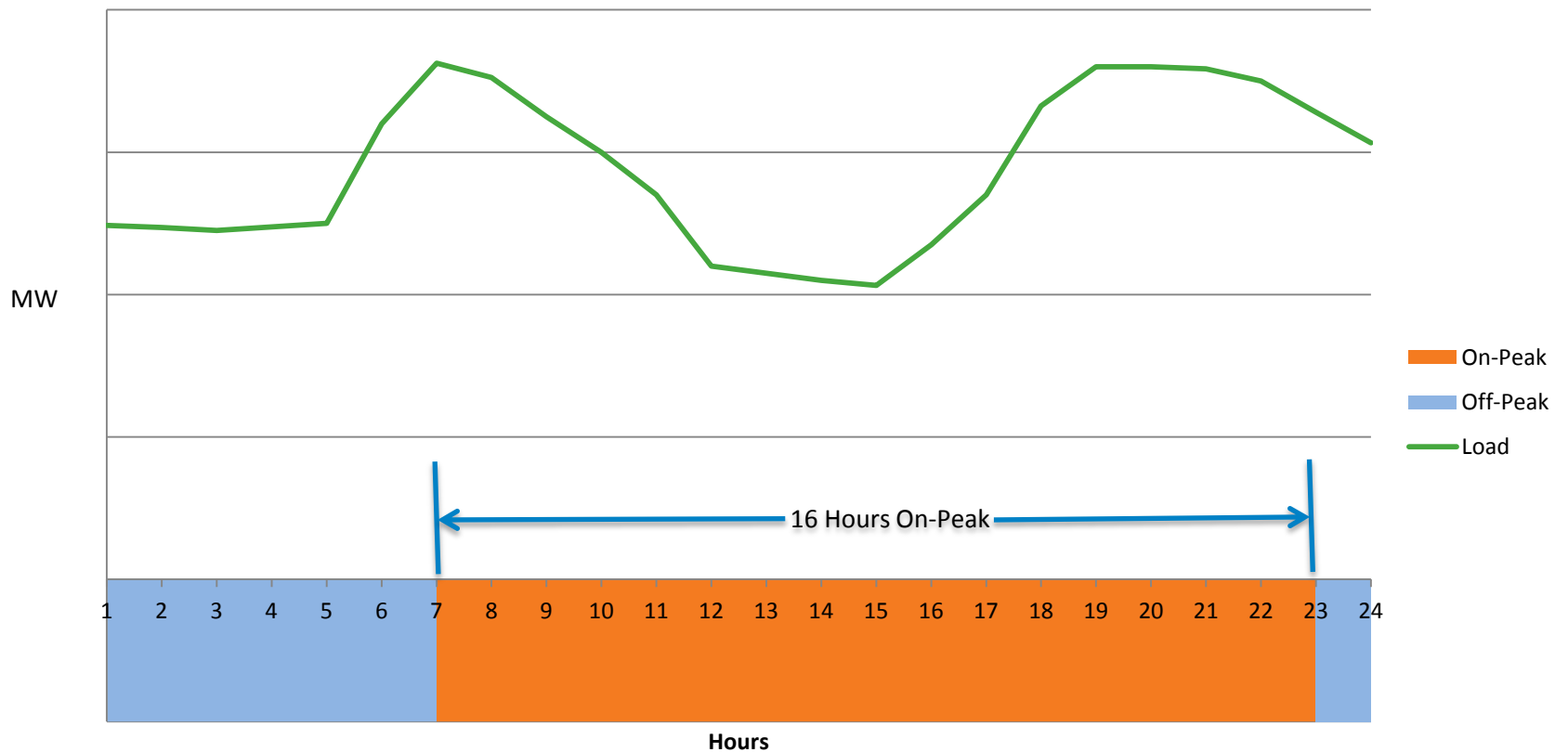


Thermal Generation Serving Load Shape

Clear Winter Day – Present (Camelback)



Non-Summer Demand Shape and Standard Product Hours



Demand Shape and New Products (Trough and Evening Peak)

