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May 14, 2015

Docket Control
Arizona Corporation Commission
1200 West Washington Street
Phoenix, Arizona 85007

RE: Arizona Public Service Company (APS)
Energy Imbalance Market (EIM) Workshop Presentation
Docket No. E-00000V-13-0070

Attached please find a copy of the materials APS and the California Independent System Operator presented during the May 13, 2015 EIM Workshop.

If you have any questions regarding this information, please contact Gregory Bernosky at (602)250-4849.

Sincerely,

Lisa Malagon

LM/sb
Attachment

Arizona Corporation Commission
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Energy Imbalance Market Workshop

May 13, 2015

aps

Overview of Today's Discussion

- Introduction and Overview of EIM
- EIM Operation
- EIM Governance
- APS's Assessment
- EIM Impact on IRP
- FERC Matters
- Next Steps

II. Introduction and Overview of EIM

Brad Albert (APS)

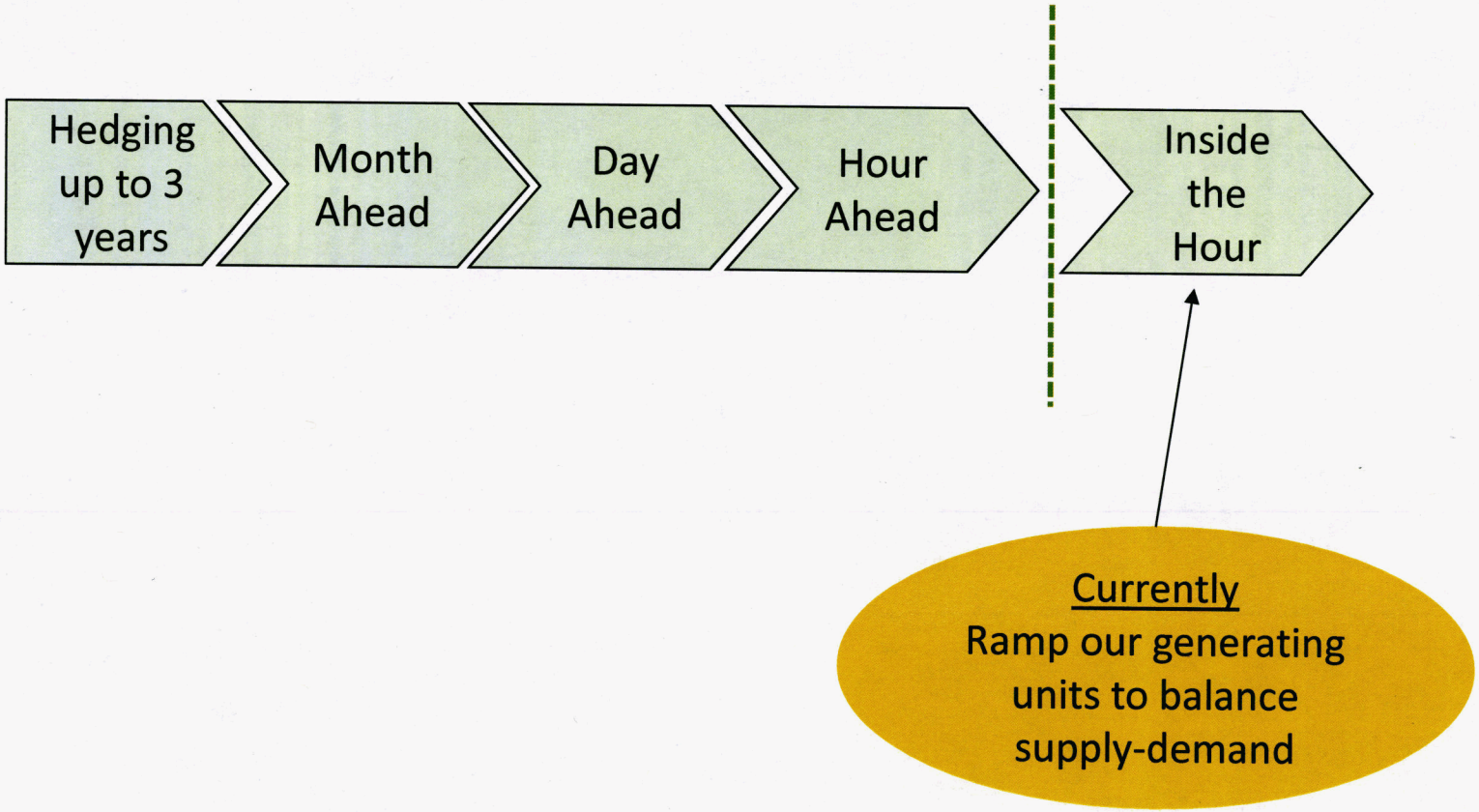
Introduction

- **History of APS's Consideration of EIM**
  - PUC EIM Group formed in 2011
  - NREL studies in 2012 – unrealistic benefits estimates
  - High cost of "greenfield" EIM formation in Desert SW
  - 2013 – California ISO and PacifiCorp propose EIM offering
  - 2014 – APS initiates our own assessment efforts
- **Results**
  - APS believes that there are substantial customer benefits to participating in the EIM
  - Net annual customer benefits of $7M

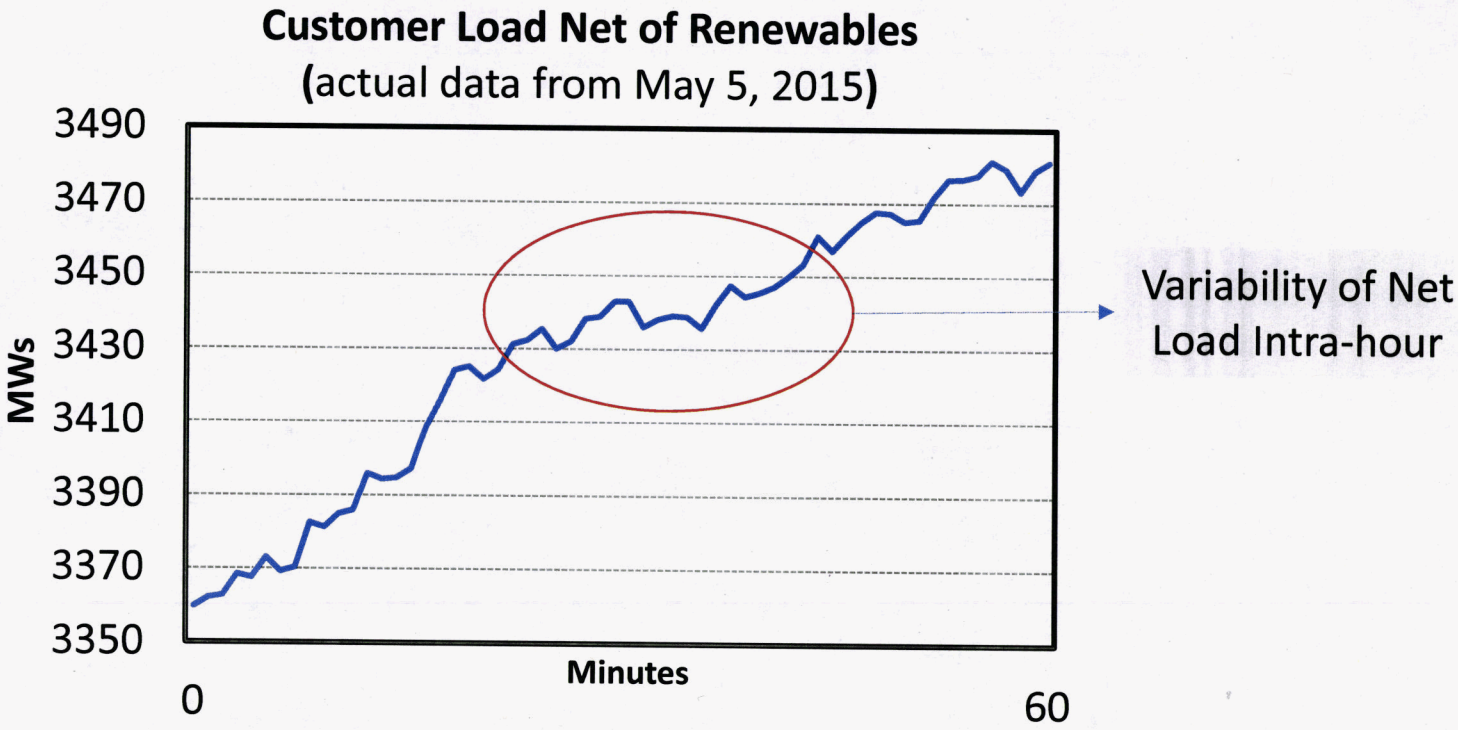
Existing Practices: Finding the Optimal Solution

- **Satisfying our customer's energy requirements in a low cost manner**
  - Reliability comes first
  - Which combination of generating units to deploy?
  - Can someone else produce it cheaper?
  - Do we have surplus that can be profitably sold?
- **The benefit of all of these optimization activities flow to customers through the Power Supply Adjustor (PSA) mechanism**

Existing Practices: Finding the Optimal Solution

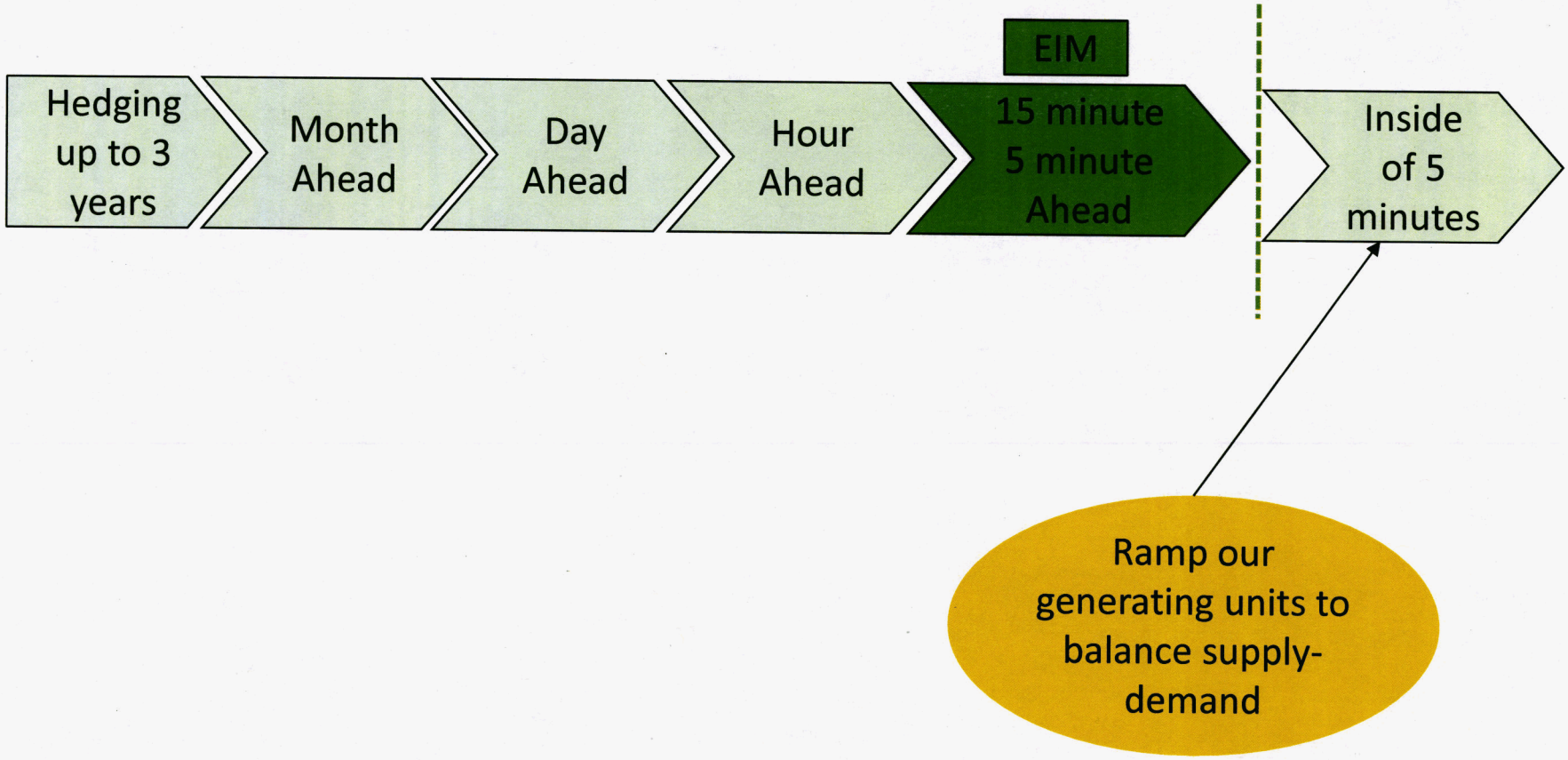


Inside the Hour Variability



- **Customer demand constantly fluctuates**
- **Demand can trend up/down during the hour**
- **Renewable output can vary (intermittency)**

With EIM:
Finding the Optimal Solution



EIM Participation: What Does it Change?

- **We are always looking to reduce costs for our customers**
  - Actively participate in the wholesale markets today
  - Currently, we buy and sell electricity in hourly increments
  - Joining a market that automatically balances supply and demand every five minutes enables APS to optimize our generation more efficiently
- **EIM participation is an extension of current practices**
  - Bring economic savings to APS customers through lower production costs
  - Improve visibility and situational awareness for system operations in the Western Interconnection
  - Improve integration of renewable resources

What EIM is Not

- **APS will retain all reliability obligations**
  - We decide how to participate
- **EIM participants must be self-sufficient**
  - Capable of meeting their own customer load requirements
  - Must meet their peak load, ramping capability, and contingency response
  - Does not solve the "duck curve"

VI. EIM Impact on IRP

Brad Albert (APS)

EIM Impact on IRP

- **The Integrated Resource Plan (IRP) process addresses long-term resource selection and procurement**
  - Type of resource capabilities needed to serve evolving customer demands
  - Energy source diversity
  - Technology evolution

- **The EIM provides for short-term economic efficiency (optimization)**
  - For each hour, each participant must pass a resource sufficiency test

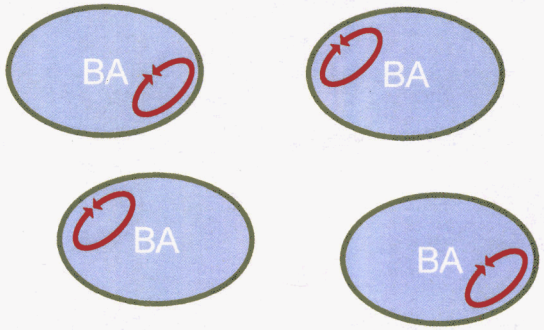
- **EIM participation will not change APS's need to have sufficient capacity resources with the right capabilities to meet our own customer requirements**
  - IRP and long-term procurement are not impacted

III. EIM Operation

Mark Rothleder (California ISO)

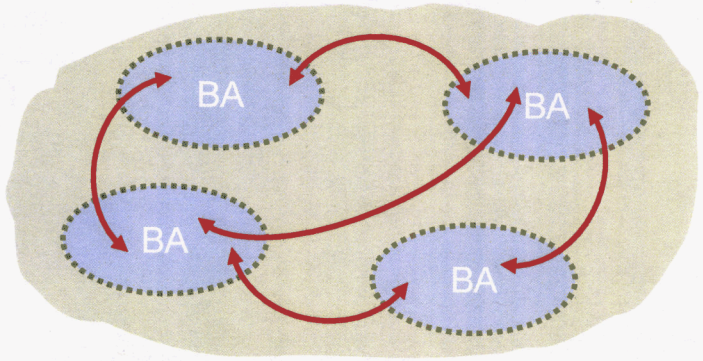
EIM enhances variable resource integration by dispatching energy every five minutes

Today:
Each BA must balance loads and resources within its borders.



- Limited pool of balancing resources
- Inflexibility
- Economic inefficiencies
- Increased costs to integrate wind/solar

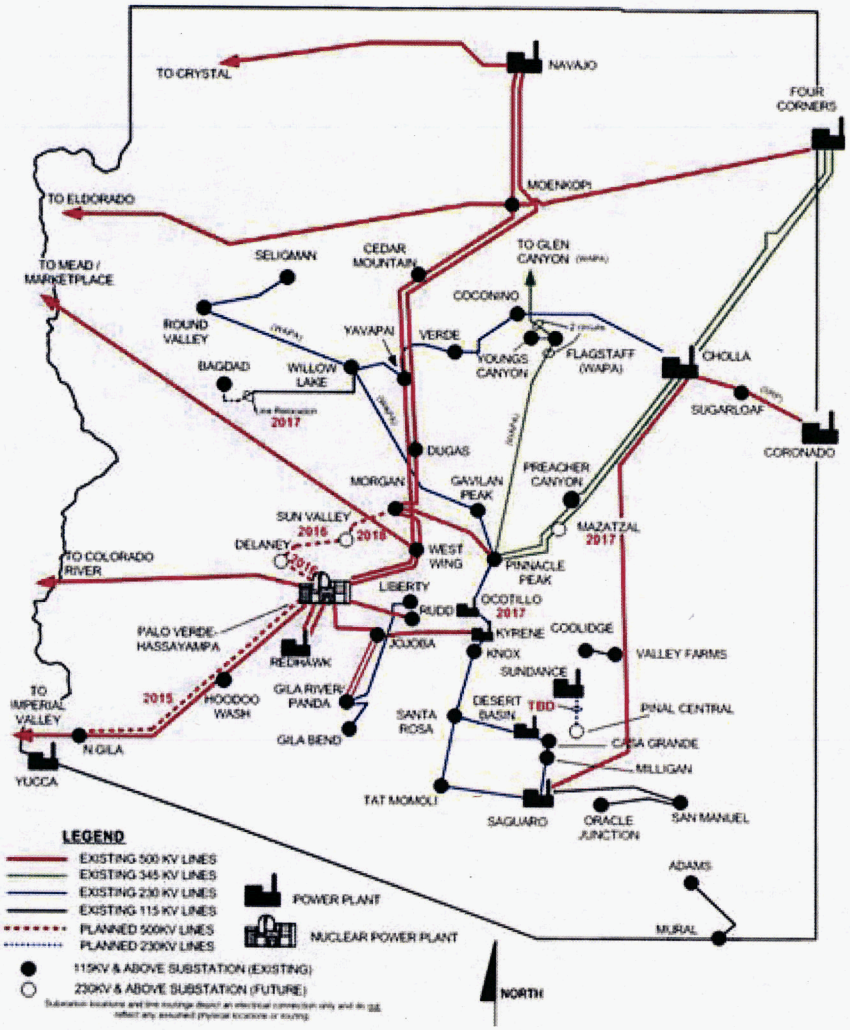
In an EIM:
The market dispatches resources across BAs to balance energy



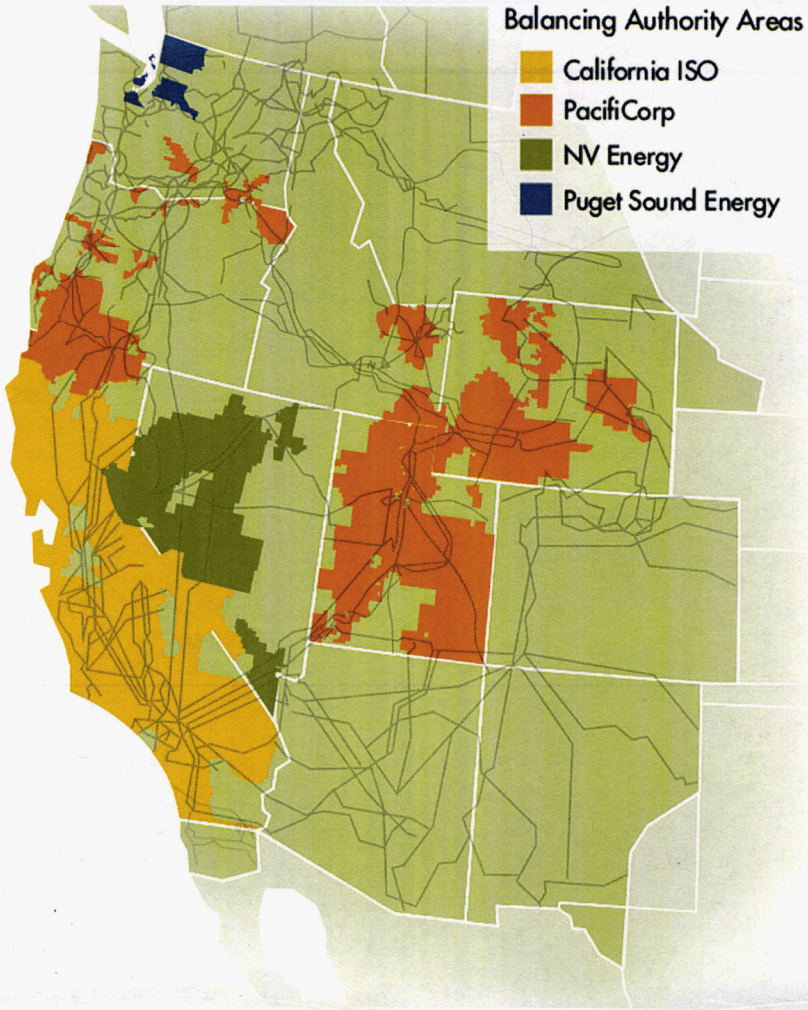
- Diversity of balancing resources
- Increased flexibility
- Decreased amount of balancing capability needed
- More economically efficient
- Decreased integration costs
- Easily scalable

EIM preserves APS autonomy

- APS maintains control over all transmission and generation assets
- APS retains all compliance and reliability obligations



EIM currently operating in seven western states



- EIM operation with PacifiCorp already showing benefits
- NV Energy on schedule to begin participation in October 2015
- Puget Sound Energy underway for an October 2016 start date

Results of EIM operation thus far

Actual gross benefits over all balancing authority areas (BAAs) are consistent with earlier benefits analysis

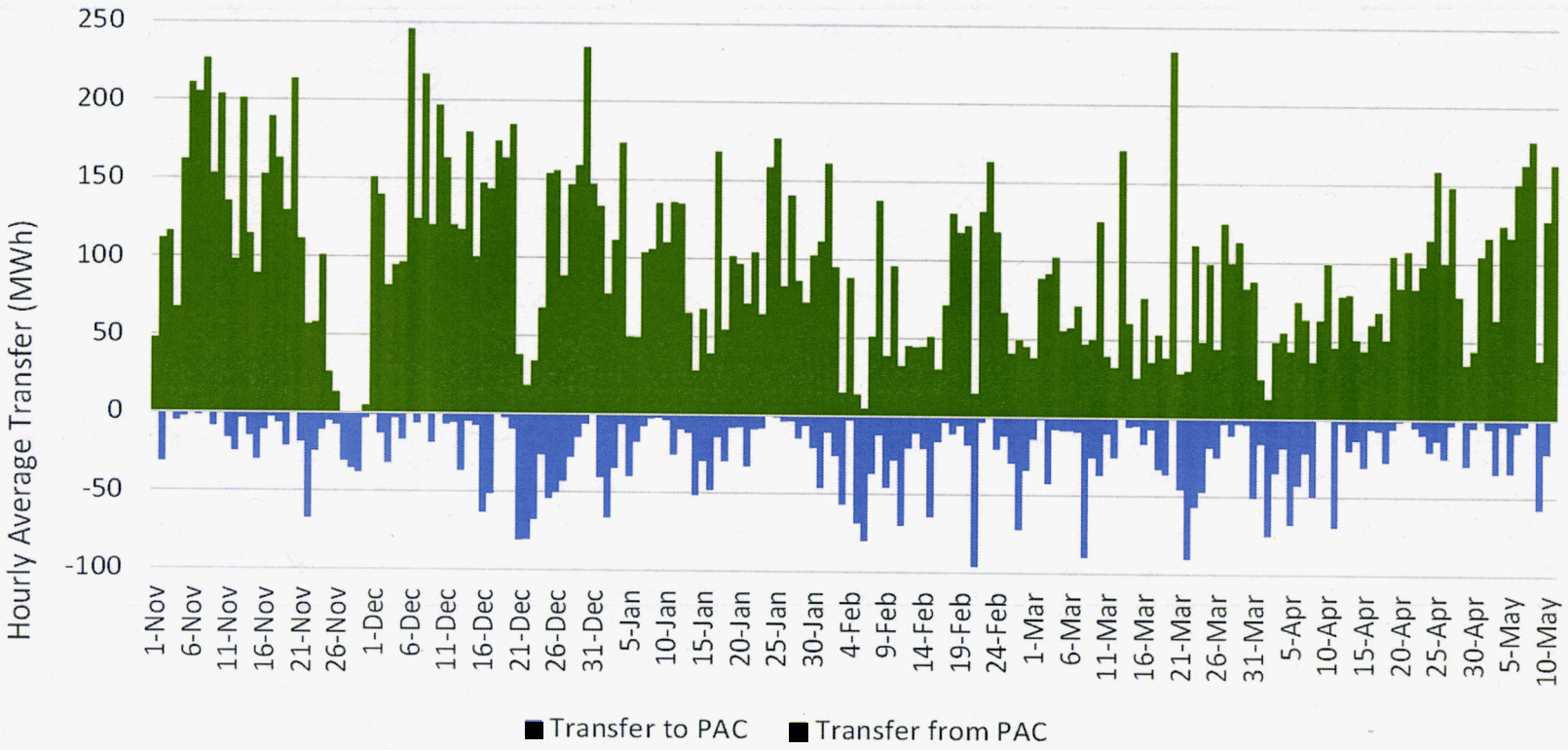
Millions of dollars

BAA	Nov-Dec 2014	Jan-Mar 2015	Total
ISO	$1.24 M	$1.45 M	$2.69 M
PACE	$2.31 M	$2.62 M	$4.93 M
PACW	$2.42 M	$1.19 M	$3.61 M
Total	**$5.97 M**	**$5.26 M**	**$11.23 M**

Quarterly reports will separate benefits for all balancing areas

PacifiCorp has realized benefits from both buying and selling

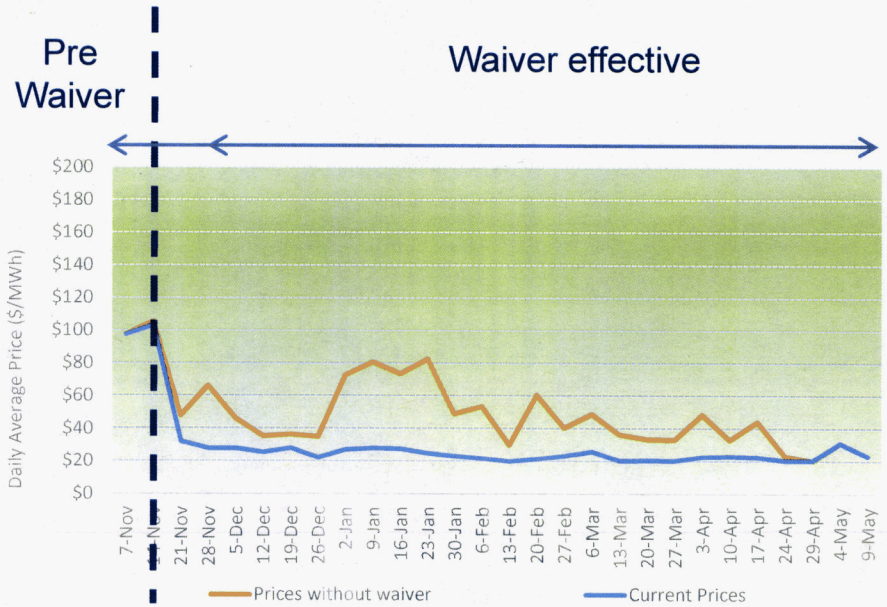
15-minute data



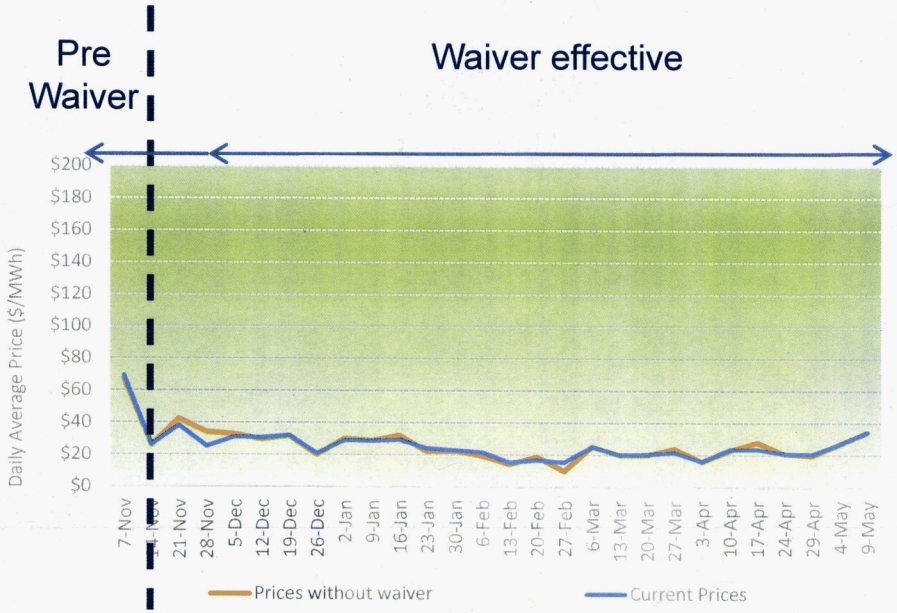
(+) PacifiCorp to ISO / (-) ISO to PacifiCorp

Pricing performance improves in March and April

15-minute PACE Aggregate Price



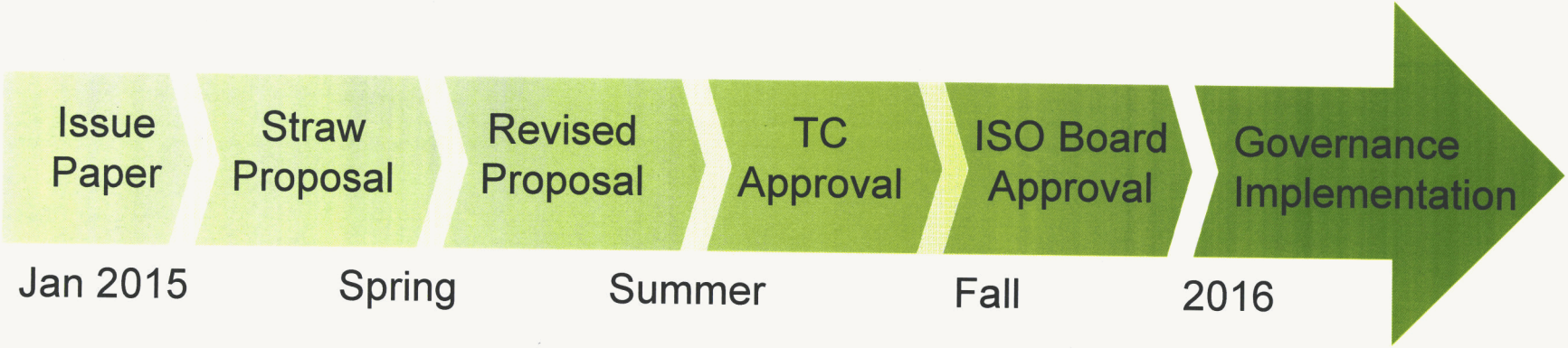
15-minute PACW Aggregate Price



IV. EIM Governance

Stacey Crowley (California ISO)
Brad Albert (APS)

EIM Transitional Committee, appointed in May 2014, is developing a governance proposal for EIM matters



- Guiding objectives of committee:
  - Develop an adaptable structure
  - Promote successful implementation and continued regional interest
- The committee is following an iterative stakeholder process for the development of the governance proposal
- Committee expected to present a revised proposal on June 25, 2015

The proposal describes key elements of an EIM governing body with delegated authority over EIM issues

- EIM governing body would:
  - serve as the primary decision-maker on market rules that are specific to participation in the EIM
  - occupy a key advisory role on other market rules that affect but are not unique to EIM participation
  - be identified by a nominating committee consisting of voting and non-voting members
  - establish a mechanism for reevaluation of EIM governance
  - establish an advisory committee of state regulators and representatives from publicly owned utilities

Governance – APS Views

- **APS is supportive of the straw proposal**
  - Strikes the right balance between separate governance and maintaining alignment with other ISO markets
  - Commitment to re-examine the governance structure periodically
  - Straw proposal contains key features
    - Advisory body comprised of state regulators in EIM footprint
    - Nominating Committee to establish initial board composition

- **APS has participated in Transitional Governance Committee process**
  - Have reviewed and commented on proposals
  - Have participated in all meetings to date
  - Will become Committee member

Governance – APS Views

- **Several considerations that limit the governance risk**
  - Up-front costs are relatively low as compared to expected benefits
  - Some of the up-front investment brings other benefits (metering and energy accounting)
  - Penalty-free exit provision
    - 180-day notice
    - Can continue to participate in EIM during 180-day period
    - Settlement activity may extend beyond 180 days

V. APS Assessment of EIM

Subba Nishtala (APS)

APS's Assessment of EIM

- **Our assessment is comprised of 3 parts**
  - Benefits study
  - Up-front implementation costs
    - Equipment, software systems, business processes
  - Costs for on-going participation

- **Summary**
  - There are significant customer benefits from EIM participation
  - Anticipated gross annual customer benefits of approximately $11 million
  - Anticipated net annual customer benefits of approximately $7 million

Benefits Study

- **APS hired E3 Consulting to perform study**
  - Experience with this type of analysis
  - APS experts involved extensively in study setup, assumptions, and review of results
- **E3 uses a sub-hourly model called PLEXOS**
  - PLEXOS simulates dispatch of generation across EIM footprint
  - Estimates energy flows in EIM between participants

Estimated EIM Annual Benefits

EIM Economic Benefits = **Production Cost Savings from EIM** + **Savings from Decreased Amount of Balancing Capability Needed**

Gross Benefits for Primary Case

$10.9 M

Primary Case = $8.9 M

Range of Sensitivity Cases = $5.9 M to 14.9 M

Middle of Range = $2 M

Range of Savings = $1 M to $3.2 M

Scenarios and Sensitivities

Different Cases Modeled	APS Dispatch Savings ($M)	Flex Reserve Savings ($M)**	Total EIM Savings ($M)	Difference from Primary Case
[1] Primary Case: $4.40/MMBtu gas price, 33% RPS in CAISO	$8.9	$2.0	$10.9	--
[2] 40% RPS in CAISO	$12.9	$2.0	$14.9	40% vs. 33% RPS in CAISO
[4] EPA 111d: Moderate Coal Retirement	$8.0	$2.0	$10	Moderate coal unit Retirement in WECC
[5] High Natural Gas Price ($5.7/MMBTu)	$11.9	$2.0	$13.9	$5.7/MMBtu vs. $4.4 gas price
[6] Low Natural Gas Price ($3.1/MMBTu)	$5.9	$2.0	$7.9	$3.1/MMBtu vs. $4.4 gas price
[8] 40% CAISO RPS, Moderate coal retirement, High gas price	$14.9	$2.0	$16.9	RPS, coal, high gas
[8b] 40% CAISO RPS, Moderate coal retirement, Low gas price	$8.9	$2.0	$10.9	RPS, coal, low gas

*Benefits in table are only those attributed to APS (not WECC-wide)
**Represents the middle of the range identified by the E3 analysis, which was $1-$3.2 million per year

Estimated Implementation Cost

Category	One-Time Cost
Systems and Integration • Marketing & Trading • Transmission Operations • Settlements	$9M
Meters Replacement	$3.5M*
CAISO Fee	$1M
Total	**$13.5M**

- Costs represent mid-points of the range of cost estimates

* Scope of the required meter replacement has reduced since initial assessment

Estimated On-Going Annual Cost

- **Anticipated ongoing costs for participating in EIM**
  - Personnel for new systems and processes (in transmission operations, real time trading, accounting, and technology support): $3M
  - Annual fees to EIM operator (CAISO): $0.7M
  - Software maintenance fees: $0.3M
  - **Total estimated on-going costs: $4M/year**

  - Anticipated costs are estimates based on a range

Summary of Estimated Benefits and Costs

One-time Costs: $13.5M

On-going Benefits: $11M /Year
On-going Costs: $4M/Year

Net Benefits: $7M /Year

Costs represent mid-points of the range of cost estimates

Cost Recovery

- **Anticipated recovery of costs of participation in EIM**
  - Transmission Cost Adjustor (TCA)
  - Power Supply Adjustor (PSA)
  - Recovery through base rates

VII. FERC Matters

Brad Albert (APS)
Mark Rothleder (California ISO)

Key FERC Filings

- **EIM Implementation Agreement**
  - Terms and conditions outlining the responsibilities of each party including the scope, schedule, and fees for implementing the EIM services
  - Filed by CAISO
- **EIM Amendments to Open Access Transmission Tariff**
  - Adopts terms and conditions allowing for the participation in the EIM
  - Governs relationship between APS and transmission and interconnection customers
  - Recovery of EIM administrative costs through a formulaic monthly charge
  - Filed by APS
- **Market Readiness Certification**
  - Certifying readiness of processes and systems to participate in EIM 30 days prior to start of participation
  - Filed separately by APS and CAISO

Pending FERC Pricing Review

- Prices competitive when sufficient bids exist
- Transitional short-term price excursions have improved
- Filed waiver at FERC to price based on last marginal bid
- FERC held technical conference on pricing held April 9
- ISO filed proposal to automate recognition of capability available to EIM Entity on April 23

VIII. Next Steps

Brad Albert (APS)

Assessment Conclusions

- The EIM has been operating successfully for 6 months, and has shown real benefits in line with estimates
- APS assessment shows benefits to its customers and APS believes it is in the best interest of its customers to participate in the EIM
- The first opportunity to start participation is October 2016

Anticipated EIM Schedule

Activity	Date
Implementation Agreement Filing and Anticipated Approval	May – July 2015
Begin Systems and Meter Upgrade Projects	June 2015
OATT Amendment Stakeholder Processes	Fall 2015
File OATT with FERC	March 2016
Complete Integrated Network Model and Submit to CAISO	March 2016
Begin Table Top Scenarios and Systems Connectivity Testing	April 2016
Anticipated FERC Approval of OATT	May – June 2016
Begin Market Simulation/User Acceptance Testing	July 2016
Readiness Filing	September 2016
Complete Systems and Meter Upgrade Projects	September 2016
Parallel Testing	September 2016
Start Participation	October 2016

Note that anticipated dates and durations are approximate

Anticipated Next Steps

- Continue project planning and begin implementation steps
- Finalize EIM Implementation Agreement with California ISO
- Begin APS participation on the EIM Transitional Governance Committee
- Coordinate stakeholder processes and file amendments to OATT at FERC