



Using CIM in Enterprise Model Management

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California ISO

CIM User Group Meeting 2016, Atlanta, GA



UCA
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CIM
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Welcome and Presentation Outline

- Background
- Objectives of Enterprise Model Management
- What is Enterprise Model Management
 - Consolidation of Technologies
 - Business Process Improvements
 - Centralized Model Management
- Use of CIM in Enterprise Model Management
- Challenges and Lessons Learned
- Future Road Map

Background

California ISO (CAISO) established in 1998

CAISO is regulated by Federal Energy Regulatory Commission (FERC)

CAISO manages 80% flow of electricity in California and small part in Nevada

Major Milestones

Market Redesign and Technology Upgrade (MRTU) – 2009

Energy Imbalance Market (EIM) – 2014

Background

What is Energy Imbalance Market (EIM)?

- find low-cost generation to meet demand every 5 minutes
- find low-cost renewable energy across state lines in real-time

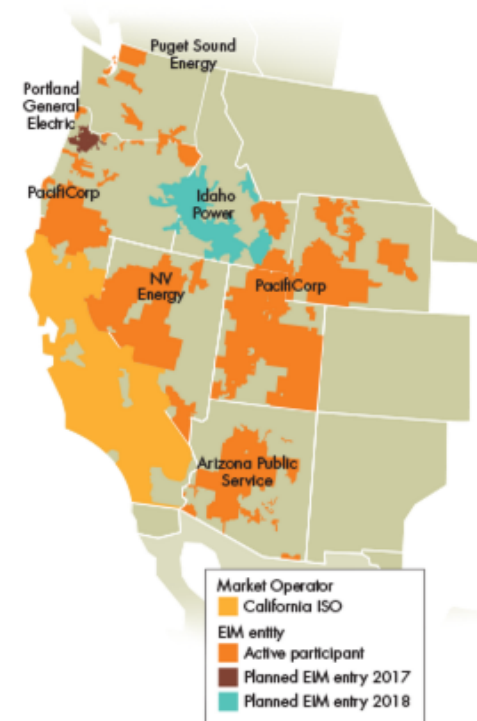
EIM Benefits Since November 2014

- cost benefits — \$114.35 million
- carbon emissions — reduced more than 143,695 metric tons

Portland General Electric and Idaho Power have agreed to participate beginning in 2017 and 2018

Potential EIM participants

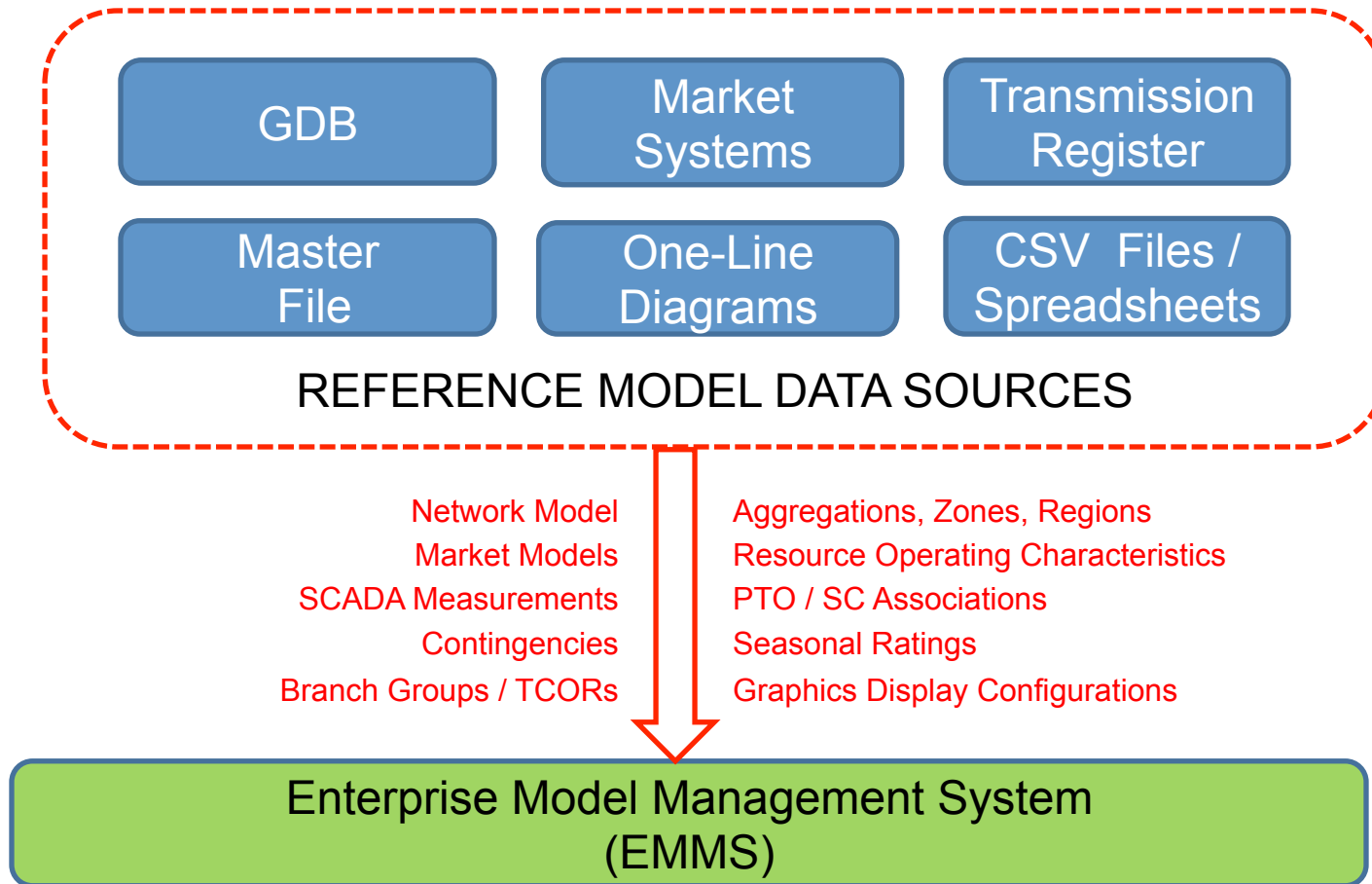
- Mexican grid operator El Centro Nacional de Control de Energía (*CENACE*) for Baja California Norte
- Sacramento Municipal Utility District (SMUD)



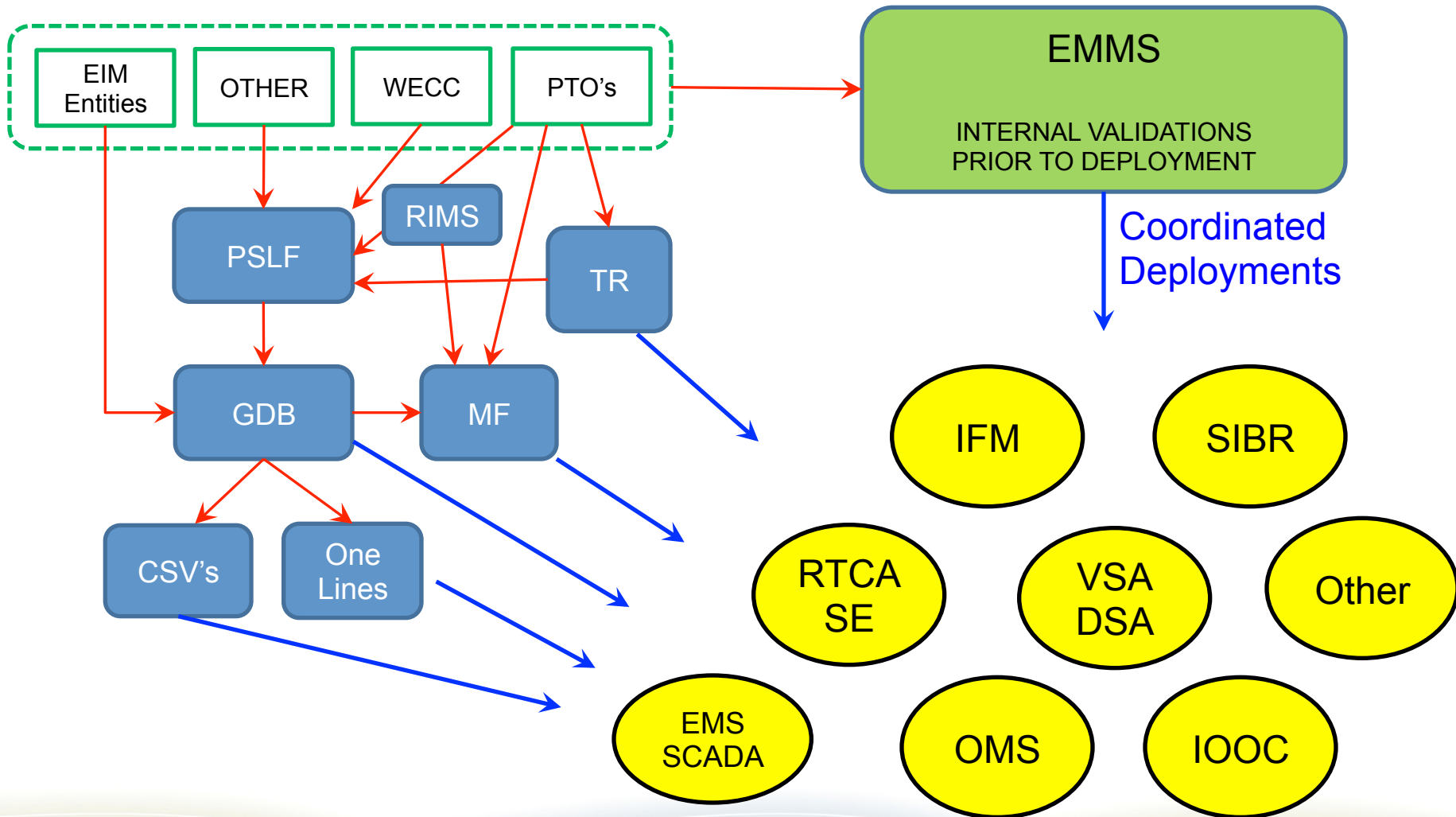
Objectives of Enterprise Model Management

1. Model Maintenance — centralized model management across the enterprise
 - centralized model maintenance
 - centralized deployment process
2. Model Deployment — flexibility and efficiency in model update and deployment cycle
 - time based model maintenance
 - bulk and Incremental payloads
3. Adaptability to merge models from multiple balancing authorities
4. Automation
 - reducing the testing cycle of network model builds

Consolidation of Technologies



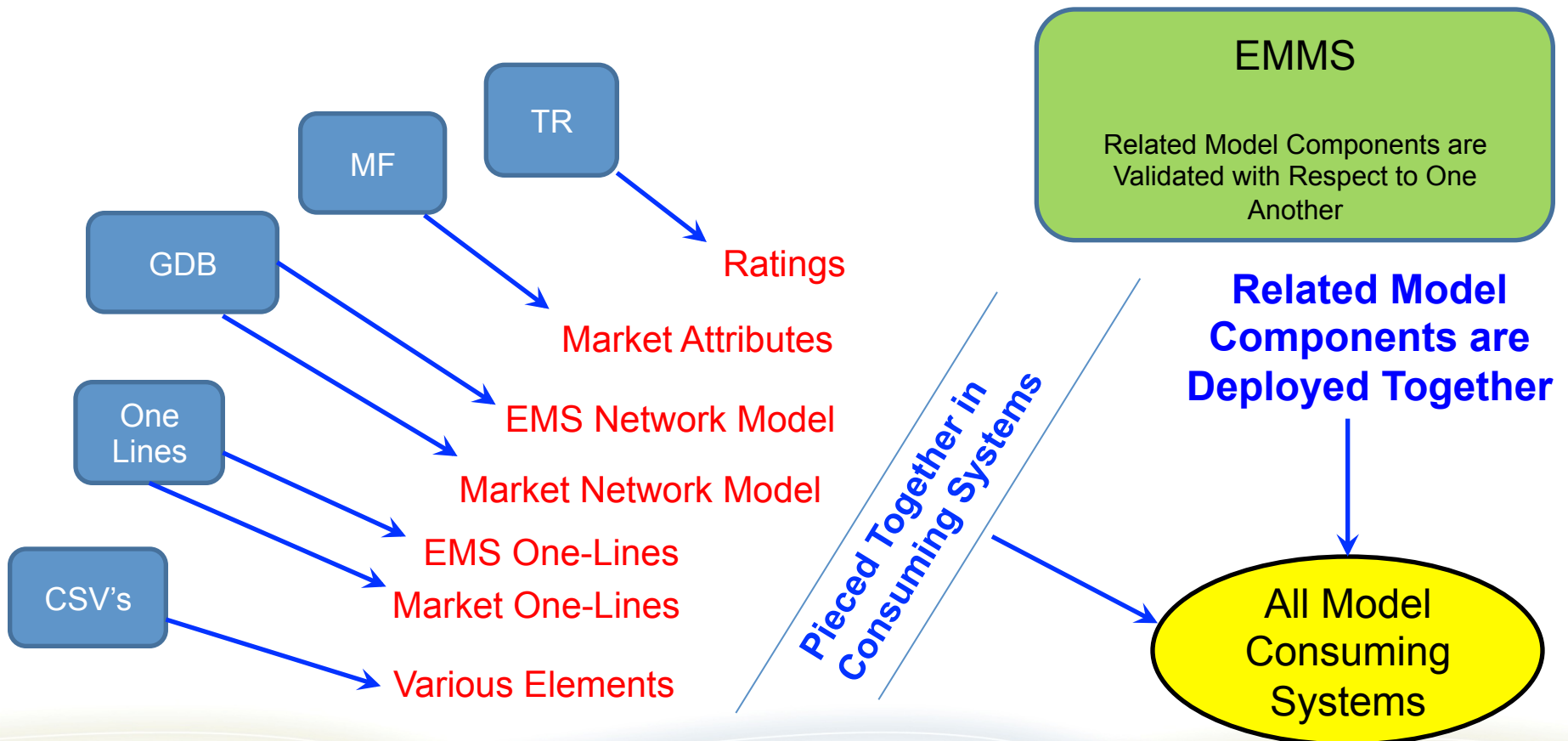
Business Process Improvements and Centralized Model Management



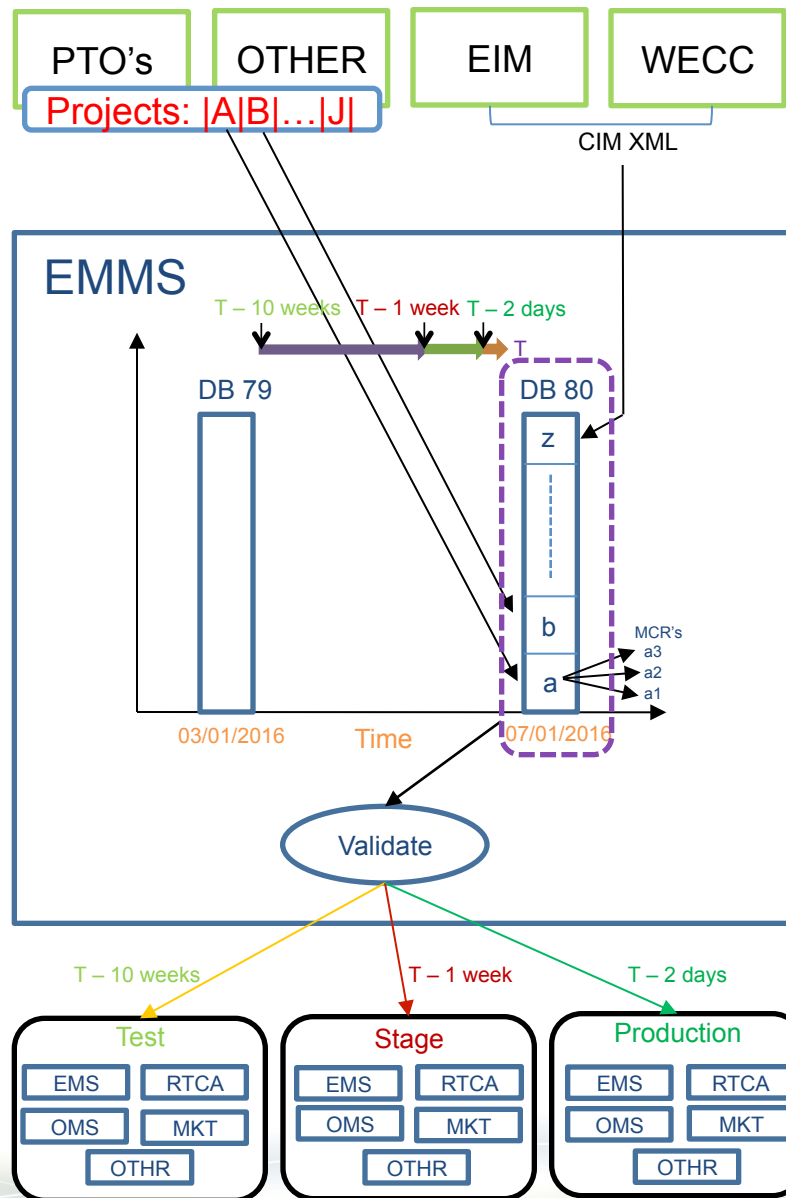
Value for Coordinated Model Deployments from EMMS

Interrelated model components are

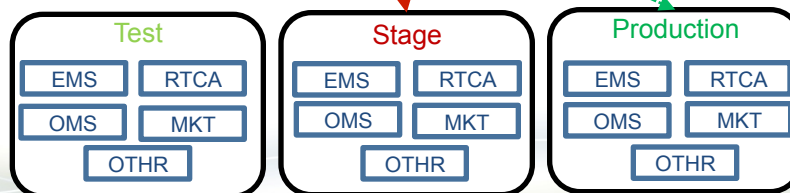
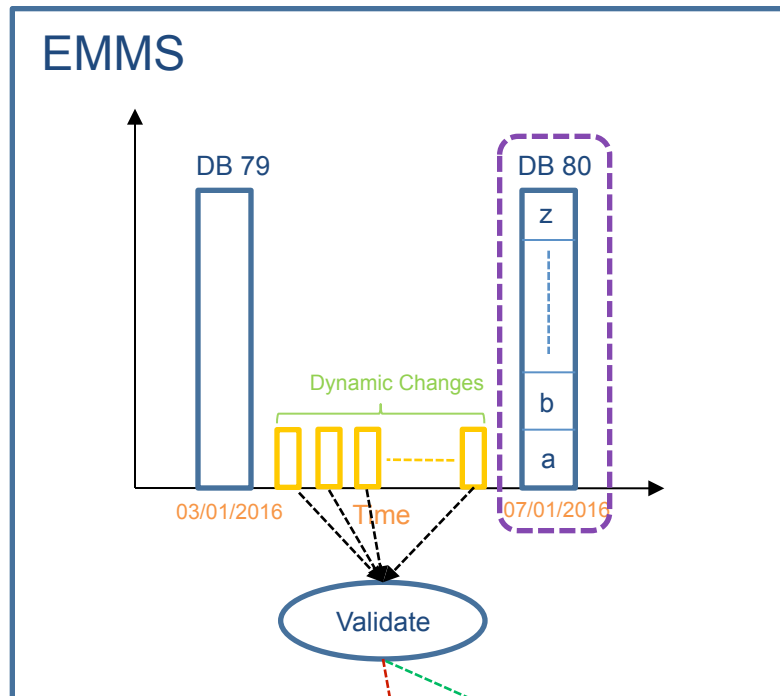
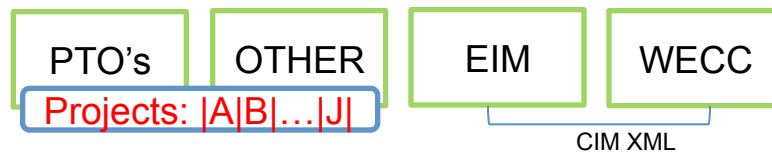
- validated with respect to one another prior to deployment
- deployed together (or deferred together, or reverted together)



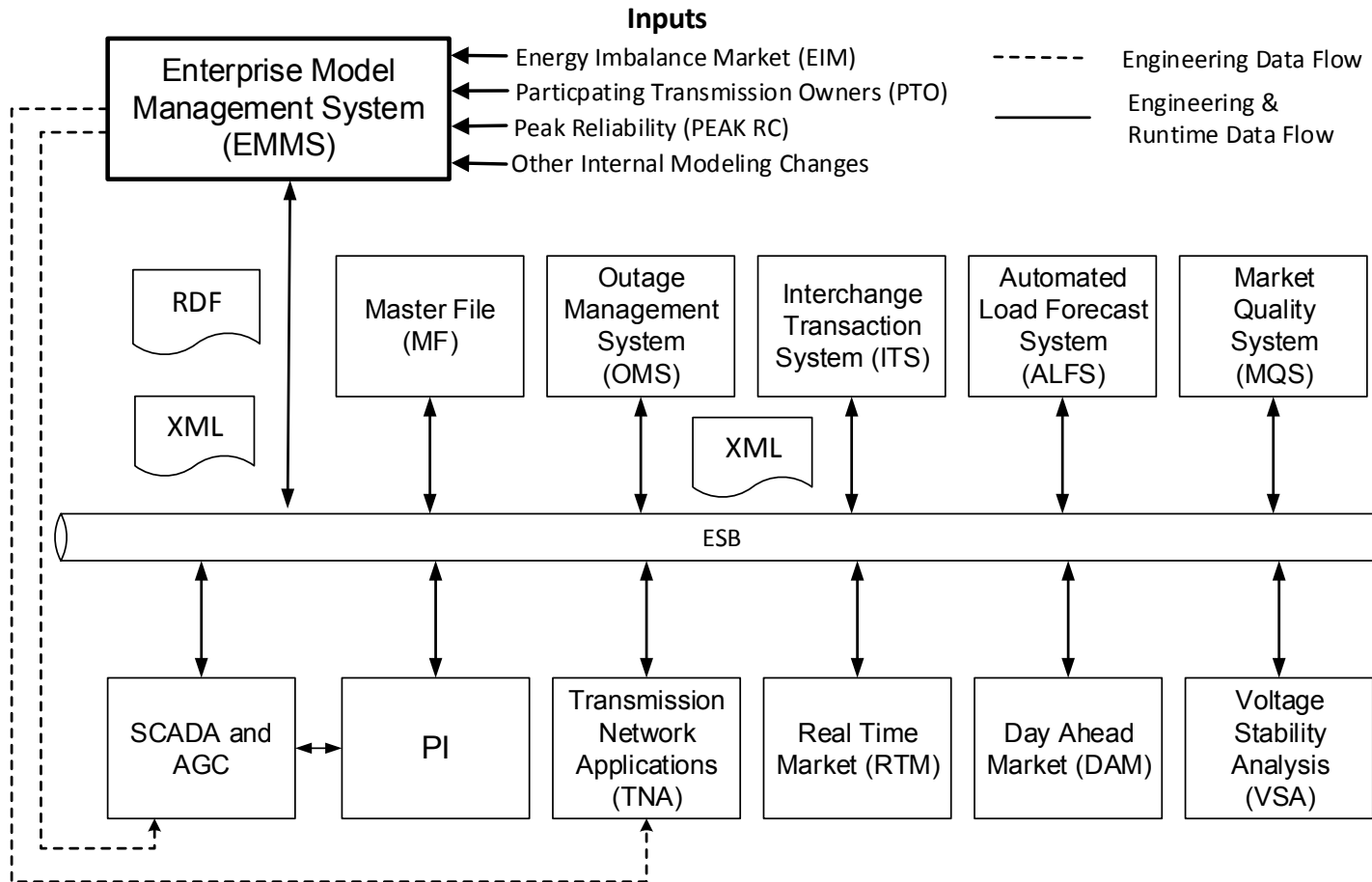
Model Build Process



Dynamic Build Process



EMMS SOA Architecture



Use of CIM in Enterprise Model Management

CAISO has taken the approach of using CIM RDF XML for network model payloads and CIM XSD profiles for all other payloads

CIM RDF XML Network Models

- two network models — Grid reliability model and market model
- GE PSLF (bus branch) to simplified CIM (breaker node)
- model type — EMS only or market only or both
- IEC 61970 package
- Why CIM Converters??
 - CIM 10 to CIM 15
 - CIM 15 to CIM 10
- CIM XSD Profiles
 - IEC 61970, IEC 61968 and IEC 62325 packages
 - contingency data
 - dynamic network model data (like Branch Groups, etc.)
 - future phase — market reference data, transmission registry data

Use of CIM in Enterprise Model Management

Web Service Pattern

- request-response pattern for NERC CIP applications
- publish-subscribe pattern for all other applications

UML Model Maintenance

- tools used, Sparx EA, CIMTool and Data Modeler (vendor product)
- enterprise UML model comprises of 3 packages
 - IEC CIM packages
 - CAISO extensions
 - vendor extensions
- utmost care has to been taken while creating extensions

Challenges and Lessons Learned

Seamless Integration

- exchange of CIM RDF network model with EIM entities
- exchange of CIM XSD profiles with different vendors within CAISO

EMMS Challenges

- supporting both CIM 10 and CIM 15 network model files
- challenges & Issues during conversion process of CIM 10 to CIM 15
- any change to EMMS will impact all downstream applications
- RDF XML to XSD XML conversions proving to be costly; limitation of the product architecture

Enterprise Semantic Model Challenges

- maintaining CIM 10 and CIM 15 UML models
- exchange and co-ordination of enterprise UML model between CAISO and prime vendor
- Data Dictionary and Service (or UDDI) Registry

Future Road Map

Network Model Builds Frequency

Quarterly — all changes to full network model

Monthly — all changes to full network model with the exception of Tie, BAA, boundary changes and EIM data elements

Weekly — all changes to full network model with the exception of Tie, BAA, boundary changes and EIM data elements in addition to topology (powerflow) changes

Daily — modifications to ratings; attributes such as resistances, impedances, default switch positions, default tap positions, regulation voltages and statuses, MVAR capability curves, contingencies, nomograms, SCADA points, displays etc.

Reliability System Technology Upgrades (RSTU) program — an umbrella of projects that includes EMS replacement, EMMS upgrades (phase 3C), EMNA (RTCA, SE), ESB Sonic Replacement, Master File to SOA, etc.

Model synchronization and activation (MSAA) — post RSTU program

Thank you

