

2016 NASPI Work Group Meeting

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Session 6:

Integration of PMU Data in the Control Room

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PEAKRELIABILITY
assuring the wide area view

Same Problem – Different Control Room

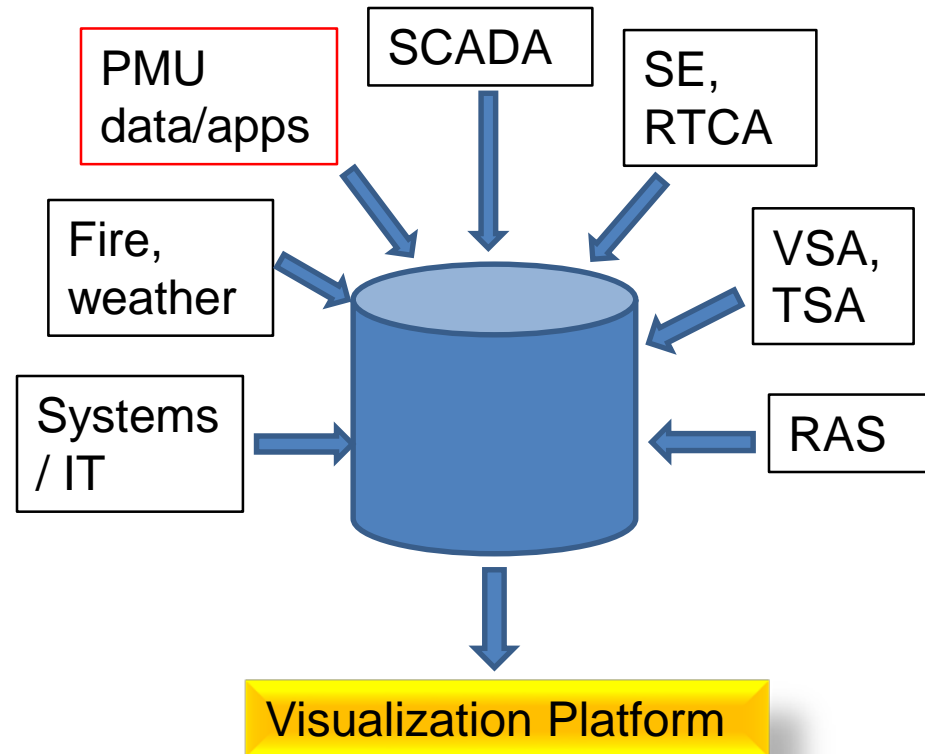
- More and more data coming into the control centers responsible for larger areas than ever before
 - Addition of PMU and other high definition data sources (even more data)
 - Need to make it comprehensible by humans – turning data into information
 - Allow the most important data to rise to the top and be understood by operations staff
 - Data and tools **MUST** be maintainable
- Alarms
 - SOL/IROL
 - SE and RTCA
 - ACE, generation, load, reserves
 - RAS
 - Systems / IT
 - Voltage and Transient stability
 - Phase Angles
 - Oscillations
 - Modal analysis

Keep It Together

- In some ways we already knew, but thought maybe PMUs were different
- Creating one-off solutions can never be better than integrating and improving the existing
- Evolution works – leads us to continuous improvement and sharpens focus

Integrating Data into Final Solution

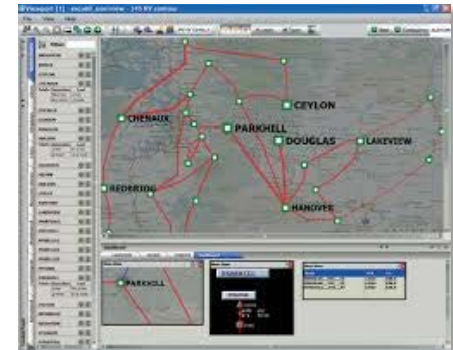
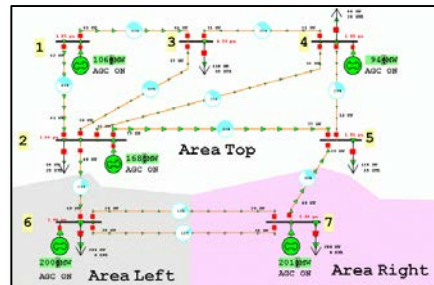
- Evolution works
- Integrated solutions better than one-off solutions



Experience Gained

- eTV
- WAV
- STI
- Macomber Map
- PowerWorld
- ESRI

Lots of solutions available –
it's about the best match



Peak Visualization Platform (PVP)

Peak Area ACE (sum)

304.10

Area Generation

- PGAE ACE: 0.00
Gen: 11,880
- BPA ACE: 9.00
Gen: 11,428
- AESO ACE: 4.95
Gen: 9,220
- BC-HYD ACE: -1.67
Gen: 7,093
- SCE ACE: 0.00
Gen: 6,137
- APS ACE: -7.92
Gen: 5,740
- PACE ACE: 76.77
Gen: 5,148
- PSCO ACE: -8.66
Gen: 4,755
- SRP ACE: 17.75
Gen: 4,535

Company Details

PGAE

ACE 0
Generation 11,880
Load 12,970

Scheduled Interchanged 0
Actual Interchange 0
MSSC 0
Total Reserves Required 0
Total Reserves 0
Spinning Reserves Required 0
Spinning Reserves 0
L10 0
BAAL Participant 0
BAAL High 0

Map

Substations

Q Filter

- SIERRA - 120.00KV
- SIERRA - 120.00KV
- 106th South Street - PACE - 138.00KV
- 118th South - PACE - 138.00KV
- 119th Street - BPA - 115.00KV
- 22nd Street - TEP - 138.00KV
- 26R - PGAE - 230.00KV
- 29EDD18 - AESO - 138.00KV
- 29EDD2 - AESO - 69.00KV
- 29EDD3 - AESO - 240.00KV
- 29EDD34 - AESO - 240.00KV
- 29EDD56 - AESO - 240.00KV
- 29EDD65 - AESO - 240.00KV

Paths

PATH.19	1,874.06 MW / 2,200.00 MW	85.06%
PATH.25	58.22 MW / 80.00 MW	72.95%
PATH.36	1,008.40 MW / 1,388.81 MW	72.61%
PATH.8	1,394.00 MW / 2,000.00 MW	68.80%
PATH.15	1,923.71 MW / 2,850.00 MW	67.38%

Path Queries

Path Loading

Path Operator

Path Details

PATH.19

Description 0

Actual Flow (MW) 1,874

Path Loading (%) 85

Path Limit (MW) 2,200

Limit 1 (MW) 2,200

Limit 2 (MW) -9,999

retrievaltime 8/17/2016 06:57:15

IROLs

	Peak	CallSO	Offline
NW_Wash_Load_Area	43.93%		
Percent	62.46%	0.00%	49.22%
Margin	3,117.61	99999	5352
Limit	8,304.48	99999	10539
SDGE_Import_Summer	29.67%		
Percent	74.27%	32.26%	29.68%
Margin	3,427.00	2492	2813
Limit	4,614.00	3679	4000
SDGE_Import_Non_Summer	12.72%		
Percent	-69.16%	27.48%	0.00%
Margin	8,727.03	3357	8727
Limit	5,159.00	4629	8727

IROL Details

NW_Wash_Load_Area

iroi_ineffect 1.00

scenario_monitored 0.00

current_mw 5,186.87

tv 30.00

time 0.00

peak_margin 3,117.61

peak_limit 8,304.48

methodology 0

caliso_limit 99999

peak_percent 62.46

caliso_margin 99999

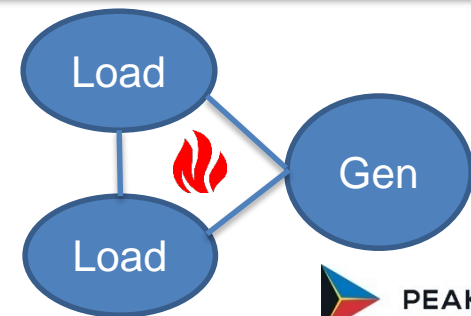
caliso_percent 0.00

PMU Angles

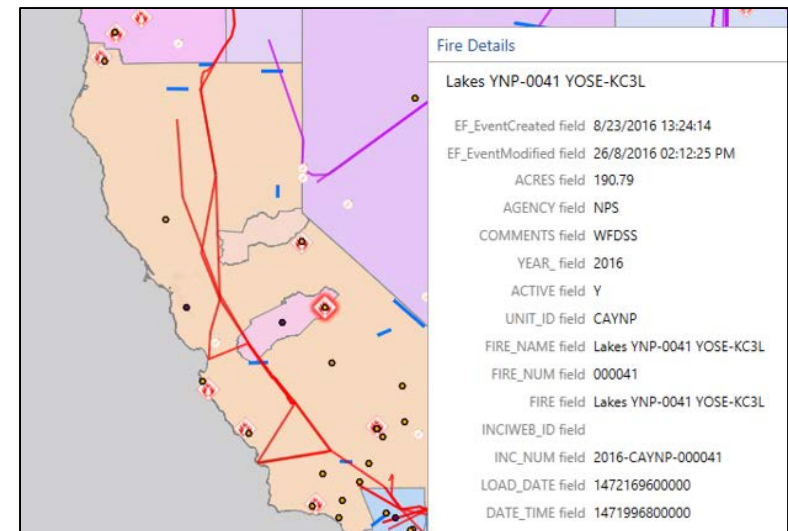
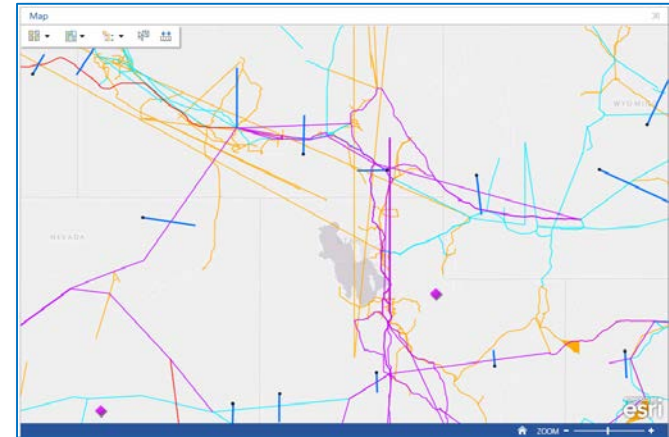
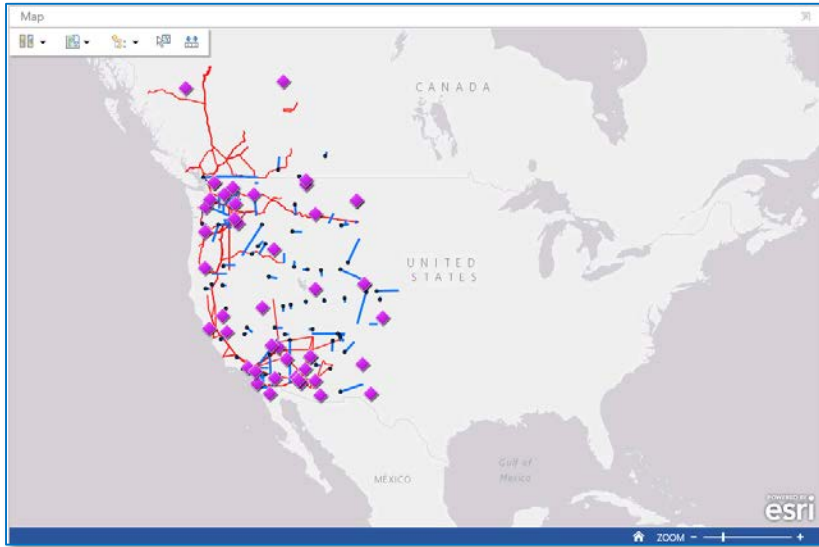
NVE/HALLEN -> PAC/CAMPWIL	137.15
AESO/GENESEE -> LADWP/ADLNT0	74.93
NWE/COLSTRIP -> LDWP/ADLNT0	64.54
NWE/COLSTRIP -> SCE/CONTRL	0.00
IPCO/CALDWELL -> PNM/RIOPUER	0.00
PNM/RIOPUER -> PNM/SAN_JUAN	0.00
IPCO/BROWNLEE -> LDWP/CASTIC	-10.54

Applying the Technology to Grid Reliability

- Reduce the amount of time it takes an Operator to comprehend information.
- Fires impacts three 500kV lines, two 230kV lines, > 1,000 MW generation
- RC relies on phone to assess fire impacts, locations, and threats to other facilities – not timely
- No current geographically visualization
- Impacts Operating Plan
- Future state
 - Visualize fire location and boundaries *together* with operational impacts
 - Phase angles provide immediate indication of stress level (5-10 minute lead vs. analytical tools)



Navigation and Visualization



- Drill down capabilities
- Multiple data sources displayed
- Fire location, size and spatial geometry boundaries updating every 5 minutes from USGS

Solution Highlights

- Easy display creation and modification
- Whiteboard philosophy
 - can build anything – not limited
- Data driven solution
- Leverage Peak Investment in OSIsoft PI
- EMS vendor Agnostic
- Quickly reconfigure based on input from users
- Future tool sharing with external reliability entities
- Eye toward secure external tablet and mobile use

What Value Was Achieved

- Organization of data to the operation staff
- Empowered operations staff to control their environment
- IT focuses on making data available
- Better decisions in less time



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