



A  Sempra Energy[®] utility



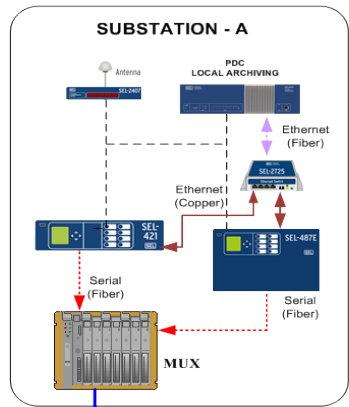
SDG&E SYNCHROPHASOR PROJECT

Presented by

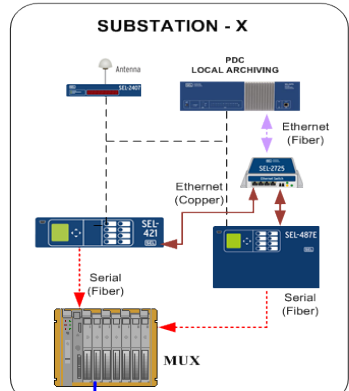
Tariq Rahman
Project Engineer

NASPI Meeting October 12-13, 2011

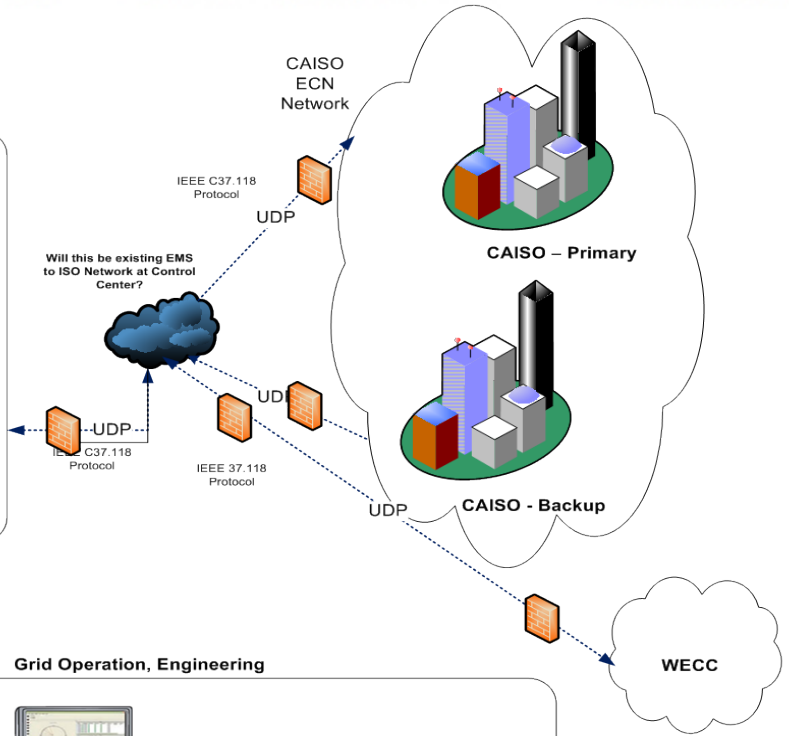
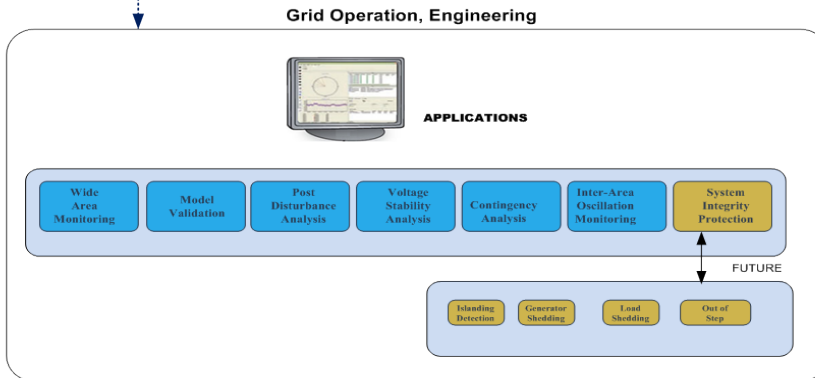
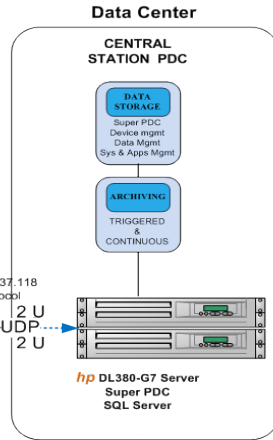
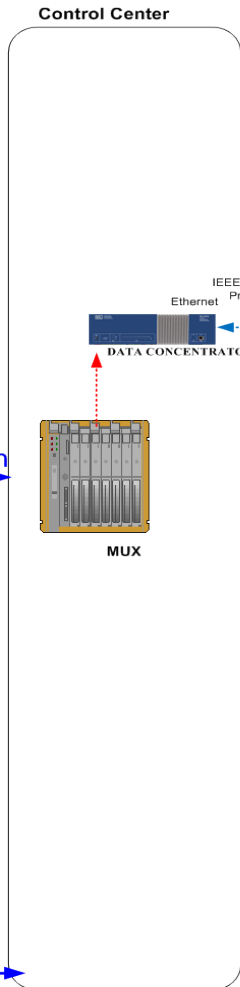
SYNCHROPHASOR ARCHITECTURE



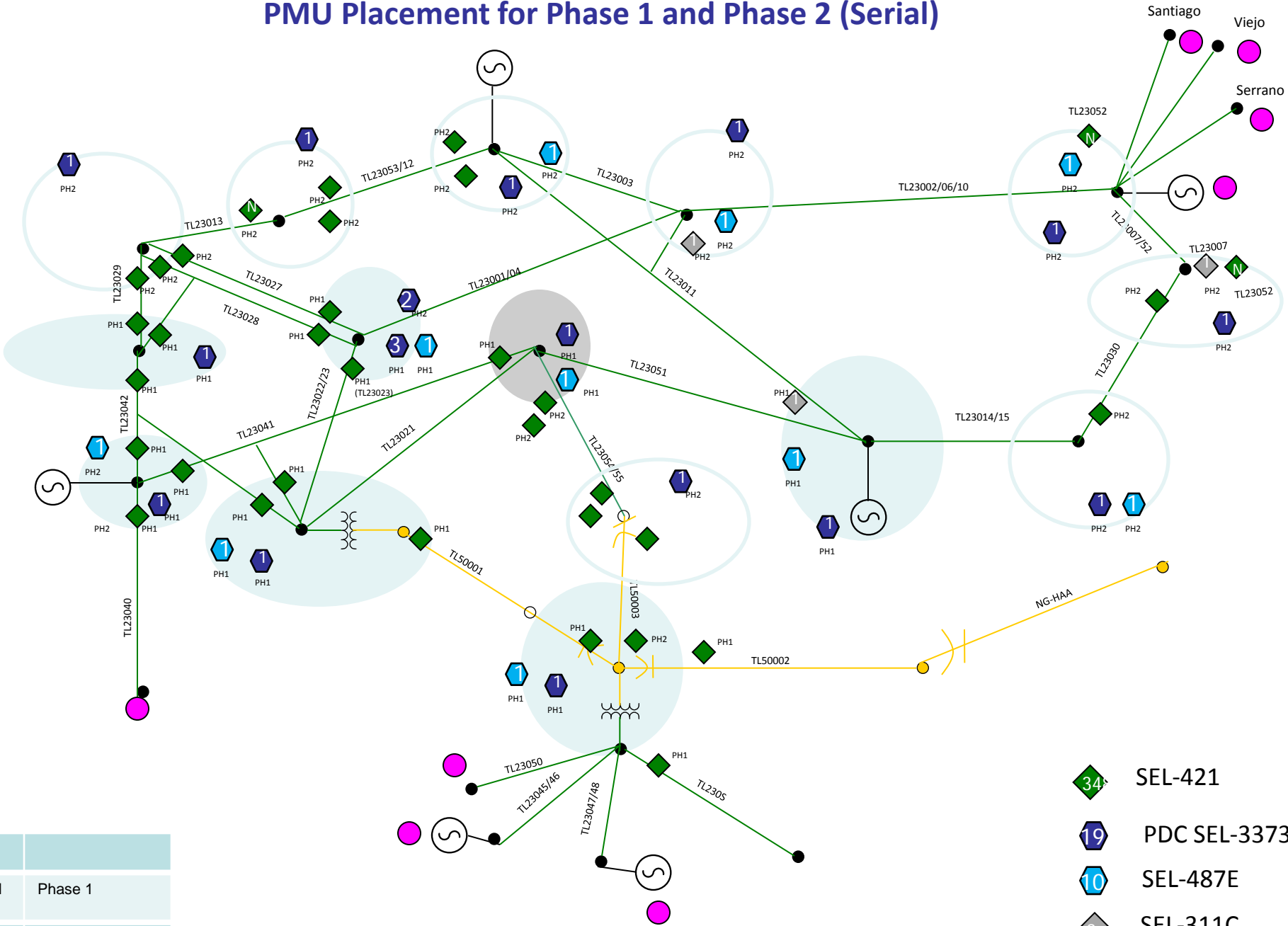
Serial Communication







Serial Communication



PMU Placement for Phase 1 and Phase 2 (Serial)



PH 1	Phase 1
PH 2	Phase 2

-  SEL-421
-  PDC SEL-3373
-  SEL-487E
-  SEL-311C

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ISSUES, DISCOVERIES & SOLUTIONS

- Hardware and software
- Meet NERC/CIP requirements – serial communication
- What data we need, how to use and who needs what
- Coordinating the needs of other departments on PMU

Applications and needs

- Security requirements of IT
- Challenge of resources to meet deadline

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ISSUES, DISCOVERIES & SOLUTIONS

- What information to exchange with external entities, CAISO, WECC, and others and how
- Back-up PMU, criticality of PMUs
- Vendor Support – selecting the vendor was easy for but may be a challenge for others

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ISSUES, DISCOVERIES & SOLUTIONS

- *Serial communication for PMU data*
 - The communication equipment were not capable for speeds greater than 38.4Kbps
 - Some devices were not capable of serial communication
 - Cut down on the number and size of the signals to send

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ISSUES, DISCOVERIES & SOLUTIONS

- *Using existing Relays / Installation of new PMU's*
 - The existing 421 relays needed Ethernet Ports for local area network. We decided to upgrade them ourselves, but ended up sending them to the factory.
 - The current 487E PMU models were not capable of streaming data on all three serial ports simultaneously

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ISSUES, DISCOVERIES & SOLUTIONS

- *PMU Signals and Message Format*
 - Bus Voltages
 - Current and Voltage Formats

SYNCHROPHASOR MESSAGE



SG23029	
WEST BUS 230 kV	VZ
TL23029 LINE AMP	IW

SG23028	
EAST BUS 230 kV	VZ
TL23028 LINE AMP	IW

SG23042	
PROT PT 230 kV	VY
TL23042 LINE AMP	IW

PDC	
EAST BUS 230 kV	
WEST BUS 230 kV	
TL23029 LINE AMP	
TL23028 LINE AMP	
TL23042 LINE AMP	

PROT PT VY WILL NOT BE PART OF SYNCHROPHASOR MESSAGE

SEL-421 PMU	PF & P5
MAXIMUM NUMBER BYTES	90
FIXED	18
FREQUENCY FLOAT	8
SYNCHROPHASORS I (IL, IA, IB, IC) FLOAT 8*4	32
SYNCHROPHASORS V (VI, VA, VB, VC) FLOAT 8*4	32
ANALOG VALUES 4*0	0
DIGITAL STATUS WORD 2*0	0
TOTAL BYTES	90

P1 - 2032
P2 - MBA POTT
P3 - MBB POTT
P5 - Synchrophasors + Telnet (Ethernet)
PF - Synchrophasors (Serial)

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SG23029

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SYNCHROPHASOR PROJECT

