CEA - CALM Energy - Infratech

CALM WATER

CEA, Fr - CALM Energy, NY – Infratech, NY

- **Expertise:** Development and best practice integration of “smart”, artificial intelligence based network control and management capabilities for water utility corporations

- **Services:** CALMWATER offers water utilities customized Smart Utility Management (SUM) Platforms, which are adapted to effectively support these corporations in their data flow processing and management using artificial intelligence, expert systems, experience based machine learning and intelligent sensing technology solutions as a competitive advantage for upgrading the reliability, security, safety, resiliency and efficiency of their drinking water supply and treatment systems.

Adapting electric smart grid and intelligent nuclear sensing technology to meet water utility needs

Purpose Bio-Smart

- Demonstrating that the deployment of smart grid with multi-parameter spot measurements and redundancy of data throughout the network increases the reliability of an early detection system and enables its systemic implementation.

Bio-Smart Approach

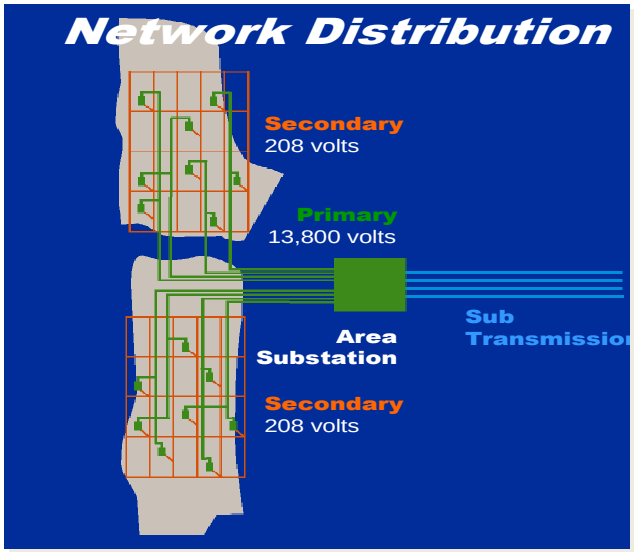
- Early Detection
  - System Requirements
  - Signals/Data characteristics
  - Looking at sensor, spot, and in network propagation for early anomaly detection, confirmation, and scale
- Optimization of mitigation
  - Time dependent zoning detection & public information
  - Based on the confidence level recommend testing or action
  - Indicating monitoring versus system anomaly
  - Identified requirements

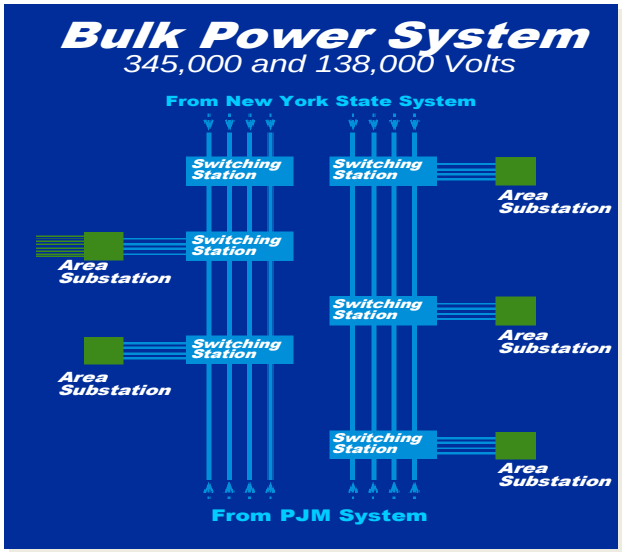
BioSmart - What we do

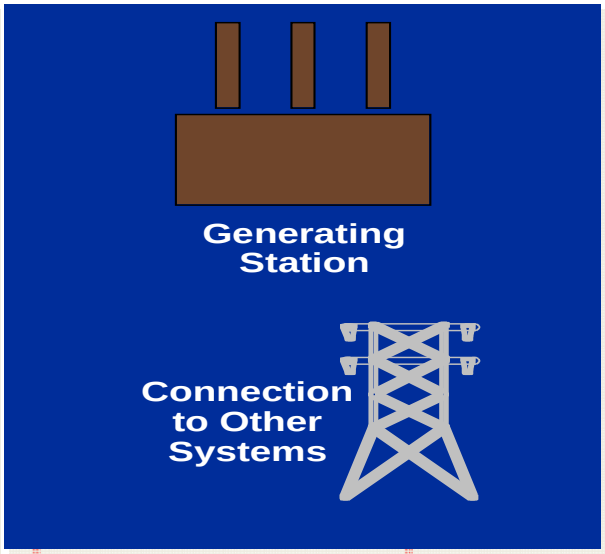
- Support system requirements
- Network instrumentation – Multi-parameter
  - Network based Optimization
- Risk assessment procedure applied – QRMA
- Smart early detection system development
- Off-line demo-simulation
- System assessment and recommendation for pilot testing

Early Detection System Development

- How do we define the system – Intelligent Enterprise platform – CALM Water
  - Integrated System Model
    - Common Information Model
    - Business Process Rules Model
    - Learning/AI Algorithms
    - Integrated Decision Support
- Artificial Intelligence sensing technology - CEA







Design Model

Control Systems

Decision Support

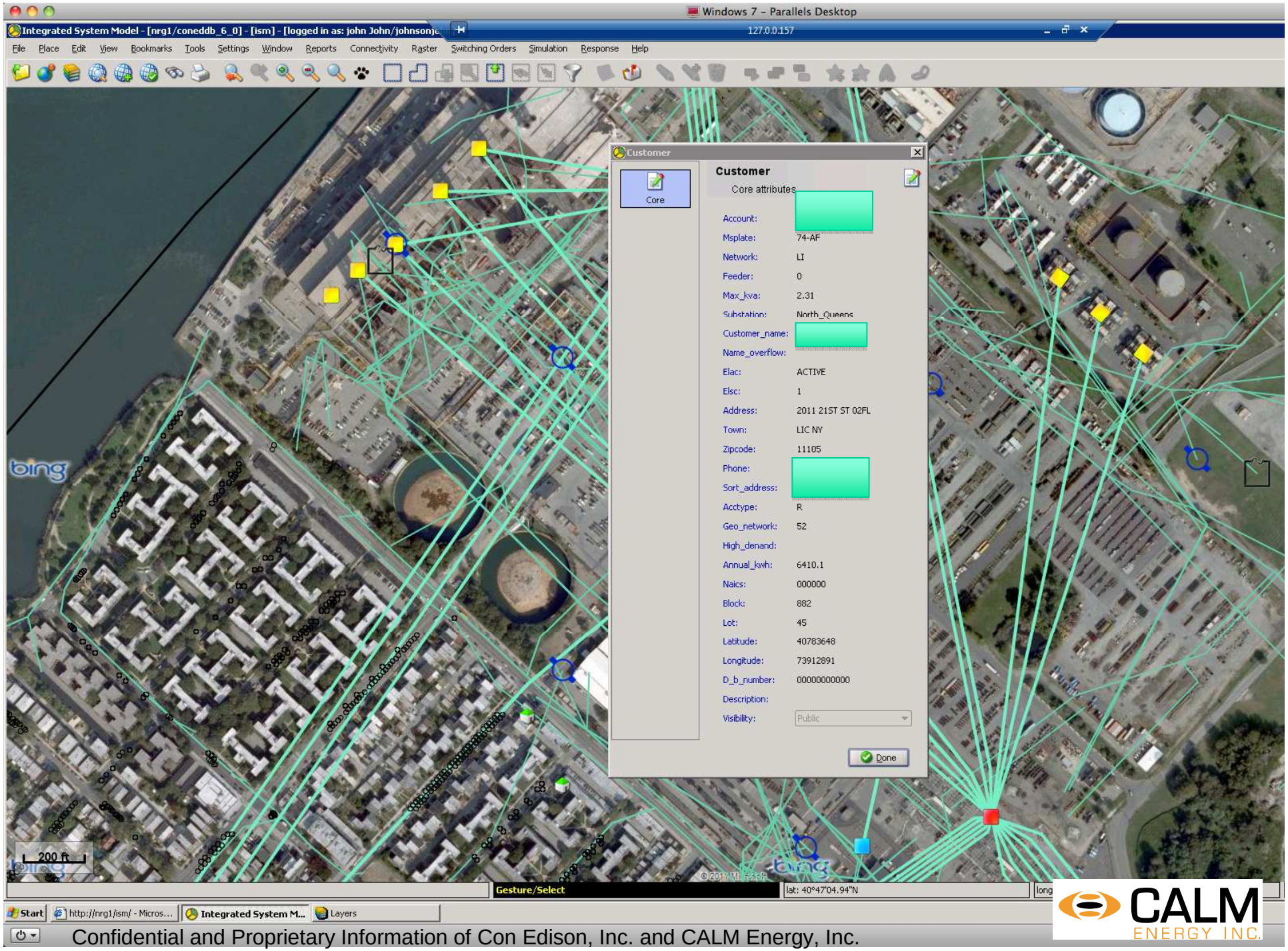
Maintenance

Price Signals

Asset Deployment	Reliability	Restoration	Prediction & Prevention	Energy & Asset Optimization
Smart Grid	Power Routing	Electric Operations	Workflow	Efficiency in Usage
Planning	Systems Behavior	Customer Operations	Scheduling	Customer Focus
	Virtual SCADA			

Integrated System Model

By using the same decision aid for normal and emergency work, the system will be more prepared and accurate to support emergency situations



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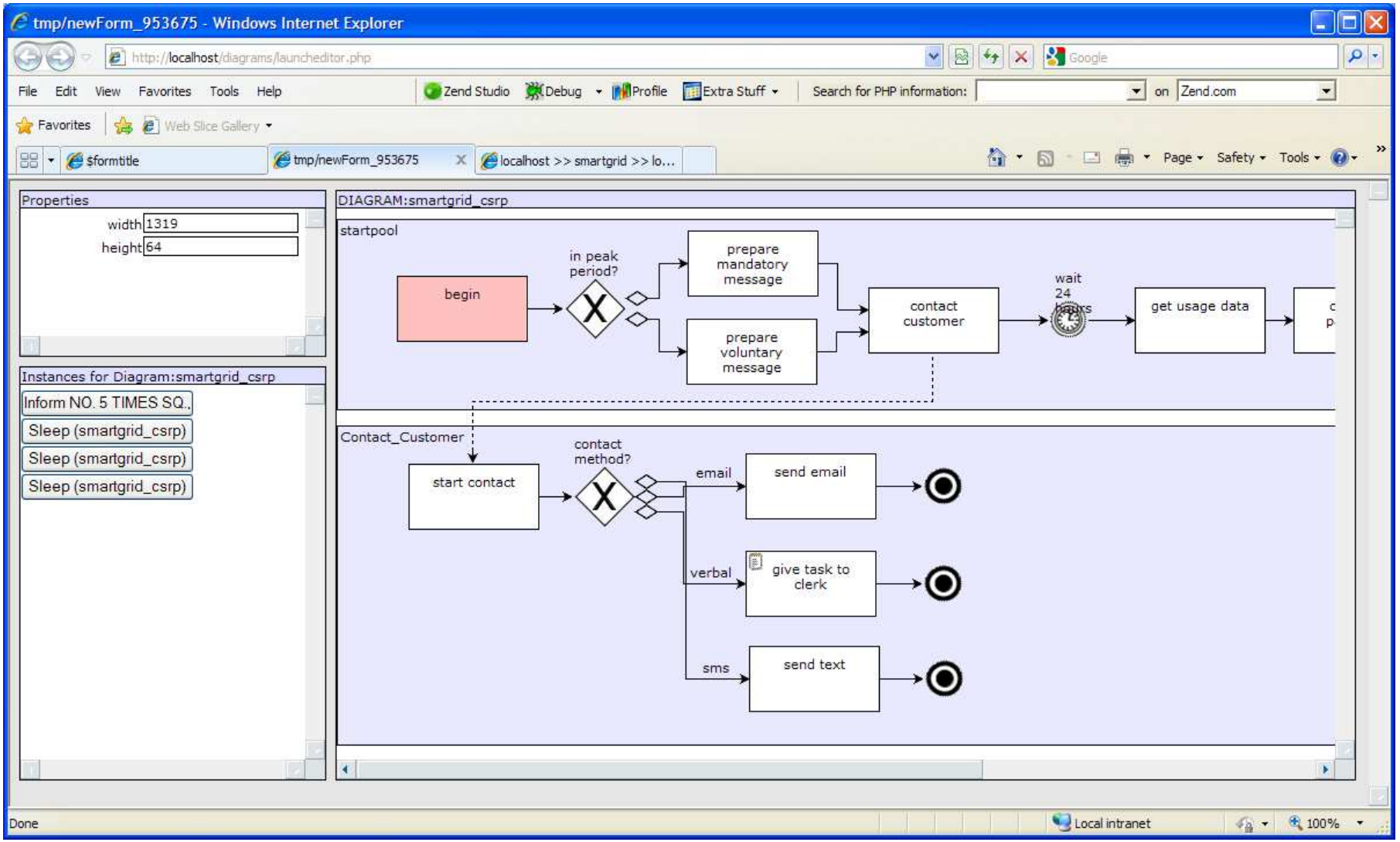
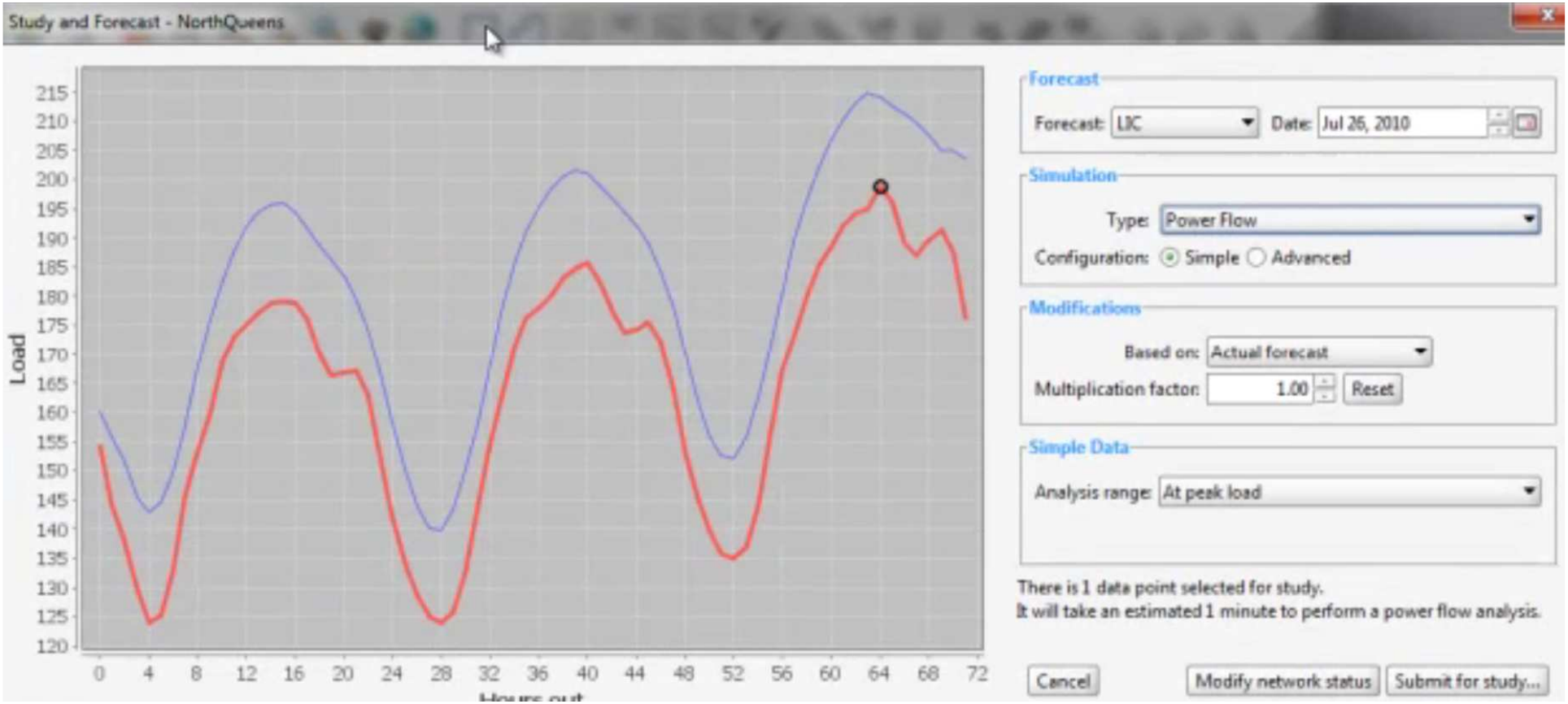
Paper
XLP
EPR
N Queens S/S

Task Orchestration



Forecasting and Study Request Console



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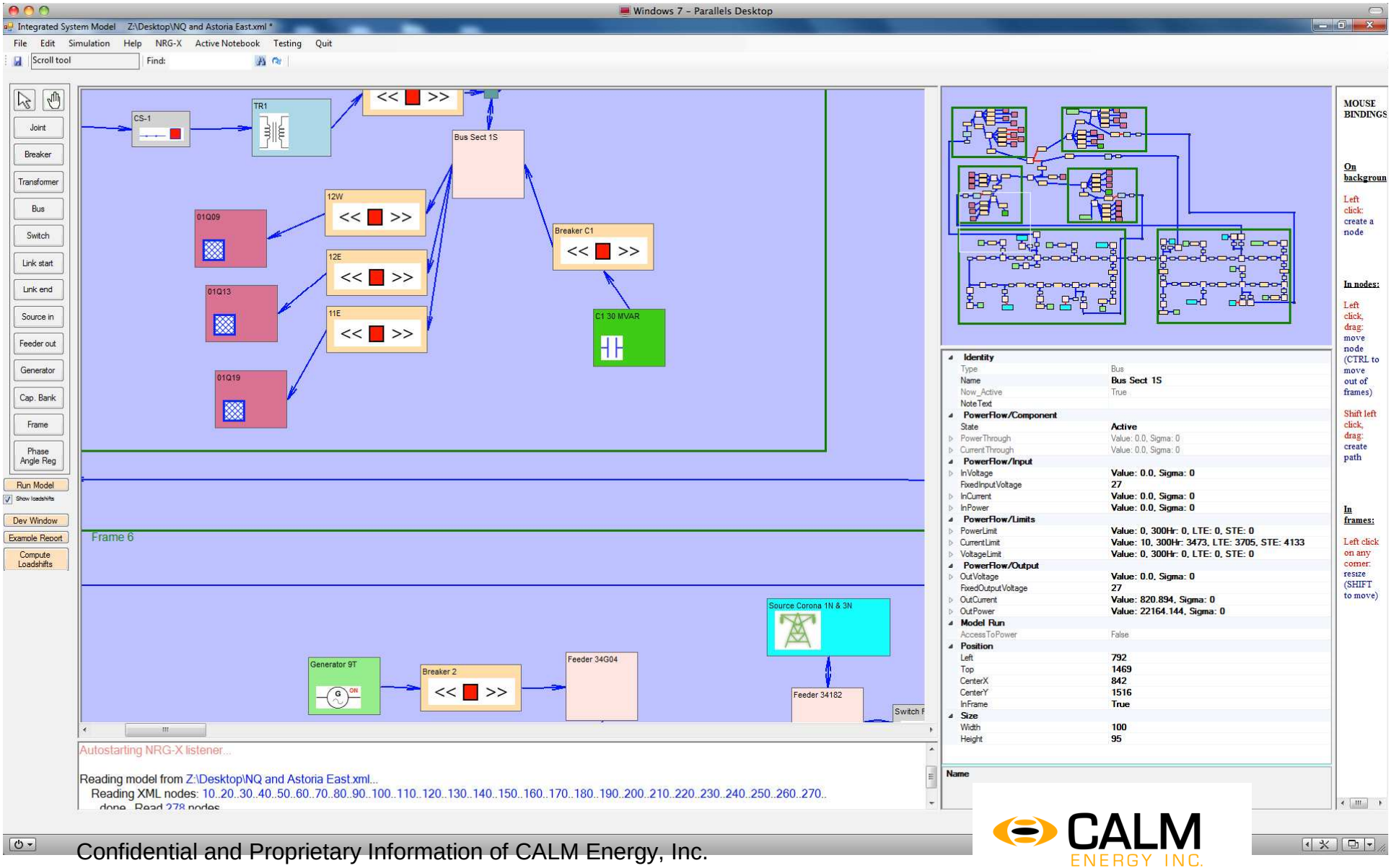
Simulator



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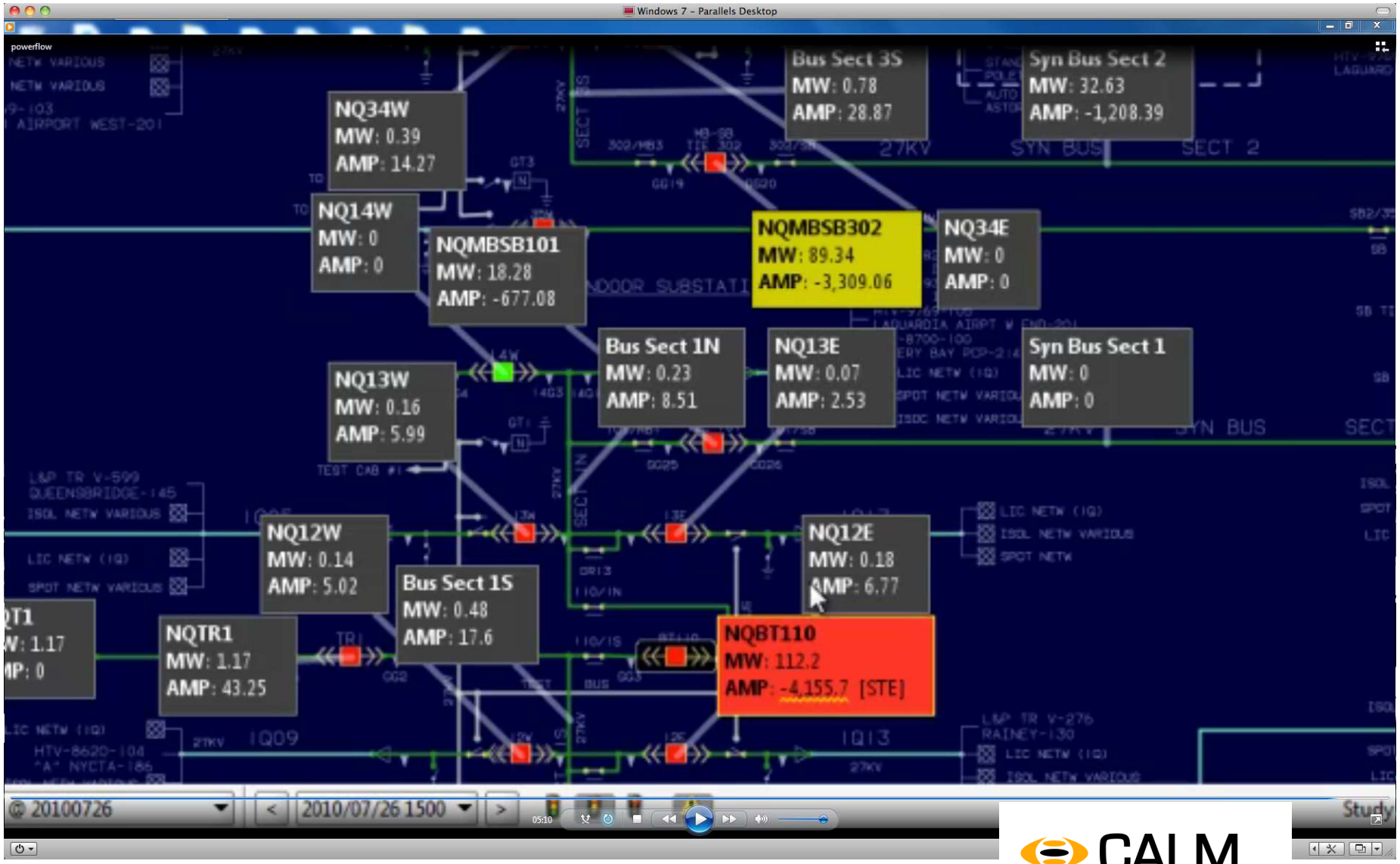
Violation at NQ BT110



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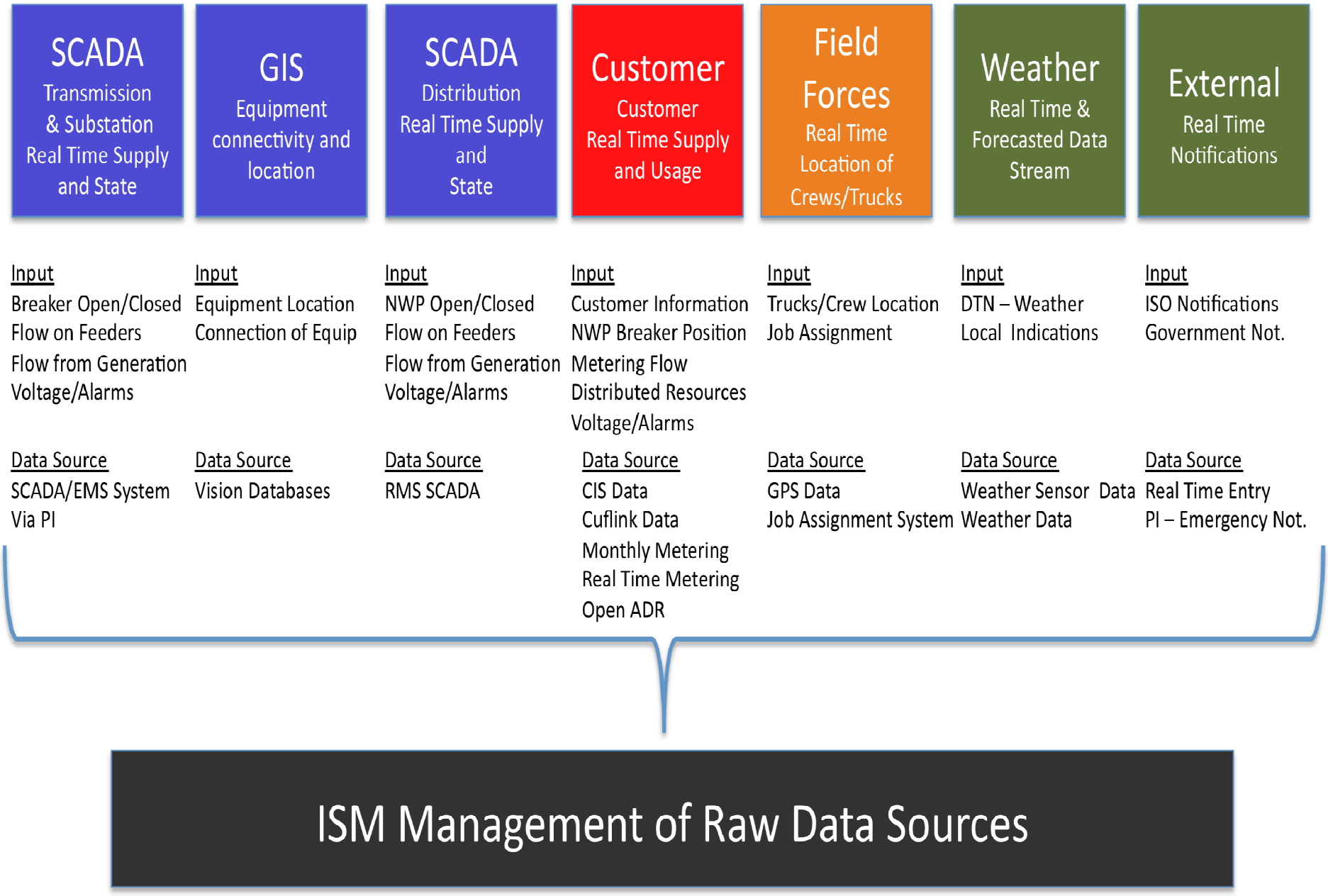
SCADA
Transmission & Substation Real Time Supply and State
GIS
Equipment connectivity and location
SCADA
Distribution Real Time Supply and State
Customer
Customer Real Time Supply and Usage
Field Forces
Real Time Location of Crews/Trucks
Weather
Real Time & Forecasted Data Stream
External
Real Time Notifications
Input
Breaker Open/Closed
Flow on Feeders
Flow from Generation
Voltage/Alarms
Input
Equipment Location
Connection of Equip
Input
NWP Open/Closed
Flow on Feeders
Flow from Generation
Voltage/Alarms
Input
Customer Information
NWP Breaker Position
Metering Flow
Distributed Resources
Voltage/Alarms
Input
Trucks/Crew Location
Job Assignment
Input
DTN – Weather
Local Indications
Input
ISO Notifications
Government Not.
Data Source
SCADA/EMS System
Via PI
Data Source
Vision Databases
Data Source
RMS SCADA
Data Source
CIS Data
Cuflink Data
Monthly Metering
Real Time Metering
Open ADR
Data Source
GPS Data
Job Assignment System
Data Source
Weather Sensor Data
Weather Data
Data Source
Real Time Entry
PI – Emergency Not.
ISM Management of Raw Data Sources

Next Steps

Planning – Assumed 6 weeks

- Support system requirements
  - Decision making process – Rules/Processes
  - Information Sources
  - Actionable results
- Data configuration plan
- Site topology and characteristics

Testing – 3 Months – Time based on others

- Test site - Data capture
- Additional testing

Algorithm exploration and testing – 4 Months

Task	Month																	
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.
I – Industry Platform for ß testing																		
I.1– Con-Agreement																		
I.2 – Users' Require																		
1.3 – Tech Ass & Adapt																		
II – Site Instrument & ß testing																		
II.1 – Site Char & Instr																		
II.2 – Data Proc & Anal																		
II.3 – Utility ß testing																		
III – Adapt & Demo– simulate proto-systems																		
II.1– Adapt SG solutions																		
II.2– Pilot Demo-plan																		
II.3 – Demo-simulation																		
II.4 – Outcome Assess Workshop																		
IV – Tech Assessment & Prof. Training																		
IV.1 – Tech Assessment																		
IV.2 – Prof Training																		
IV.3 – Standard Support																		
V – Reporting & Project Management																		
V.1 – Outcome Report																		
V.2 – Project Mgmt.																		

Work Package / Task	WP Lead Institution	Deliverables	Allocated Budget (k€)
WPI – Industry Platform & Users Requirements	W-SMART		**40**
I.1 – Consortium Agreements	W-SMART	D1 - Consortium Agreement	**5**
I.2 – Users' requirements	W-SMART	D2 – User Requirements	**10**
I.3 – Tech Assess & Pre-Qual	KWR		**25**
Allocated Budget			**40**
WPII – Utility ß Testing Sites: USTL & VITENS	KWR		**305**
II.1 – Site Character & Instrumentation	USTL & VITENS	D3 – GIS based info-system D4 – Instrumentation Report	**115**
II.2 – Data Process & MQRA Tools Integration	KWR & USTL	D5 – Data Analysis & Risk Assessment Tools – Report	**90**
II.3 – ß testing including standard testing, multi-sensor systems & selected technology solutions	KWR & Utilities	D6 – ß Testing Report	**100**
Allocated Budget			**305**
WPIII – "Bio-SMART" system Adaptation &Demo-simulations	CW & CEA & Utilities	D7 – BIO-SMART system(s) Demo-simulations Report	**315**
III.1 – Adapt SG solutions	CW & CEA		95
III.2 – Pilot Demo-planning	CW & CEA		45
III.3 – Utility Demo-simulations	CW & CEA		130
III.4 – Outcome Assessment	KWR & Utilities	D8 – Workshop Proceedings	45
Allocated Budget			**315**
WPIV – Technology Assessment Prof. Training & Standard Sup.	USTL, KWR, WS		**60**
IV.1 – Tech Assessment	W-SMART & Utilties	D9 - Utilities' Assessment Report	20
IV.2 – Professional Training for Monitoring systems	USTL	D10 – Bio-Monitoring Training sessions for the Utilities	25
IV.3 – Standardization Support	KWR		15
Allocated Budget			**60**
WPV – Reporting & Project Mgmt.	KWR & W-SMART		**50**
V.1 – Outcome Report & Recom for pilot scale system architecture	W-SMART	D11 – Final Report with Industry Recommendations	20
V.2 – Scientific Quality Control	KWR		5
V.3 – Project Mgmt.	W-SMART	D12 – Interim Progress Reports	25
Allocated Budget			**50**
Total Costs of Project			**770**