

THREAT SIMULATION

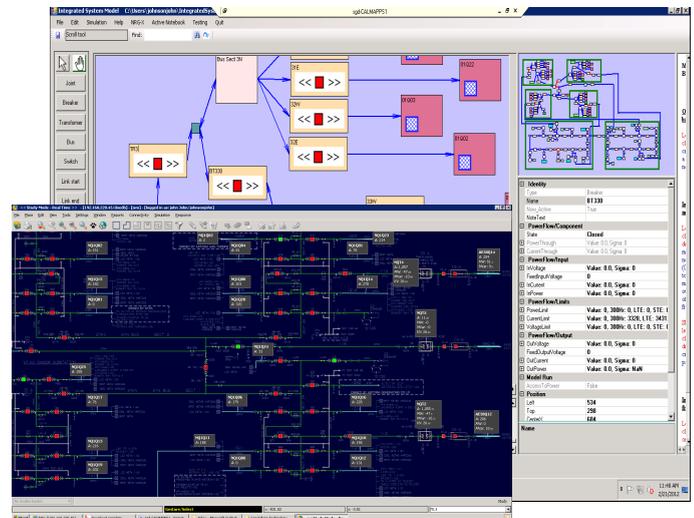
Command and Control System of Systems (C2SOS)

Improving Energy Security through Threat Simulation

Utilities face the challenge of external impacts to their supply and delivery system in the form of natural disasters like storms and floods, and catastrophic events in the form of undetectable origins such as from terrorism or human error outside the confines of infrastructure monitoring. These uncontrollable and in many cases undetectable event's impact can be mitigated and in some cases fully preventable. Utilities invest capital to maintain the reliability of energy assets like generators or electric transformers or gas mains through siloed disciplines of electrical, civil, mechanical engineering. But what is not analyzed is the interdependent infrastructure vulnerability to these types of threats. Analysis should include the corresponding design basis of interdependent infrastructure and operational capabilities of response to provide the optimal means to prevent or mitigate the impact and to recover expediently from such improbable events. Dealing with uncertainty in exogenous detrimental impacts is typically given a broad brush of pointing to industry standards of design for energy assets as the solution, which does little in improving the resiliency of the infrastructure to such threats. C2SOS provides a methodical approach to achieving higher levels of energy security at lower investment costs through simulating scenarios of threats to energy supply that we have been developing in concert with an electric utility.

Improving Resiliency

Within C2SOS, energy supply delivery systems and supporting delivery systems are mapped and integrated via topological modeling of infrastructure systems with their energy conversions and interdependencies. As an example, a single gas transmission main supplying power to three unitized and physically independent power plants results in the gas main being one of the critical pieces of infrastructure that if lost could result in a regional blackout if insufficient electric transmission is not available to make up for the local generation supply. C2SOS simulation can include all fuel deliveries and where it comes from, such as fuel oil back-up for electric generation. If fuel oil back up is available after 2 days through barge delivery for 50% of the generation supply,



C2SOS Deployment in an Electric Power Utility

then the corresponding energy security for the specific region can improve significantly. Through this type of analysis of vulnerability barge facilities with back up emergency piping to get this oil to the generating facilities may be identified as a low cost solution to an otherwise unidentified vulnerability, and become a higher priority in the capital plan.

Prevention, Mitigation, and Investment

In most cases, only a few major capital expenditures can be affordable, but intelligent mitigation through emergency response may provide the least cost option. As an example, electric infrastructure costs to install another transmission line for energy security may not be feasible, but mobile emergency generation response with quick installation capabilities coupled with electric demand response in the event of an specific incident may provide a cheaper alternative given its real option valuation of supporting multiple contingencies. An investment strategy that includes C2SOS scenario simulation capability offers the chance to make significantly better investment and operational readiness decisions that pay off through improved energy security.

