

**MICIE**  
**Tools for Real Time Service Level Risk Analyses for Interdependent Critical Infrastructures**

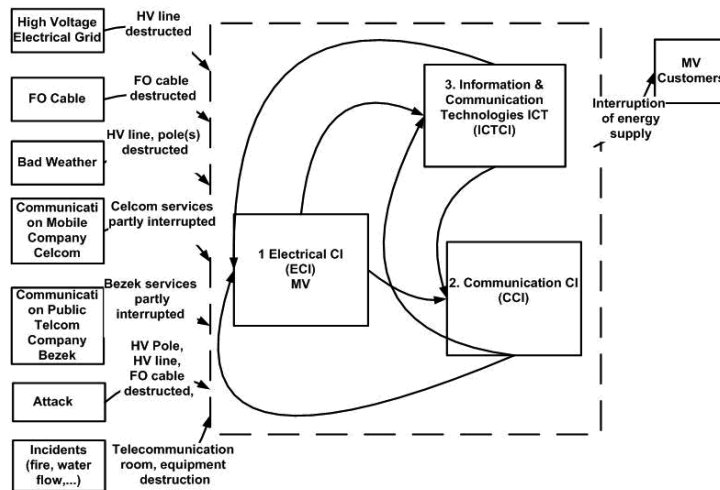
Heterogeneous (stochastic versus deterministic, agent based, dynamic simulation, etc.) Models are under development, with the aim of investigating the short term prediction of the quality of services (qos) delivered by interdependent power grid and telco networks. Models are based on the underlying interconnected networks that cooperate for service delivery and on possible undesired events (i.E. Attacks to the most critical elements, sequences of realistic failures, and congestions and consequences of rerouting policies of communication networks).

**FRAMEWORK**

Power grids rely on SCADA communication links which are dependent upon Telco networks and represent one of the major channels of mutual propagation of disturbances and adverse events between Power grids and Telco networks. Power grids and Telco networks have a heavy impact on daily life and are typically referred as Critical Infrastructures (CIs), since their correct operation is essential for the every-day life of our modern society. Dependent (bi)directional relationships and reciprocal influences among CIs are named (inter)dependencies. CIs rely more and more on information and communication technology and, largely through this reliance, they have become more and more interdependent.

**REFERENCE SCENARIO**

Identifies: a) the services; b) the set of interconnected networks supporting such services (i.e. topologies, essential systems such as Telco emergency power supply, cooling systems, etc.); c) inter-connections and types of interconnections among networks and systems; d) sequences of possible adverse events (failures, attacks, congestions) that could impair the quality of such services (in terms of continuity, readiness, performances, time response) and may include e) operator procedures to implement services under consideration.



**PERFORMANCE AND ROUTING CALCULATIONS OF FISR SERVICE**

We discuss about performance and rerouting calculations of a specific service delivered by the SCADA system and their impact on the QoS of the power supplied to customers network. In particular, we refer to the Fault Isolation and System Reconfiguration (FISR) service that detects and isolates faults in Power distribution grid and then reconfigures the grid to supply again the isolated customers.

In delivering FISR service, SCADA system, Telco network and Power grid act as a whole heterogeneous We investigate the usability of the same discrete event simulator, NS2, which fits very well to represent SCADA system and Telco network, also to represent the power grid, limited to the implementation of FISR service.

## MORE INFORMATION

### Project Website:

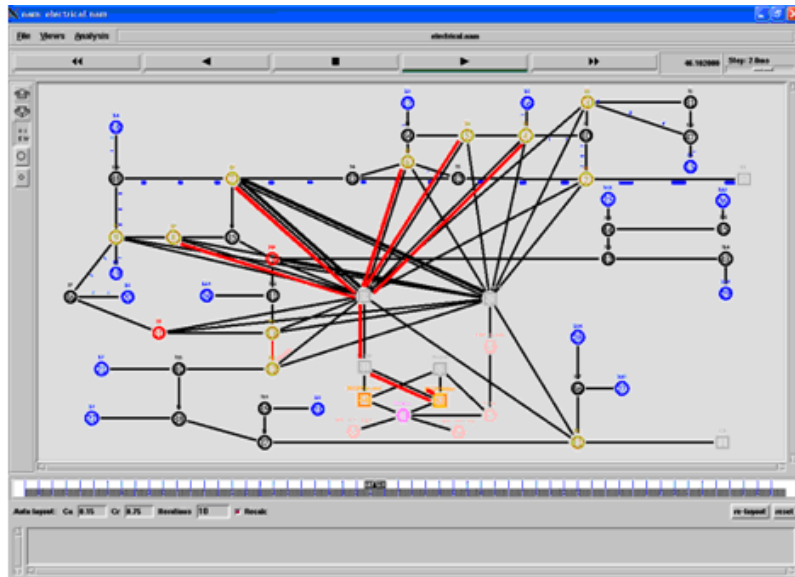
[www.micie.eu](http://www.micie.eu)

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## DETERMINISTIC AND AGENT BASED SIMULATION

A model of the three interdependent CIs using RAO simulator (presented in D2.2.1) has been started in a way to get at the end a unique model with interdependencies included. The model will reproduce the behavior of each CI (electricity distribution, communication and SCADA) as well as behavior arising from the CIs interdependencies. So the model will be able to simulate various reference scenarios and to estimate the influence of CIs parameters and interdependency factors on the important indicators of quality of service for customers, contributing to estimate risks.

Natural or internal (malicious or random) adverse events hit (specific components of) interdependent Electrical, Communication and Information Infrastructures and may propagate till to customers of the Medium Voltage (MV) grid in term of interruption of power supply. FISR, performed by SCADA system by means of SCADA operator is a particularly critical service because its degradation affects the quality of power supplied to customers. In Power grids, failures may cause the de-energisation even of large part of power customers and need to be located, isolated and repaired quickly and safely. In Reference Scenario, FISR service is remotely operated by the SCADA operator, which implements a specific procedure (based on grid monitoring, loss of power sensing, Circuit breakers operations) by means of Remote Terminal Units (RTUs).

## SECURITY ASPECTS

For each service, their dependencies are expressed in terms of confidentiality, integrity and availability. Metrics and underlined measures for each attribute are identified.