Planned validation of and expectations on the MICIE Tool

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Israel Electric Corp

The Israel Electric Corp. (IEC) - General Data

- State owned utility
- Annual turnover (2006): 4.2 Bn USD
- Isolated Grid (no interconnection between neighboring systems)
- Employees: 12,500
- Installed Capacity: 11,297 MW
- Additional 2,500 MW till 2010
- Length of power grid: 24,500 km
- Development of Gas Distribution System
- 190 switching stations and sub-stations


HAARETZ
(THE PALESTINE NEWS)
Daily Newspaper
הארץ

Since 1923

SEVENTH FRAMEWORK PROGRAMME

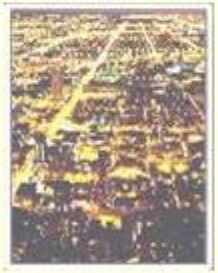
חברת החשמל
Israel Electric

MICIE

"Electricity Supply Chain"
Generation – Transmission –Distribution

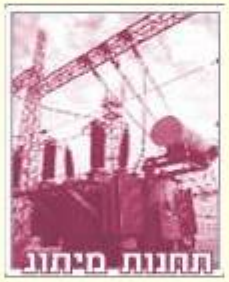
National Dispatch Center

Distribution



* 5 Districts
* 36,000 km Low & High Voltage lines
* 2.3 Million consumers

Switching & Sub Stations



* 154 IEC Switch & Sub Station
* 38 IPP Switch & Sub Station

Transmission

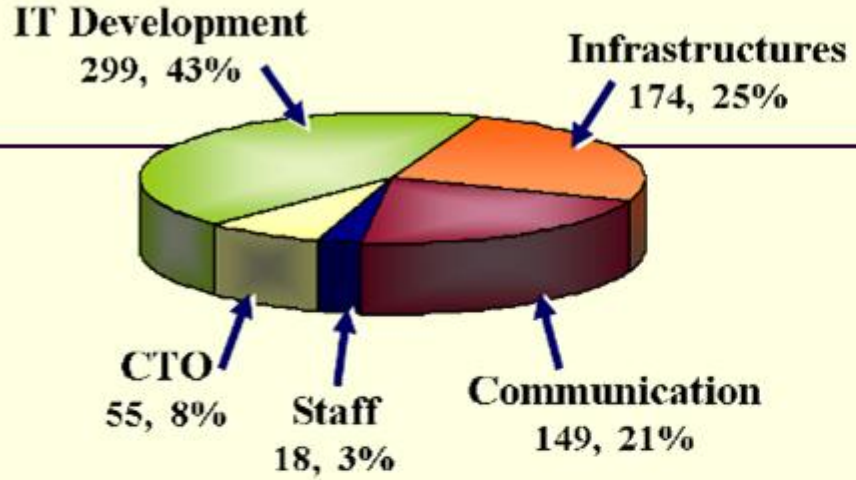
High Voltage Transmission lines

5000 km

Generation

* Coal Fired 4,840 Mw
* Oil/Gas Fired 1,620 Mw
* Oil Fired 290 Mw
•Combined Cycles 2,000 Mw
•Gas Tune 2,540 Mw

The ICT Division Human Resources



Total 695 Employees

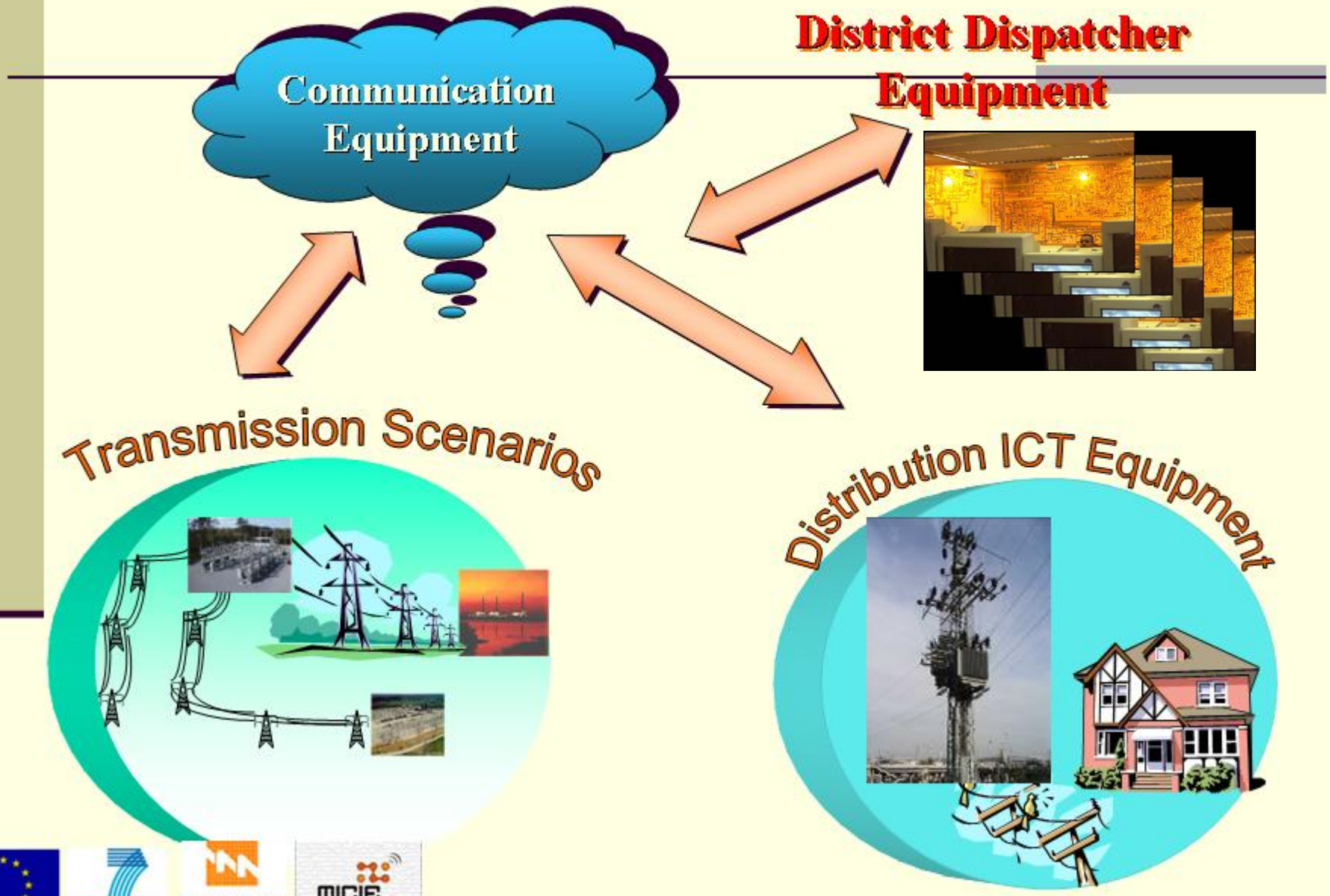
- Experience in broad spectrum of domains
- High level of Responsibility and Motivation
- Dr's, Msc's, Bsc's, Experts…

- From Best academic institutions
- Trained in an internal training center and external courses for the Specific needs

IEC involvement in FP7 projects

- Protection of Critical Infrastructures
- Communication technologies
- Early warning
- Real Time Risk Analysis
- ICT technologies for control and monitoring of energy producing, transmission and distribution
- Smart grid

IEC Validation Concept



IEC Provides Interdisciplinary Knowledge, Real Equipment, Operational Scenarios, Interdisciplinary Facilities for Validation

System engineering:

- **Scenarios building and integration**
- **Validation Planning and Implementation**
- **Requirement management and verification**

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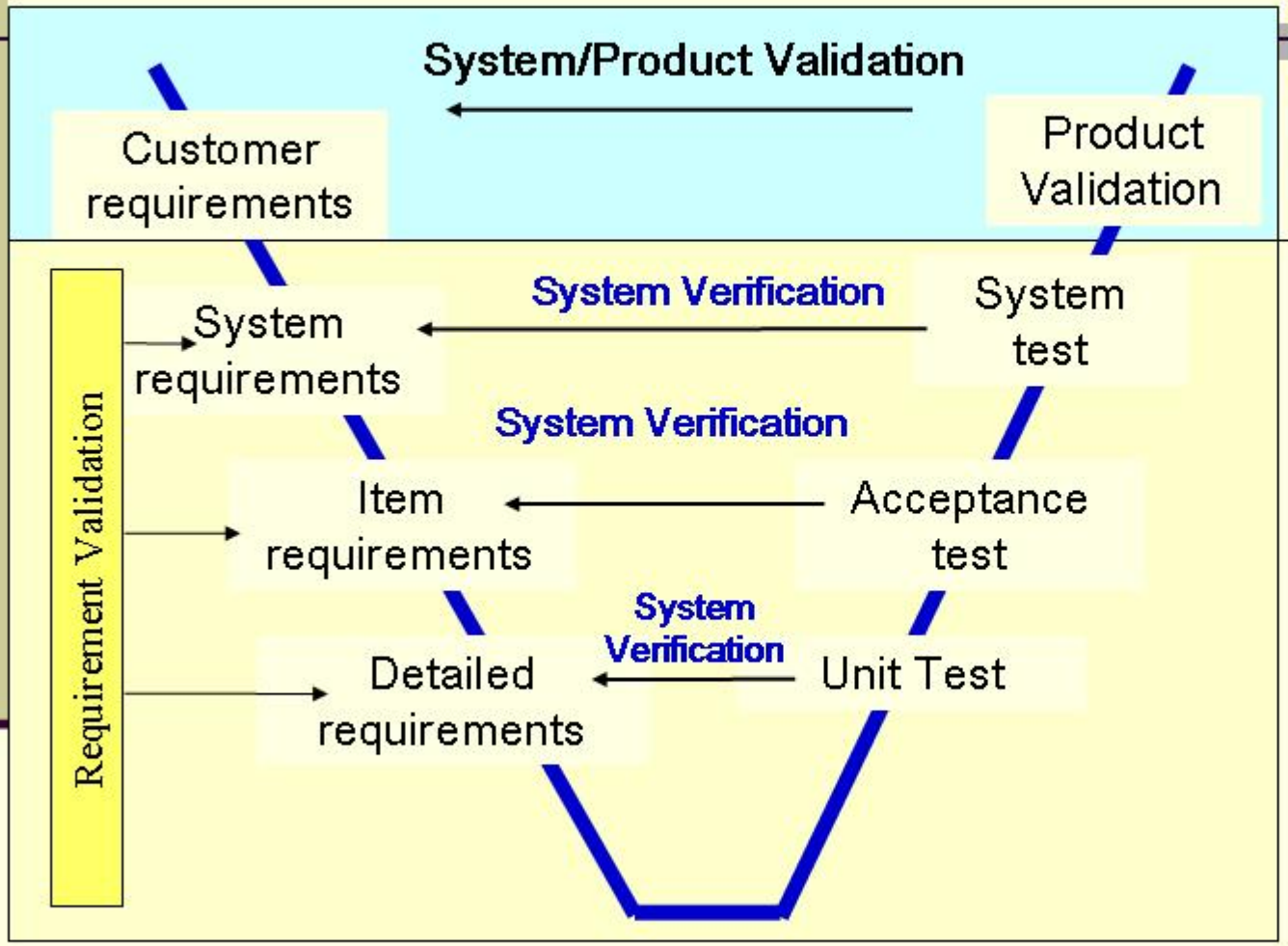
IEC Services:

- **Knowledge in different infrastructures**
- **Real Equipment**
- **Labs Facilities**
- **Operational Scenarios**

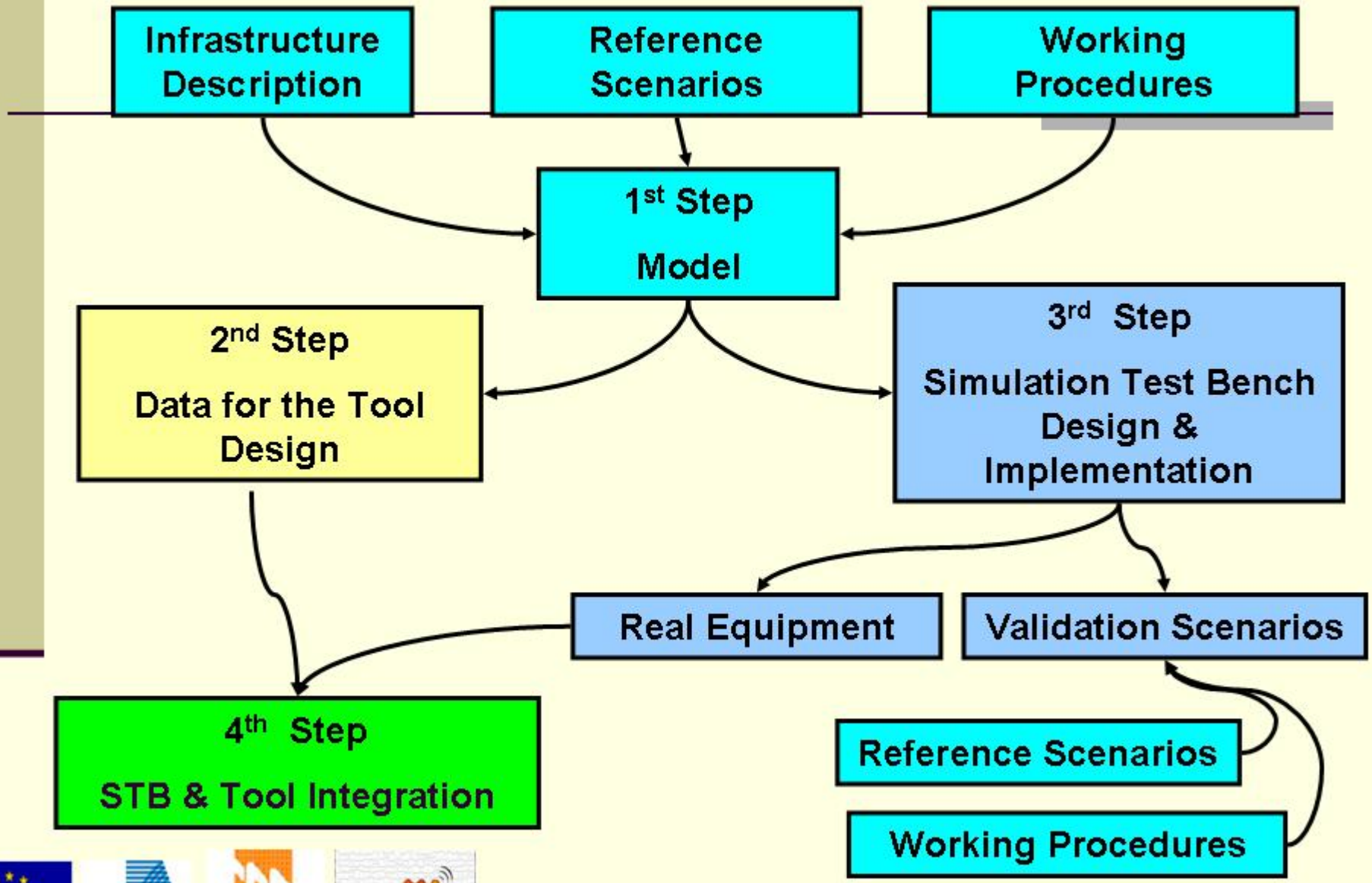
System Engineering V& V Concept



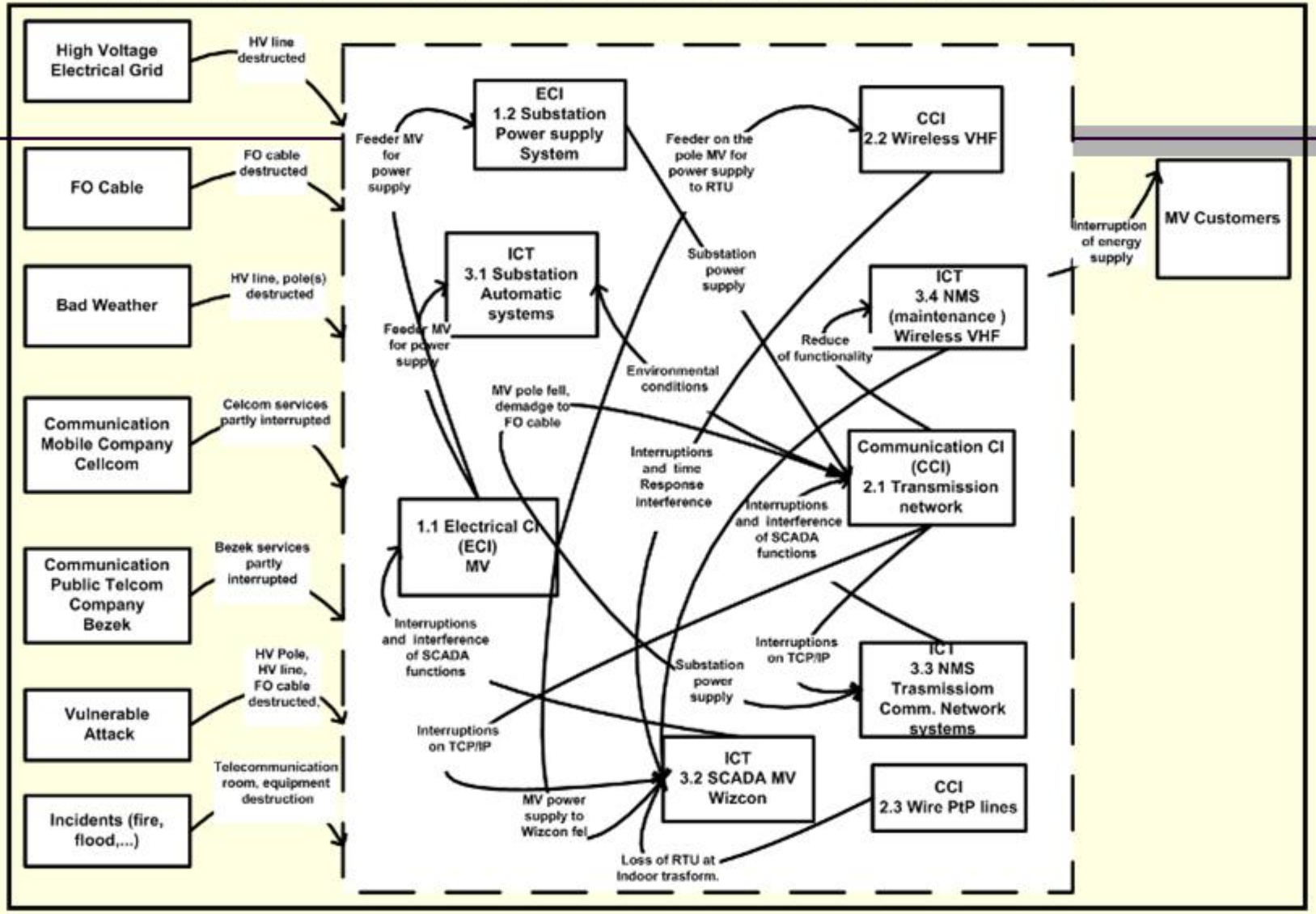
IEC Responsibility, Partners Participation

Partners Responsibility, IEC Participation

Validation Concept



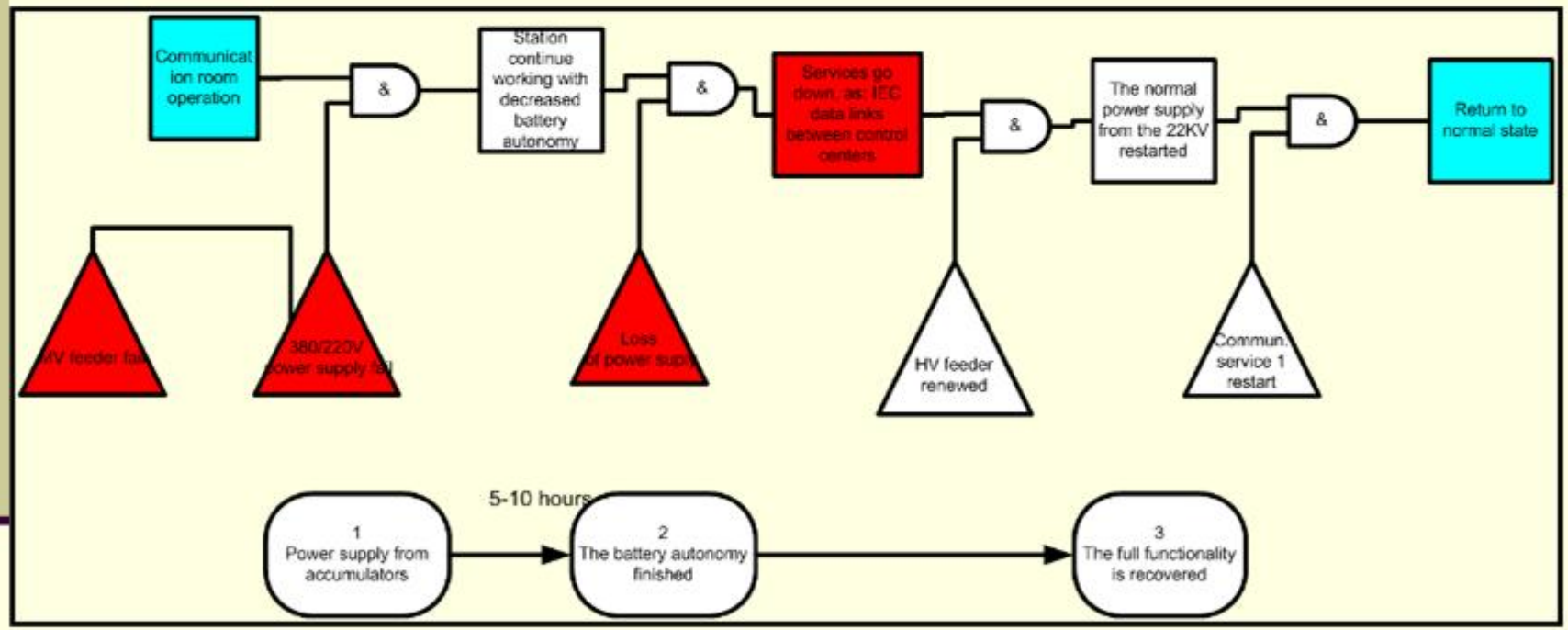
Reference Scenarios (3rd Step example)



Reference Scenarios (Cont.) (3rd Step example)

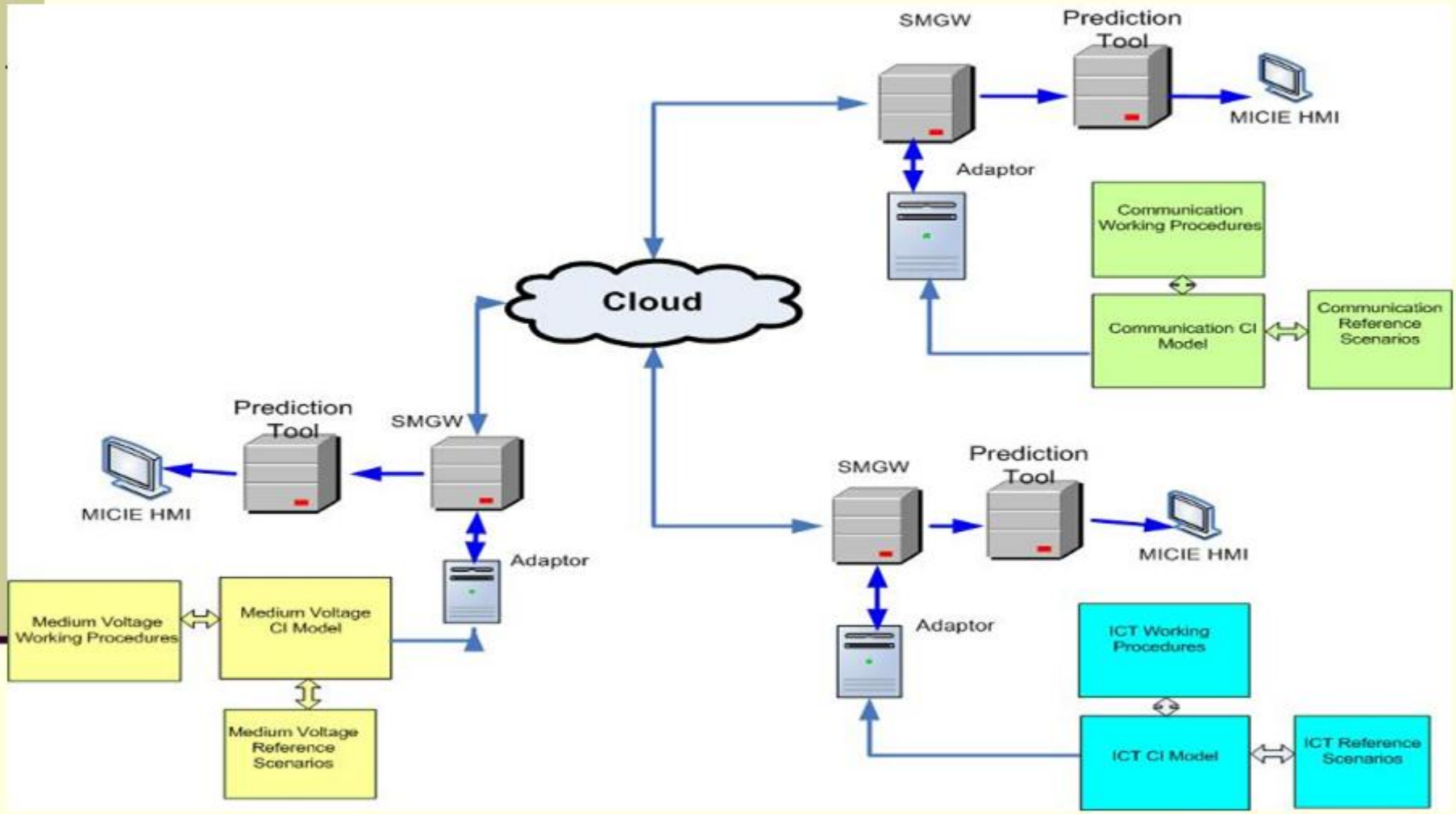
CCI FFBD 2000: High voltage (HV) pole fall

CCI FFBD 2000 concerns High voltage (HV) pole fall. F.O. line is installed on the top of HV poles

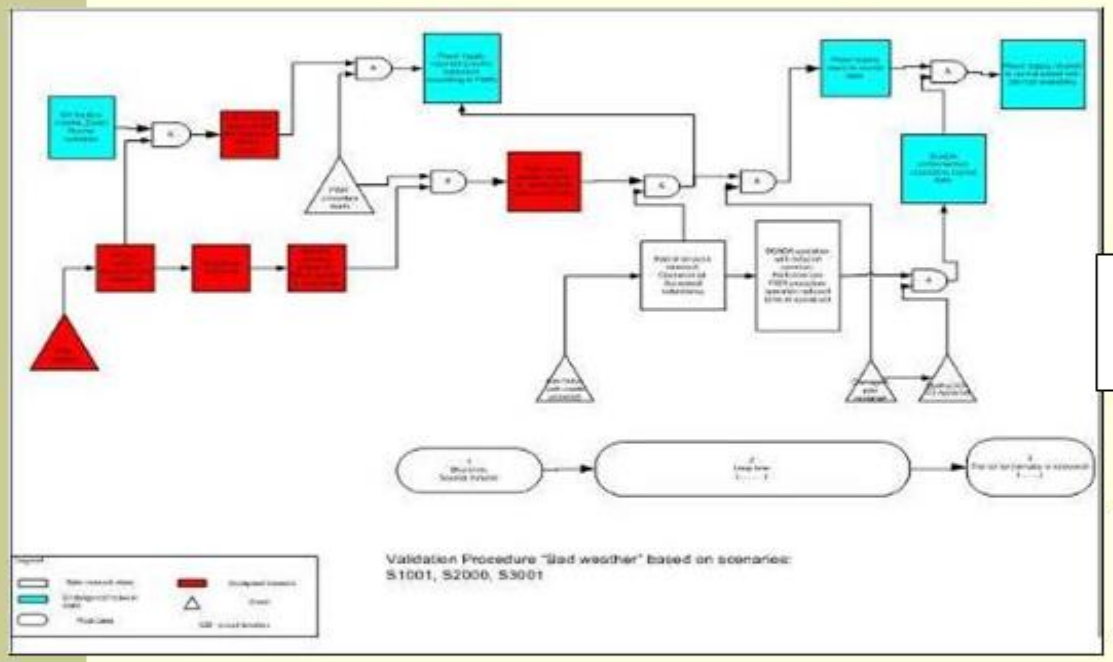


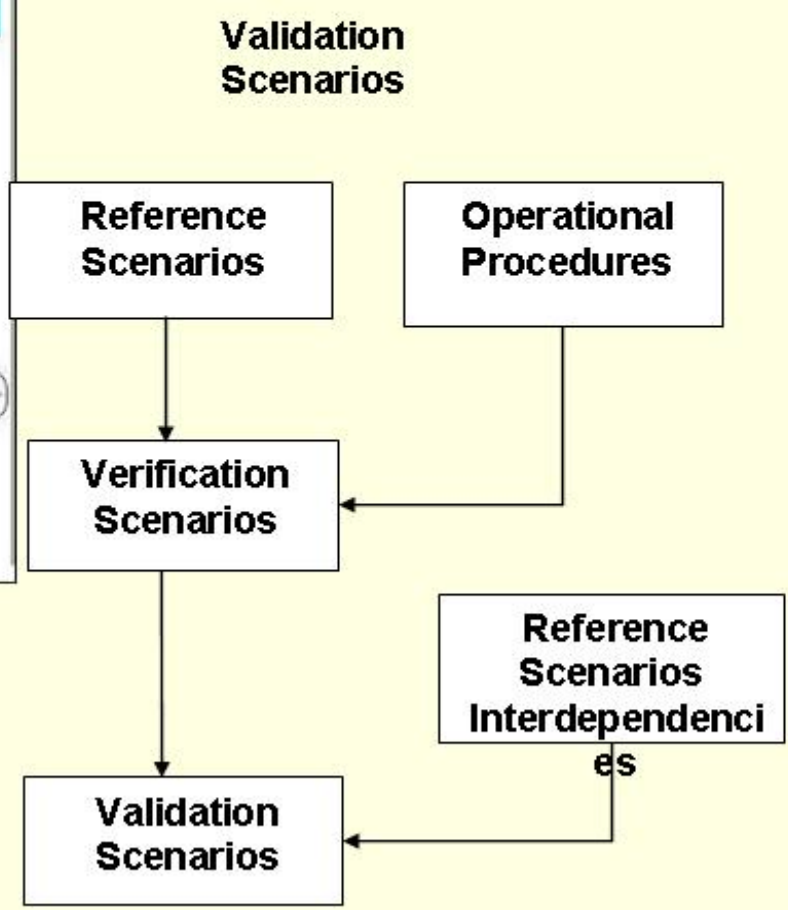
MICIE Tool
Validation Process

MICIE Tool Validation Concept

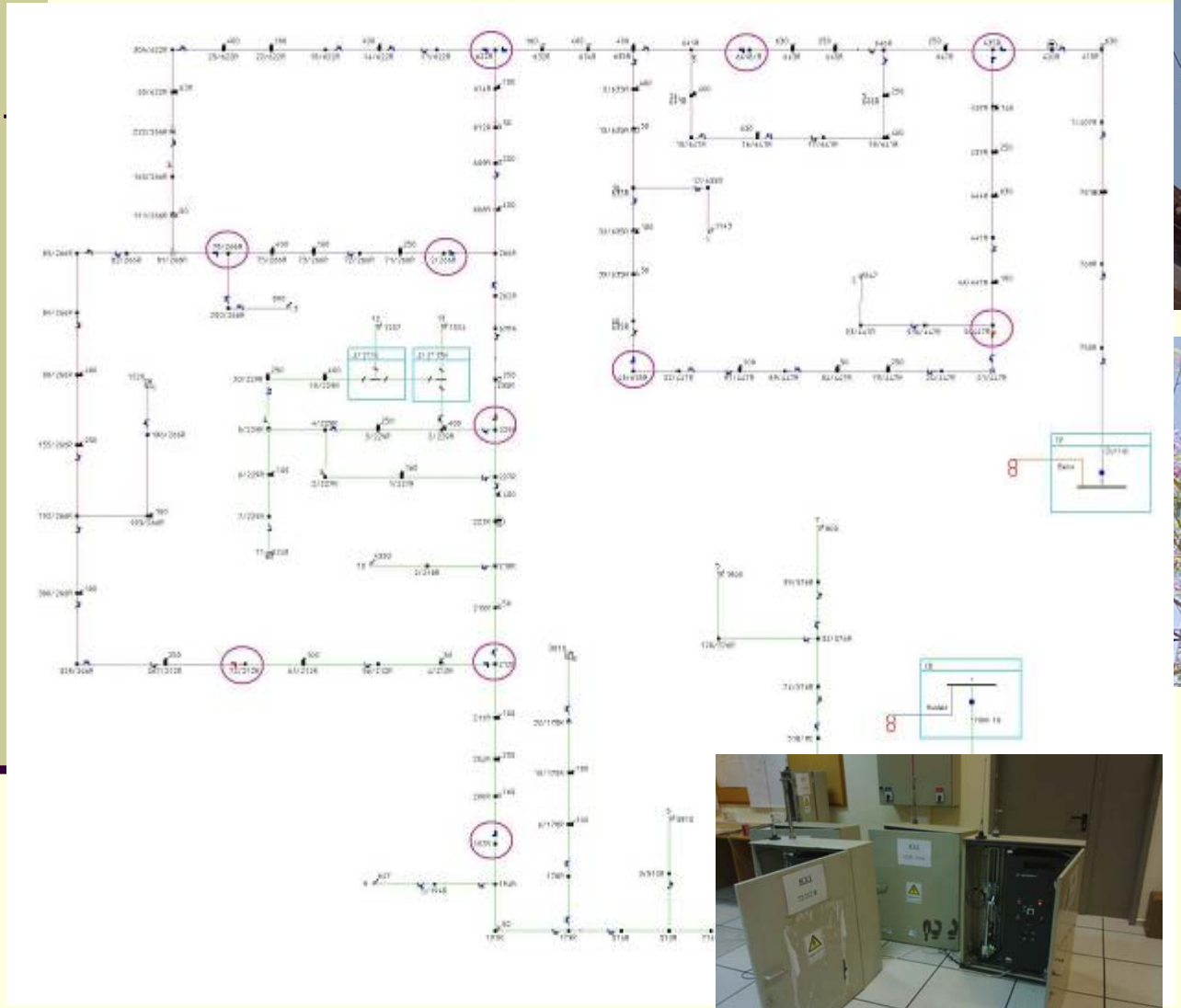


Validation Scenario Example

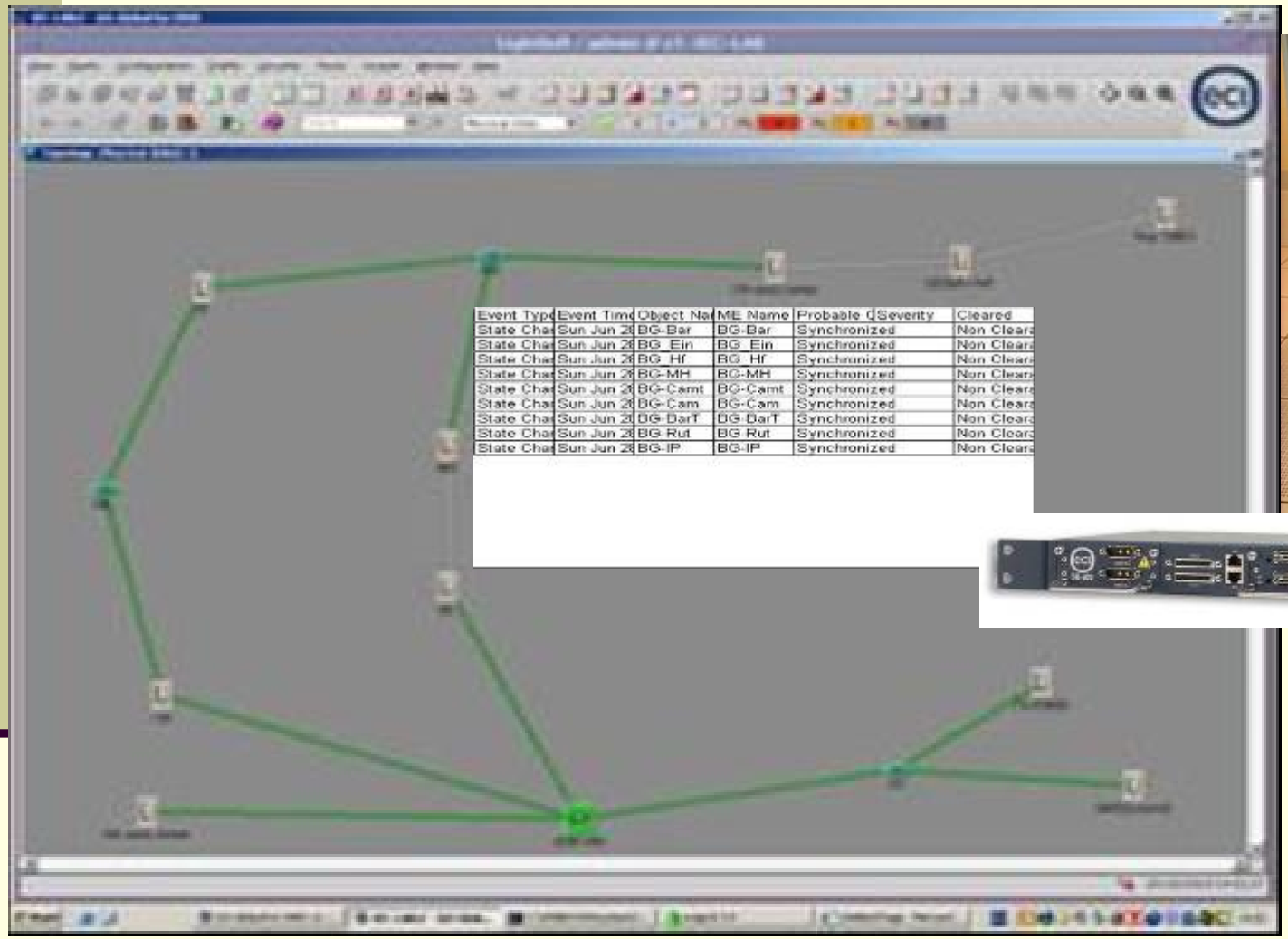




Electrical Medium Voltage Grid CI

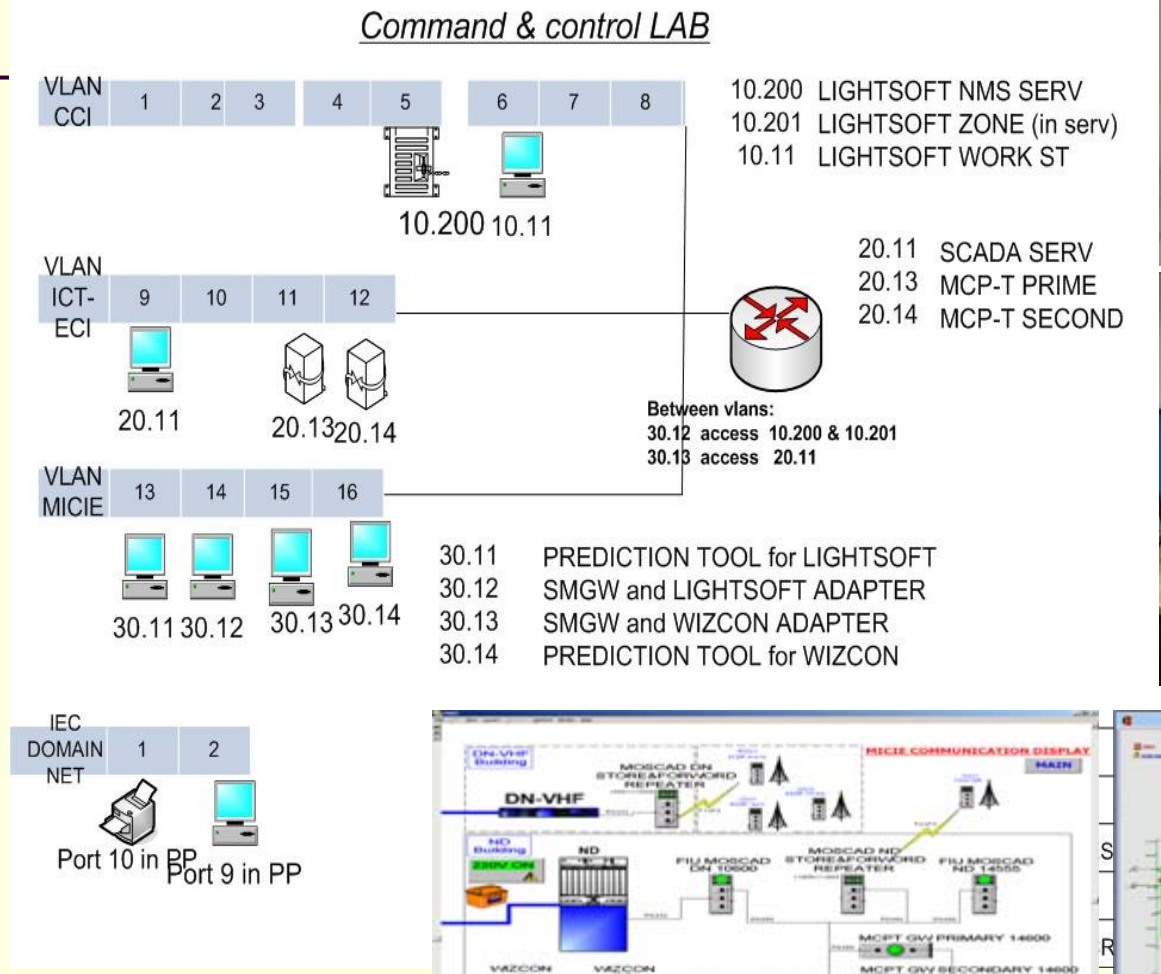


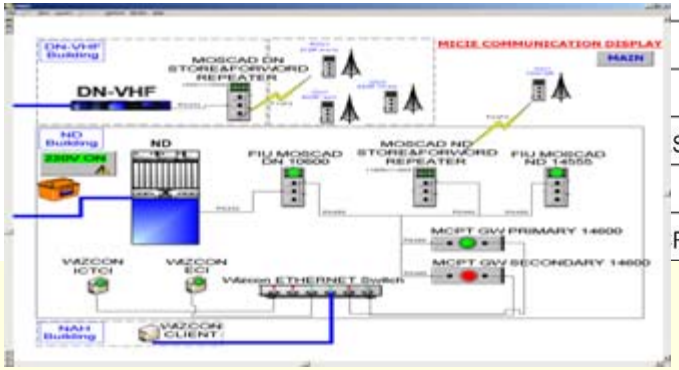
Communication Transmission Grid CI



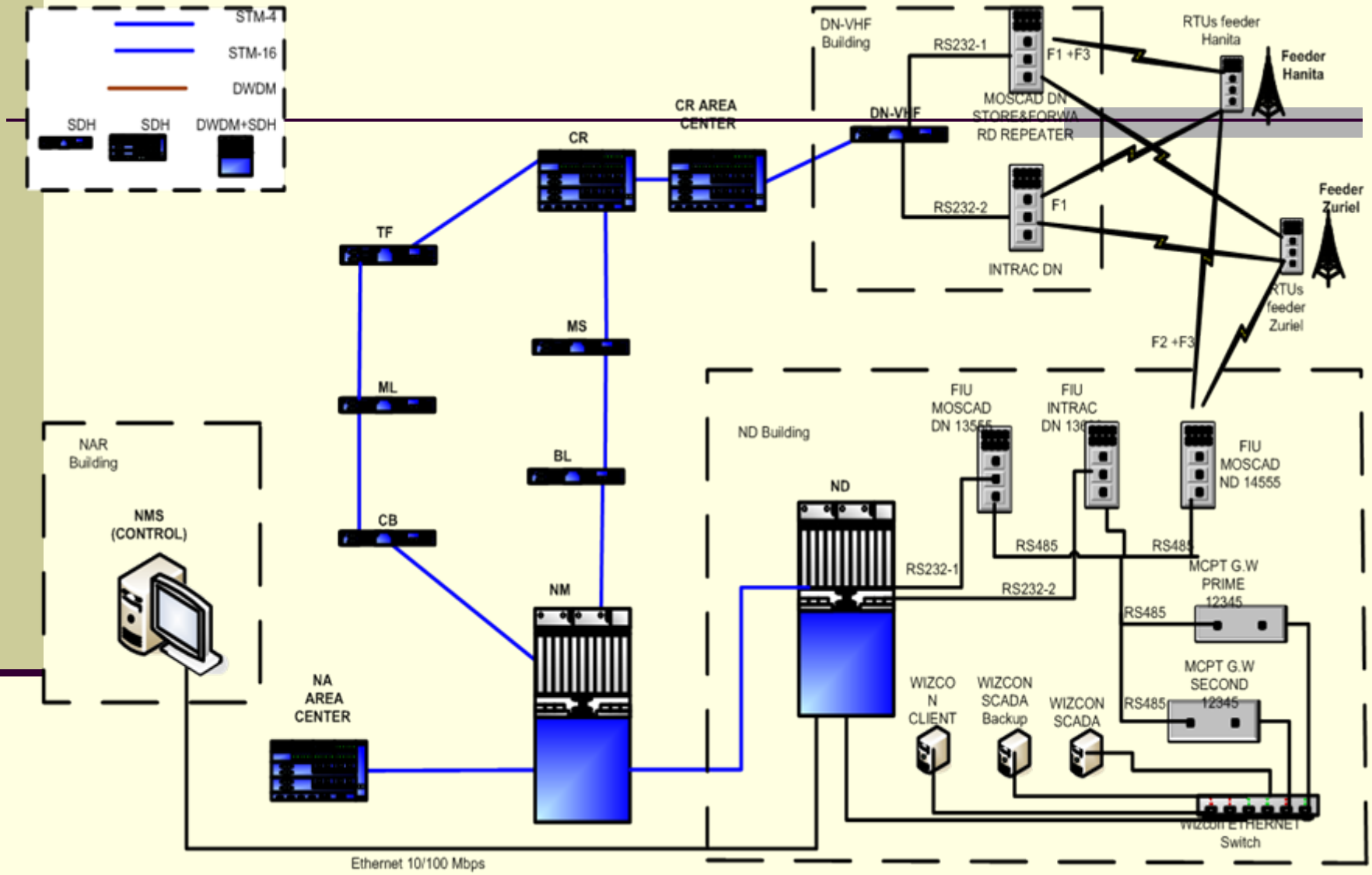
Event Typ	Event Tim	Object Na	ME Name	Probable C	Severity	Cleared
State Cha	Sun Jun 2	BG-Bar	BG-Bar	Synchronized		Non Clear
State Cha	Sun Jun 2	BG_Ein	BG_Ein	Synchronized		Non Clear
State Cha	Sun Jun 2	BG_Hf	BG_Hf	Synchronized		Non Clear
State Cha	Sun Jun 2	BG-MH	BG-MH	Synchronized		Non Clear
State Cha	Sun Jun 2	BG-Camt	BG-Camt	Synchronized		Non Clear
State Cha	Sun Jun 2	BG-Cam	BG-Cam	Synchronized		Non Clear
State Cha	Sun Jun 2	DG-DarT	DG-DarT	Synchronized		Non Clear
State Cha	Sun Jun 2	BG-Rut	BG-Rut	Synchronized		Non Clear
State Cha	Sun Jun 2	BG-IP	BG-IP	Synchronized		Non Clear

Control Centres

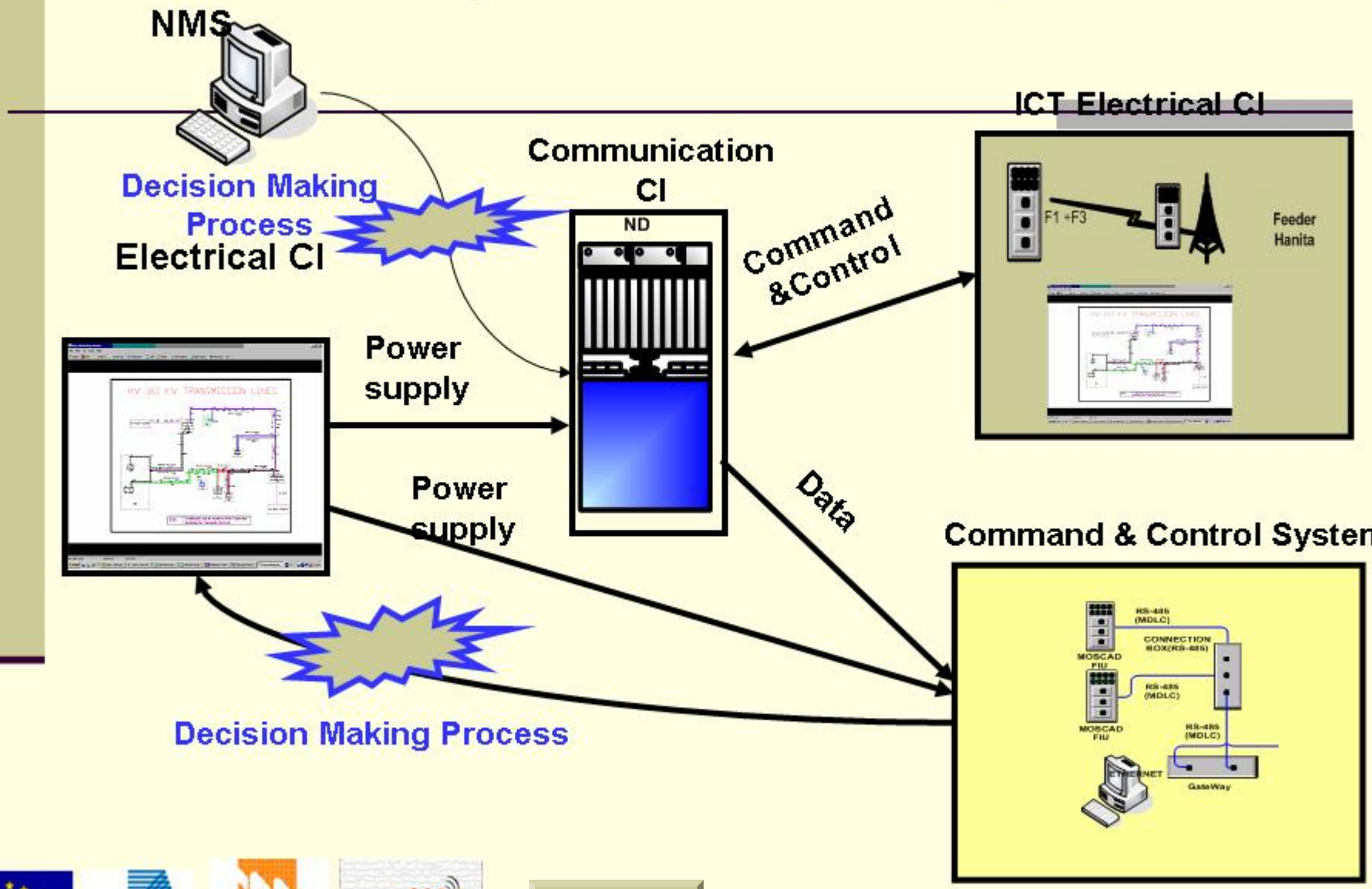




Simulation Test Bench



Expectations Example



Comparison of outage duration (tn) in case of communication failure to RTUs

STEP	Unsupplied KVA	Duration [min]		MICIE Tool	
		Communication O.K.	Communication failure	Unsupplied KVA	Duration
0	39000	5	90	39000	5
1	36800	1	20	36800	1
2	19300	1	30	19300	1
3	15700	1	10	Not counted	1
4	13700	1	10	17300	1
5	13200	1	5	16800	1
6	Not counted - less than 1 minutes				
7	6400	148	148	10000	148
8	1300	176	176	4900	176
t_n		37.7	163.1	3600	67.4

$t_n = \sum(KVA*Duration)/Installed\ KVA = 1469700/39000 = 37.7$ minutes

Expectations

Applications

- Protect Energy and Communication CIs
- Decrease uncertainty while operating the CI
- Reduce time of service restoration
- Support on-line decision making to predict cascade failure
- SLA improvement based on analysis of highly risk potential outages of the CIs

Where Could be Used

- Energy Supply Control Centers
- Municipalities Control Centers
- “Drill down” Events
- Operation Risk Study Analyses

Main Problems

- Data Security
- Data Availability
- Data Operability
- Model Detailing Level
- Scenarios Preparation

Thank You