

A Framework for Risk Analysis in Smart Grid Perspective Based Approach

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Introduction

- From traditional grid to a smart grid
 - significant new risk to the energy sector .
- Risk analysis is essential
 - harms, threats and vulnerabilities.
- Challenging to choose a risk analysis methodology.
- Devised a framework specifically for the Smart Grid and Smart Metering System
 - Perspective Based Approach

Smart Grid

- Efficient Energy Management
 - Accurately measuring the power usage.
 - Reduction of peak demand.
 - Lower production cost.
 - Lower carbon emissions.

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Smart Meter

- Identified as a primary requirement in a smart grid.
- Smart meter roll out in many countries – some mandated.
- During and after roll-out many schemes have been subjected to considerable criticism.
 - Health
 - Security
 - Privacy

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Reverse Triad – A I C

- **Availability of electricity & information**
 - Disruption in communication and energy flow.
- **Integrity of data**
 - Unauthorized modification / insertion of the data.
- **Confidentially of data**
 - Customer information & detailed information of electricity usage .

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Issues

- **Protests and demonstrations against smart metering systems.**
- **Reasons for their protests**
 - Health hazards.
 - Privacy breaches.
- **Misleading information**
 - Smart Meter a 'spy' from 1 min interval reading.
 - Erroneous information sources - large social impacts.

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Preparation for the risk analysis framework

- **Chaos in Risk Terms**
 - ISO 27005
 - SP 800-30 by NIST
 - Working Group (WG)
 - Society of Risk Analysis (SRA)
- **Definition used consistently without confusion**
 - DPIA Template in 2012 - Working Party highlighted it often confused risk and threat.

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Identifying and Defining Risk Elements

- **Stakeholder**
- **Asset**
- **Threat**
- **Vulnerability**
- **Harm**
- **Controls**
- **Risk**

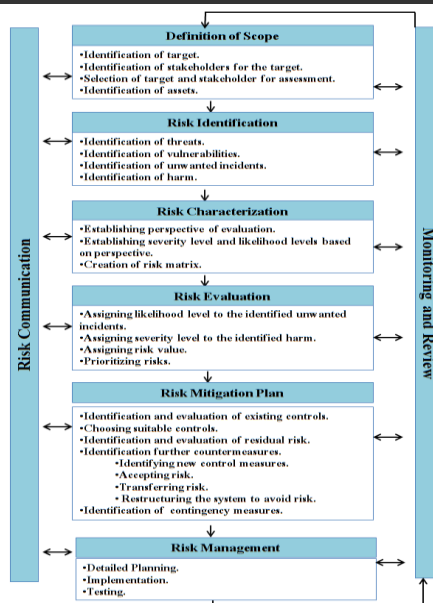
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Terminologies used for Risk Elements

| Risk Elements | Different Terminologies Used |
|---------------|---|
| Stakeholder | User, Party |
| Asset | Resource, Property |
| Threat | Hazard |
| Vulnerability | Weakness, Susceptibility |
| Harm | Impact, Consequence, Damage, Effects of Unwanted Incident |
| Control | Safeguard, Treatment , Countermeasure |
| Risk | Probability, Chance |

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Proposed Framework



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Definition of Scope

- Identify target of evaluations .
- Involvement with one or many stakeholders.
- Choose the target for assessment.
- Identify the assets involved.

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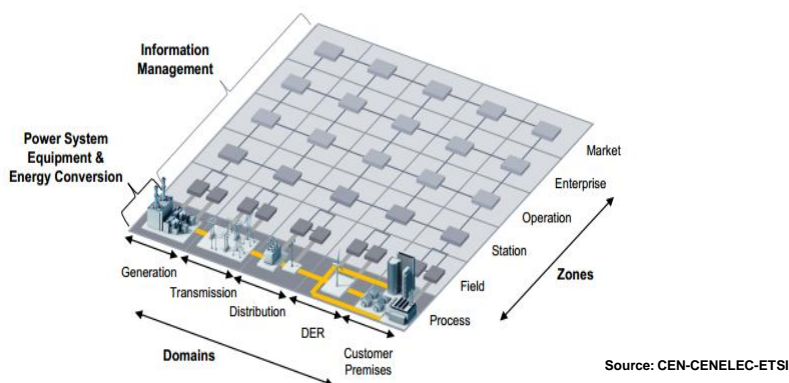
Models for Smart Grids

- Smart Grid Conceptual Model (SGCM)
 - established by the National Institute of Standards and Technology (NIST)
- Smart Grid Architecture Model (SGAM)
 - established by the Working Group Reference Architecture (SG-CG/RA)

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Smart Grid plane

- More comprehensive coverage of parties
- Cells assists the analyst in identifying the relevant scenarios



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Choice of Target

- Each Domain/Zone cell
 - e.g. in the Customer Premises/Process cell the target will be a smart meter.
- Zone to Zone
 - e.g. zones Process and Field we can target the data transmitted from the smart meter to the concentrators/collectors and vice versa.
- Domain to Domain

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SGAM can be used for

- Coordinate work between different stakeholders
- Map use cases
- Develop interface specifications
- Map portfolio
- Map customers and competitors
- Identify new applications, services
- Analyse installed architectures and migration scenarios

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Limitation of SGAM model

- Lacks to identify third parties
 - digital certificate suppliers/revocation services, financial services, manufacturers & system integrators.
- But these limitation can be easily rectified.

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Risk Characterization

- **Vital step .**
- **Perspective of analysis.**
 - e.g. an unauthorized party gaining read-only access to the meter data may occur as a minor risk to a utility provider but from the perspective of the consumer it is still a major risk.
- **Severity levels and likelihood levels vary.**

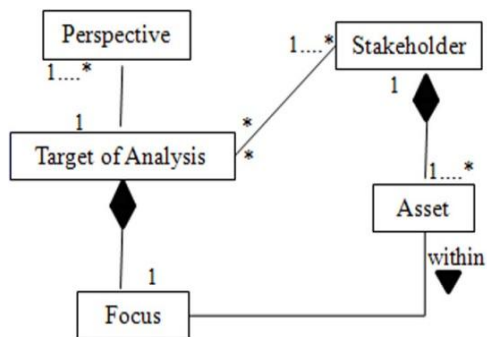
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Rest of the steps

- **Evaluation**
 - Likelihood level , severity level, Prioritizing risk
- **Mitigation**
 - Control evaluation and identification
- **Management**
 - Detailed Planning ,Implementation ,Testing
- **Communication**
 - Stakeholder involvement and education, mass media communication
- **Monitoring and Review**

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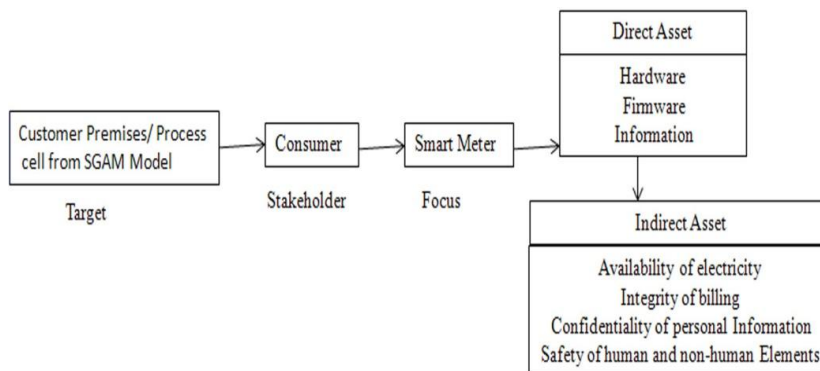
Defining Scope for Analysis



Using CORAS – style layouts

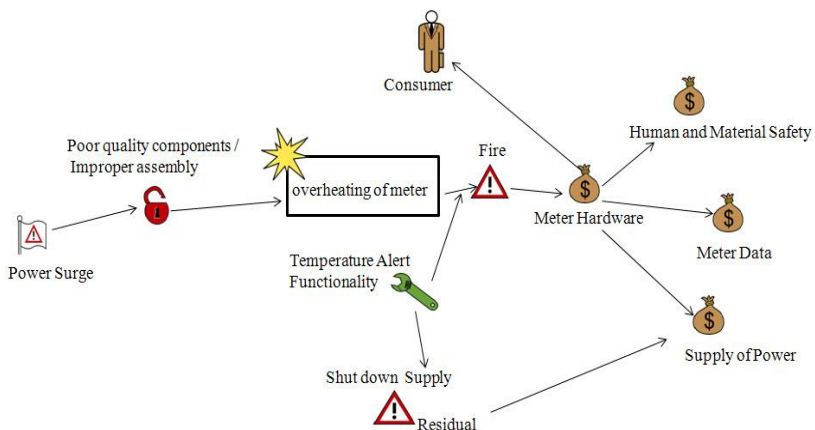
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Choosing Focus of Analysis



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Scenario Analysis



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Limitation

- Lacks empirical testing
 - needs to have industrial tie up to test and validate results.

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Future Work

- Use this framework to analyse risk from a consumer perspective
 - Consumer concerns
 - Consumer responses
 - Identify consumer requirements

Thank You !



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