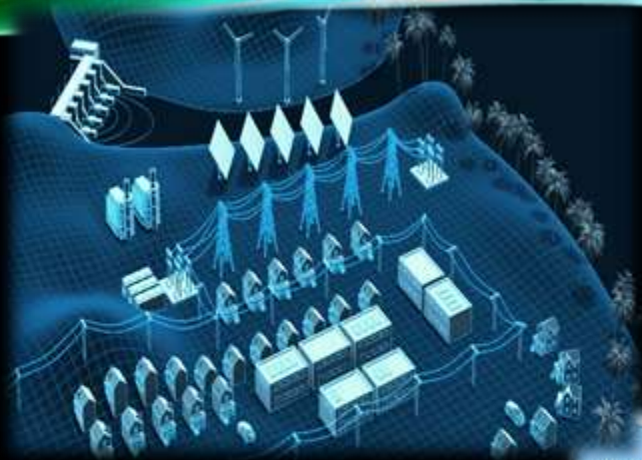


SYSTEMS ENGRAINING, IEC STANDARDISATION OF SUPPLY & DEMAND MANAGEMENT

Dr. Mohammad Haribat

GOAL SESSION

Show multidisciplinary and systems engineering nature of standardisation of Smart Grids in general and Supply and Demand Management in particular.

TABLE OF CONTENT

SYSTEMS ENGINEERING APPROACH FOR SYSTEMS

SYSTEMS THINKING & SYSTEMS ENGINEERING

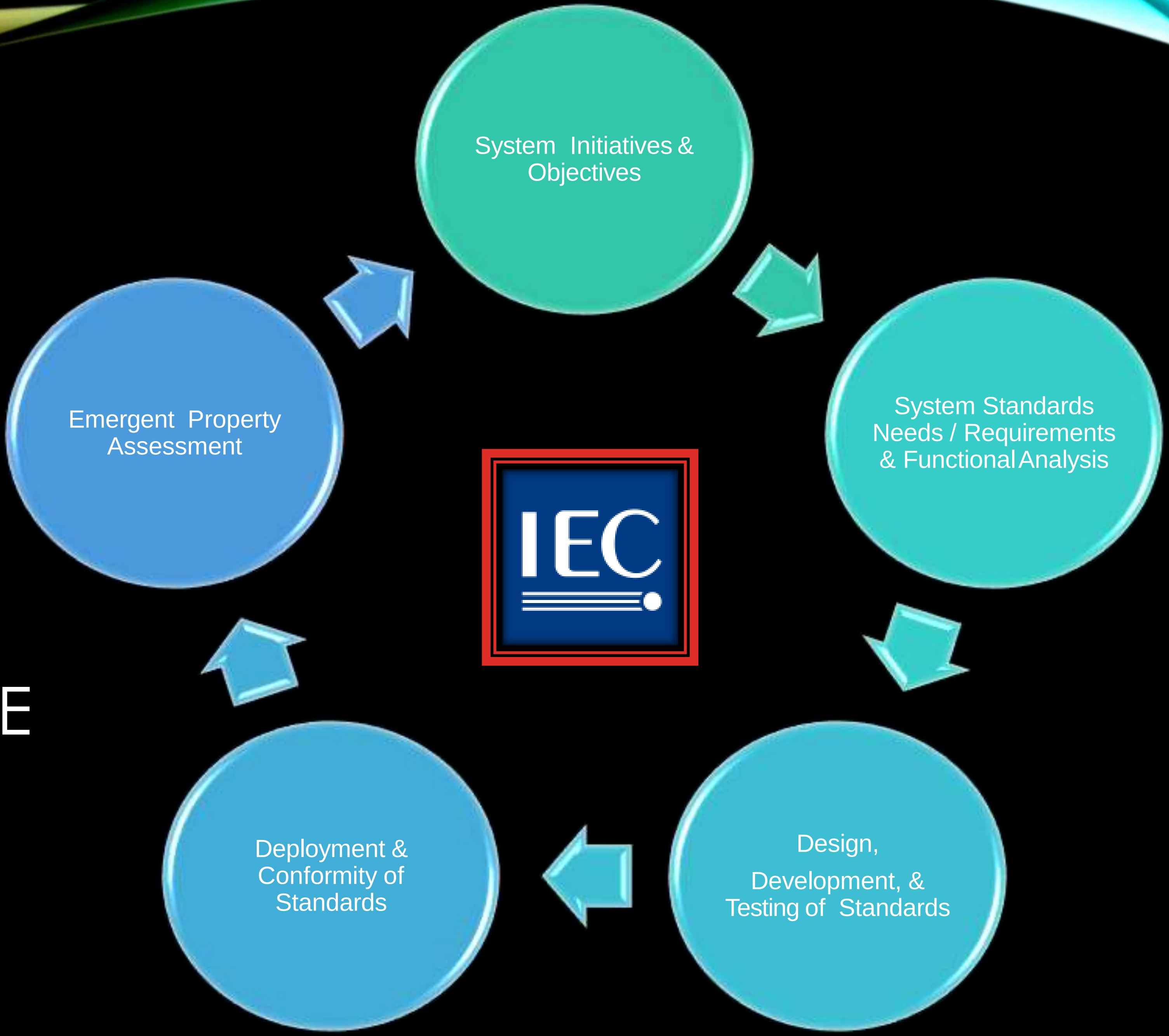
"Systems engineering is an interdisciplinary approach and means to enable the realization of successful systems" **INCOSE Systems Engineering Handbook**

❖ Systems Engineering is all about creating and sustaining successful, purposeful systems

- Need for Systems Thinking
- Need for Strategic System Engineering approach
- Need for capturing actual System Emergent Properties
- Need for Transparency and Collaboration across the verticals
- Need for common Model Based Systems Engineering Tool(s) to provide necessary holistic view of system

SYSTEMS AND STANDARDS LIFE CYCLE

SYSTEMS AND STANDARDS LIFE CYCLE



POWER SYSTEM AND ITS CHALLENGES

DRIVERS FOR CHANGE

- Combat climate change
- Support growing populations
- Support electrification of energy use
- Improve cost efficiency
- Enhance security of supply

Causes for decision makers, engineers and researchers to rethink the power system

INTEGRATION OF NEW 'GRID USERS'

- Intermittent energy sources
- Distributed generation
- New electrical loads
- 'Smarter' grid users

CONCEPT OF NEW FLEXIBILITY SOURCES

Main requirements

- Balance supply and demand
- Economic use of grid capacity

Solution direction

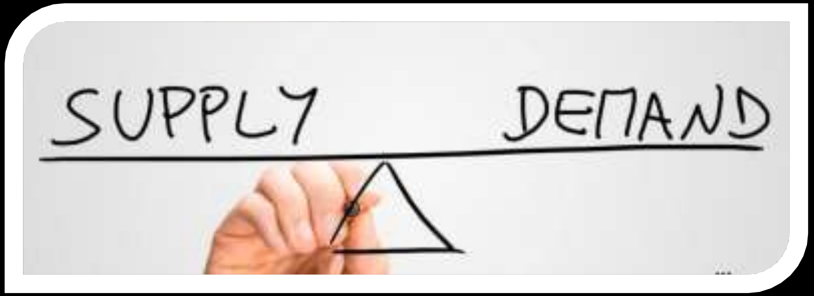
- Use of alternative sources of 'flexibility'
- Scale management of flexible energy resources to more endpoints

SUPPLY AND DEMAND MANAGEMENT

SUPPLY AND DEMAND MANAGEMENT (SDM)

Integration of these new ‘users of the power system’ into:

- Power markets
- Scheme’s for balancing
- Scheme’s for protection



ENORMOUS SOLUTION SPACE

- Standardisation is seeking unanimity
- It starts with unanimity on what to standardise

For every ‘quadrant’, there are already more than one solutions … what to standardise?

STANDARDISATION CHALLENGE

STANDARDISATION CHALLENGE

- Embrace a multidisciplinary approach
- Cater for market and org. structure variations
- Standardise (quickly), but design for change

EMBRACE MULTIDISCIPLINARY

- Root challenges are electro-technical in nature
- Requires input also from other disciplines such as ‘Business’ and ‘ICT’
- SDM standardisation must cover:
  - Analysis and design from all viewpoints
  - Clear definition of their interrelationships to bridge the different ‘languages’

STANDARDISE, BUT DESIGN FOR CHANGE

- Need for SDM solutions is there, but area is not yet mature
- However, waiting for the best solutions to emerge simply does not suffice
- So start standardisation quickly but don’t hamper future innovations

STANDARDISE, BUT DESIGN FOR CHANGE

- Tight-coupling is an important anti-pattern
- Barrier for improvements in the field
- Even if internationally Standardised, because of the capital destruction required to change

Examples

- Tight-coupling between communication (on the transport level) and SDM approach
- Integrating concepts specific to the SDM approach into energy resources

SDM STANDARDISATION @ IEC

STANDARDISATION EFFORTS @ IEC RELATED TO SDM

- SG 3 on Smart Grids
- SEG 2 on Smart Grids
- TC 8 Systems aspects for electrical energy supply
- TC 57 Power systems management and associated information exchange
- PC 118 Smart grid user interface

LIST NIST FRAMEWORK STANDARDS

	Smart Grid Functionality & Service	List of Standards
Smart Network Management	- Electromagnetic compatibility & power quality - Advanced network operation and control (e.g. faster fault identification and self-healing capabilities, advanced network automation, volt var/watt control) - Smart metering and power line communication	IEC 61000 series IEC 61968/61970/62325 (CIM) IEC 61850 series, IEC 60870 series IEC 62689 series IEC 62351 series IEC 60255 series
Smart Integration of Distributed Generation and e-mobility	- Integration of distributed generation - Integration of electric vehicles - Integration of new usages such as storage, heating & cooling, etc.	EN 50438 IEC 61850 series TS 50549-1 & 2 ISO/IEC 15118 IEC 62786 IEC 61851
Smart Markets and Active Customers	- Enable DSO to act as market facilitator and grid optimiser - Develop demand response and demand side management programmes - Aggregate distributed energy resources and e-mobility - Balance the power grid	IEC 61968/61970/62325 (CIM) IEC 62056 (DLM/COSEM) IEC 61850 series SEP 2.0, Open ADR, ...

CONCLUSIONS

- Smart grid in general and SDM in particular is a very interesting field with potentially enormous impact
- But it is a complex and immature field requiring
  - Multidisciplinary teams
  - Capable of systems thinking