CIGRE e-Session 2020

Key Take-away day

C1: Power System Development & Economics

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C1: Power System Development & Economics

Overview

- Scope
- Structure
- Working groups
- Tutorial
- Preferential subjects

C1: Power System Development & Economics

Scope

- The scope of SC C1 is:
  - ✓ to study **economic and system analysis methods** important for the development of power systems and
  - ✓ to assist utilities to find the best solutions in various **evolving, competitive and unbundled conditions**

in the context of the **overall energy supply system** and with **social and environmental considerations.**

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Structure

- Advisory groups:
  - ✓ **System Development**
  - ✓ **Asset management**
  - ✓ **Business Management**
  - ✓ **Horizontal & Vertical Integration Issues**
- Tutorials
- 10 active Working Groups
- Green book: Asset Management Methods

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Active working groups

- C1.22 Investment decisions in a changing and uncertain environment
- C1.23 Transmission Investment Decision Points and Trees
- C1/C3.31 Including stakeholders in the investment planning process
- C1.33 Interface & Allocation Issues in multi-party and/or cross-jurisdiction power infrastructure projects
- C1.34 ISO Series 55000 Standards: General Process Assessment Steps and Information Requirements for Utilities
- C1.35 Global Electricity Network Feasibility Study

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Active working groups

- C1/C4.36 Review of Large City & Metropolitan Area power system development trends taking into account new generation, grid and information technologies
- C1.38 Valuation as a comprehensive approach to asset management in view of emerging developments
- C1.39 Optimal Power System Planning Under Growing Uncertainty
- C1.40 Planning Coordination between System Operators, Transmitters and Distributors: Frameworks, Methods, and Allocation of Costs and Benefits

Preferential subjects

E-session 2020

- PS1 – Power System Resilience Planning
  - ✓ **Evaluating, improving and measuring power system resilience,**
  - ✓ **given increasing threats from human & natural hazards, incl. climate change,**
  - ✓ **specifically in system planning, economic assessment and asset management.**
- PS2 – Energy Sector Synergies for Decarbonising Efficiently
  - ✓ **Planning approaches for energy sector synergies across power, gas, transport, heating/cooling & new energy carriers,**
  - ✓ **in order to optimise overall decarbonisation efficiency.**
  - ✓ **How do they include aspects of energy conversion and storage, technical and economic sector interfaces?**
- PS3 – Distributed Energy Resources in Transmission Planning
  - ✓ **Tools & techniques in system planning & investment decisions to evaluate renewables and storage at all voltage levels,**
  - ✓ **as well as growing customer flexibility,**
  - ✓ **especially in holistic approaches that combine technical assessment and reliability impacts on customers.**

Papers 2020

	Whole system approach										
	Vertical Coordination	Sector Coupling	RES	HVDC & FACTS	Storage	P2X	EVs	Extreme weather	Heat networks	Flexibility	Inter-connection
Traditional power system planning • Power quality • Frequency stability • Reliability											
Modelling - Verification - Uncertainty											
Types of analysis - Probabilistic - Indicators - Expert judgement - Optimisation - CBA											
Scenarios											
Decision making											
Digitalisation - Data exchange - Visualisation - Software tools - HIL testing											

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Tutorial at E-session 2020

- SC C1 tutorial: **Optimal power system planning and investment decisions under growing uncertainty**".
- This tutorial gives a brief report on the work of WG C1.39 (Optimal power system planning under growing uncertainty) and WG C1/C6.37 (Optimal transmission and distribution investment decisions under increasing energy scenario uncertainty), with C1.39 focusing on the bulk system and C1/C6.37 on distribution in interaction with transmission planning. The objective of this tutorial is to present the uncertain factors existing in power systems around the world and how they are best considered in system planning and investment decisions. Both WGs build on significant prior work in CIGRE SC C1 and elsewhere and attempt to describe the evolving best practices.
- The growing uncertainty will fundamentally change the way that the power system balances generation and load, and further challenge power system planning and investment decisions. Making investment decisions under growing uncertainty requires a comprehensive understanding of mechanisms, methodologies, experiences as well as policy and technical barriers for implementing investment decisions under growing uncertainty. This tutorial introduces a wide range of understandings and experiences on power system planning under growing uncertainty from different countries. Best practice and lessons learned from power systems around the world are summarized.

Proposed new working groups

2020

- Hydrogen, Green Molecules & Power-to-Gas: potential perspectives and barriers
- Smart Sector Integration: potentials & perspectives for flexibility solutions at transmission system level
- Offshore grids: system planning guidelines and compatibility with future system expansion
- Interconnections and sector integration projects: consistent long-term scenarios and metrics for benefits assessment
- Power system resilience planning for decarbonizing energy sector, including response strategies to unexpected risks during the energy transition, impact of TOTEX, new standards
- Developing an enabling framework for novel flexibility options, benchmarking and optimising them across supply and demand sectors

Preferential subjects

Paris session 2022

PS1: System transition resilience & asset management response

- Resilience metrics & measures to safeguard stakeholder value through grid-forming converter control, smart load shedding, fast restoration
- Response to unexpected emerging system risks during the energy transition, risk to business values
- New standards (equipment & system) for resilient and life-cycle sustainable system

PS2: Energy sector integration and tackling the complexity of multi-faceted network projects

- Energy sector integration, hydrogen & power-gas, deep electrification: technical & economic aspects
- Multi-purpose, multi-terminal, multi-actor, multi-jurisdiction grid projects: how to tackle their planning complexity
- Including the flexibility options from non-network assets and non-electric solutions in the planning process (e.g. storage, VPP, DR, Energy communities, behind-the-meter resources)

PS3: Planning under uncertainty and with changing external constraints

- Modelling the impact of environmental conditions, technical advancements, greater stakeholder involvement, generation fleet shift, new type of contingencies
- Data driven network planning methods for long-term load forecasting, including impact of COVID pandemic on load profiles, planning scenarios, investment patterns and assets maintenance schemes
- Decision making under pervasive energy policies: optimising economic vs environmental benefits for consumers and matching centralized energy targets with private driven investments
- Leveraging the evolving system services, market products and load profiles to optimize investment and timing, avoiding stranded assets (also from fossil plants dismissed)

System development & Asset management

Horizontal / Vertical Integration

System Planning & Business Investments