

CIGRE D2

Data Science and next Generation Communications in Electricity Networks

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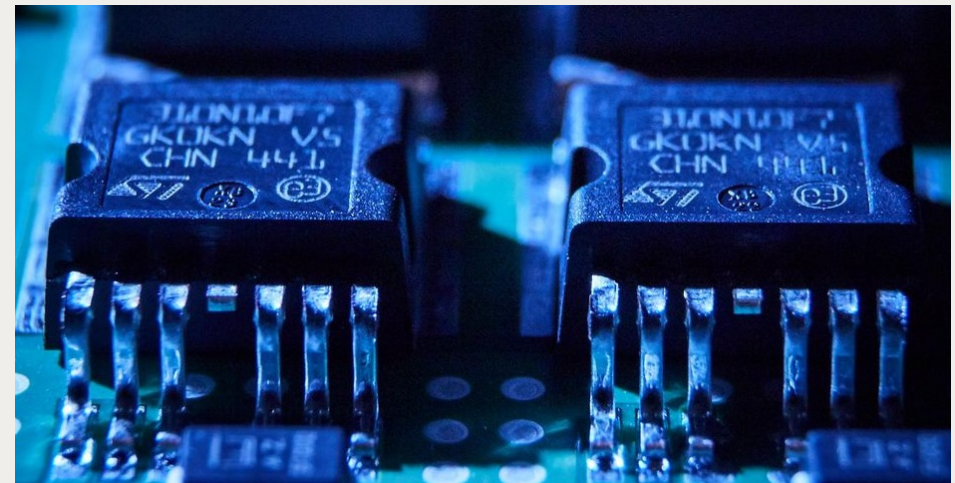


cigre

For power system expertise

Overview

- CIGRE D2 committee
 - Scope and ambition
 - Structure
 - Topics
 - Working Groups
 - Output
- Industry Context
 - Net-zero
 - Future Energy Scenarios
 - How digital technology is saving the planet



CIGRE D2 – Scope and Ambition

- Primary Focus
 - Information Systems and Telecommunications for Power Systems
- Applications of ICT in the areas of
 - System Operation
 - Protection and Control
 - Cyber Security
 - Asset Management and Maintenance
 - Other key business processes (business continuity, disaster recovery, data exchange with stakeholders, etc.)



CIGRE D2 - Structure

- 3 Strategic Advisory Groups (SAGs)
 - Core business
 - Cyber security
 - Telecommunications
- 24 regular members
- 12 Observer members



CIGRE D2 - Topics

IIoT

Big Data

Blockchain applications

Market Platforms

Predictive AM

SDN

Cloud Computing

5G

DER & Microgrids

AI/ML

MPLS-TP /
MPLS-IP /
SDWAN

Centralisation /
Virtualisation

Data
Diodes

CIM

Digital
Twins

Digital
Sub

CSOC

PTP over
WAN

AR

CIGRE D2 – Working Groups (I)



WG	WG Title
WG D2.57	CIM (Common Information Model) Methodology
WG D2.56	Interdependence and Security of Cyber-Physical Power System
WG D2.55	Application of 5G Technology to Smart Grids
WG D2.54	Regulatory approaches to enhance EPU's cybersecurity frameworks
WG D2.53	Technology and Applications of Internet of Things in Power Systems
WG D2.52	Artificial Intelligence Application and Technology in Power Industry
WG D2.51	Implementation of Security Operations Centres (SOC) in Electric Power Industry as Part of Situational Awareness System
WG D2.49	Augmented reality / Virtual reality to support Operation and Maintenance In Electric Power Utilities

CIGRE D2 – Working Groups (II)



WG	WG Title
JWG B2/D2.72	Condition monitoring and remote sensing of overhead lines
JWG D2/C2.48	Enhanced information and data exchange to enable future transmission and distribution interoperability
JWG D2/C6.47	Advanced consumer side energy resource management systems
JWG B5/D2.67	Time in Communication Networks, Protection and Control Applications – Time Sources and Distribution Methods
WG D2.45	Impact of governance regulations and constraints EPU sensitive data distribution and location of data storage
WG D2.44	Usage of public or private wireless communication infrastructures for monitoring and maintenance of grid assets and facilities
JWG A2/D2.65	Transformer Digital Twin – concept and future perspectives
JWG B3/D2.62	Life-long Supervision and Management of Substations by use of Sensors, Mobile Devices, Information and Communication Technologies

CIGRE D2 – Outputs (I)

- Conference papers
- Journal articles
- Technical Brochures
- Tutorials
- Other publications
 - TB 892: Data Management
 - TB 884: Time in Communications networks, Protection and Control applications
 - TB 866: Enabling Software Defined Networking for electric power utilities
 - TB 840: Cyber Security for Contingency Operations
 - TB 796: Cyber security – future threats
 - TB 746 Design, Deployment and Maintenance of Optical Cables associated to Overhead HV Transmission Lines.



CIGRE D2 – Outputs (II)

- TB 782: Utilisation of data from smart meter systems
- TB 762: Remote Service Security Requirement Objectives
- Green book: Utility Communication Networks and Services
- Green book: Electricity Supply Systems of the Future
- Tutorial: Artificial Intelligence Application and Technology
- Workshop: Standardization of cybersecurity in power utility digital infrastructure – a joint vision from IEC, IEEE and CIGRE
- Tutorial: Cyber Security Management – a key player in the EPU resilience strategy



Industry Context – Net Zero 2050

- Net Zero target by 2050 – well established in law
- Zero-carbon operation by 2025
- Run on clean energy permanently by 2035
- Trajectory defined in Future Energy Scenarios (FES).
- 4 Scenarios are considered (note – 2023 issue planned for 10/07/2023)
 - Falling short
 - Leading the Way
 - Consumer Transformation
 - System Transformation



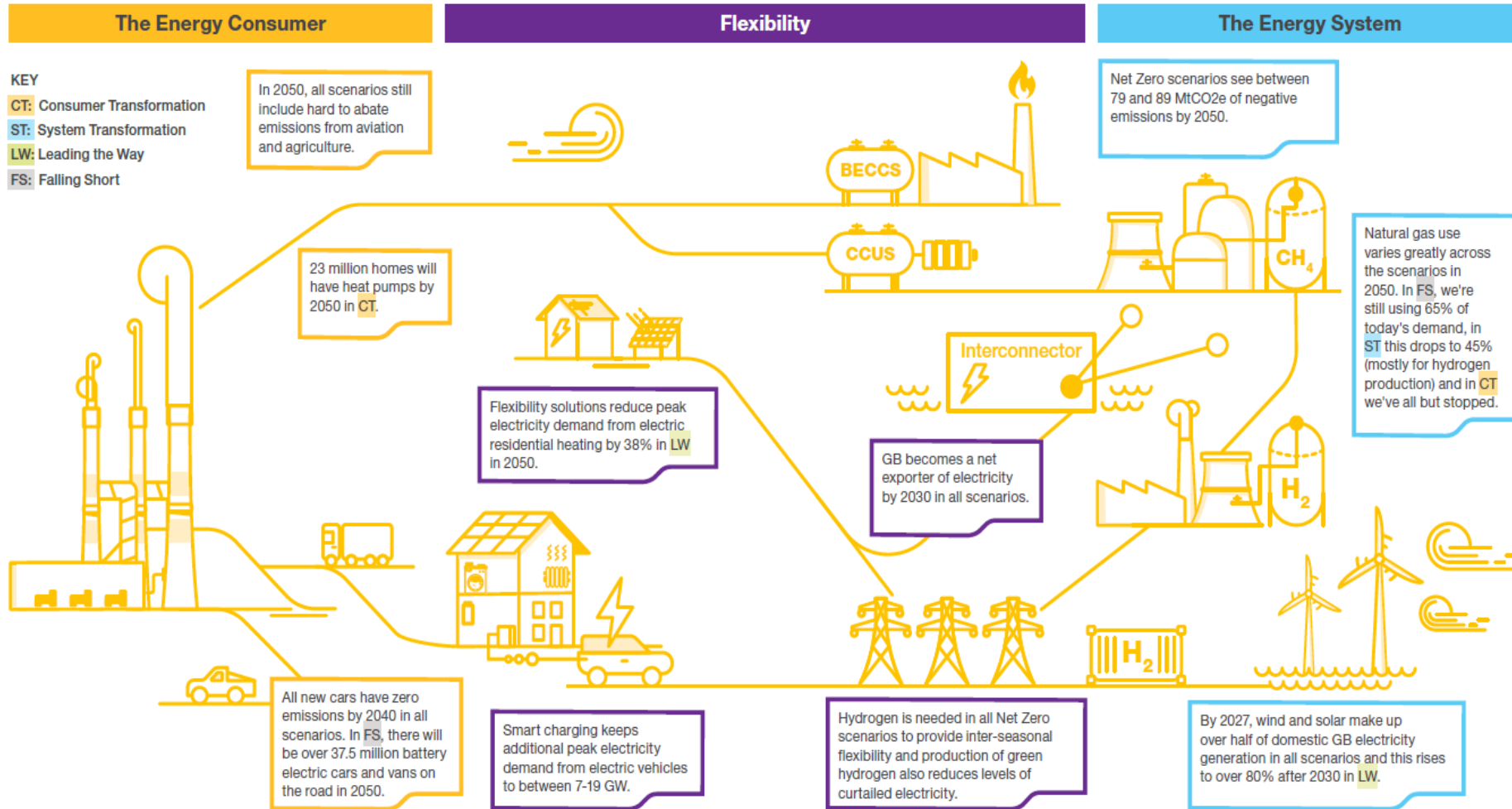
Industry Context – Net Zero 2050

- FES recommendations for a reliable, affordable and fair energy system:
 - Demand side strategy, flexibility, hydrogen storage
 - Energy efficiency
 - Regional strategies
 - Digitalisation and innovation
 - Consumer information
 - More flexible (gen) capacity
 - Location specific signals / market drivers (connections, consumption, etc.)
 - Boost market participation from industry, commercial sector, aggregated residential demand etc.
 - Whole system approach across electricity and hydrogen sectors
 - Inter-seasonal hydrogen and electricity storage
 - Competition in delivery -> optimised for local requirements



Industry Context – Net Zero 2050

- From the FES 2022 in 5 (see ESO website): <https://www.nationalgrideso.com/future-energy/future-energy-scenarios>



How Digitalisation supports Net-Zero – System examples

- Situational awareness, planning
 - Operation
 - Market platforms
 - Monitoring
 - Modelling
 - Optimisation
 - Flexibility, Inertia, FL
 - Whole system
- Underpinned by
- Industry specific telecommunications services
 - Data collection, aggregation, analysis and processing
 - Cyber security
 - New algorithms
 - AI & Automation
 - Data sharing, standardisation – CIM/BIM
 - System modelling tools / digital twins
 - IP management
 - WAMPAC



How Digitalisation supports Net-Zero – Transmission examples



- Situational awareness, planning
- Market platforms
- Monitoring
- Modelling
- Optimisation
- Whole system
- System access
- Asset management



Underpinned by

- Industry specific telecommunications services
- Data collection, aggregation, analysis and processing
- New algorithms
- AI
- Data sharing, standardisation – CIM/BIM
- System modelling tools / digital twins
- IP management
- Digital assets / centralisation / virtualisation
- Automation
- Asset health modelling
- Cyber security - Secure remote access
- VR/AR
- DLR - WAMPAC



How Digitalisation supports Net-Zero – Distribution examples



- Situational awareness, planning
 - Market platforms
 - Monitoring
 - Modelling
 - Optimisation
 - Whole system
 - System access
 - Asset management
- Underpinned by
- Industry specific telecommunications services
 - Data collection, aggregation, analysis and processing
 - New algorithms
 - AI
 - Data sharing, standardisation – CIM/BIM
 - System modelling tools / digital twins
 - IP management
 - Digital assets / centralisation / virtualisation
 - Automation
 - Asset health modelling
 - Cyber security - Secure remote access
 - VR/AR
 - WAMPAC
 - Dynamic ratings, configurations and settings
 - DSO functions



Success factors



Note: Images in this presentation are owned by NGET, NG ESO, or CIGRE respectively.