CIGRE C0 event

26 February 2021

Irina Melnik, Paul Giesbertz, Cees Plet, Danny Klaar

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Agenda

1. Introduction
   - Tour de table
   - What is CIGRE and “C0”? (Wessel Bakker)
   - Update deliverables “C0” in 2020
2. CIGRE Paris Centennial session 20-25 August 2021
   - Special reports 2020 session
   - Prepared contributions NL
   - Contributions NGN CIGRE (Massimiliano Longhin)
3. CIGRE Paris Conference 21-26 August 2022
   - Preferential subjects
   - Call for possible NL papers & deadlines
4. Possibilities for new WG members
5. Possible topics for next “C0” events
6. Wrap up and closure

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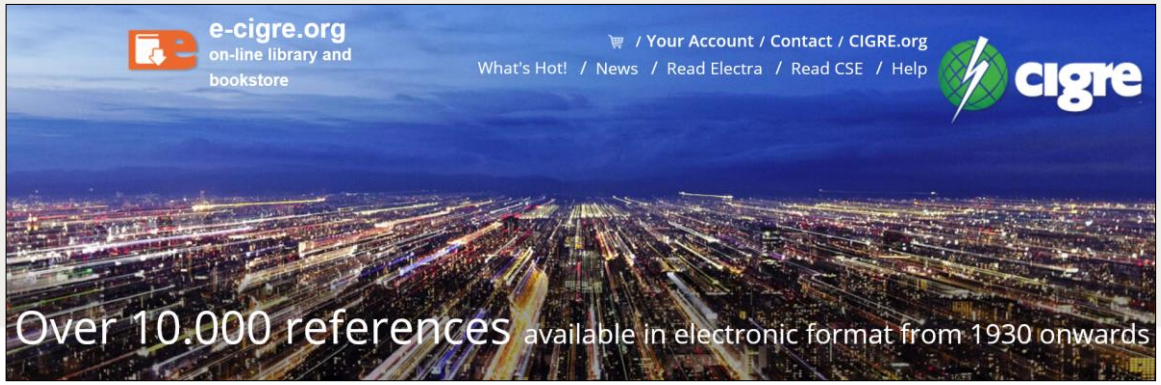
Tour de table

We have participants in this meeting from:

- Energy market parties
- Technical universities
- Industrial manufacturers
- Ministry of Economic Affairs and Climate Policy
- Agency for the cooperation of Energy Regulators
- Consultancies
- DSOs
- TSO

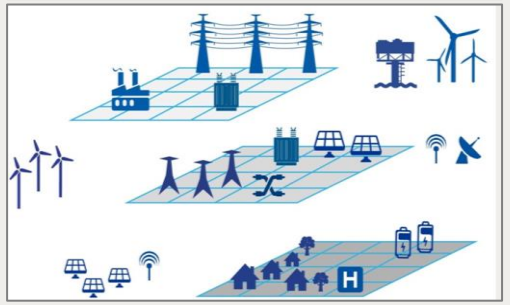
CIGRE

- 3500 experts world wide, 250 in the Netherlands
- Structured across knowledge domains
  - 16 Study Committees
  - 250 Working Groups
- Objectives:
  - Design of electrical infrastructure of the future
  - Optimization (use) of existing electrical infrastructure
  - respecting environmental and surroundings
  - facilitating knowledge sharing
- Highlight CIGRE Conference each 2 year in Paris with a network of 3200 senior executives and experts
- Symposia, theme days & colloquia addressing specific topics
- 10000 publications (Technical Brochures, Papers, Green Books)



Domain knowledge in (National) Study Committees

A1	Rotating Electrical Machines
A2	Transformers
A3	High Voltage Equipment
B1	Insulated Cables
B2	Overhead lines
B3	Substations
B4	HVDC and Power Electronic
B5	Protection and Automation
C1	**System Development and Economics**
C2	**System Operation and Control**
C3	System Environmental Performance
C4	System Technical Performance
C5	**Electricity Markets and Regulation**
C6	**Distribution Systems and Dispersed Generation**
D1	Materials and Emerging Test Techniques
D2	Information Systems and Telecommunications

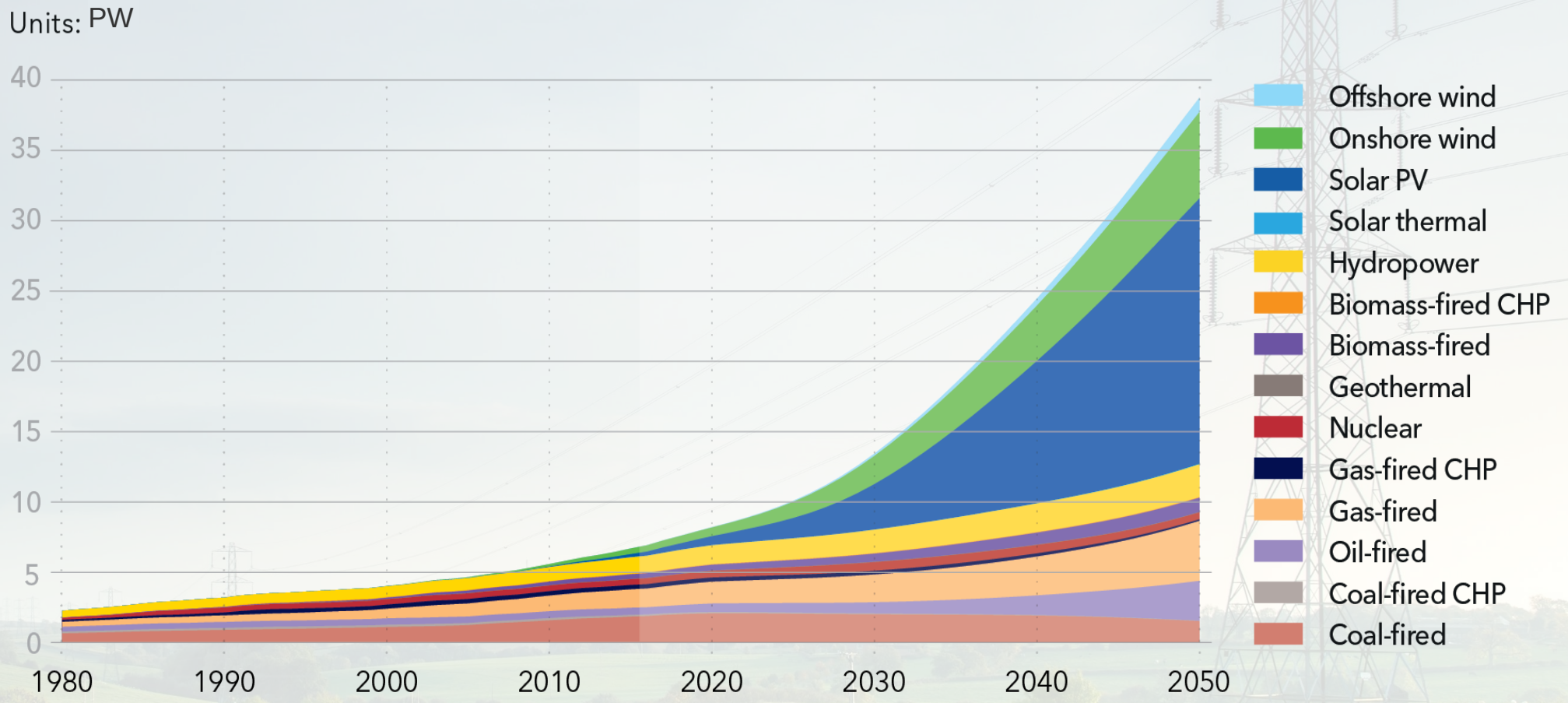


“C0” = C1+C2+C5+C6

Power electricity systems: what is the challenge?

The largest man made machine on earth

MORE THAN 5x NEW INSTALLED CAPACITY



Bron: DNV GL

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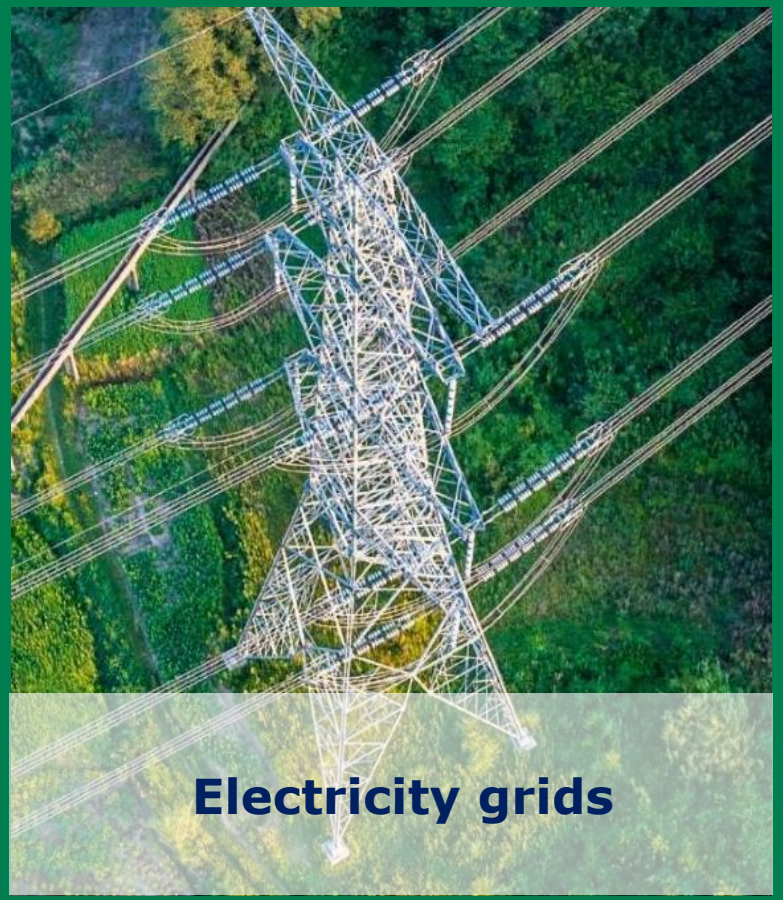
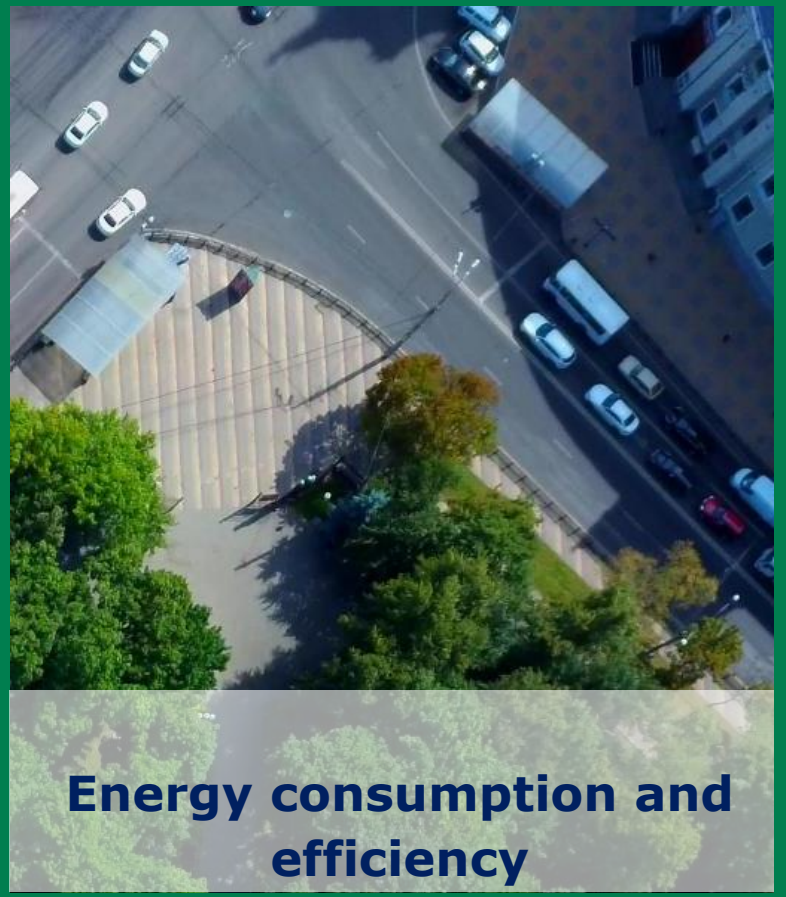
Energy transition on three areas

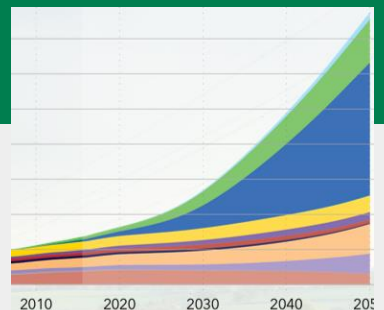
Sustainable energy



Electricity grids



Energy consumption and efficiency



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Power system of the Future

- System of Systems
- Sector Coupling (P2G)
- Flexibility, curtailment, congestion mgt
- Digitization
- Offshore Grids
- Data driven Asset Management
- Dynamic Rating
- Gamification

Grid Accelerator

- Standardization, modularization, mobilization
- Staffing
- Education, upcoming talent talent
- Public acceptance
- Soft skills, connect, IMPACT
- Consents & Policies
- BIM/CIM

- Digital Twin NL Transmissie net

- Power Electronics
- Markers & sensors
- Adequacy & flexibility

- Best practices
- Ownership of Quality
- Certification / Verification

Blackout prevention

- Root Causes of Power Failures
- Cyber security and data privacy
- Low Inertia
- Grid Resilience

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Update deliverables“C0” in 2020

C1:

- TB 820 - Optimal power system planning under growing uncertainty
- TB 791 - Valuation as a comprehensive approach to asset management in view of emerging developments

C2:

- TB 821 - Capabilities and requirements definition for Power Electronics based technology for secure and efficient system operation and control

C5:

- TB 803 - Exploring the market value of Smart Grids and interactions with wholesale (TSO) and distribution (DSO) markets
- TB 808 - Short-term flexibility in power systems: drivers and solutions
- TB 824 - The role of blockchain technologies in power markets

C6:

- TB 793 - Medium voltage direct current (MVDC) grid feasibility study

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CIGRE Paris Centennial session 20-25 August 2021

- Special reports 2020 session:
  It was not intended to have special reports being created, so they are not available.
  Due to covid-19 the 2020 session was built upon prepared video paper presentations followed up by questions raised by the special reporters and answered by the presenters.
  On 24 September 2020 a Key Take Away's event about the 2020 session was held.
  See: https://www.cigre.nl/cigre-key-take-away-event-24-september/

- Prepared contributions NL
  The CIGRE Technical Council is busy figuring out the setup for this CIGRE Centennial session. It could possibly going to be a hybrid physical/online session. Preferential subjects are the same as 2020 and papers of 2020 could be updated by the authors. A Large Disturbance Workshop will be organized.

- Contributions NGN CIGRE

Preferential subjects 2020 - SC C1

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.

Preferential subjects 2020 - SC C2

PS1 - Capabilities Required for Future System Operation

• Operator Training • Decision support tools including new methodologies • Wide area monitoring and control

PS2 - System Operation Interfaces: Improving Observability and Controllability

• TSO-TSO interface/cooperation/data exchange • TSO-DSO interaction/cooperation/data exchange

PS3 - System Operation Challenges with Increasing Use of Distributed Energy Resources

• Enhancing flexibility and resilience • Providing grid services through aggregators • Aggregator interaction

Preferential subjects 2020 - SC C5

PS1 - The changing Nature of Markets and Ancillary Requirements

> Market adaptations to handle the value shift between energy and services > Markets and services to address inertia and resilience > Role of markets with respect to aggregation and the provision of network services > Pricing approaches for emerging technologies and impacts of those approaches.

PS2 - Changing role of Regulators and Standards

> Role of regulators in the changing markets > Evolving policy, standards, and guidelines to address issues affecting markets > Regulatory policies on transmission and distribution – too little or too much.

PS3 - Market Designs for Co-ordination of Generation and Network Investments

> Markets and regulations to promote coordinated investments > Customer-driven market changes – the transition from centralised to distributed planning > Impacts of the changing nature of customers on investments and markets. > The impact of peer-to-peer trading on the provision of market services.

Preferential subjects 2020 - SC C6

PS1 - Advanced Distribution System Design incorporating DER

• Configuring demand response and intelligent loads for customer empowerment. • Exploiting local energy storage possibilities and managing uncertainties. • Enabling multi-energy systems using intelligent inverters and controls.

PS2 - Enabling Technologies and Solutions for Distribution Systems

• Management and aggregation platforms for Distributed Energy Resources. • Individual microgrid, multiple microgrid, and virtual power plant design and control. • Rural electrification and off-grid distribution systems.

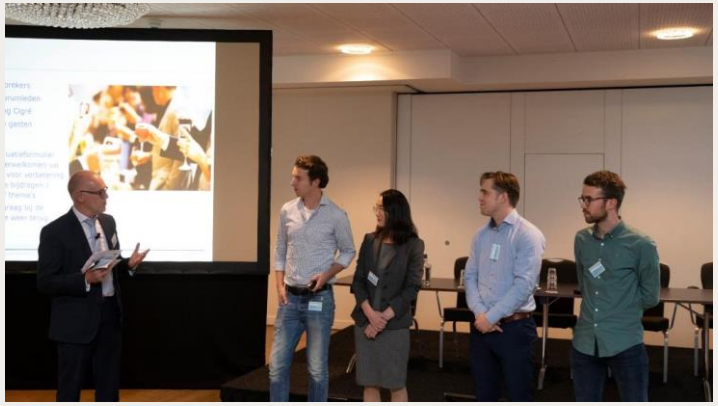
Next Generation Network (NGN) NL

also referred to as Young CIGRE, the Netherlands (YC-NL)

- **Established in the year 2014**
- **Mission:** NGN seeks to facilitate a successful transition into the power systems industry for early career professionals and students by providing technical resources and networking opportunities
- **9 board members**
- **162 active subscribers** – students and young professionals
- **NGN member advantages**:
  - Access to technical brochures and publications via the online library www.e-CIGRE.org
  - Matchmaking
  - Networking
  - Personal Development
  - Access to various events organized by NGN NL

NGN NL – Events

- YC team networking day (Dive into the wind)
- Yearly presentations at universities (TU/e – TU Delft)
- Symposiums (e.g. Kabeldag)
- YC matchmaking event (Annual event)
- Offshore Energy Hubs Webinar
- Participation in CIGRE Paris session – student support
- **NGN Showcase 2021**



NGN Showcase Events

- An event that takes place during CIGRE Paris Sessions
- Students/young professionals present their research in a 10-min time slot to an international CIGRE audience
- The presenters receive free access and support for the whole CIGRE Paris conference
- CIGRE NGN NL representatives (1 or 2 board members) accompany them for various CIGRE NGN events, discussions and forums
- In 2020, we had 2 candidates from the Netherlands representing CIGRE (NGN) NL in the event
- For 2021, CIGRE Netherlands and CIGRE NGN Netherlands have nominated **3 candidates**

NGN Showcase 2020 – NL Representatives

- B4: **Adeep Santosh** (TU Delft/Lovink Enertech)

Topic: Determination of the pre-qualification rules for the acceptance testing of MV DC cable systems

- D2: **Siva Kaviya** (TU Delft/PowerWeb Institute)

Topic: Design of Illuminator – Energy System Integration Development tool kit

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- During the CIGRE e-Session of 2020, Siva and Adeep have presented their interesting work in the NGN 2020 Showcase event

- Unfortunately, the Covid-19 situation did not allow for a physical Paris session, but hopefully that is different this year

NGN Showcase 2021 – NL Candidates

- C2: **Leonel Noris Martinez** (DNV-GL)

Topic: Black-Start Network Restoration using Wind Power

- C4: **Roozbeh Torkzadeh** (TU Eindhoven)

Topic: Model Validation for Propagation of Severe Voltage Dips in Future Networks

- C6: **Sangitha Harmsen** (TU Delft/Stedin)

Topic: Optimal medium-voltage distribution system expansion planning in an integrated energy system

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- The candidates will also be accompanied by two CIGRE NGN NL board members:
  - Aleksandar Boričić (TU Delft)
  - Sanjay Ganeshan (Lievense/WSP)
- We are now waiting for the final decision from the organizers (end of March 2021)
- If accepted, the candidates will represent CIGRE (NGN) NL in Paris with their excellent work/research

Join CIGRE NGN NL- Free membership!!

- Information about activities and news in CIGRE to your mailbox
- Various events during the year
- Access to e-CIGRE publications, opportunity for discount on conferences
- Participation in CIGRE Paris sessions – student support
- Support with introduction to Study Committees

Register and follow us at:

https://www.cigre.nl/mission-young-cigre/

Cigré NGN the Netherlands: @youngcigrenl

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CIGRE Paris Conference 21-26 August 2022

- Preferential subjects
- Call for possible NL papers & deadlines
- Possibilities for new WG members

Preferential subjects 2022 - SC C1

PS1 : System transition resilience & asset management response

- Resilience metrics and measures to safeguard stakeholder value through grid forming, power electronics control, smart load shedding, fast restoration.
- Response to unexpected emerging system and business risks during the energy transition.
- New standards (equipment design and system planning) 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-to-gas, deep electrification: technical and economic aspects.
- A Multi-purpose, multi-terminal, multi-actor, multi-jurisdiction grid projects: how to tackle their planning complexity.
- Including in the planning process the flexibility options from non-network-assets and non-electric solutions (storage, virtual power plants, DR, energy communities, behind-the-meter resources).

Preferential subjects 2022 - SC C1

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, use of data driven network methods for long-term load forecasting, including impact of COVID pandemic on load profiles, planning scenarios, investments 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 dismissal).

Preferential subjects 2022 - SC C2

PS1 : System control room preparedness: today and in the future

- Operator Training, Situational Awareness and Decision Supporting Tools.
- Effective and Efficient use of Synchrophasor Data in Power Systems Operation.
- Advanced and Intelligent Methods applied to power systems operation.

PS2 : Operational planning strategies, methodologies and supporting tools

- High share of grid-connected and distributed power electronic interfaced resources including hybrid AC-DC systems.
- Advanced and intelligent methods applied to power systems operational planning and day-ahead programming.
- Impact of low demand and other predictable extreme operating conditions.

Preferential subjects 2022 - SC C5

PS1 : The evolution of market design and regulation to integrate distributed energy resources

- Market design developments to facilitate the integration of new participants and renewable resources.
- The role of retail electricity markets in the promotion of behind the meter technologies.
- Innovative contracts/services between market participants and with customers/distributed energy resource owners.

PS2 : Changes to markets and regulation to enhance reliability and resilience

- The lessons for markets and regulation from major system disturbances and social disruptions.
- Market designs for reliability and resilience in systems with high penetration of asynchronous and low inertia connected facilities.
- Markets to coordinate resources that are not responsive to demand or price.

Preferential subjects 2022 - SC C5

PS3 : Working with innovation and disruption — preparing for the future

- Innovative approaches to markets and regulation to achieve energy policy targets and to include edge-of-grid activities.
- The design and structure of retail and wholesale electricity markets to support capital-intensive investments.
- Sector regulation and tariff design in the face of technological disruption, e.g. vehicle to grid, hydrogen and new forms of storage.

Preferential subjects 2022 - SC C6

PS1 : DER solutions and experiences for energy transition and decarbonisation

- Electric mobility charging systems configuration and operation.
- Demand response and intelligent load configuration for customer empowerment.
- Electrification of transportation, heat systems and industrial processes.

PS2 : Innovative planning and operation of active distribution systems

- Aggregation and management platforms for active distribution systems with DER.
- Strategies and tools for DER integration, hosting capacity, congestion management and system service provision by DER.
- Greening rural and green-field electrification, off-grid distribution and zero emission industrial systems.

Preferential subjects 2022 - SC C6

PS3 : Aggregated DER for enhancing resilience, reliability and energy security of distribution systems

- Configuration of local energy storage systems for managing uncertainties.
- Coordination of multi-energy systems supported by state-of-the-art technologies including intelligent inverter controls.
- Individual AC and DC micro-grids, multiple micro-grids, virtual power plant and local energy communities' control and network integration.

Call for possible NL papers & deadlines

- Delivery of synopses to the Dutch CIGRE National Committee (NNC) **Friday 9 April 2021 until 15:00 pm**. Mail: secretariaat@cigre.nl
- Feedback from NNC to the authors of the synopsis: **Tuesday 20 April**
- Delivery of final synopses: Thursday **29 April 2021 until 17:00 pm.** Mail: secretariaat@cigre.nl
- Secretariat Cigre Nederland will upload the synopses to the Central Office Cigre: **Friday 30 April 2021**
- Notification of acceptance: **Friday 2 July 202**

Agenda

4. Possibilities for new WG members
5. Possible topics for next “C0” events
6. Wrap up and closure

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Existing WGs – SC1

- 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/C4.36 Review of Large City & Metropolitan Area power system development trends taking into account new generation, grid and information technologies
- C1/C6/Cired.37 Optimal transmission and distribution investment decisions under increasing energy scenario uncertainty
- C1.40 Planning Coordination between System Operators, Transmitters and Distributors: Frameworks, Methods, and Allocation of Costs and Benefits

Possibilities for new WG members - SC1

- WG C1.45: Harmonised metrics and consistent methodology for benefits assessment in Cost-Benefit Analysis (CBA) of electric interconnection projects
- JWG C1/C4.46: Optimising power system resilience in future grid design
- WG C1.47: Energy Sectors Integration and impact on power grids
- WG C1.48: Role of green hydrogen in energy transition: opportunities and challenges from technical and economic perspectives

Existing WGs – SC2

- WG 2.18: Wide Area Monitoring Protection and Control Systems – Decision Support for System Operators
- WG 2.24: Mitigating the risk of fire starts and the consequences of fires near overhead lines for System Operations
- WG 2.25: Operating Strategies and Preparedness for System Operational Resilience
- WG 2.26: Power system restoration accounting for a rapidly changing power system and generation mix
- WG 2.39: Operator Training in Electricity Grids at Different Control Levels and for Different Participants/Actors in the New Environment
- WG 2.40: TSO-DSO Cooperation – Control Centre Tools Requirements
- JWG C2/C4.41: Impact of high penetration of inverter-based generation on system inertia of networks

Possibilities for new WG members – SC2

- JWG C2/C5.06: The Impact of Market Interventions by System Operators during Emergency Situations
- JWG C4/C2.62/IEEE: Review of phasor measurement unit applications

Existing WGs – SC5

- WG C5-26: Auction Markets and Other Procurement Mechanisms for Demand Response Services
- WG C5-28: Energy price formation in the wholesale market
- JWG C5/C6-29: New Electricity Markets, local energy communities
- WG C5-30: The Role of Blockchain Technologies in Power Markets
- WG C5-31: Wholesale and Retail electricity cost impacts of flexible demand response
- WG C5-32: Carbon pricing in wholesale electricity markets

Possibilities for new WG members – SC5

- JWG C2/C5.06: The Impact of Market Interventions by System Operators during Emergency Situations
- WG C5.33: Trading Electricity with Blockchain systems

Existing WGs – SC6

- WG C6.35: DER aggregation platforms for the provision of flexibility services
- WG C.6.36: Distributed Energy Resource Models for Impact Assessment
- JWG C5/C6.29: New Electricity Markets, local energy communities
- JWG C6/B4.37: Medium Voltage DC distribution systems
- WG C 6.38: Rural electrification
- WG C 6.39: Customer Empowerment
- WG 6.40: Electric Vehicles as Distributed Energy Resource (DER) systems

Possibilities for new WG members – SC6

- C6.41: Technologies for Electrical Railway Distribution Supply Systems
- C6.42: Electric Transportation Energy Supply Systems
- C6.43: Aggregation of battery energy storage and solar PV systems

Agenda

5. Possible topics for next “C0” events
6. Wrap up and closure

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Possible topics for next “C0” events

- Position/vision papers (European Commission, Ministry of Economic Affairs and Climate Policy, NGOs, consultants, etc.)
- System integration: from concept towards implementation (technical, regulatory, economical and environmental dimension)
- H2 application: onshore vs offshore, centralised vs. decentralised
- Necessity of CO2 capture technology

Agenda

6. Wrap up and closure

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Thank You!
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