



European Union Agency for the Cooperation
of Energy Regulators

Regulatory challenges

related to

power exchanges in EU

APEX Conference, 22 September 2023

Topics:

- What works well?
- Where are improvements needed:
 - (a) Unbundling of competitive and regulated activities
 - (b) Developing long-term markets
 - (c) Adaptability to fast-paced energy transition and integration
 - (d) Computational burden to find efficient integrated market solutions

Power exchanges are key enablers of integrated electricity market in EU

- Enable efficient functioning of the whole system
- Provide price signals for operation and investments
- Integrate different (national) markets to work as a single EU electricity market
- Promote trust in the market, minimise counterparty risk
- Promote competition, trading, new entry
- Promote market transparency and monitoring

Unbundling of competitive and regulated activities

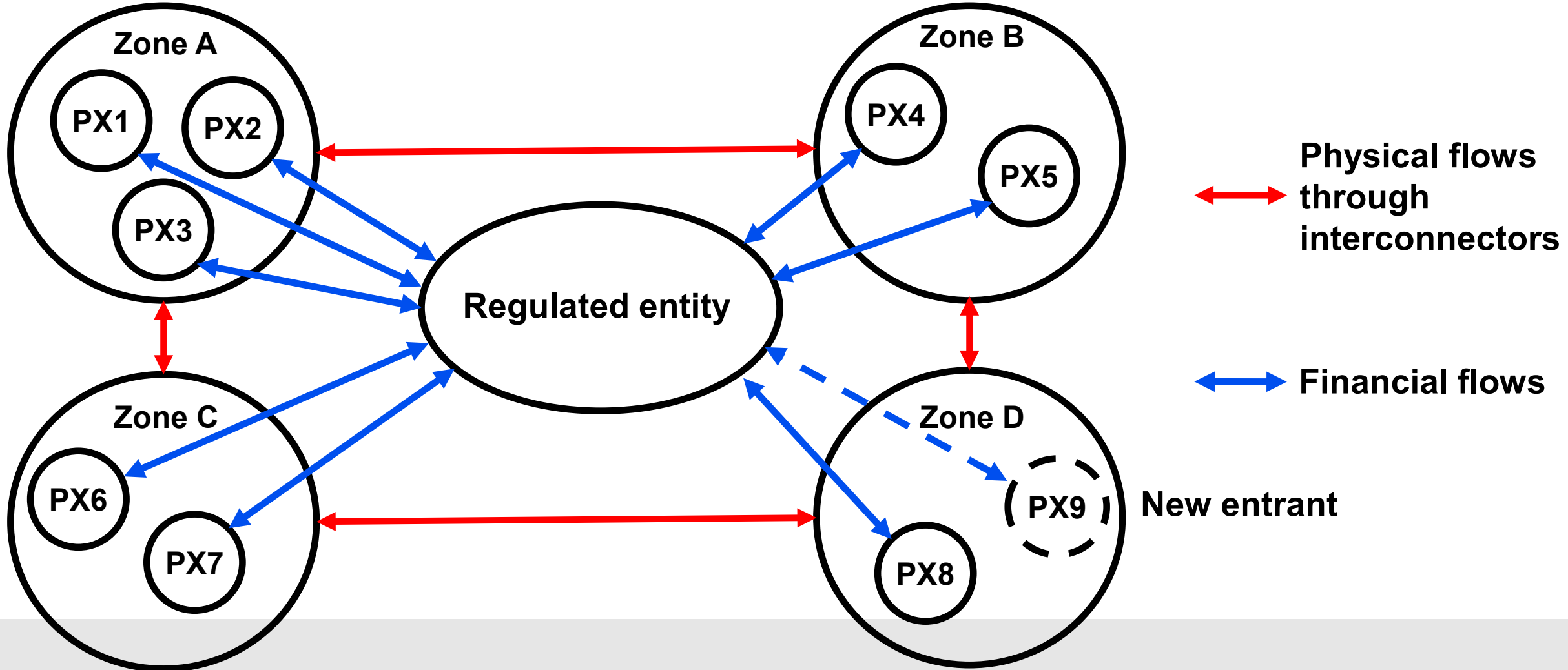
- Power exchanges in EU are generally in competition:
- MS's generally allow more than one power exchange to operate in their territory (Some national monopolies still exist)
- Trading in electricity is heavily impacted by congestion management (limited trading capacity between different locations)
- Congestion management is a monopolistic activity!
- How to enable competition between power exchanges within a monopolistic network?

ACER proposes strict unbundling:

- Allocation of scarce trading capacities is monopolistic activity – **single regulated entity**
- Providing trading services to market participant is a competitive activity – **multiple competing PX's**

Unbundling of competitive and regulated activities

Regulated entity calculates and settles all physical and financial flows between PXs



EU long-term (forward) market is struggling

- Fragmentation, low liquidity, insufficient maturities, many disincentives to hedge
- Participants face difficulty finding products to hedge their production/consumption (**most markets are illiquid**)
- Hedging investments is even harder (**no long-term market beyond 3 years ahead**)
- Energy crisis significantly increased the **costs of collaterals** at PXs
- ACER, EC in cooperation with PXs and stakeholders are **looking for solutions**

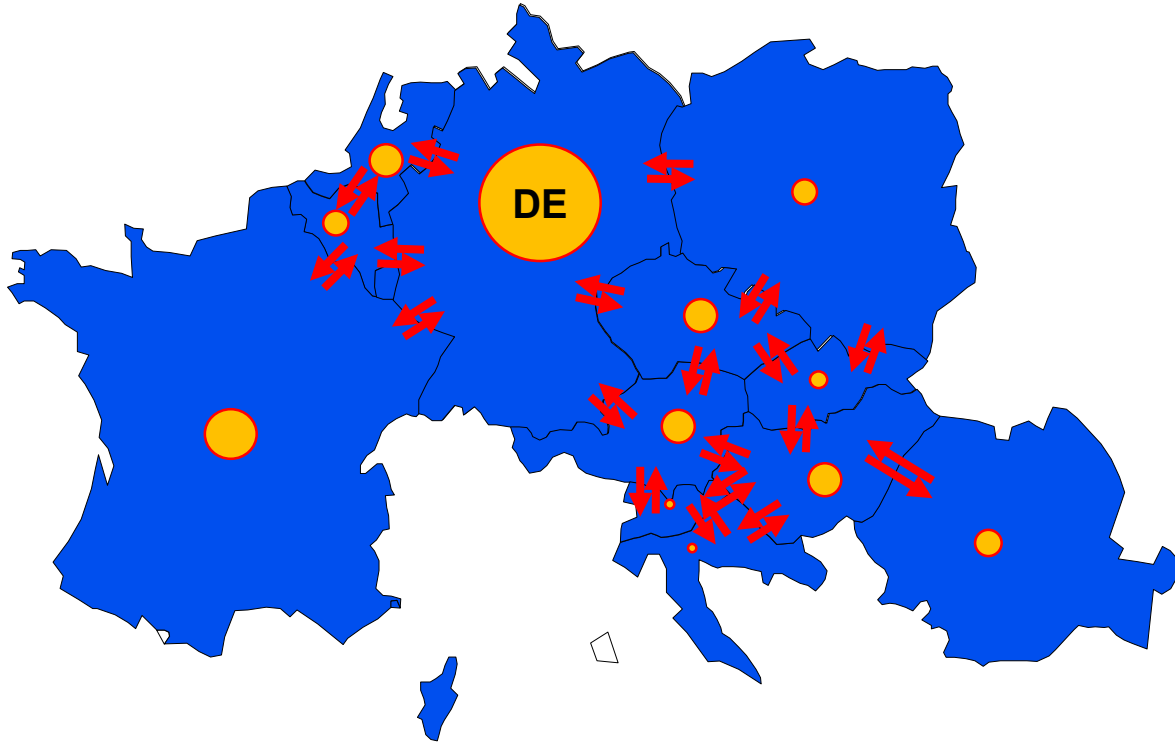
ACER proposed establishment of regional trading hubs for forward market

- Pooling the liquidity from the current fragmented national markets into **regional trading hubs**
- Complement regional hubs with improved market for **Financial Transmission Rights** to cover the **basis risk**

Developing long-term markets

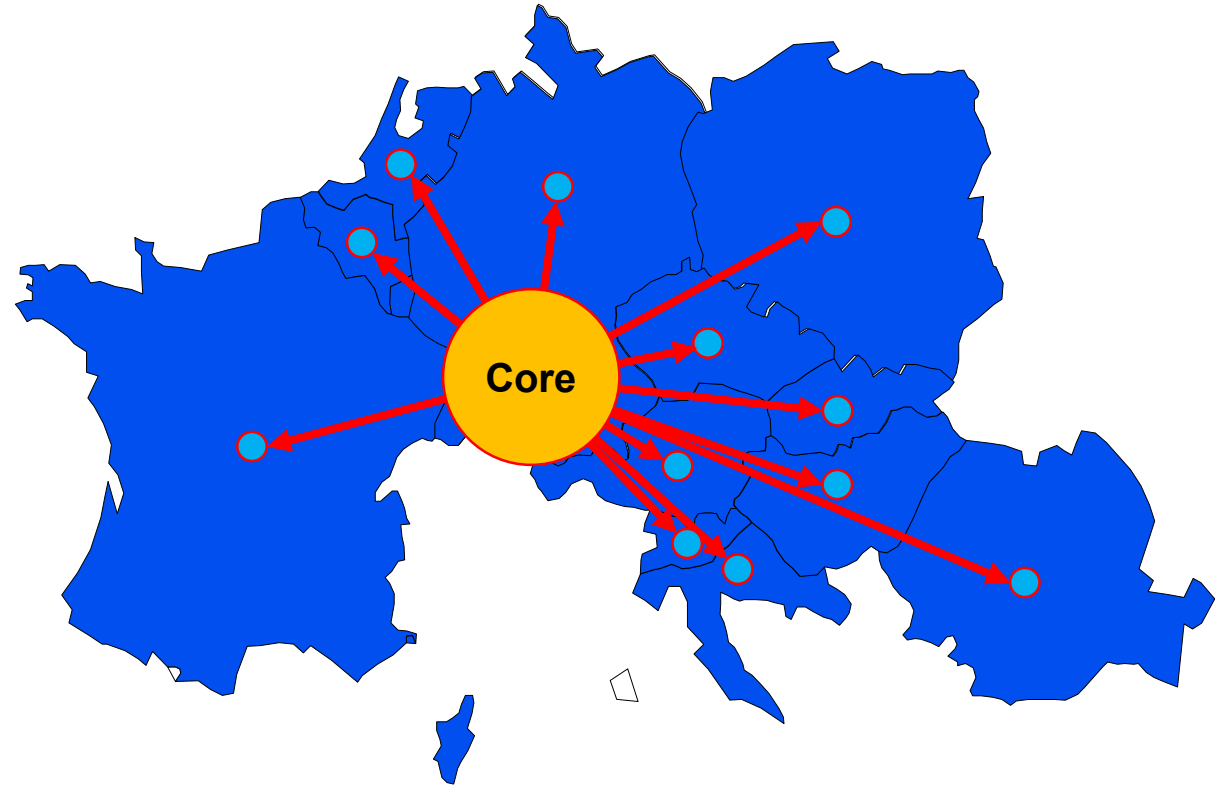
Existing design:

-  12 forward markets
 -  38 cross-zonal products
-  Fragmentation
Poor liquidity



Proposed design:

-  1 forward market
 -  12 cross-zonal products
-  Integration
High liquidity

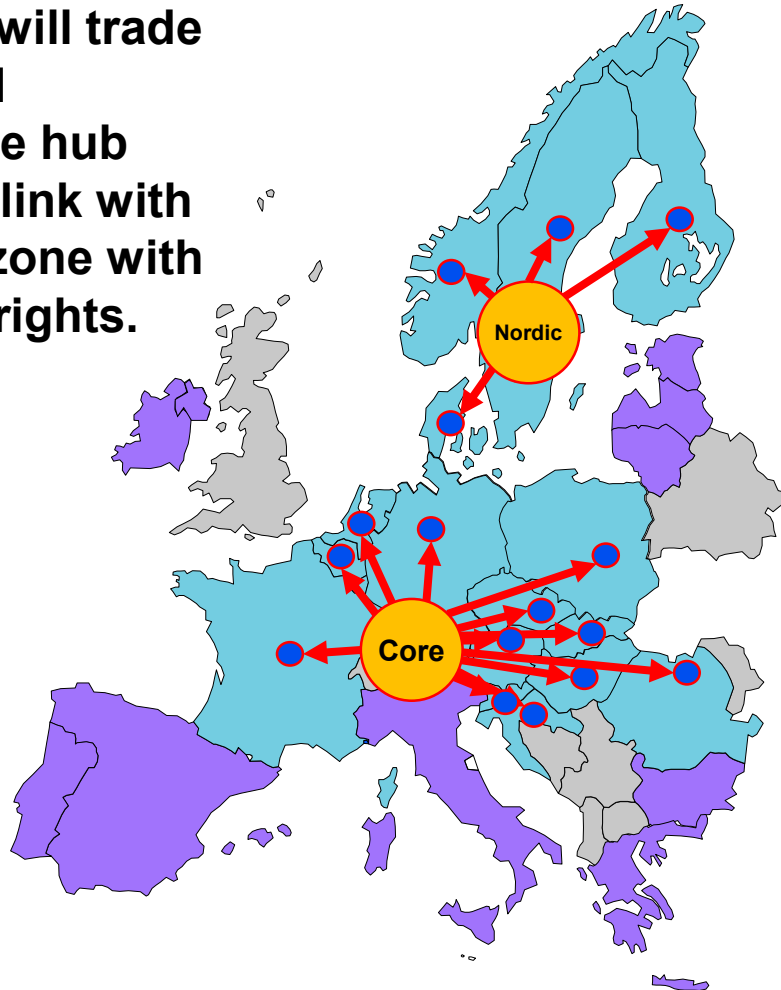


 Trading with Futures/Forwards

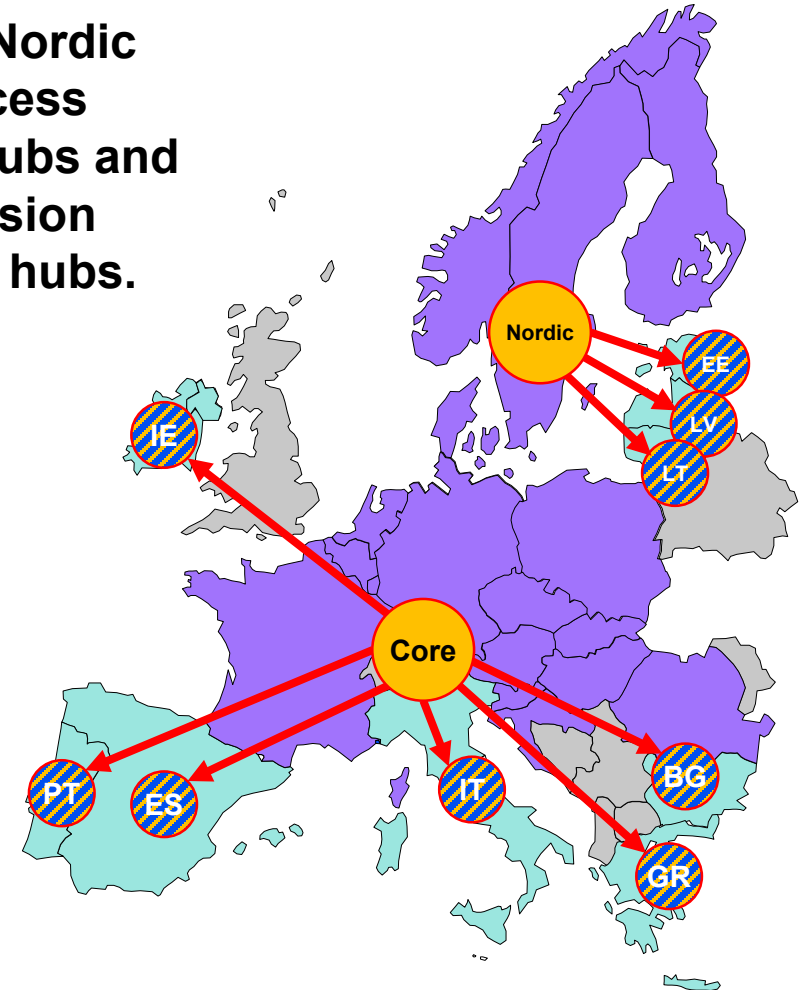
 Trading with Transmission Rights

Developing long-term markets

Market participants in Core/Nordics will trade future/forward products at the hub and make the link with their bidding zone with transmission rights.



Bidding zones outside Core/Nordic could also access Core/Nordic hubs and offer transmission rights to such hubs.



 Trading with Futures/Forwards

 Trading with Transmission Rights

EU market is going through further integration and energy transition

- The speed of changes is increasing year by year
- Market design needs to adapt quickly enough
- The regulatory framework must enable quick adaptation
- EU needs simpler and more effective regulatory framework to keep up with the pace

Computational burden to find efficient integrated market solutions

- Integrated EU market is the largest single electricity market
- The central market algorithms must optimise many generation, demand and network resources
- Difficult to accommodate complexity of bidding and products, time and geographical granularity
- Difficult compromises ahead to keep and expand the integrated market and adapt to energy transition



CREG

Comisión de Regulación
de Energía y Gas



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de Energía y Gas

Regulatory Aspects for Energy Transition

Juan Carlos Bedoya

Expert Commissioner Energy and Gas
Regulatory Commission-CREG

Colombia - September 2023



NEW PARADIGM OF ENERGY POLICY

1

..... Decarbonization of electricity production and utilization

2

..... Use of unconventional renewable energy sources

3

..... New technologies for production and consumption

4

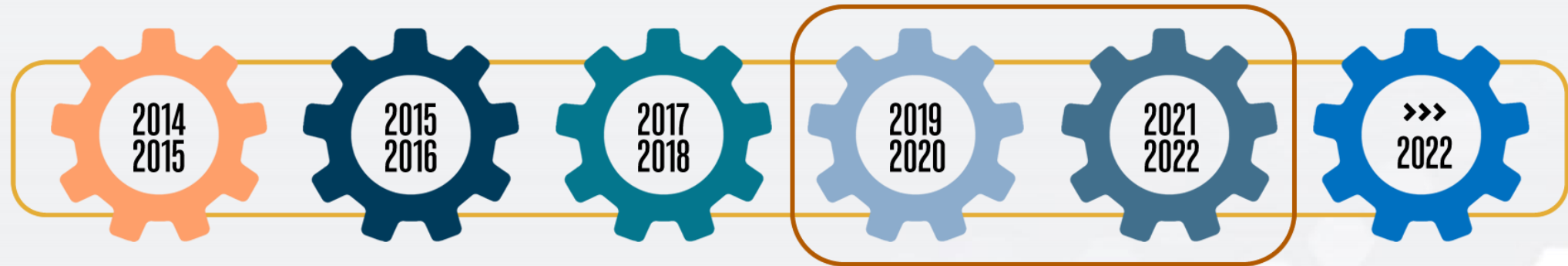
..... Digitalization and electrification

5

..... New operational and business models

ENERGY POLICY

- Law 1715/2014 → Promotion of NCRES; Decrees 1073/2015, 348/2017 → Self-generation (SG) guidelines; UPME 281/2015 → SG Capacity
- MME 40072/2018, 40459 and 40483 2019, 40142 and 40311 2020 → Advanced Metering Infrastructure (AMI), Connections
- Ley 2099/2021 → Energy Transition, more incentives for renewables and energy efficiency projects



REGULATORY FRAMEWORKS

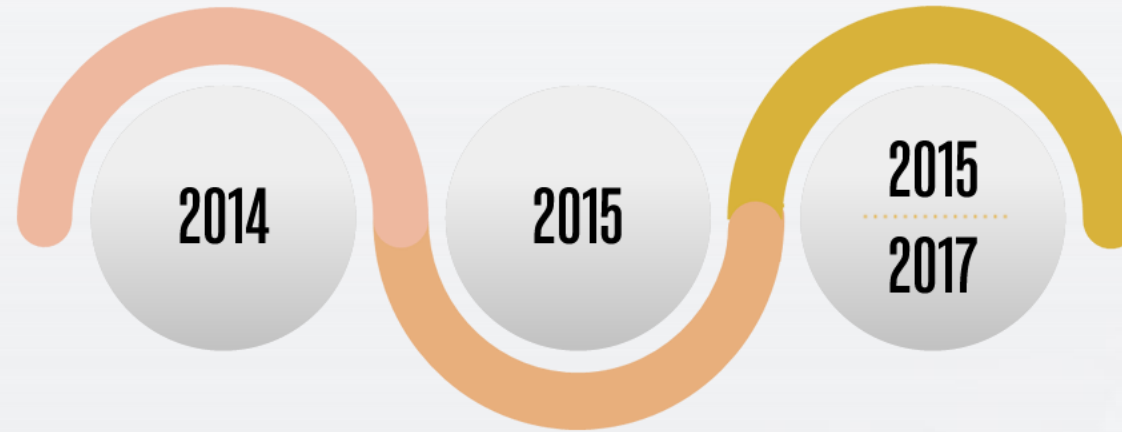
- CREG 024/2015, 030/2018, 038/2018, 174 y 135/2021 → SG
- CREG 167/2017, 201/2017 → Firm Energy for Reliability Charge Solar and Wind (S&W)
- CREG 060/2019, 148/2021, 101 011 2022 → Requirements. S&W Connections to National Transmission Grid (“STN” by its acronym in Spanish), Regional Transmission Grid (“STR” by its acronym in Spanish), Local Distribution Grid (“SDL” by its acronym in Spanish)
- CREG 200/2019 Shared Connections
- CREG 075/2021 → Connection Process to National Interconnected System (“SIN” by its acronym in Spanish) Generators and Users
- CREG 098/2019, 101 023 de 2022 → Batteries
- CREG 131 y 219 2020 (consultas), 101 001 2022 (definitiva) → AMI

FUTURE DEVELOPMENT

- Demand Response (DR) and Distributed Energy Resources (DER)
- Revision of the Network Code
- New Wholesale Market

PUBLIC POLICY

The first wave...



UPME 281 of 2015
Small-scale self-generation
limit < 1 MW

Law 1715 2014

Promotes the Development and Use of NCRES in the NIS and participation in Non - Interconnected Zones (“ZNI” by its acronym in Spanish)

- Tax incentives
- Allows the sale of generation surpluses to the grid
- Creates the distributed generator
- Orders simplified connection processes for SG
- Orders the creation of DR mechanisms

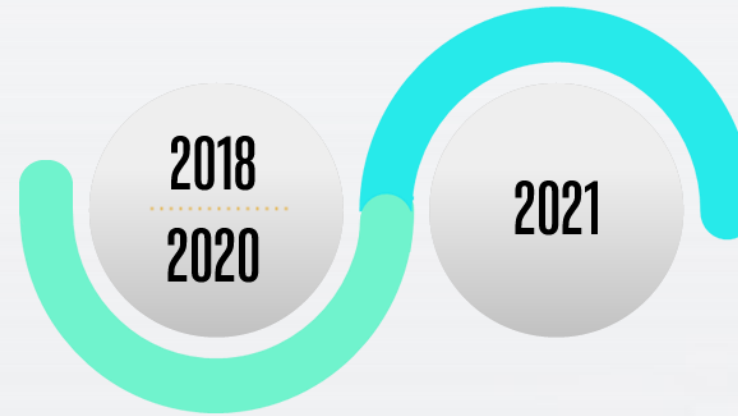
Decreets MME 1073 and 348

Guidelines for self-generation

- The amount of energy can be any percentage of consumption
- SG assets can be owned by third parties
- Energy credits
- Must comply with the Technical Regulation of Electrical Installations (“RETIE” by its acronym in Spanish)

PUBLIC POLICY

The second wave...



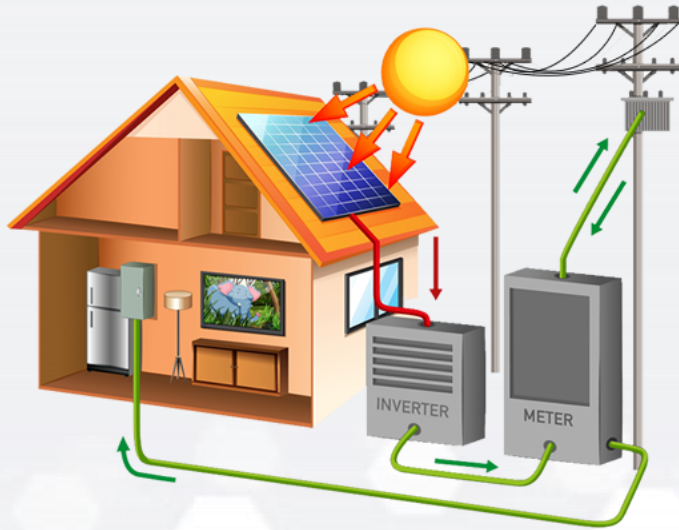
MME 40072/2018, 40459 and 40483 2019, 40142 40311 2020
AMI Guidelines and Power Plant Connections

- Facilitate energy efficiency schemes
- Improve service quality
- Manage loss reduction
- Gradual implementation
- Clarity in capacity allocation

Law 2099 of 2021:
Energy Transition

- Creates the Non-Conventional Energy Fund: financing for NCRES
- Increases tax incentives
- Incentives for geothermal generation
- Promotes green hydrogen production
- Promotes resources to ZNI

SELF-GENERATION (SG) AND DISTRIBUTED GENERATION (DG)



CREG RESOLUTIONS

024/2015, 030/2018,
038/2018, 174 y 135/2021

04 / 2015

- **Large Scale SG:** Energy sales, connection process, marketing, measurement rules

30 / 2018
038 / 2018

- **Small Scale SG (SSSG) and DG:** Simplified connection process, simplified measurement rules, energy sales rules (NIS, NIZ)

174 / 2021
update
030 / 2018

- **Small Scale SG :** Increase reception capacity (limits in N1), increase DG to < 1 MW, Connection processes differentiated by capacity, timelines in all stages (connection request, documentation review, technical review, approval, and commissioning), settlement details.

135 / 2021

- **Small Scale SG :** rules on rights and duties of the SSSG users in all stages: before delivering energy, during operation, and at the end of the contract.

INTEGRATION OF NCRES: FIRM ENERGY FOR THE RELIABILITY CHARGE - SOLAR AND WIND



CREG Resolutions
167/2017, 201/2017

Proposals 2022:
701 008 and 009

Current Wind

167 / 2017

- Energy Model
- Allows with and without on-site data

Wind Proposal

701 008 / 2022

- More detailed Energy Modeling
- Include OFFSHORE
- With and without on-site data

Current Solar

201 / 2017

- Formula
- Doesn't allow without on-site data

Solar Proposal

701 009 / 2022

- More detailed Energy Model
- More panel types: bifacial
- Time slot from 7 am to 5 pm
- With and without on-site data

INTEGRATION OF NCRES: CONNECTION REQUIREMENTS FOR SOLAR AND WIND



**060 of 2019:
STN and STR**

**148 of 2021: SDL with
a capacity greater
than 5 MW**

CREG RESOLUTIONS
060/2019, 200/2019, 148/2021, 01 011 2022
Requirements for S&W Connections
to the STN, STR, SDL, and Shared
Connections

1. Primary frequency regulation
2. Voltage regulation and Fixed PQ - QV curve (CREG 229/2021)
3. VRT
4. Quick frequency response for wind
5. Quick reactive current response - QRRC
6. Meteorological variables
7. Supervision and directives from the CND (National Dispatch Center)
8. Protections and Tests
9. Plant models: validated and updated

1. Primary frequency regulation
2. CNO (National Operation Council): Voltage regulation and the relevance of the PQ curve evaluated by voltage level.
3. Relevance of QRRC evaluated by the CNO
4. VRT
5. Meteorological variables
6. Supervision (directives from the CND – OR)
7. Protections, Tests
8. Plant models: validated and updated
9. Island Operation Mechanism

INTEGRATION OF NCRES: CONNECTION REQUIREMENTS FOR SOLAR AND WIND



101 011 de 2022
Local Distribution Grid with a capacity greater than 1 MW and < 5MW

1. Downward primary frequency regulation only
2. Simplified voltage regulation, WITHOUT PQ curves
3. Voltage sags and surges
4. Supervision
5. Directives from the CND or OR
6. Protections and Tests
7. Plant models: validated and updated 200 / 2019 Shared Connections

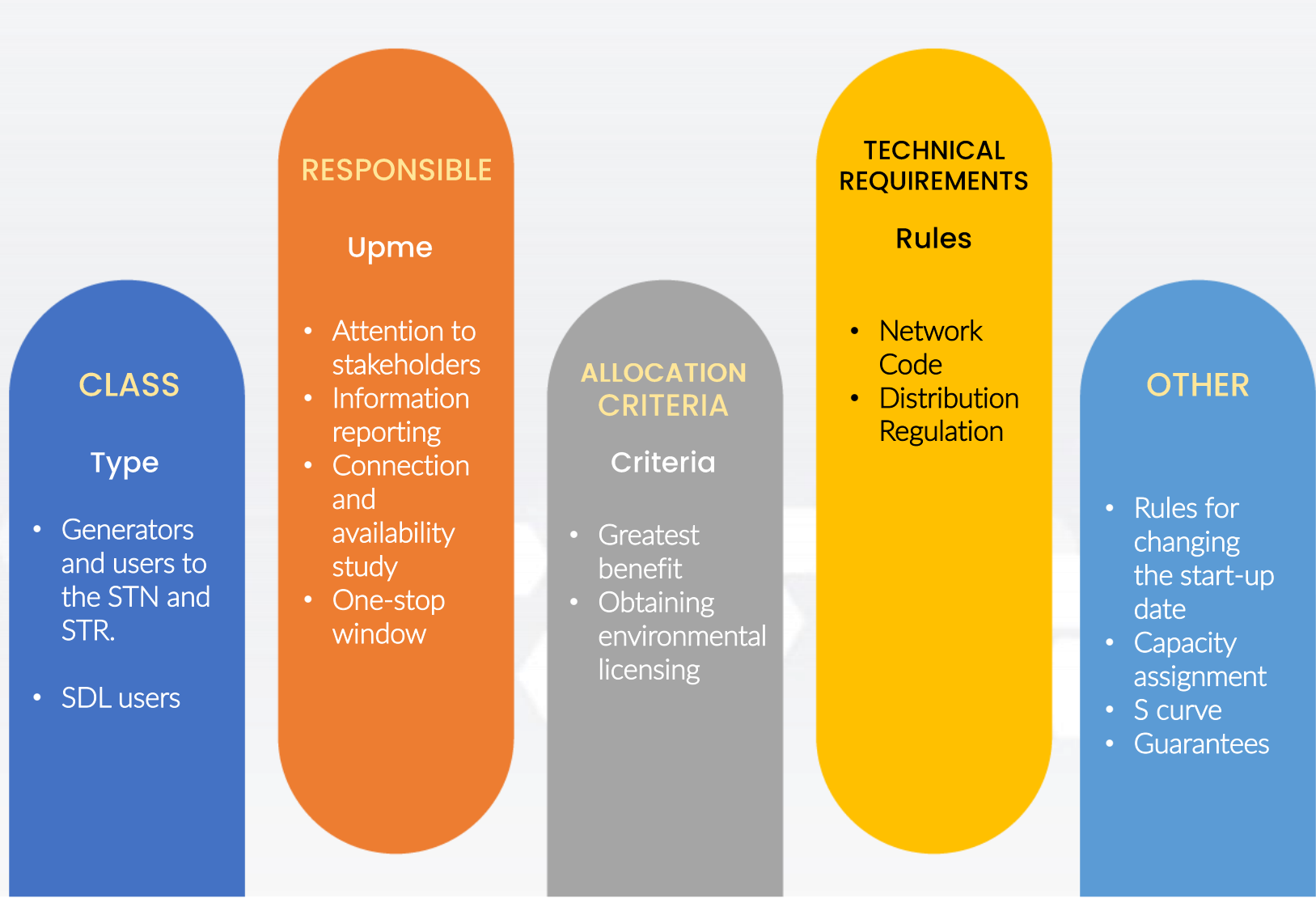
200 / 2019
Shared Connections

1. Shared connection agreement
2. Centrally dispatched only
3. Measurements are referenced to the main border
4. Each border, both individual and shared, complies with the measurement code

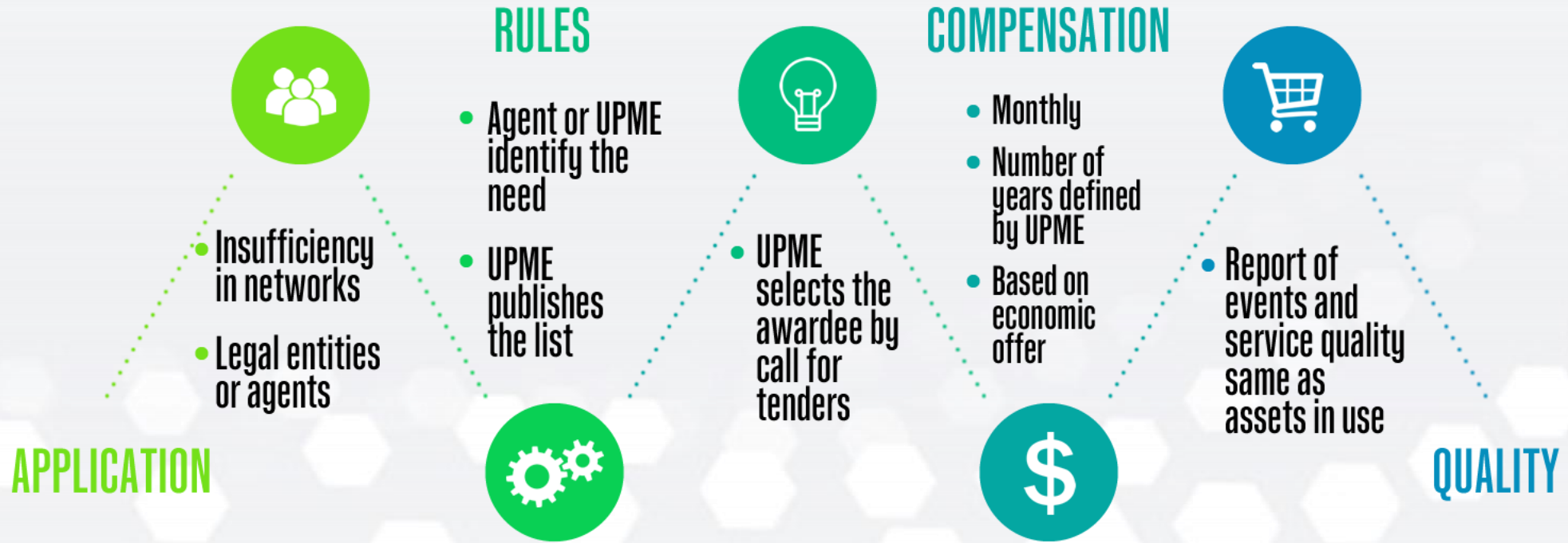
CREG RESOLUTIONS

060/2019, 200/2019, 148/2021, 01 011 2022
Requirements for S&W Connections to the STN, STR, SDL, and Shared Connections

CONNECTION TO THE SIN: ALLOCATION OF TRANSPORTATION

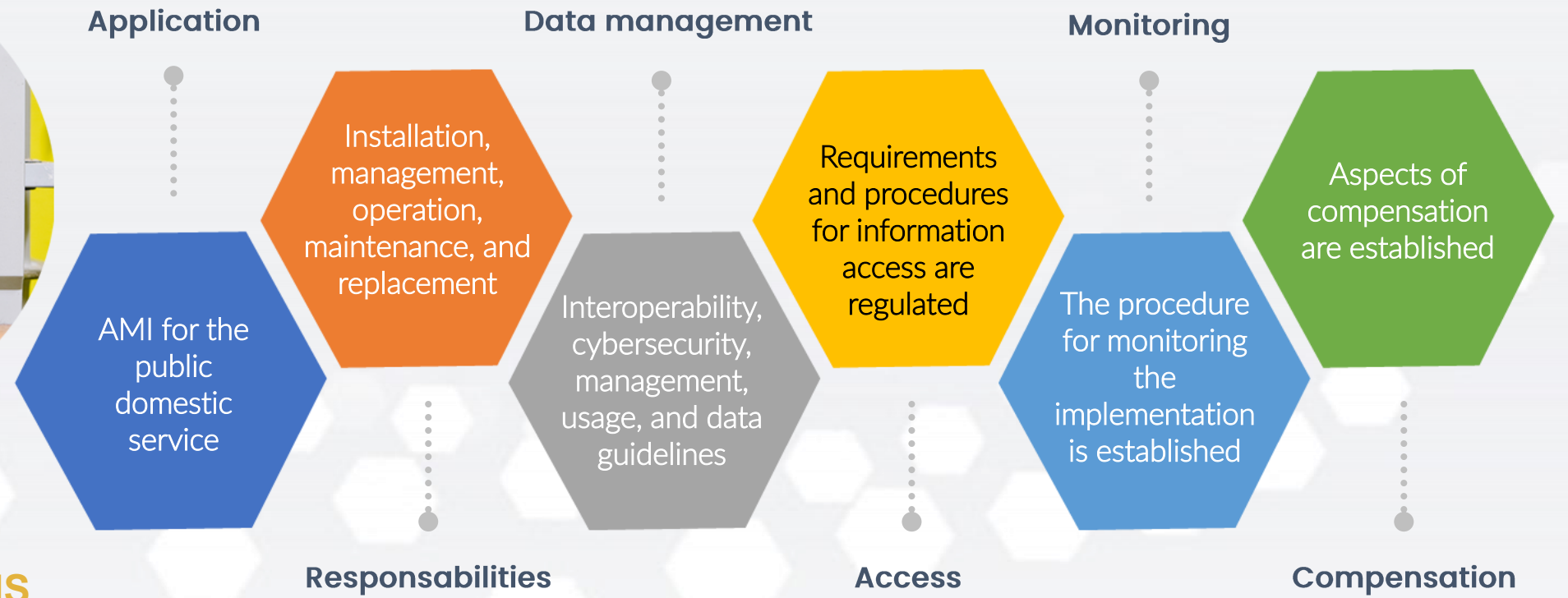


ENERGY STORAGE SYSTEMS



CREG RESOLUTIONS 098 OF 2019 AND 101 023 OF 2022

ADVANCED METERING INFRASTRUCTURE (AMI)



CREG RESOLUTIONS

131 and 219 2020 (proposals)
101 001 2022 (final) AMI

DEMAND RESPONSE ROADMAP

- **Final Resolution DDV (Voluntary Disconnectable Demand):**
CREG 101 019 de 2022
- Aggregation activity study
- New RD market program

2022 / 2023

- Distributed Energy Resources
- Complementary services in the SDL
- Virtual plants (aggregation and surplus marketing)
- New marketing models (transactive energy)

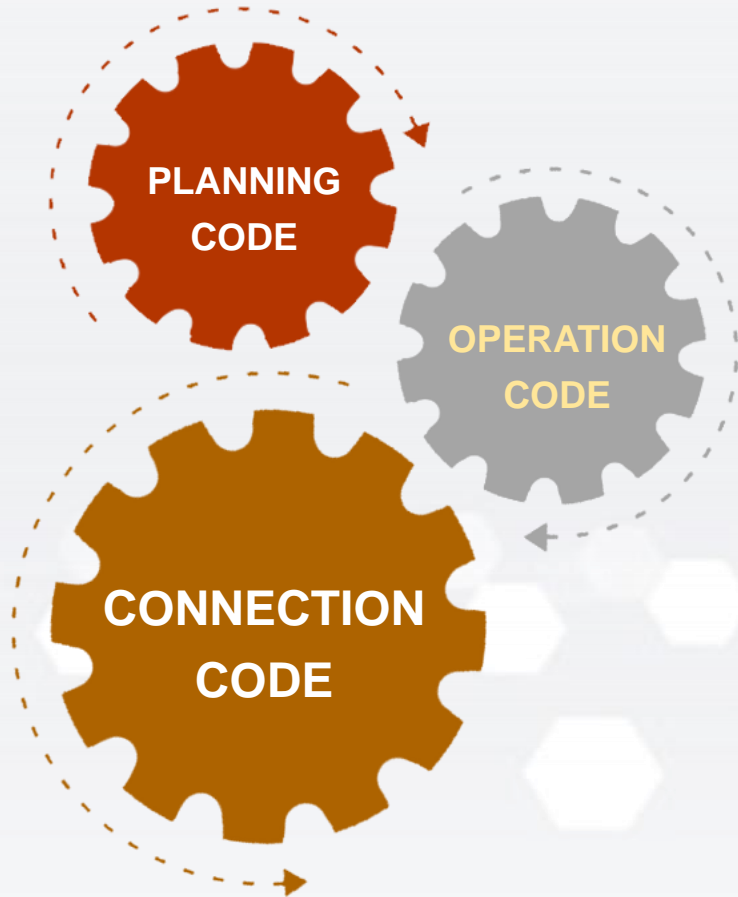
2022

- Demand reduction in the Stock Exchange
- Direct participation of users in the Wholesale Energy Market
- Compensation methodologies and hourly blocks
- Other applicable RD programs

2023 / 2024

NETWORK CODE REVIEW

MODIFICATION CREG RESOLUTION 025 OF 1995



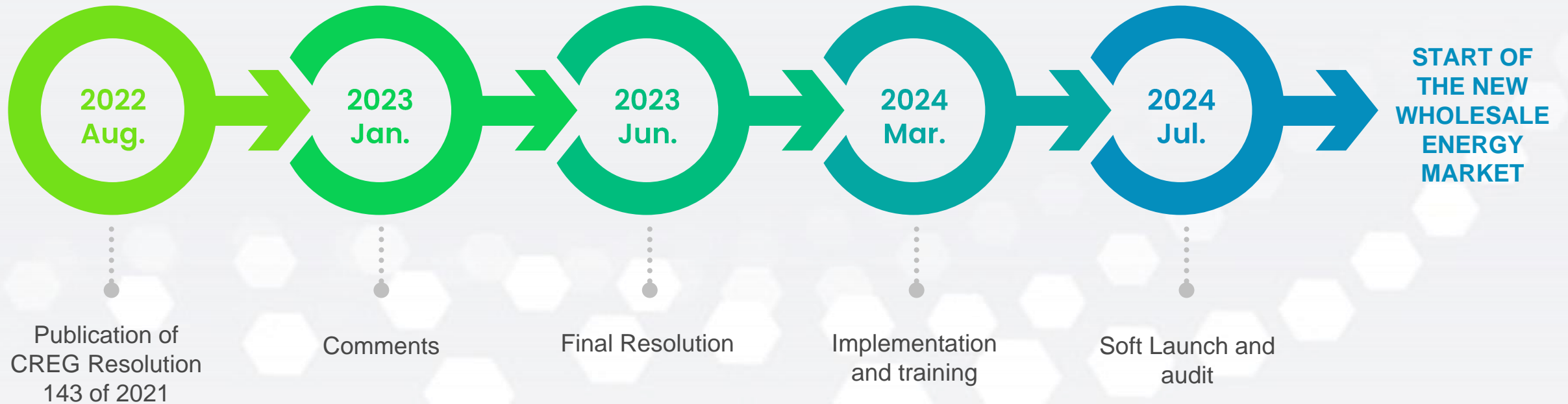
1. Inclusion in expansion plans of new technologies according to their maturity in the market
2. Cybersecurity and telecommunications architecture in substations
3. Update of Technical Standards and Detailed Engineering for the design of Lines, Substations
4. Technical specifications for elements such as HVDC, FACTS, synchronous capacitors, digital substations, among others
5. Inclusion of New Generation Technologies, energy storage, transmission, and telecommunications
6. More demanding electrical parameters (power factor, short circuit levels, wave quality, grounding)

MODERNIZATION OF THE WHOLESALE ENERGY MARKET

1. Participation of demand in the price formation of energy on the stock market (two-sided auction).
2. Define firm commitments (prices and quantities) prior to operation:
 - Day-ahead market (Binding Dispatch)
 - Position adjustment in intraday markets (three binding sessions).
3. Mitigation of bids prior to dispatches (pivotality and conduct test).
4. Co-optimized dispatch of energy and complementary services.
5. Payment of deviations by generators and demand.
6. Expanded generator market (all plants equal to or greater than 5 MW bid).
7. Complementary services market (upward/downward secondary regulation, tertiary, and autonomous start-up).



IMPLEMENTATION ON THE NEW WHOLESALE MARKET REGULATION





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