

CIGRE Study committee C5

PROPOSAL FOR THE CREATION OF A NEW WORKING GROUP

WG C5.38

NAME OF THE CONVENOR

XIANG Kangli (CHINA)

TITLE

Certificates of origin for electricity in power markets

THE WG APPLIES TO DISTRIBUTION NETWORKS: NO

ENERGY TRANSITION

4 / Sustainability and Climate Change

POTENTIAL BENEFIT OF WG WORK

- 1 / commercial, business, social, economic benefits
- 2 / potential interest from a wide range of stakeholders
- 3 / likely to contribute to new or revised industry standards
- 4 / state-of-the-art or innovative solutions or directions
- 5 / Guide or survey on techniques, or updates on past work or brochures
- 7 / Addressing environmental requirements & sustainable dev. goals

STRATEGIC DIRECTION

- 1 / The electrical power system of the future reinforcing the End-to-End nature of CIGRE: respond to speed of changes in the industry by preparing and disseminating state-of-the-art technological advances
- 2 / Making the best use of the existing systems
- 3 / Focus of the environment and sustainability (in case the WG shows a direct contribution to at least one SDG)

SUSTAINABLE DEVELOPMENT GOAL

- 7 / Affordable and clean energy
- 9 / Industry, innovation and infrastructure

BACKGROUND :

Many countries have introduced policies to develop renewable energy and set mandatory targets for its growth to reduce carbon emissions. Among these policies, certificates of origin for electricity have emerged as a crucial mechanism, widely adopted to encourage the production of renewable energy. Examples include International Renewable Energy Certificates (I-RECs) and APX Tradable Instrument for Global Renewables (APX-TIGRs) globally, Renewable Energy Certificates (RECs) in the US, Guarantee of Origins (GOs) in the EU, and Green Energy Certificates (GECs) in China. These certificates establish a market for green electricity by conferring environmental value on renewable energy, thereby promoting its development through market trading. The environmental value of certificates of origin for electricity has been applied to power grid emission factors, carbon footprint accounting, carbon market trading, and carbon tariffs .

However, there are still several challenges surrounding Certificates of Origin for electricity and their trading market, including:

- 1. Standards for Certificates of Origin.** The recognition of these certificates remains contentious in several respects. First, there is disagreement over whether subsidized renewable energy should qualify for Certificates of Origin. While some argue against it, certain countries, such as China, do issue certificates for subsidized renewable energy. Second, there is debate over what qualifies as eligible renewable energy sources. For example, some countries consider hydropower and nuclear energy to be renewable, while others do not. Third, the issue of granularity in recognition is disputed. Certificates of Origin are typically issued on a monthly or annual basis, but some countries and industries are advocating for the '3-pillar' principle, which includes Hourly Time-Matching, Deliverability, and Additionality. Hourly Time-Matching requires that electricity consumption aligns with renewable energy production on an hourly basis. Deliverability mandates that renewable energy must be sourced within the same market or operational region. Finally, Additionality insists that renewable energy must be generated from newly developed sources.
- 2. Incentive effect of certificates of origin for electricity on energy transition targets.** The incentive effect of Certificates of Origin for electricity on energy transition targets is increasingly significant as the renewable energy sector continues to expand. The effectiveness of these certificates in promoting low-carbon electricity needs to be assessed in terms of economic efficiency, renewable energy targets, and carbon emission reduction goals. Certificates of Origin for electricity are traded through two mechanisms: compulsory and voluntary. In compulsory trading, regulations such as the Renewable Portfolio Standard (RPS) in the US and China require enterprises to include a specified proportion of renewable energy in their electricity consumption. Voluntary trading, however, is driven by consumers purchasing certificates based on their energy needs or a desire to support renewable energy development. Currently, compulsory trading dominates the market, resulting in a supply of certificates that often exceeds demand. The extent to which certificate trading fosters renewable energy development and helps achieve intended environmental goals remains an important topic of discussion.
- 3. The coupling mechanism among certificate of origin market, electricity market and carbon market.** In relation to the electricity market, consumers can obtain Certificates of Origin either through Certificates of Origin trading (separation mode) or via green electricity trading (integration mode). The price of Certificates of Origin varies between these two modes. Additionally, Certificates of Origin transactions are not subject to regional restrictions, while green electricity trading is limited by geographical boundaries, affecting the transaction scope and the feasibility of cross-regional electricity trades. When coupling with the carbon market, whether Certificates of Origin are included in the calculation of power emission factors significantly impacts carbon emission accounting for enterprises. Moreover, the environmental benefits of electricity may be subject to double counting, which can disrupt the functioning of the carbon market. This can occur in cases such as when multiple issuers exist within a single country, when Certificates of Origin and Certified Emission Reductions (CERs) are used concurrently, or when the electricity is applied to other certified products, such as hydrogen or e-fuels.
- 4. The impact of certificates of origin for electricity usage on the international trade.** Carbon footprint disclosure has become a critical element in global low-carbon development, as demonstrated by mechanisms such as the Carbon Border Adjustment Mechanism (CBAM) and the EU Battery Regulation. However, the varying acceptance of Certificates of Origin for electricity across different countries can create discrepancies in product carbon footprints. This variation can enhance the competitiveness of products with lower carbon footprints while diminishing the competitiveness of those with higher footprints, ultimately influencing the landscape of international trade.
- 5. The application of emerging technologies in the certificates of origin for electricity.** Trading Certificates of Origin for electricity requires robust traceability of energy, particularly renewable energy, which demands higher standards for timeliness, transparency, and credibility. As a result, emerging technologies such as blockchain and artificial intelligence are being explored and implemented in the Certificates of Origin market to enhance data authentication, reduce transaction costs, and improve overall transaction transparency.

PURPOSE / OBJECTIVE / BENEFIT OF THIS WORK :

This proposal aims to investigate and evaluate the mechanisms of various certificates of origin for electricity, propose worldwide certificates of origin for electricity accreditation standard, and assess the role of existing certificates of origin for electricity in the development of renewable energy and the achievement of carbon reduction targets. It will evaluate the impact of certificates of origin for electricity on carbon emission calculations and international trade, and discuss the carbon footprint and grid emission factor calculation standards considering the certificates of origin for electricity, study the coupling mechanism among the certificate of origin market, the electricity market and the carbon market, and analyze the future development trends of certificates of origin for electricity.

The main objectives are:

- To investigate and evaluate existing certificates of origin for electricity mechanism accreditation standards, and to discuss applicable general accreditation standards of certificate of origin for electricity.
- To evaluate the impact of certificates of origin for electricity on the development of renewable energy and the achievement of carbon reduction targets, and to assess their effectiveness.
- To investigate the coupling mechanisms among the certificate of origin market, the electricity market and the carbon market, to evaluate the impact of certificates of origin for electricity on carbon emission calculations and international trade, and to discuss the calculation standard of carbon footprint and power grid emission factor considering certificates of origin for electricity.

SCOPE :

The working group will investigate the mechanisms, policies, and regulatory frameworks of certificates of origin for electricity globally, including analyzing market impacts, price trends, and interactions between certificates of origin for electricity and other markets such as electricity markets and carbon markets. Additionally, this study will explore the impact of certificates of origin for electricity on carbon footprint accounting and international trade, evaluate the application of emerging technologies such as blockchain in the certificate of origin market, and assess future development trends of certificates of origin for electricity.

Specifically, the following aspects will be covered:

1. Mechanisms, Policies, and Regulatory Frameworks for Certificates of Origin for Electricity.

Discuss the mechanisms, policies, and regulatory frameworks for certificates of origin for electricity in various countries/regions, including I-RECs and APX-TIGRs globally, RECs in the US, GOs in the EU, GECs in China, etc.

2. Price Trends of Certificates of Origin for Electricity and PPAs.

Examine the historical price trends of certificates of origin for electricity and power purchase agreements (PPAs) in various countries/regions. Analyze the relationship and interactions between PPAs and certificates of origin for electricity.

3. Certificates of Origin for Electricity Effect on Renewable Energy Generation and Global Emission Reduction.

Analyze how certificates of origin for electricity affect the development of green electricity and promote carbon emission reduction. Evaluate the positive impact of the certificate of origin for electricity mechanism on the development of global renewable energy.

4. The Coupling Mechanism Among the Certificate of Origin Market, the Electricity Market and the Carbon M

Investigate and analyze the relationship between the certificates of origin market and the electricity market, examining their influence on green power prices and the behavior of market participants. Analyze the application and coupling mechanisms of certificates of origin for electricity in the carbon market, evaluate the relationship between certificates of origin for electricity and the carbon right in terms of emission reduction, and discuss whether the environmental benefits of renewable energy are redundantly certified in the scenario of multiple issuers exist within a single country, Certificates of Origin and Certified Emission Reductions (CERs) are used concurrently, or electricity is applied to other certified products, such as hydrogen or e-fuels.

5. The Impact of Certificates of origin for electricity on the International T

Discuss the global recognition and integration of certificates of origin for electricity, focusing on mechanisms such as carbon footprint accounting and the Carbon Border Adjustment Mechanism (CBAM) and EU Battery Regulation. Evaluate the impact of certificate of origin for electricity acceptance on the carbon footprint of products, and subsequently assess its influence on consumer purchasing decisions and international trade.

6. New Technology in Trading of Certificate of Origin for Electricity.

Discuss the role and impact of emerging technologies such as blockchain and artificial intelligence on the trading of certificate of origin for electricity, including data authentication and trading transparency.

7. Future Development Trends of Certificates of origin for electricity.

Examine the future development trends of the certificate of origin market, with a focus on the integration of certificates of origin for electricity into global trade and the anticipated policy trends in various countries.

References:

Relevant previous related activities which the work of this WG will be based on include:

1. TB 710, impacts-of-environmental-policy-on-power-markets, 2017
2. TB 824, The role of blockchain technologies in power markets, 2020
3. TB 877, Energy Price Formation in Wholesale Electricity Markets, 2022
4. TB 897, Carbon Pricing in Wholesale Electricity Markets, 2023
5. WG C1.48, Role of green hydrogen in energy transition: opportunities and challenges from technical and economic perspectives, 2020
6. JWG C5-C1.36 Certification of the electricity used to produce hydrogen, 2022

This new WG will cooperate and coordinate with the aforementioned WGs to make sure that the work is not duplicated. For example, JWG C5-C1.36 focuses on definition and identification of green hydrogen, while this new WG will focus more on the influence and interaction of certificates of origin for electricity.

DELIVERABLES AND EVENTS

Deliverables Types

Annual progress and activity report to Study Committee
Technical Brochure and Executive Summary in Electra
Webinar

Deliverables schedule

Technical Brochure Q1 2027 Final TB

Webinar Q2 2027 Webinar

Time schedule

Q1 2025 Finalize recruitment + develop first work plan

APPROVAL BY TECHNICAL COUNCIL CHAIRMAN:

Rannveig S- J. Løken

October 21st, 2024