# Renewable energy generation units: regulatory challenges for energy transition – Türkiye case

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# Introduction: Energy Transition in Türkiye

**Key Points:**

- Electricity demand in Türkiye continues to grow steadily, typically increasing by around 4-5% annually, driven by economic growth, urbanization, electrification and industrial development.
- Türkiye's electricity consumption exceeded 330 TWh in recent years and is expected to rise significantly over the next decade.
- Türkiye is undergoing a major energy transition to reduce energy imports and carbon emissions.
- Renewable energy plays a central role in national energy policy. Government targets increasing renewable electricity share to around 65% by 2035.
- Energy import dependency remains high, with around 70% of primary energy demand met by imports.
- The energy transition is also linked to Turkey's 2053 net-zero emissions target, announced as part of its climate policy commitments.

# Electrification & EV Uptake

**Rapid growth in electric vehicle adoption:**
EV registrations are increasing rapidly, driven by tax incentives and the expansion of the national charging infrastructure network.

**Charging infrastructure expansion:**
Türkiye continues expanding public fast-charging networks under government-supported programs.

Number of EVs: 10k 4 years ago – 400k today.
Number of charging points: 2k 4 years ago – 40k today.

# Carbon Markets

**CBAM implementation phase started in Europe:**

The European Union Carbon Border Adjustment Mechanism (CBAM) entered the transitional phase, increasing pressure on Turkish exporters in carbon-intensive sectors such as steel, cement and aluminum.

EMRA has a role to regulate the carbon market which will be operated under EPIAS (energy exchange of Türkiye)

# Key Challenges

Grid connection capacity

Permitting procedures

Land use regulations

Regulatory changes

Uncertainties surrounding CBAM implementation

# Grid Connection Constraints (1)

Transmission grid capacity is limited in many regions. Connection approval depends on capacity announcements by TEİAŞ (TSO).

In the latest application rounds for renewable generation combined with energy storage, investors submitted projects totaling more than 250 GW, far exceeding the available grid capacity. Approximately 33 GW has received pre-license approval, allowing developers to proceed with project development activities. However, less than 1 GW has so far obtained a full generation license, meaning that the majority of projects are still in early development stages.

Current situation:
- Around 45 GW installed renewable energy capacity (excluding hydro) + 30 GW hydro
- Around 125 GW total installed capacity

# Grid Connection Constraints (2)

Projects holding a pre-license typically have up to 36 months to fulfill permitting and some other requirements before obtaining the final license.

Developers may also apply for additional time extensions under certain circumstances, which is relatively common in practice. While this flexibility helps developers manage project risks, it also creates significant uncertainty regarding the actual pipeline of projects that will reach completion.

As a result, there is a large gap between announced renewable capacity and projects that are likely to be realized, making long-term grid planning and market expectations more challenging.

# Permitting procedures

Generation license
Environmental Impact Assessment (EIA)
Land use permits
Grid connection agreement
Construction permits
This process can take up to 48 months, though reforms aim to reduce it to less than 24 months.

# Land Use and Environmental Restrictions

Agricultural land restrictions
Forestry permits
Protected areas
Zoning compliance

These legal requirements can delay projects or trigger litigation if environmental compliance is inadequate.

# Regulatory Uncertainty


Examples:
Amendments to unlicensed generation rules
Changes to balancing and settlement regulations
New requirements for aggregators and storage.

Frequent updates create investment uncertainty for developers and financiers.

# CBAM implementation (Default Values)


**ANNEX III – Default values for electricity imported into the customs territory of the Union**

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| Country or territory | Emission factor (tCO2eq/MWh) |
|---|---|
| Albania | 0 |
| Belarus | 0.383 |
| Bosnia and Herzegovina | 1.148 |
| Egypt | 0.442 |
| Georgia | 0.440 |
| Israel | 0.480 |
| Kosovo | 0.984 |
| Moldova, Republic of | 0.530 |
| Montenegro | 0.979 |
| Morocco | 0.907 |
| North Macedonia | 0.887 |
| Russian Federation | 0.585 |
| Serbia | 1.041 |
| Tunisia | 0.436 |
| Türkiye | 0.718 |
| Ukraine | 0.907 |
| United Kingdom | 0.430 |
| European Union | 0.612 |

# CBAM implementation (Default vs Real)


- Default value for electricity imported into the EU: 0.718 $tCO_2eq/MWh$!

| Year | EU Import (MWh) | EU Export (MWh) | Net (MWh) |
|---|---|---|---|
| 2025 | 1,781,536 | 2,012,928 | -231,932 |
| | Weighted Average Emission Factor ($tCO_2eq/MWh$) ≈ 0.38 | | |

- In 2025, the weighted average emission factor for electricity generation in Türkiye was approximately 0.38 $tCO_2eq/MWh$

| Date | Hour | EU Import (MWh) | EU Export (MWh) | Net (MWh) | Emission Factor ($tCO_2eq/MWh$) |
|---|---|---|---|---|---|
| April 1, 2025 | 11 – 12 | 217 | 5.5 | +211.5 | 0.16488 |
| April 1, 2025 | 12 – 13 | 264.5 | 4 | +260.5 | 0.16460 |

- On an hourly basis, this value can be significantly lower at certain times, depending on the generation mix and the share of renewable energy in the system during those hours.
- The current CBAM methodology does not adequately reflect the actual progress made by non-EU countries in diversifying their energy mix and integrating renewable energy sources.

# CBAM implementation (RES to Europe)


- A case in which zero-emission electricity generated from RES is exported to Europe under PPAs.

# CBAM implementation (Default Values – Indire

**ANNEX II – Default values for indirect emissions of goods listed in Annex I of Regulation (EU) 2023/956 and not listed in Annex II of that Regulation**

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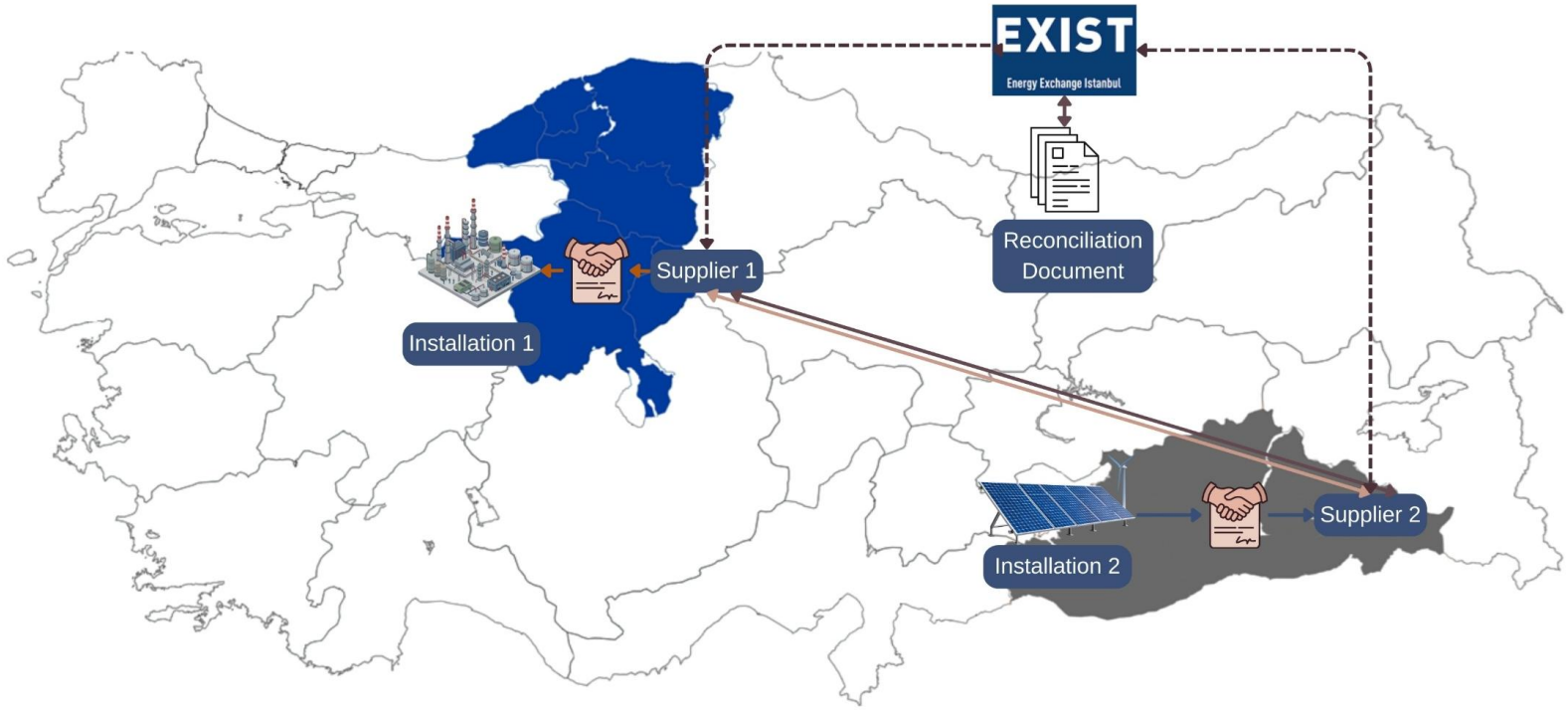
| Country or territory | Emission factor (tCO2eq/MWh) |
|---|---|
| Albania | 0 |
| Algeria | 0.498 |
| Angola | 0.216 |
| Argentina | 0.287 |
| Armenia | 0.183 |
| Australia | 0.645 |
| Azerbaijan | 0.431 |
| Bahrain | 0.697 |
| Bangladesh | 0.567 |
| Belarus | 0.325 |
| Benin | 0.518 |
| Bolivia | 0.319 |
| Bosnia and Herzegovina | 0.734 |
| Botswana | 1.324 |
| Brazil | 0.096 |
| Brunei | 0.758 |
| Burkina Faso | 0.567 |
| Cambodia | 0.470 |
| Cameroon | 0.234 |
| Canada | 0.119 |
| Chad | 1.536 |
| Chile | 0.356 |
| China | 0.605 |
| Colombia | 0.183 |
| Congo | 0.640 |
| Oman | 0.387 |
| Pakistan | 0.377 |
| Panama | 0.324 |
| Paraguay | 0 |
| Peru | 0.201 |
| Philippines | 0.711 |
| Qatar | 0.475 |
| Russian Federation | 0.366 |
| Rwanda | 0.340 |
| Saudi Arabia | 0.611 |
| Senegal | 0.567 |
| Serbia | 0.729 |
| Singapore | 0.381 |
| South Africa | 0.963 |
| South Sudan | 0.844 |
| Sri Lanka | 0.520 |
| Sudan | 0.235 |
| Suriname | 0.505 |
| Syria | 0.550 |
| Taiwan | 0.561 |
| Tajikistan | 0.061 |
| Tanzania, United Republic of | 0.388 |
| Thailand | 0.470 |
| Togo | 0.423 |
| Trinidad and Tobago | 0.553 |
| Tunisia | 0.418 |
| Türkiye | 0.420 |
| Turkmenistan | 0.718 |
| Uganda | 0.023 |
| Ukraine | 0.310 |
| United Arab Emirates | 0.451 |
| United Kingdom | 0.193 |
| United States | 0.358 |
| Uruguay | 0.048 |
| Uzbekistan | 0.519 |
| Venezuela | 0.087 |
| Viet Nam | 0.581 |
| Yemen | 0.742 |
| Zambia | 0.165 |
| Zimbabwe | 0.573 |
| Other countries and territories | 0.465 |

# CBAM implementation (Unlicensed Gen.)

**Recognition of unlicensed renewable energy generated from the plant investments made by Turkish industrial companies in a location outside their installation.**




**Hourly Net Metering**

| Time Periods | Generation (kWh) | Consumption (kWh) | Net (h) |
|---|---|---|---|
| 1. Hour | 600 | 160 | +440 |
| 2. Hour | 120 | 700 (120 from Installation-2) | -600 |
| 3. Hour | 880 | 160 | +720 |
| 4. Hour | 40 | 480 (40 from Installation-2) | -440 |
| Total | Net Generation: 1160 | Net Consumption:1040 | |

- Generation and consumption must belong to the same legal entity. However, they are not required to be connected to the grid within the same distribution zone.
- Default value for indirect emissions: 0.420 $tCO_2eq/MWh$!

# CBAM implementation (GO, YEK-G…)


## PURPOSE OF YEK-G

Improving **use of Renewable Energy Sources** at producing and consuming Electricity

Suppliers verifying that they have renewable energy **in their portfolio** within the scope of **their obligation to disclose** the source of electricity they provide to their end consumers

Protecting the environment

The system tracks, verifies, and discloses that the energy supplied to end consumers is generated from renewable sources.


Designed to track electricity from generation to consumption through **Blockchain technology**

- ✓ In line with **EU GO** System
- ✓ In line with **AIB rules**
- ✓ EXIST performs as both **Issuing Body** and **Market Operator**

# CBAM implementation (GO, YEK-G…)


## YEK-G PROCESS

### METER BASED ISSUANCE

Actual generation data is automatically transferred from TEİAŞ / DSOs to EPİAŞ.

### 1 MWh = 1 CERTIFICATE

Each YEK-G represents 1 MWh of real renewable electricity with time and plant identity.

### UNIQUE DIGITAL ID

Every certificate has a unique blockchain-based code.

The unique ID remains unchanged throughout trading, transfer and cancellation, ensuring full traceability.


- ✓ All processes from metered generation to final cancellation are managed within EPİAŞ.
- ✓ YEK-G enables reliable market-based indirect emission calculations through metered generation data.

### DOUBLE COUNTING PREVENTION

Same generation cannot be certified twice in any scheme.

### ACCOUNT-BASED TRACKING

Certificates are created, held, traded and cancelled in participant accounts within EPİAŞ.

### CANCELLATION FOR END-USER

Cancellation links the certificate to a consumption period and creates the green electricity claim.

### EXPIRY RULE

Certificates are valid for 12 months after generation.

# THANK YOU
# FOR YOUR ATTENTION!

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