

# Energy Track and Trace

Partner meeting

European partnership on next generation energy tracking.

May 19<sup>th</sup> 2022

# Agenda

- Welcoming of new-comers
- Federated network concept and architecture paper release
- Development time-line(s) and prototype functionalities
- EU-regulation update
- Energy system impact of granular certification
- Cross-border exchange mechanism (options)

Next Step...

Reserve already now September 15th



## "Powered by Energy Track & Trace"



# Who is Energy Track & Trace?



## Trilateral TSO set-up to provide the tracking system

**Purpose:** Development of a **granular tracking system** (federated network design) that is applicable on European scale and includes cross-border exchange.



*East Germany and Belgium*



*Estonia*



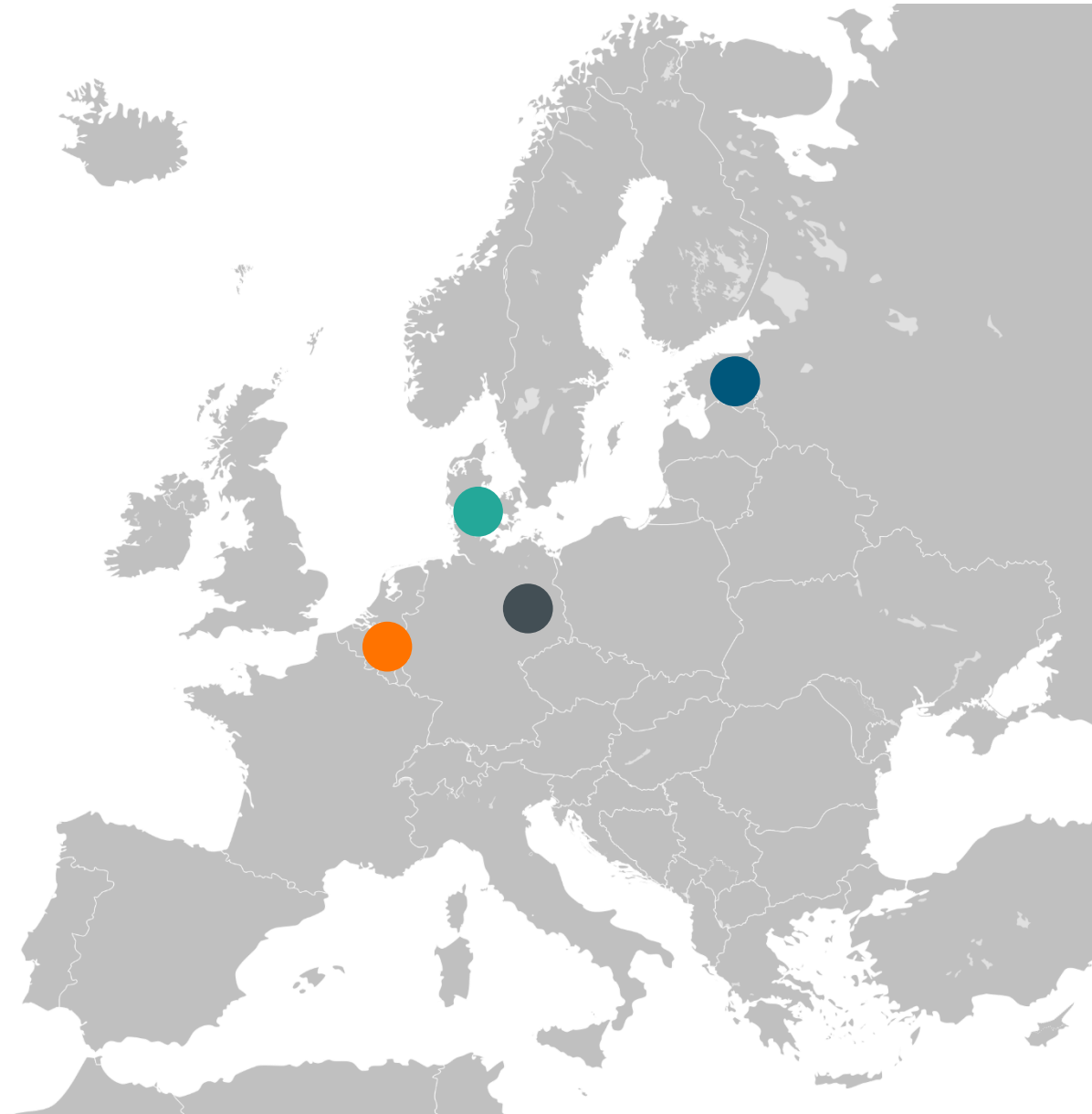
*Denmark*

## And a strong group of partners

**Corporate consumers** who want to explore 24/7 sourcing strategies.

**Suppliers and project developers** who are providing clean energy and want to offer 24/7 green contracts and SLAs.

**Service providers** that offer market solutions and matching algorithms.



# VISION

By 2025 the Granular Certificates (GCs) are playing an active part in reaching the goals of the green transition in Europe.

In 2030 GCs will be the leading method for documenting the origin of Energy throughout Europe.

# SCOPE

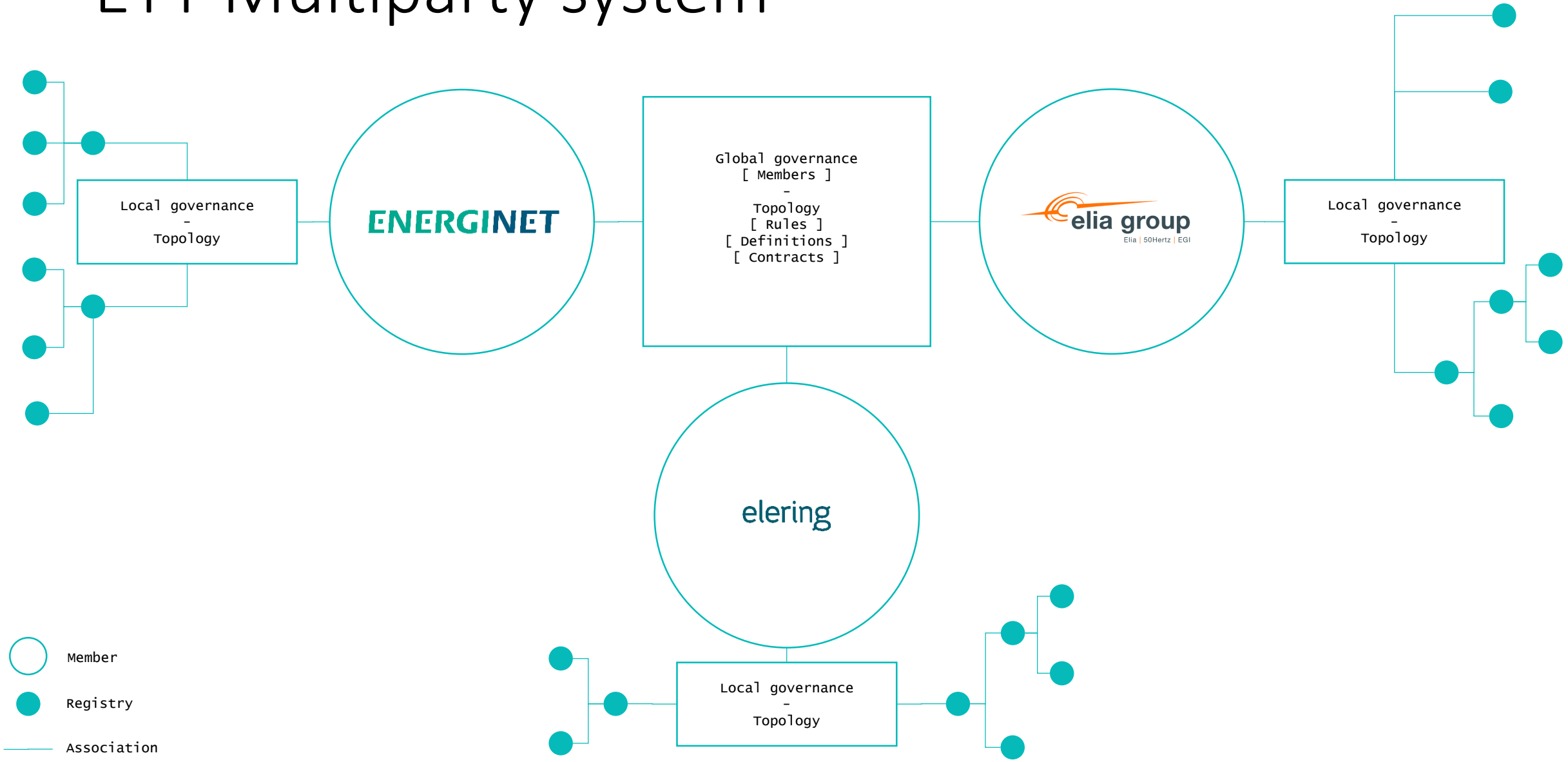
Design a system architecture for reliable and trustworthy granular energy tracking (federated network)

Develop and test a prototype system(s), based on the needs of our customers

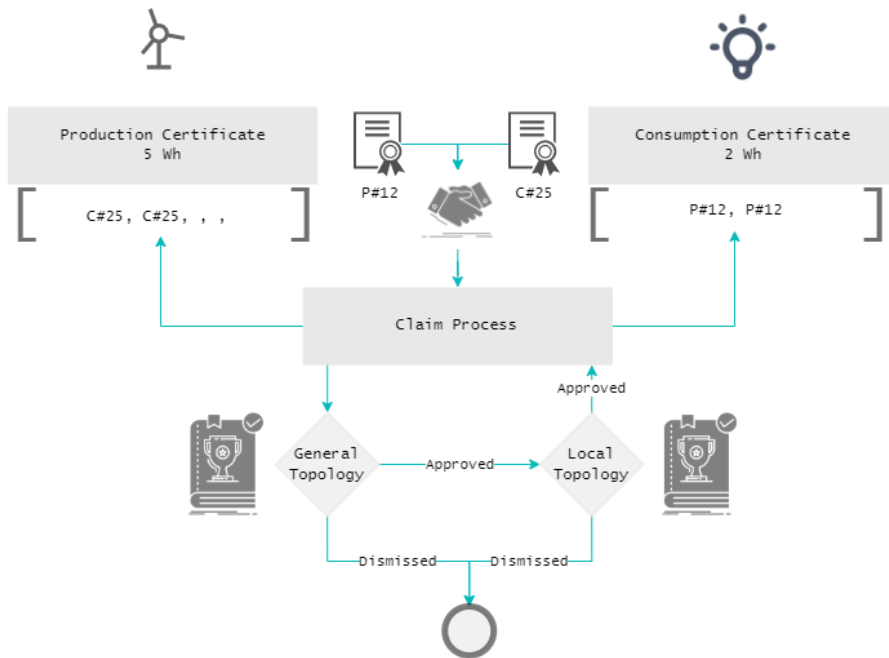
Offer a cross-border exchange mechanism for GCs.

# Federated network concept and architecture paper

# ETT Multiparty system



# Topologies



Topology == [ruleset]

- General topology = [ temporal matching, geographical matching, EU wide regulatory requirements ]
- Local topology = [ local rules, business rules, and regulatory requirements ]
- The general topology is agreed upon by members of Energy Track and Trace.
- The local rules are decided by the instance owners and operators.

# Energy Track and Trace - Yellowpaper

An overview of the concepts of the Energy Track and Trace infrastructure and the architecture required to deliver Granular Certification of energy at market resolution.

Energy Track and Trace "Yellowpaper" release  
25/5/2022.

[Energy Track and Trace \(energytrackandtrace.com\)](https://energytrackandtrace.com)





# Development time- line(s) and prototype functionalities

# Energy Track & Trace Roadmap

May 2022

System architecture design (granular tracking as federated network system)



Stakeholder workshops for design feedback



Federated network **prototype implementation.**

System architecture finalized and published



open source



[www.energytrackandtrace.com](http://www.energytrackandtrace.com)

Prototype opens for testing (incl. API connections)

Prototype **testing period**

Production system implementation

2021

Q3

Q4

2022

Q1

Q2

Q3

Q4

2023

Q1

Q2

Q3

Q4

2024

Q1

Q2

Q3

Q4

# Development of demonstrator has started

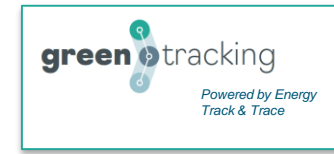
2022



Elia Group Internal Project Kick-off (demonstration project)

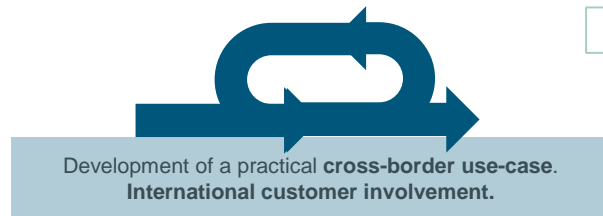
Elia group builds **Green Tracking**, a digital product "Powered by Energy track & Trace"

Energinet builds **Energy Origins**, a digital product "Powered by Energy track & Trace"



Energinet Energy Access, DataHub integration and Energy Origins production system development kick off august 2021

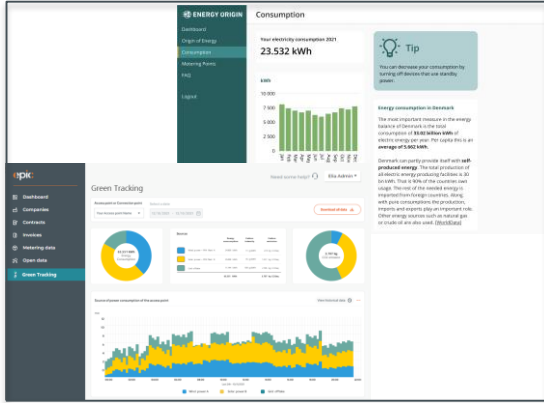
Connecting certificate registries together



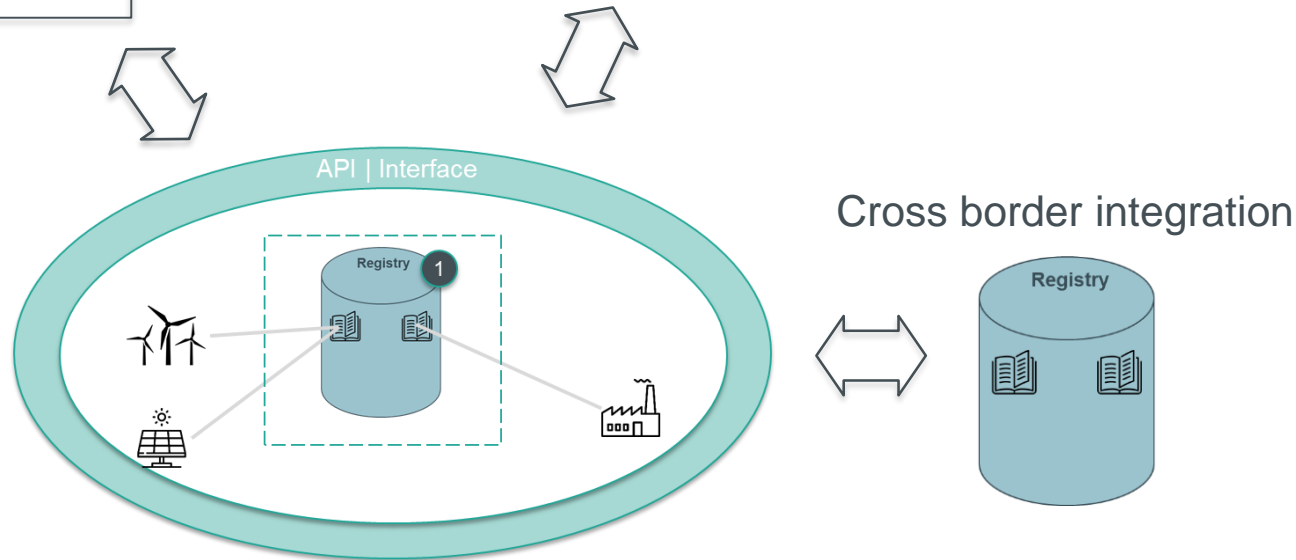
First cross border transaction of GCs

# Development of demonstrator has started

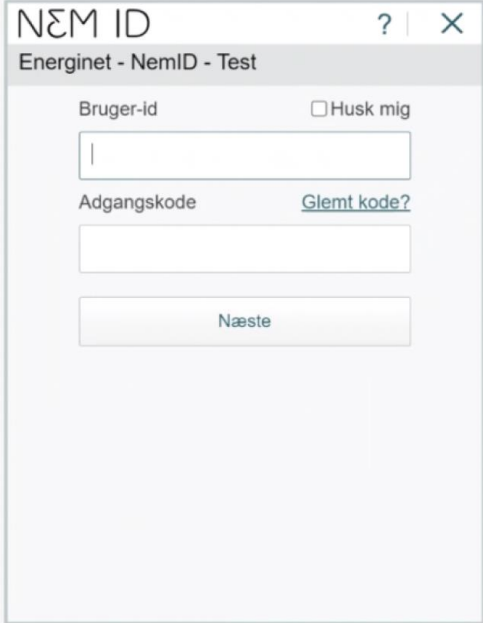
## Track & Trace user interface



## Customer, agent and/or system integration (e.g. Marketplace)



# Some feature examples from the Danish Origins Platform (not yet released) Login page



**NEM ID** ? | X  
Energinet - NemID - Test

Bruger-id  Husk mig

Adgangskode [Glemt kode?](#)

Næste

NemID Nøgglefil

### Login Energy Origin

The current version of Energy Origin can be accessed via NemID company login only.

The Energy Origin Platform is under development and new functionalities will be released continuously. The first release of the platform only offers data for companies. Data for private users is intended to form part of one of the next releases.

# Some feature examples from the Danish Origins Platform (not yet released) Privacy policy



## Read and accept our privacy policy

### Privacy Policy

(Updated 13-12-2021)

#### 1. Introduction

When you use Energy Origin - including Energy Origin's page for granting power of attorney to third parties - we collect and process a number of pieces of information about you.

In this privacy policy, you can read about what information we collect, their purpose and how we process the information.

#### 2. Data responsibility

Energinet DataHub A / S is data responsible for the processing of your personal information. Our contact information is:

Energinet DataHub A/S  
Tonne Kjærsvvej 65  
7999 Fredericia

I have seen the Privacy Policy

Back

Accept terms

# Some feature examples from the Danish Origins Platform (not yet released)

## Emissions accounts – based on energy mix

**ENERGY ORIGIN**

Dashboard

Origin of Energy

Emissions

Metering Points

FAQ

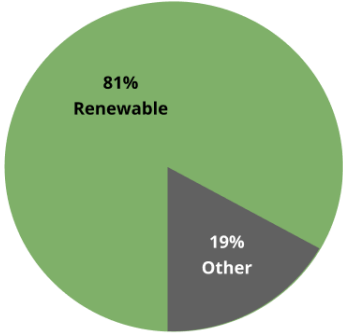
Logout

### Dashboard

#### Your hourly declaration 2021

#### Origin of Energy

Your share of renewable energy in 2021



Category	Percentage
Renewable	81%
Other	19%

#### Emissions

Your emissions in 2021

**1.198 kg CO<sub>2</sub>**

#### Hourly Declaration

The hourly declaration describes the origin of the energy you have consumed within a given period as well as the corresponding emissions.

The declaration is calculated as a weighted average based on your hourly electricity consumption and the corresponding hourly residual mix in your bidding zone.

#### Get Data for your CSR-report

Key performance indicator	Assured for 2020 <sup>1)</sup>	Unit	2016	20
<b>OUR OPERATIONS</b>				
<b>GHG EMISSIONS</b>				
Emissions Inventory <sup>2)3)</sup>				
Scope 1	●	tCO <sub>2</sub> e <sup>4)</sup>	66,218	66,5
Scope 2 (market based) <sup>5)</sup>	●	tCO <sub>2</sub> e	1,518,643	509,3
<small>1) Assurance 2) Emissions Inventory 3) Assurance 4) tCO<sub>2</sub>e 5) tCO<sub>2</sub>e</small>				

You can get the data, that you need to fill out your CSR-report, especially the ones concerning energy use and emissions.

See Emissions for further details

#### Links

- [Danish Energy Agency - Energy and Climate Politics](#)  
The danish government policies around climate and energy. Where you can read about the danish energy plan for the next 10 years.
- [Virksomhedsguiden.dk - Green transition \(danish\)](#)  
Describe how companies can become more green, with a lot of instructions and templates.
- [Energinet - Green Transition](#)  
Energinet provide data regarding the transition to a more green energy system in Denmark.
- [IEA - Denmark](#)  
The International Energy Agency, is committed to shaping a secure and

# Some feature examples from the Danish Origins Platform (not yet released) Consumption details

**ENERGY ORIGIN**


- Dashboard
- Origin of Energy
- Emissions**
- Metering Points
- FAQ
- Logout

## Emissions

Your emissions in 2021  
**1.198 kg CO<sub>2</sub>**  
[Export details](#)

Denmark must **reduce** greenhouse gas **emissions by 70 percent** in 2030 compared to 1990

**Tip**  
You can decrease emissions by investing in green technology to produce some of your energy consumption locally. It could be solar panels, wind turbines, etc.




### Danish Ministry of Climate, Energy and Utilities

#### Greenhouse gases

Greenhouse gases are a common term for the gases that contribute to the greenhouse effect. When the concentration of greenhouse gases in the atmosphere grows, it causes changes in the greenhouse effect, which overall causes the earth's temperature to rise and thus changes the climate on earth. The gases include the gases carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O) and F-gases.

Read more on the home page [Danish Energy Agency - Greenhouse Gases](#).



HYVID	BRONZE	SØLV	GULD	GRØN
10-20%	21-30%	31-50%	51-70%	70% +

### Sønderborg aims to create a CO<sub>2</sub>-neutral growth area by 2029

With a public-private partnership, ProjectZero was in 2007 created to drive Sønderborg's transition to a ZEROcarbon community by 2029. To meet the ambition, the project focuses on different initiatives including energy efficiency and conversion of energy sources into renewables. ProjectZero is already far along the climate journey, and by 2020 the CO<sub>2</sub>-emission was reduced by 51,80% within the Sønderborg-area.



Go to **menti.com** and use the code **9707 6947** or scan the QR code



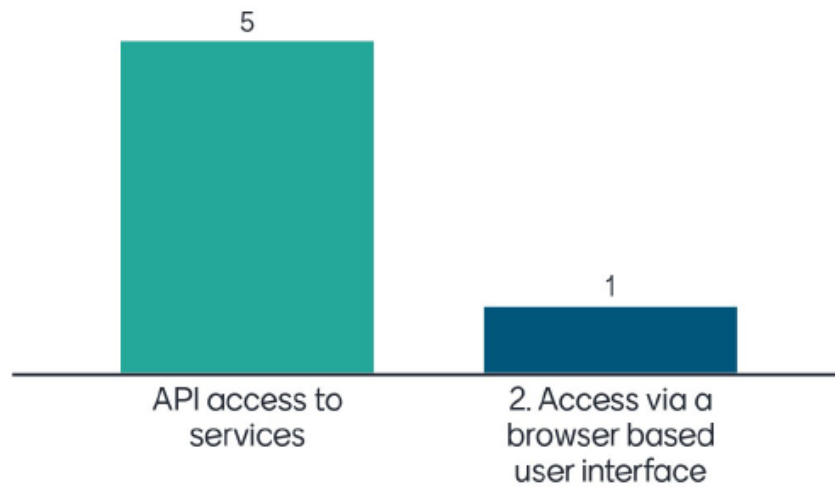
# Survey via Mentimeter



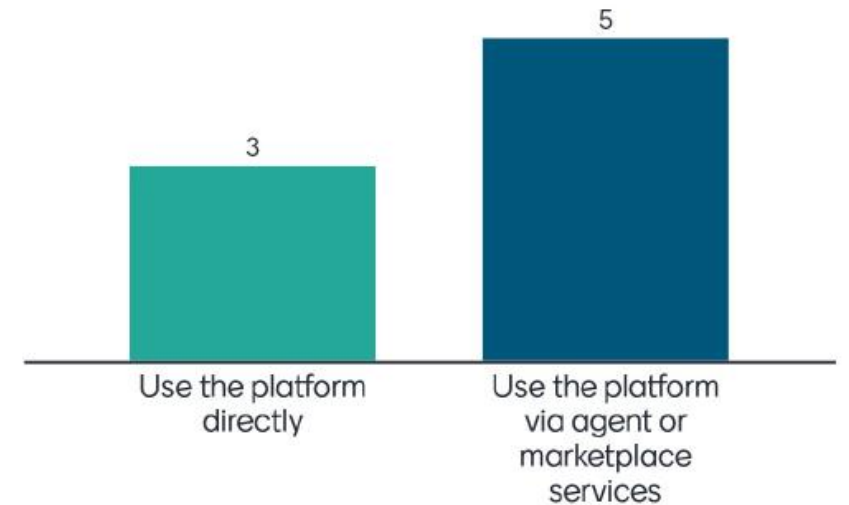
- What feature set do you think is most important?
  - API access to services
  - Access via a browser-based user interface
- Do you think users of the platforms will primarily
  - Use the platform directly
  - Use the platform via agent or marketplace services?

# Survey via Mentimeter

What feature set do you think is most important?



Do you think users of the platforms will primarily:



# EU regulation update

## Renewable Energy Directive

- Revision in light of increased 2030-target/ 2050 climate objective
- Proposal published in July 2021
- Ongoing negotiations
  - Council of Ministers
  - European Parliament
- Compromise text – with or without pathway for GCs... - expected end of year 2022



# Energy system impact of granular certification

## Granular Certification creates value from different perspectives



### Customer perspective

Choose and prove the origin of the energy you consume



### Transparency and trust

Create trust by better reflecting the physics and economics of the grid



### System perspective

Foster the development and integration of renewable energy sources

## System benefits fall into five distinct categories

Additional investments in renewables assets

Incentives to develop and activate flexibility

Driving DSM and energy storage down the “learning curve”

Improved spatial allocation of renewables and flexibility

Reduced dispatch costs and CO2 emissions



How would you rate the impact of GC on each of these aspects until 2030?

Go to **menti.com** and use the code **9707 6947** or scan the QR code



# Survey via Mentimeter



Additional investments in renewables assets

Incentives to develop and activate flexibility

Driving DSM and energy storage down the “learning curve”

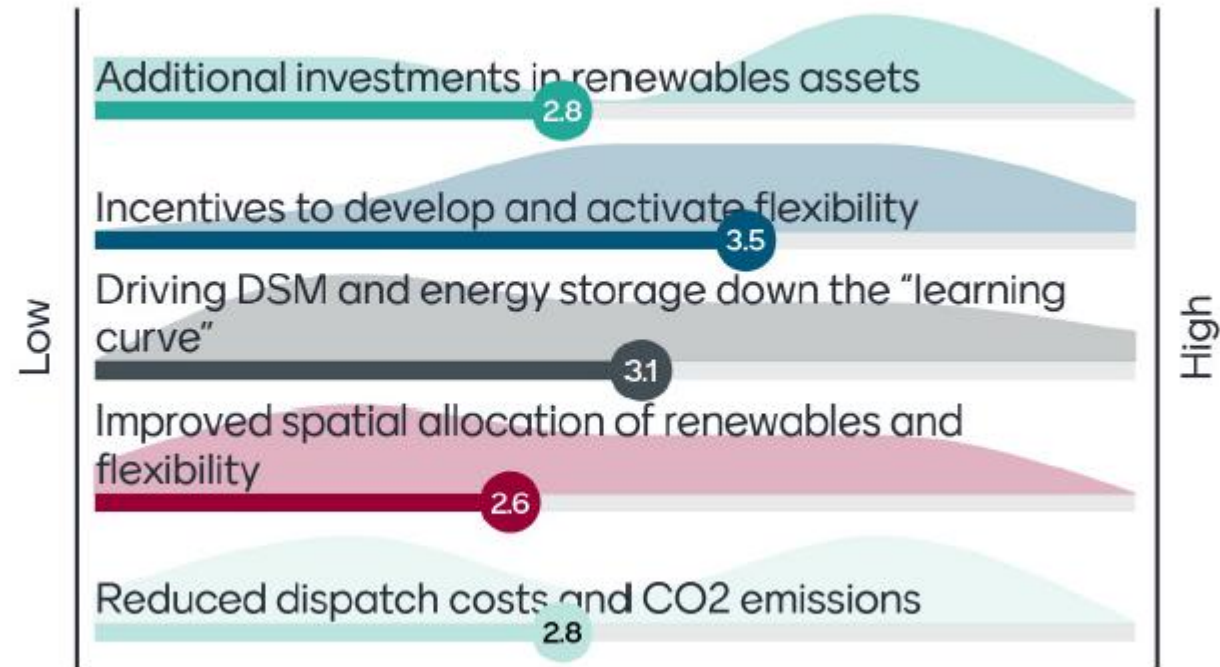
Improved spatial allocation of renewables and flexibility

Reduced dispatch costs and CO2 emissions

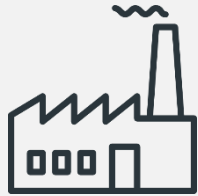


# Survey via Mentimeter

## Impact of Granular Certification



# A simplified approach to assess the impact on dispatch

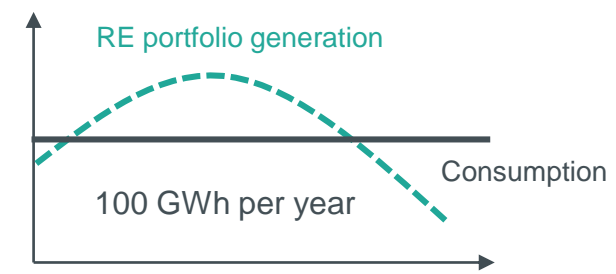


Corporate consumer  
 Located in Germany  
 100 GWh off-take in 2019  
 Engaged in green PPA(s)

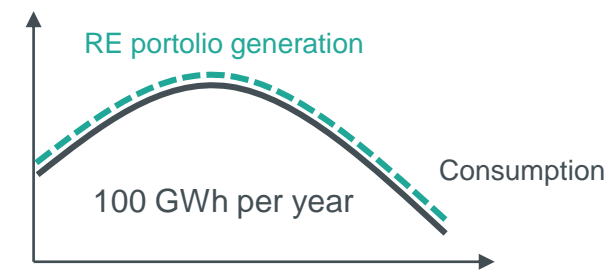
## Disclaimer

- Here we assume that the flexibility is developed on consumption side to match the generation profile. The opposite model (green baseload PPA) could give different results.
- Quick analysis under strong assumptions (100% flexible load, marginal approach...). Goal is not to calculate a reliable absolute value but rather to get insights on the direction and influence of the portfolio composition.

**Baseline**  
 100% green on an annual basis (GO)

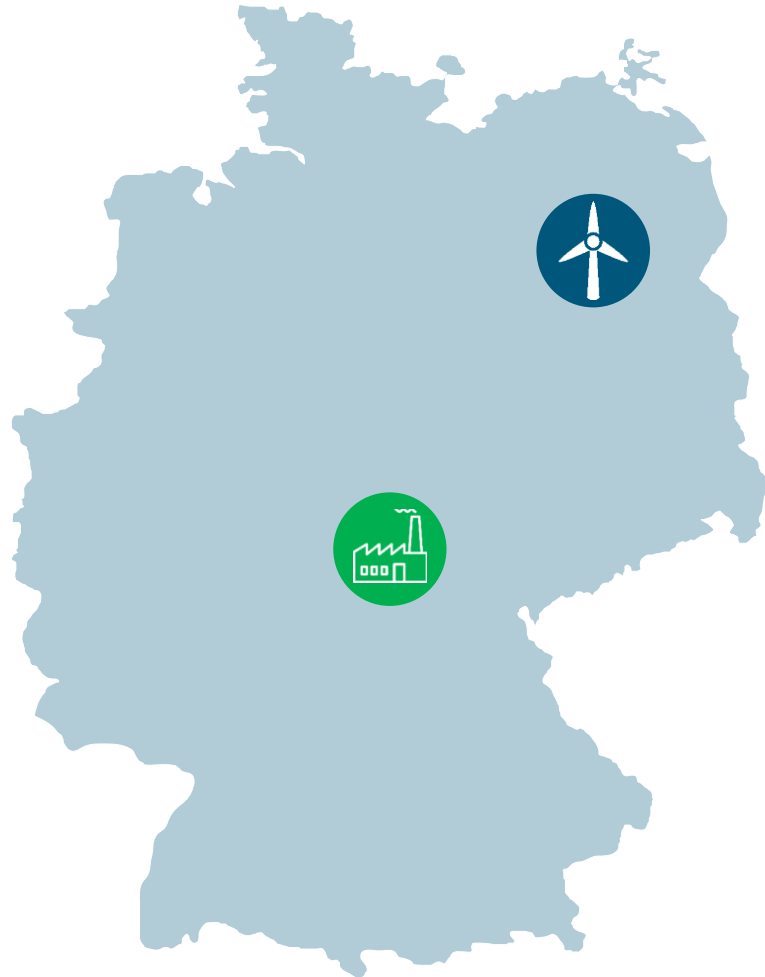


**With Granular Certification**  
 Consumption is 100% matched to generation using DSM and storage



**=** ± X €/year  
**=** ± Y tCO2/year

# Generation-matching within the same bidding zone reduces system costs and emissions, even with a small portfolio



## System costs variation

-536,000 €

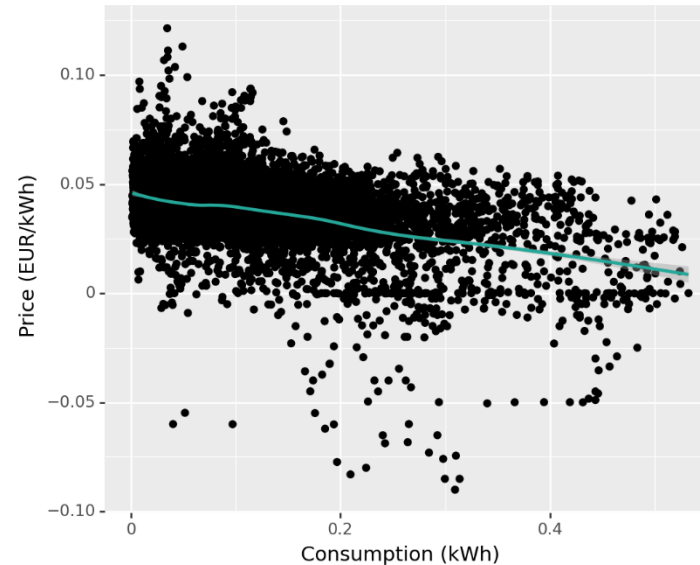
-14.2 %

## System emissions variation

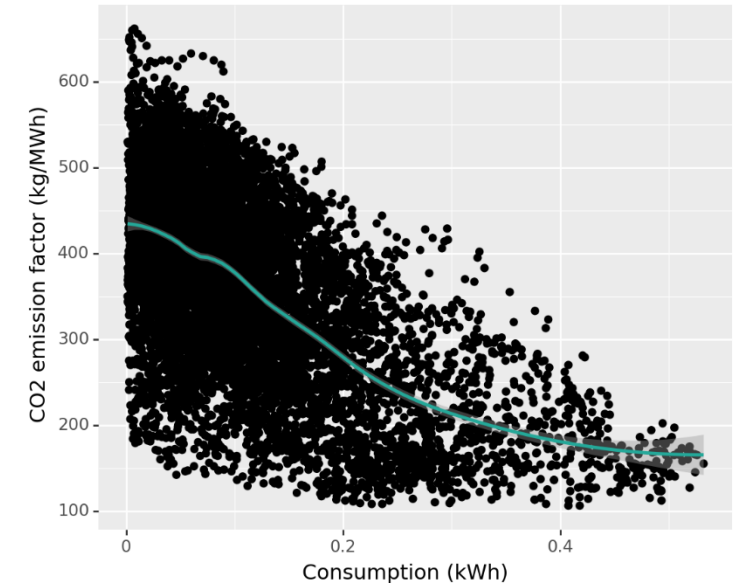
-5,730 tCO<sub>2</sub>

-15.9 %

Correlation of consumption and spot price for portfolio A1

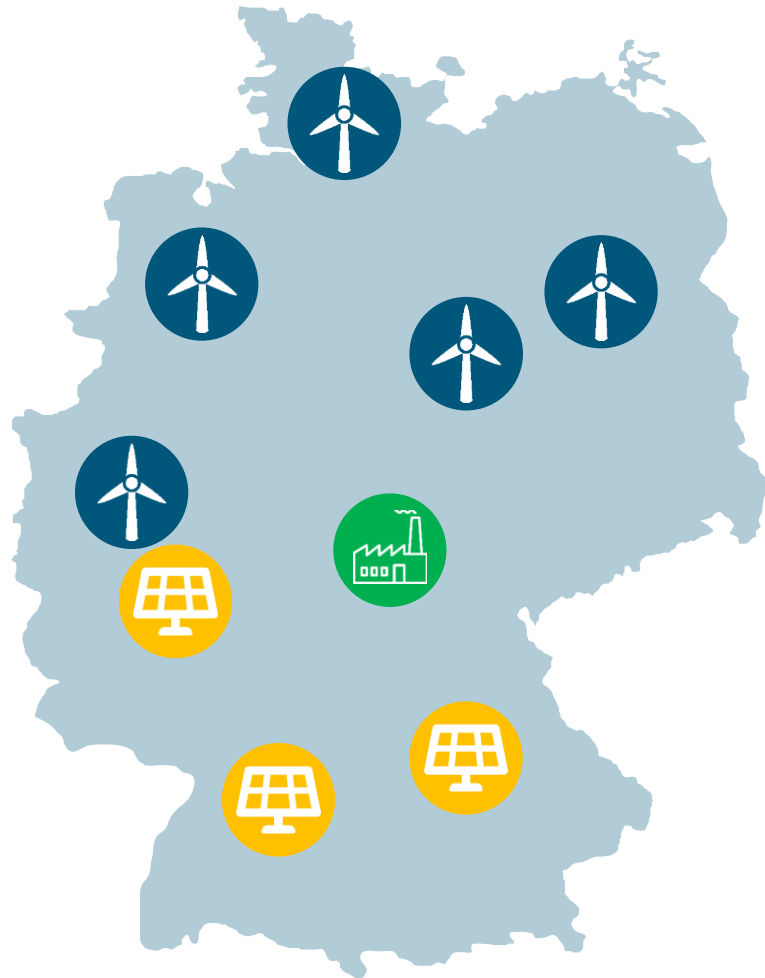


Correlation of consumption and emission for portfolio A1



- Due to a clear negative correlation between DA spot price / CO2 grid emissions and RES infeed, 100% generation-matching reduces system costs and emissions

# Generation-matching is similarly beneficial for larger portfolios but technology has an impact



## System costs variation

-346,000 €

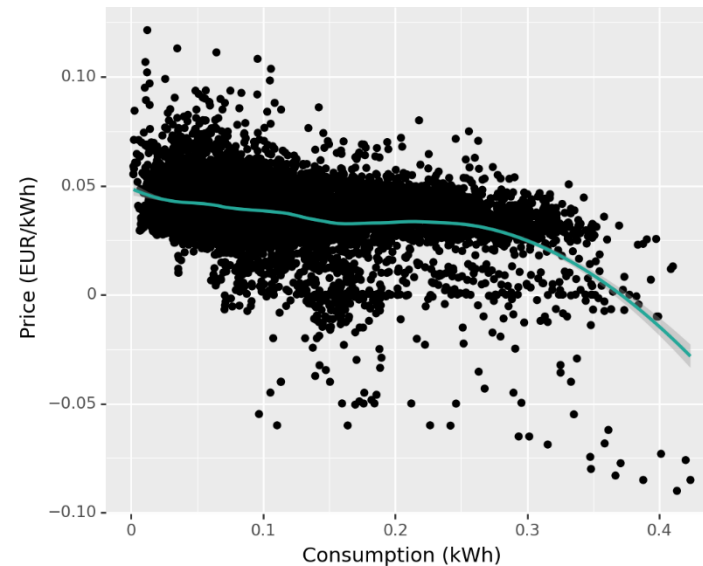
-9.2 %

## System emissions variation

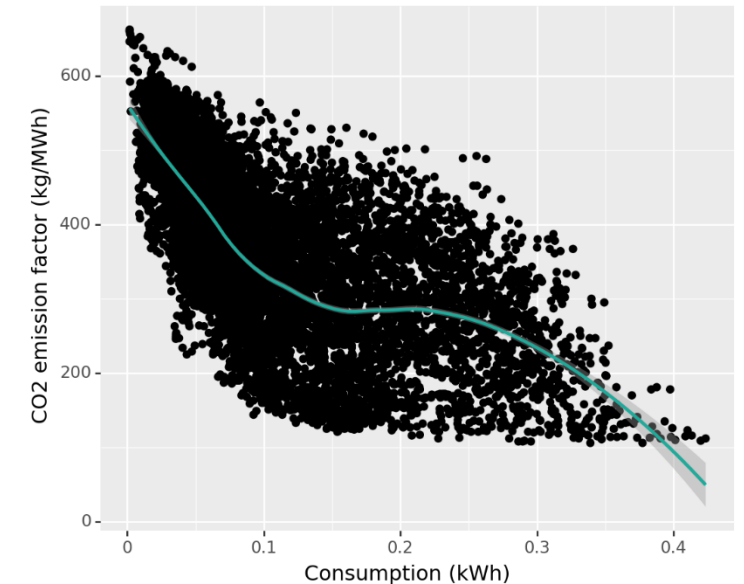
-4,950 tCO<sub>2</sub>

-13.7 %

Correlation of consumption and spot price for portfolio B2



Correlation of consumption and emission for portfolio B2



- Including solar in the portfolio adds incentives to shift the load during the day where the total consumption and thus market prices are high (valid when the PV penetration is moderate)

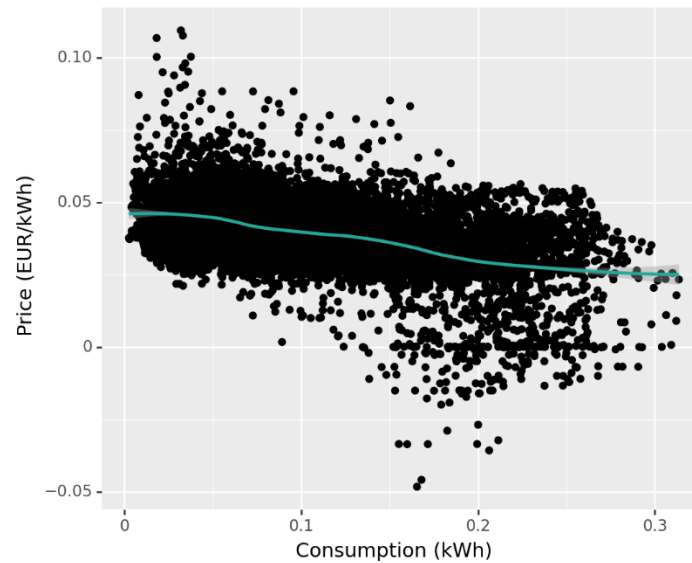
# GC provides similar benefits in areas with a high RES penetration



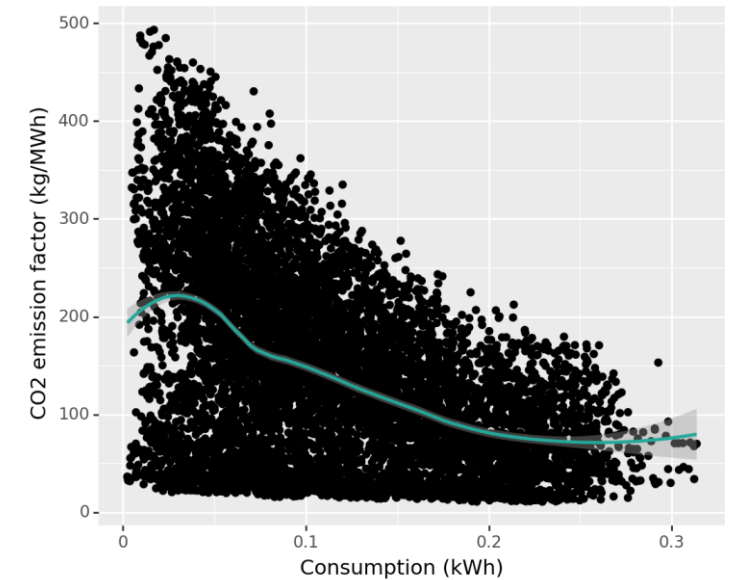
Costs variation
-334,000 €
-8.7 %

Emissions variation
-2,700 tCO <sub>2</sub>
-18.5 %

Correlation of consumption and spot price for portfolio DK1



Correlation of consumption and emission for portfolio DK1



# Cross-border generation-matching does not necessarily make sense from the dispatch perspective



## System costs variation

+86,000 €

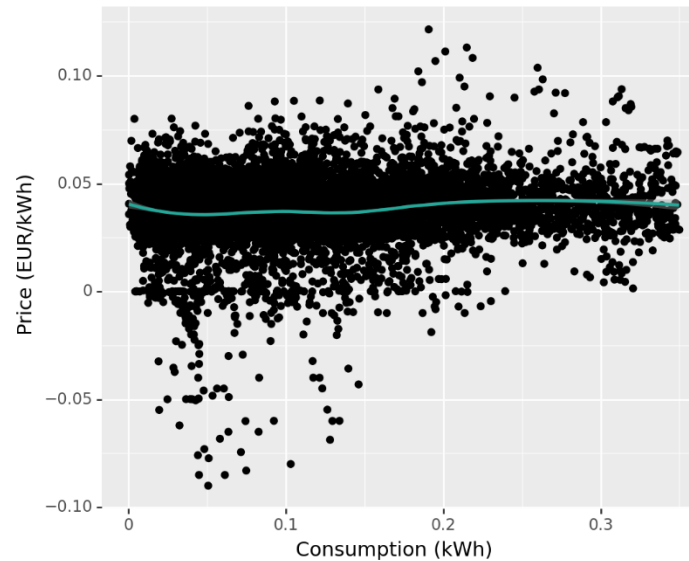
+2.3 %

## System emissions variation

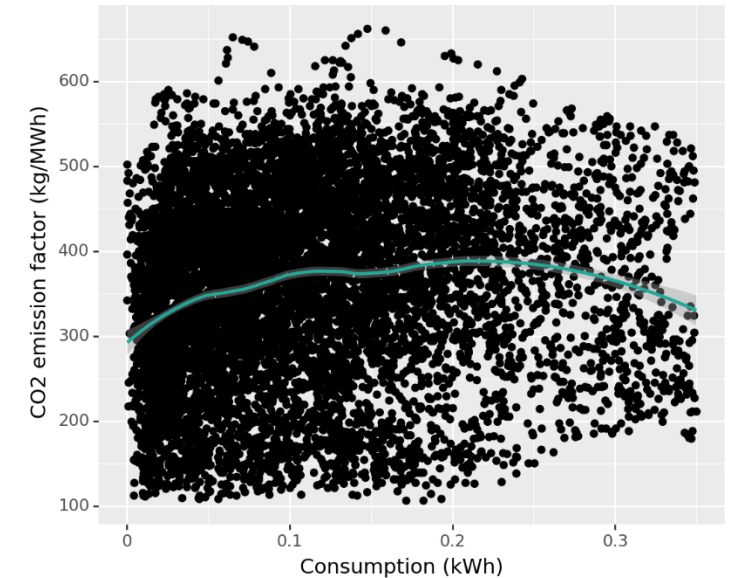
+360 tCO<sub>2</sub>

+1.0 %

Correlation of consumption and spot price for portfolio C1



Correlation of consumption and emission for portfolio C1



- In theory, XB generation-matching behaviour could increase system costs and emissions.
- In fact, consumers would (at least partially) optimize their flexibility dispatch against local market prices and would not aim at 100% generation-matching.

## Conclusions: GC's impact on short-term dispatch

### **If load and consumption are in the same bidding zone** (or in highly interconnected BZs)

- Granular certification (aligning load and RES portfolio's infeed) generally improves the system dispatch both in terms of generation costs and CO2 emissions
- The size of the portfolio doesn't make a significant difference in terms of cost and emissions reduction: the resulting dispatch behavior is similarly beneficial for small and large portfolios

### **If load and consumption are in BZs with low price convergence**

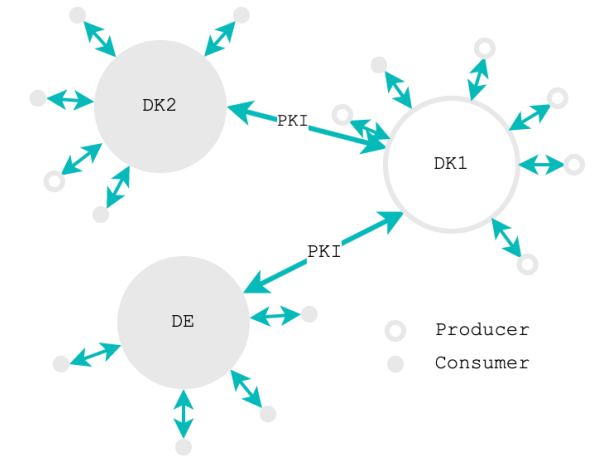
- A full generation-matching does not necessary make sense from the dispatch perspective
- In fact, consumers would, in that case, not aim at full generation-matching but rather align the use of their flexibility on local market prices and emissions

# Cross-border exchange mechanism (options)

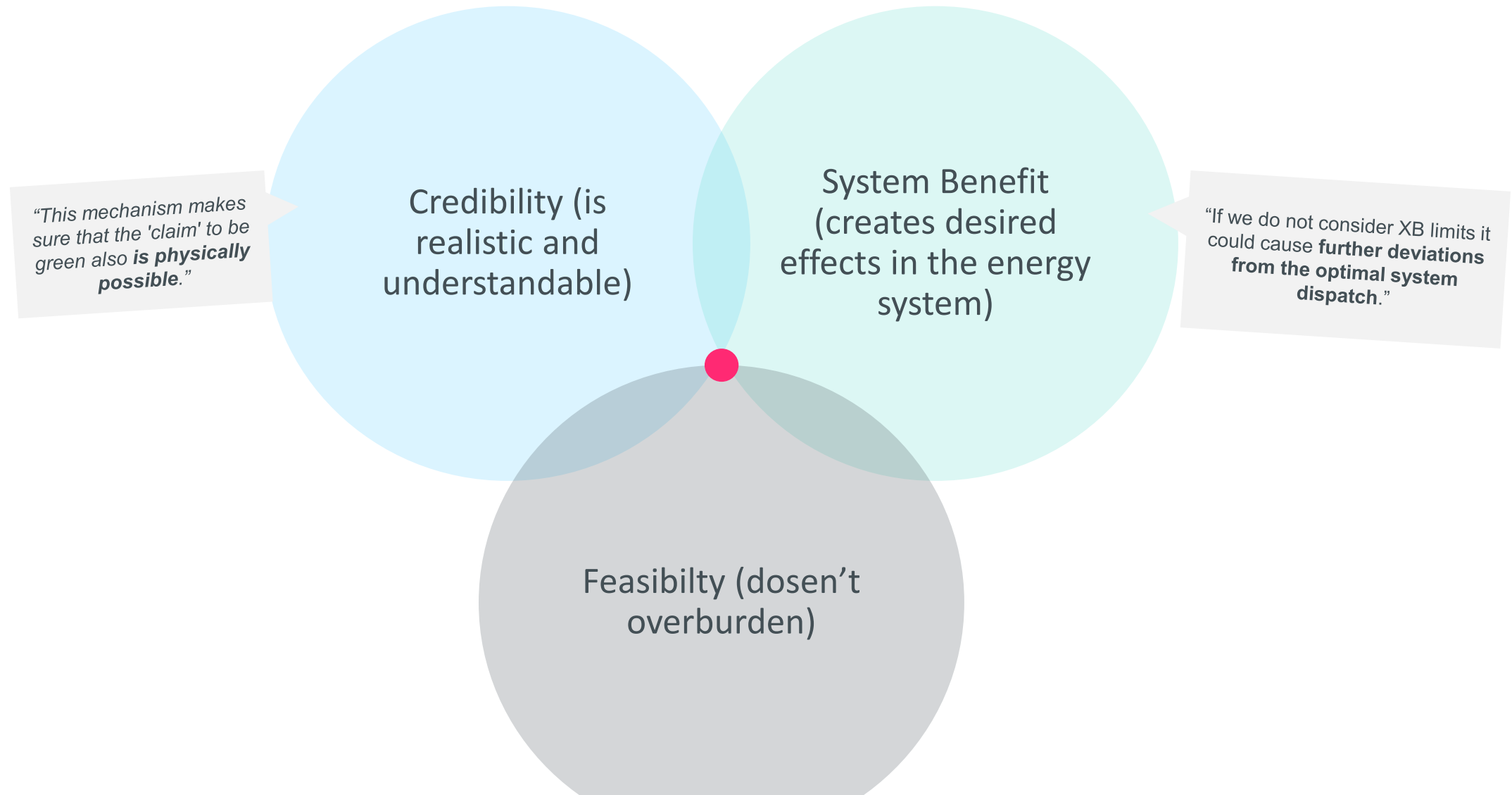


# What is the „cross-border mechanism“?

- In the ETT network prototype, the cancellation (matching) of certificates follows a set of rules - **a topology**.
- This ruleset is governed by the ETT network and define the minimum requirements for a valid match.
- The topology is designed to be adaptable (ie. to future regulatory changes). In the prototype network we want to test and demonstrate different topology rules in order to find the best solution.
- ETT aims at **enhancing credibility of the cross-border exchange of green energy** while ensuring energy system benefits.



In order to define the optimal cross-border exchange mechanisms, we take different interests into account

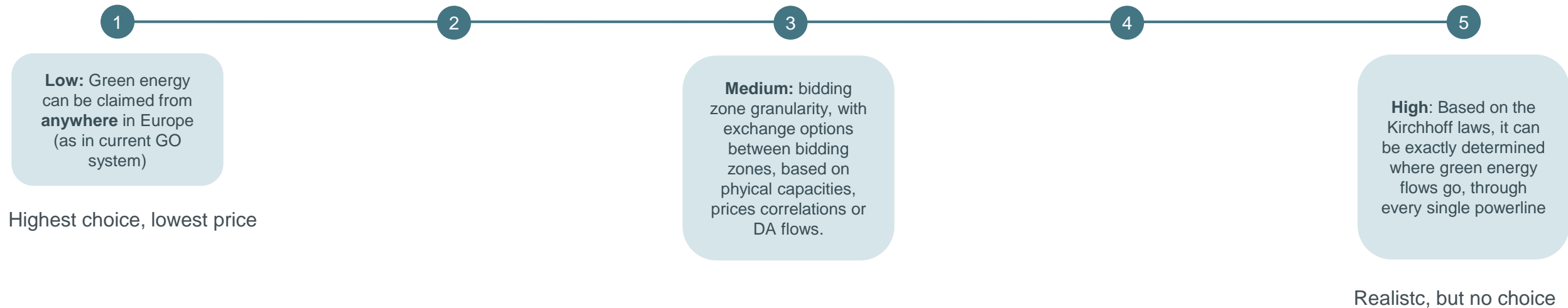


# How „realistic“ could/should granular tracking be?

Credibility - realistic and understandable

## Assumptions

- People/NGOs will increase their understanding of the energy industry and the lack of electrical grid capacity will be a visible issue.
- **Temporal matching** is already common ground for temporal matching, the optimal geographical method is still under debate.



Go to **menti.com** and use the code **9707 6947** or scan the QR code



# Survey via Mentimeter



- How „realistic“ should granular tracking be?
  - 1: No geographical matching
  - 3: Bidding zone level, with exchange between bidding zones based on capacities (or similar)
  - 5: Fully determined by power flows

# Survey via Mentimeter

## How „realistic“ should granular tracking be?



1: No geographical matching



3: Bidding zone level, with exchange between bidding zones based on capacities (or similar)



5: Fully determined by power flows

**3 different cross-border options that we consider implementing in the prototype**

## Option 1: explicit matching rules based on physical capacities

### Description:

- **Explicit IT rules** are applied to the cancellation process (a volume can only be cancelled when physical capacity is present/reserved)
- Available capacity can be allocated based on „first come first serve“, explicit booking or an auctioning process (ie. in a step-wise-approach)
- This method has **already been presented in our last workshop**

### PRO:

- understandable to end-consumers (credibility), medium realistic.

### CONTRA:

- Does not incentivize the optimization of dispatch, but limits potential damage. Limits choice/liquidity and adds complexity.

## Option 2: explicit matching rules based on statistical price correlations between bidding zones (RFNBO method)

### Description:

- **Explicit IT rules** are applied to the cancellation process (a volume can only be cancelled under certain conditions)
- Exchange is possible when in local bidding zone, or equal prices or cascading prices (in flow direction)
- This method is proposed by the **RFNBO delegated act**

### PRO:

- Ensures optimal dispatch behavior (due to price correlations)
- In line with RFNBO regulation

### CONTRA:

- Less understandable to end-consumers (credibility)
- Limits choice/liquidity and adds complexity and uncertainty



## Option 3: NO explicit rules in the IT system but publication of indicators

### Description:

- **NO explicit IT rules** are applied to the cancellation process (a volume can always be cancelled)
- Indicators are published on cancelled volumes in order to create awareness and transparency on physical deliverability
- Indicators can be based on physical capacities OR correlation method (see option 2)

### PRO:

- Free choice for consumers if to do geographical matching
- Indicators may ensure compliance with RFNBO regulation

### CONTRA:

- Less credible energy tracking
- Optimal dispatch is not ensured

Go to [menti.com](https://www.menti.com) and use the code **9707 6947** or scan the QR code



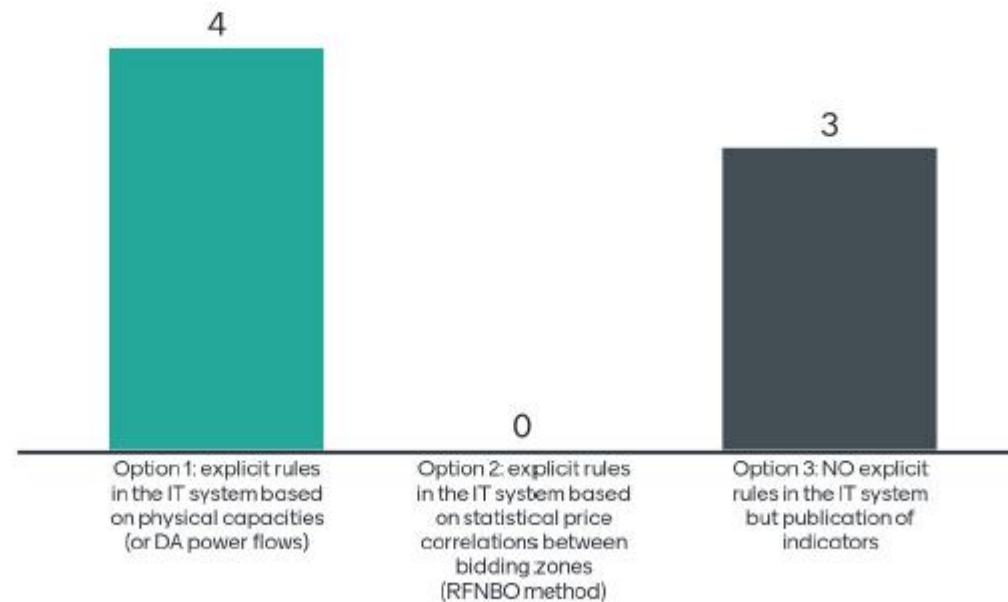
# Survey via Mentimeter



- What is the relevance of each cross-border option for you as a consumer?
  - Option 1: explicit rules in the IT system based on **physical capacities** (or DA power flows)
  - Option 2: explicit rules in the IT system based on **statistical price correlations** between bidding zones (RFNBO method)
  - Option 3: NO explicit rules in the IT system but **publication of indicators**

# Survey via Mentimeter

What is the relevance of each cross-border option for you as a consumer?



“ Energy Track and Trace is your  
digital proof that  
sustainable energy choice actually  
makes a difference

*See you again on September 15<sup>th</sup>!*