

# DESIGN OPTIONS FOR A GUARANTEES OF ORIGIN SYSTEM FOR HEATING AND COOLING

Issuing Body Webinar  
Guarantees of Origin for Heating and Cooling

Alexandra Styles | Hamburg Institut | 09.12.2021

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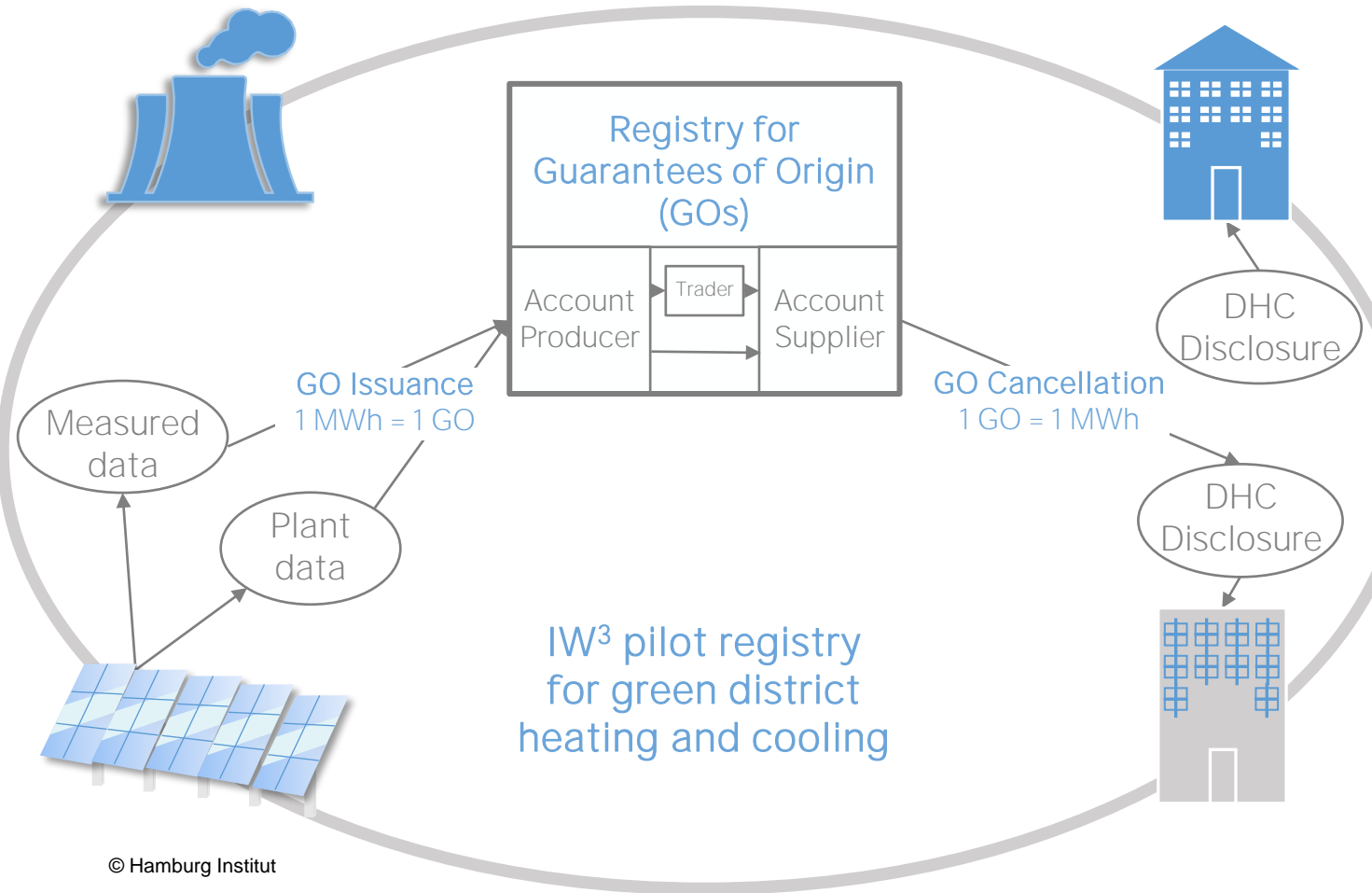
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- 1) Design principles for a guarantee of origin (GO) system for district heating and cooling
- 2) Design options and choices in the IW<sup>3</sup> pilot registry
  - Cancellation of GOs from non-interconnected networks for disclosure purposes
  - Role of final customers in the GO registry
  - Treatment of transport and storage losses
  - Treatment of energy carrier conversion (power to heat/cold, gas to heat/cold)
  - Disclosure rules for heating and cooling
- 3) Outlook

# DESIGNING A GO SYSTEM FOR DISTRICT HEATING AND COOLING: DESIGN PRINCIPLES

- **Basic principle:** Green characteristics must be 100% traceable to final consumption, avoiding multiple consumption claims
- **How to guarantee the renewable origin of energy?**
  - Issuance of 1 Guarantee of Origin (GO) for 1 MWh of energy produced
  - Supervise the issuance, transfer and cancellation of GOs – electronical, accurate, reliable and fraud-resistant
  - Ensure that the same unit of energy from renewable sources is taken into account only once
- **Focus IW<sup>3</sup> pilot registry:** Registry for renewable energy sources as well as waste heat and cold (with optional full disclosure)
- **Technical implementation** in cooperation with Grexel Systems



# DESIGNING A GO SYSTEM FOR DISTRICT HEATING AND COOLING: FRAMEWORK CONDITIONS FOR DESIGN CHOICES

- **Basic design parameters are defined by Article 19 RED II and EN 16325** (under revision), for instance:
  - Unit (1 MWh)
  - Lifetime of GOs (expiry after max. 18 months)
  - Obligatory information fields (e.g. energy source, technology, production device location, financial support)
  - Requirements on monitoring and verification of production device and measurement data
  - Issuance of GOs for net energy production
- Significant **scope for design choices** remains: e.g. optional information fields, cancellation and disclosure rules
- **Basis for assessment of design options:**
  - Evaluation of scientific literature, including results of the FaStGO project on the EN 16325 revision ([AIB 2020](#))
  - Legal framework for electricity GOs in Germany (Issuing Body: [Umweltbundesamt](#)) and existing heating/cooling GO systems in the Netherlands (IB: [CertiQ](#)) and Flanders (IB: [VREG](#))
  - Technical consulting by Grexel; exchange with IW<sup>3</sup> project partners Hamburg Energie and HAW
  - Stakeholder workshop in April 2021 with DHC suppliers, producer and consumer associations, public agencies

# DESIGN OPTION I: CANCELLATION OF GOS FROM NON-INTERCONNECTED DHC NETWORKS

- **Definition of system boundaries as a fundamental choice:**
  - **Electricity GOs:** European internal market, GOs can be transferred independently of energy deliveries and connections between networks
  - **Heating and cooling GOs:** DHC networks are local, closed systems, unlike electricity and gas networks
- **Arguments for cancellation of GOs from non-interconnected networks:**
  - Higher GO market liquidity and resilience against unplanned production device outages
  - Incentives for investments in renewable DHC projects are decoupled from green DHC demand in a given network
  - Most cost-efficient projects are realised first
- **Arguments against cancellation of GOs from non-interconnected networks:**
  - Credibility for consumers is uncertain
  - Incentives for local decarbonisation of DHC networks could be weakened
  - Exclusion of multiple consumption claims on renewable attributes requires binding, harmonised DHC disclosure rules and residual mix calculation methodology

# DESIGN OPTION I: CANCELLATION OF GOS FROM NON-INTERCONNECTED DHC NETWORKS

## German district heating market as context:

- **Transformation of heating supply** as a major energy transition challenge
  - RES share in heating and cooling: 14.6% in 2019, significantly below the EU-27 average of 22.1% ([Eurostat 2020](#))
  - RES share in grid-based heating supply: 17.6% in 2020 ([BDEW 2021](#); biomass 9.4%, biogenic municipal waste 7.4%, geothermal and solar thermal 0.8%)
- **Status quo: Heating and cooling quality** is defined by network
  - Disclosure framework (FFVAV, in force from 5.10.2021): Obligation to publish primary energy factors and RES shares for technically interconnected district heating or cooling networks
  - Technical norm for calculation of primary energy factors for building energy law applications (AGFW FW 309 Part 1): “1 network = 1 factor”
- **Stakeholder feedback:** majority favored use of GOs from interconnected networks or GOs from a regional context (e.g. quarter, district) for disclosure

## IW<sup>3</sup> pilot registry: Grid connection between production devices and consumers as prerequisite for GO cancellation

- Research focus: Role of green DHC products in incentivising local DHC grid transformations
- Additional attributes on GOs: code for network (e.g. HH-HE-1) and interconnected set of networks (e.g. HH-HE-1-HE-2)

# DESIGN OPTION II: ROLE OF FINAL CUSTOMERS IN THE GO REGISTRY

- **Electricity GOs:** In Germany, GOs have to be cancelled by electricity suppliers and can only be used in the context of suppliers' disclosure obligation to final customers (§ 30 HkRNDV)
- **Heating and cooling GOs:** Should only DHC suppliers cancel GOs on behalf of their customers, or should customers be able to cancel GOs themselves?



Marketing of GOs: separately from GO registry (over the counter)

# DESIGN OPTION II: ROLE OF FINAL CUSTOMERS IN THE GO REGISTRY

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- **Advantages of GO cancellation option for final costumers:**
  - Can facilitate individual composition of GO portfolios (e.g. in case of preference for certain energy sources/technologies)
  - Direct access to all GO information fields for sustainability reporting
  - Relevant option primarily for building management industry, process heat consumers
- **Advantages of GO cancellation only by DHC suppliers:**
  - Reduced complexity of the disclosure system (including clear responsibilities)
  - Potentially, better plannability of GO availability and prices (if cancellation is limited to interconnected networks)
- In both cases: Transparency, customisability of green DHC products and planning security depend on **contract design and disclosure rules**
- Accommodating GO cancellation by DHC suppliers and final customers is possible from technical and organisational viewpoints, but challenges in **handling transport and storage losses** have to be addressed



# DESIGN OPTION III: TREATMENT OF TRANSPORT AND STORAGE LOSSES

- **Electricity GOs:** Losses occurring during grid transport and intermediate storage of energy are neglected in most GO systems (CA-RES 2020) – implicit allocation of residual mix characteristics
- **Transport losses in DHC grids:**
  - Unlike with electricity grids, no independent grid operator is responsible for compensating losses: direct consideration in production planning
  - Significant in volume (on average 12% in DH grids in Germany 2019, AGFW 2020): credibility problem, if neglected when marketing green DHC products
- **Storage losses in DHC grids:** considerable, especially for seasonal storage facilities
  - GO cancellation for input and GO issuance for output possible, but could represent an economic burden for storage operators (similarly: GO cancellation for storage losses)
  - Storage increases the amount of green attributes that can be integrated into DHC grids: with annual disclosure, there is a case for sharing costs of GO cancellation for storage losses among GO system participants
  - Potential business case for GO cancellation by storage operators, if consumption is matched not on an annual, but e.g. on a monthly or seasonal basis

# DESIGN OPTION III: TREATMENT OF TRANSPORT AND STORAGE LOSSES

Options to account for transport and storage losses in DHC grids (assuming annual disclosure):

- **Subtracting loss factors during GO issuance**
  - 100 MWh RES generation, 20% total losses (transport + storage): GO issuance for 80 MWh
  - Challenge: volume of total losses is only known at the end of the accounting period (e.g. one year); for DHC grids in transformation, grid losses may change, and storage losses depend on actual storage usage
- **Cancellation of a share of issued GOs by the grid operator**, corresponding to the network's total loss factor
  - GO issuance for 100 MWh of RES generation, GO cancellation for 20% losses: 80 MWh marketable as green district heating
  - Challenge: at the end of the accounting period, the required amount of GOs may no longer be available / sold at a high price (unless producers, grid operator and supplier are vertically integrated or GOs from non-interconnected networks can be used for disclosure)
- **Cancellation of a share of marketed GOs by suppliers of green DHC products/final customers**, corresponding to the network's total loss factor
  - Cancellation of RES GOs for 80 MWh final consumption: additional GO cancellation for 20 MWh losses
  - Challenge: timely information is needed about the volume of losses at the end of the accounting period
  - Additional challenge if GOs are cancelled by final customers: price risks, monitoring of disclosure and associated claims



# DESIGN OPTION IV: TREATMENT OF ENERGY CARRIER CONVERSION

- What evidence has to be provided so that **energy inputs taken from networks** can be considered fully renewable?
- **Grid-based gas supply as an input for heat/cold production:**
  - Status quo: mass balancing established as an attribute tracking system
  - Perspective: Gas GOs, potentially with additional requirements (e.g. feed-in into the European gas network)
- **Grid-based electricity supply as an input for heat/cold production:**
  - Green electricity with cancellation of electricity GOs
  - Electricity-based fuels (green hydrogen in particular): discussion on proof of geographical and temporal correlation between supply and demand, and additionality of electricity generation from RES (Article 27 (3) RED II)

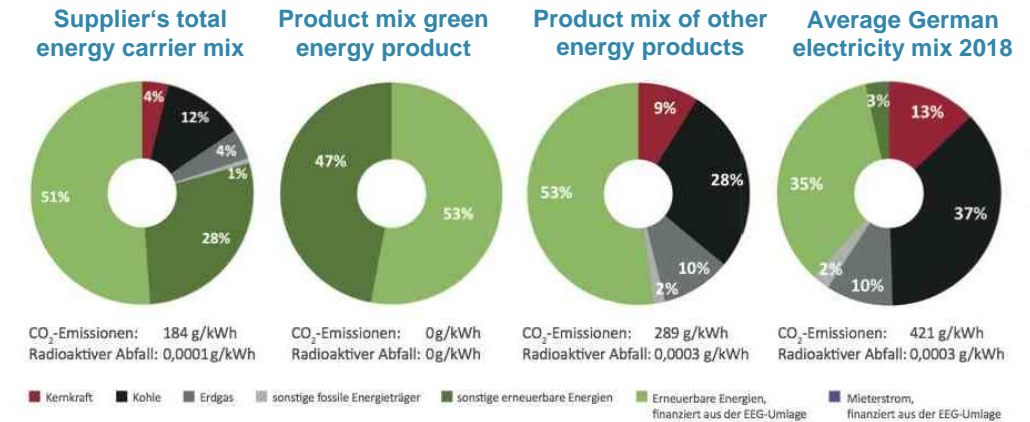
## IW<sup>3</sup> pilot registry:

- **Gas as an input:** initially mass balancing, potentially adjustment once a gas GO system is available
- **Electricity as an input:** green electricity supply with GO cancellation as a pragmatic attribute tracking option, to avoid barriers for Power to Heat technologies (+ ongoing research on qualitative criteria for different applications of GOs, e.g. [GO4Industry](#))

# DESIGN OPTION V: DISCLOSURE RULES FOR HEATING AND COOLING

- Guarantee of origin system must be accompanied by **disclosure rules** to ensure transparency for consumers
- **Electricity disclosure:** European harmonised legal framework with clear role for GOs
- **DHC disclosure:** Article 24 (1) RED II - end-users must be provided with information on the overall energy efficiency and the share of renewable energy in their district heating and cooling systems
  - Role of GOs not specified; coordination required if several energy attribute tracking methods are used in parallel
  - Complicates the exclusion of double marketing and double claims on green energy characteristics
  - No legislative framework yet for disclosure of product mixes

## German electricity disclosure statement (example)



Beispielhafte Darstellung  
Source: Hamburg Institute

### IW<sup>3</sup> pilot registry:

- Participating suppliers commit to use GOs to disclose green energy attributes (RES, waste heat and cold) as part of the scheme rules
- Full disclosure of energy sources and technologies on the basis of GOs as a voluntary option
- Development of recommendations for the detail of disclosure information in coordination with pilot participants

# DESIGN OPTION V: DISCLOSURE RULES FOR HEATING AND COOLING

- **Primary energy factors and emission factors:** national requirements result from the Buildings Energy Act (GEG)
  - Intended use: information on non-renewable primary energy consumption of buildings and associated GHG emissions
  - So far reported at network level (methodology: AGFW FW 309 Part 1), taking into account grid losses
  - Energy carrier-specific default values for input fuels available (including upstream emissions and primary energy consumption)
  - Challenge especially for bioenergy: methods and default values may change depending on the regulatory context
- **Emission factors according to the electricity disclosure approach**
  - Intended use: consumer information, climate reporting e.g. according to GHG Protocol Scope 2
  - Direct GHG emissions from DHC generation (excluding upstream emissions)
  - Energy from renewable sources and unavoidable waste heat and cold sources can be treated as carbon neutral

## IW<sup>3</sup> pilot registry:

- Emission and primary energy factors not included on GOs to begin with (emission factors: potential further development in line with EN 16325)
- Research on a DHC product-based methodology for calculating primary energy and emission factors (based on regulatory default values)

# DESIGN OPTION V: DISCLOSURE RULES FOR HEATING AND COOLING

- **Treatment of self-supply**

- Ongoing discussion in the electricity GO context: industrial consumers operating their own RES production devices express interest in being issued GOs, to be able to use them as proof of RES consumption in climate accounting (with GO cancellation for self-supply)
- Credibility concerns, if GOs issued for energy consumed by operators of production devices are indistinguishable from GOs issued for energy supplied to other parties
- FaStGO project accompanying EN 16325 revision: concept of “**dissemination level of the physical energy for which the GO is issued**” as attribute on GOs to provide transparency ([FaStGO 2020, Task 2-3](#))

## **IW<sup>3</sup> pilot registry:**

- Use of dissemination level attribute to enable GO issuance for energy supplied to customers via DHC networks and energy consumed by production device operators
- For disclosing attributes of DHC supplied to customers, only GOs with attribute “transferred over a heating or cooling network” can be used

# OUTLOOK

- **Variety of design options for heating and cooling GO systems** – advantageousness depends on framework conditions of DHC markets and potential **applications of GOs**:
  - Consumer information
  - Market-driven support for renewable energy expansion
  - Facilitating the enforcement of regulatory requirements
  - Support of renewable energy statistics and monitoring processes
- **Focus of the IW<sup>3</sup> pilot registry**: activating the consumer market's potential to support the transformation of local DHC networks; moreover, potential applications for proving fulfilment of regulatory requirements are assessed
- **Outlook on next steps**:
  - Pilot phase with DHC networks in the city of Hamburg
  - Assessment of experiences from using and operating the registry
  - Generation of lessons for the implementation of Article 19 RED II



Thank you for your interest!

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DR. ALEXANDRA STYLES

Phone +49 40 39106989-38  
[styles@hamburg-institut.com](mailto:styles@hamburg-institut.com)

**Hamburg Institut**

Paul-Neumann-Platz 5

D-22765 Hamburg

Phone: +49 40 39106989-0

[www.hamburg-institut.com](http://www.hamburg-institut.com)