Central European Gas Hub AG

Erfarungsaustausch Wasserstoffkosten

WIVAP&G

Gottfried Steiner, 16. Mai 2023

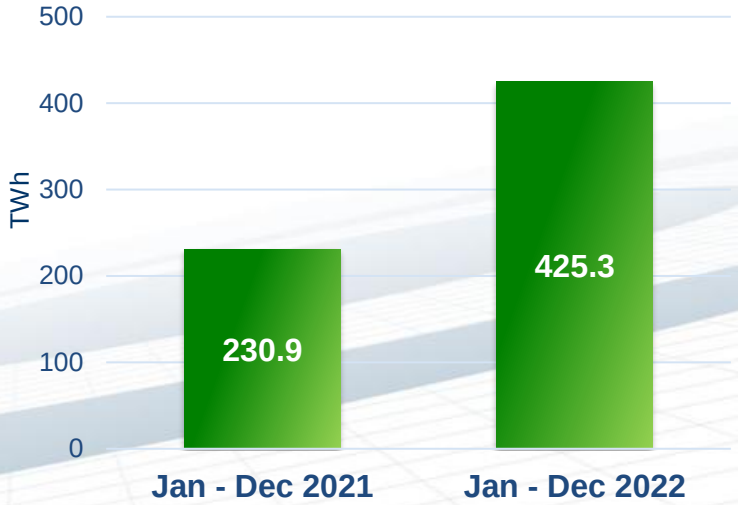
CEGH Volume – Development: 1-12/2022

CEGH VTP Market:

1-12/2022: 633.3 TWh
(y-t-y: -15.4%)

EEX CEGH Gas Market:

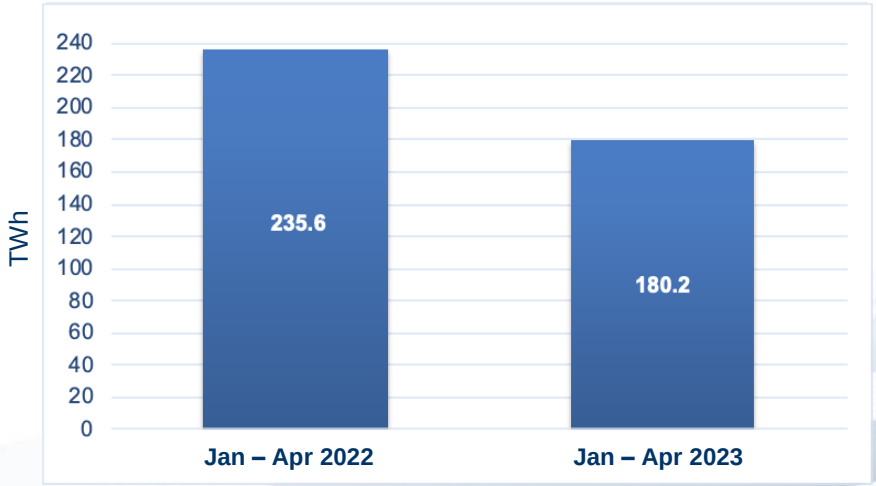
1-12/2022: 425.3 TWh
(y-t-y: +84.2%)



CEGH Volume Development 1–4/2023

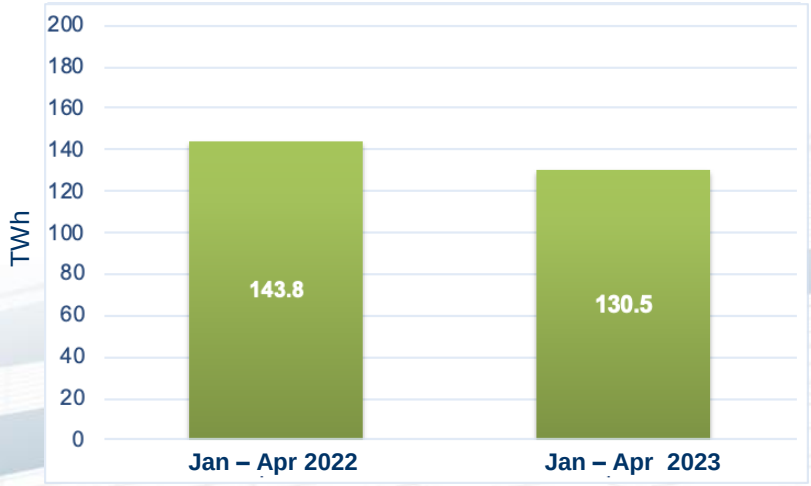
CEGH VTP Market:

1-4/2023: 180.17 TWh
(y-t-y: -23.6%)

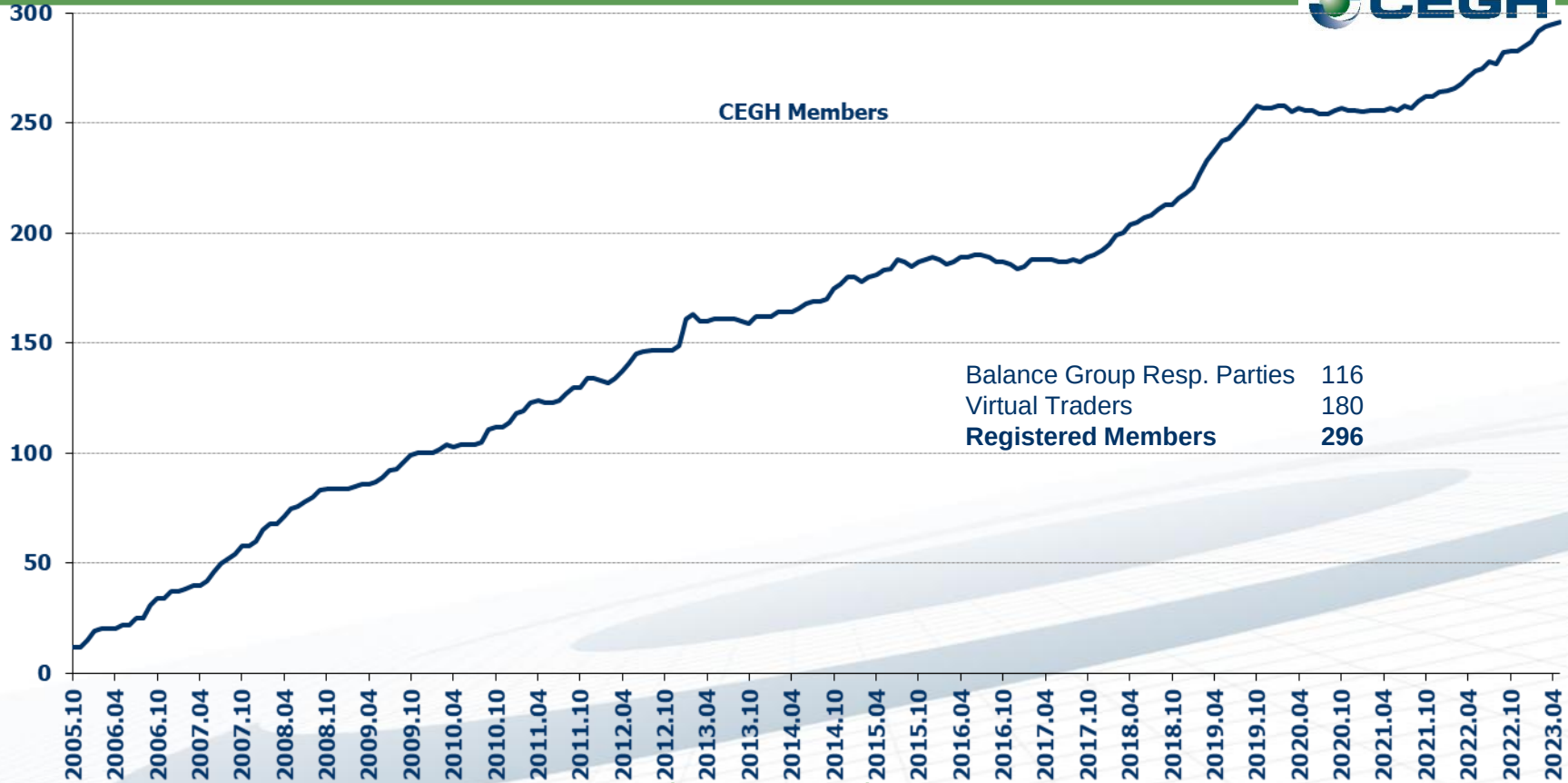


EEX CEGH Gas Market:

1-4/2023: 130.51 TWh
(y-t-y: -9.2%)

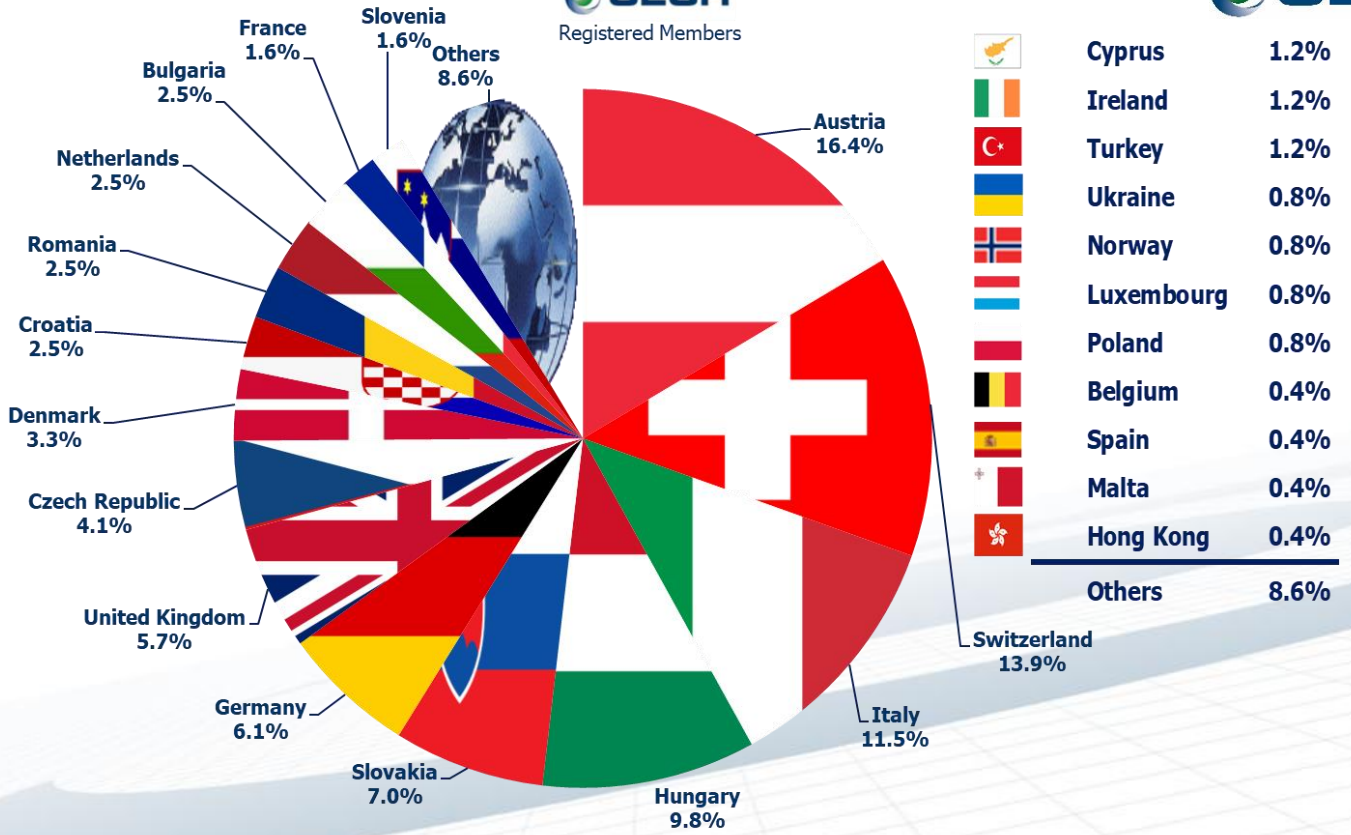


CEGH VTP registered members

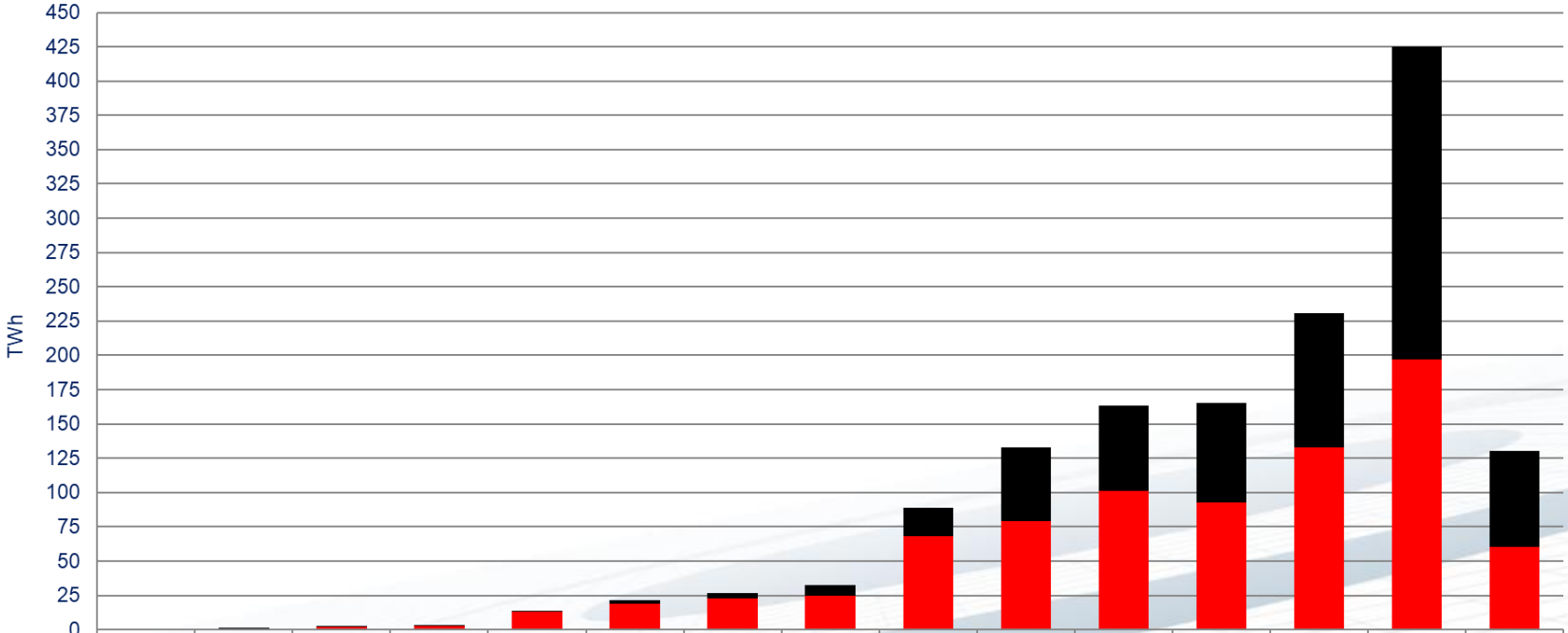


Balance Group Resp. Parties	116
Virtual Traders	180
Registered Members	**296**

CEGH - Development of VTP Diversity of Registered Members

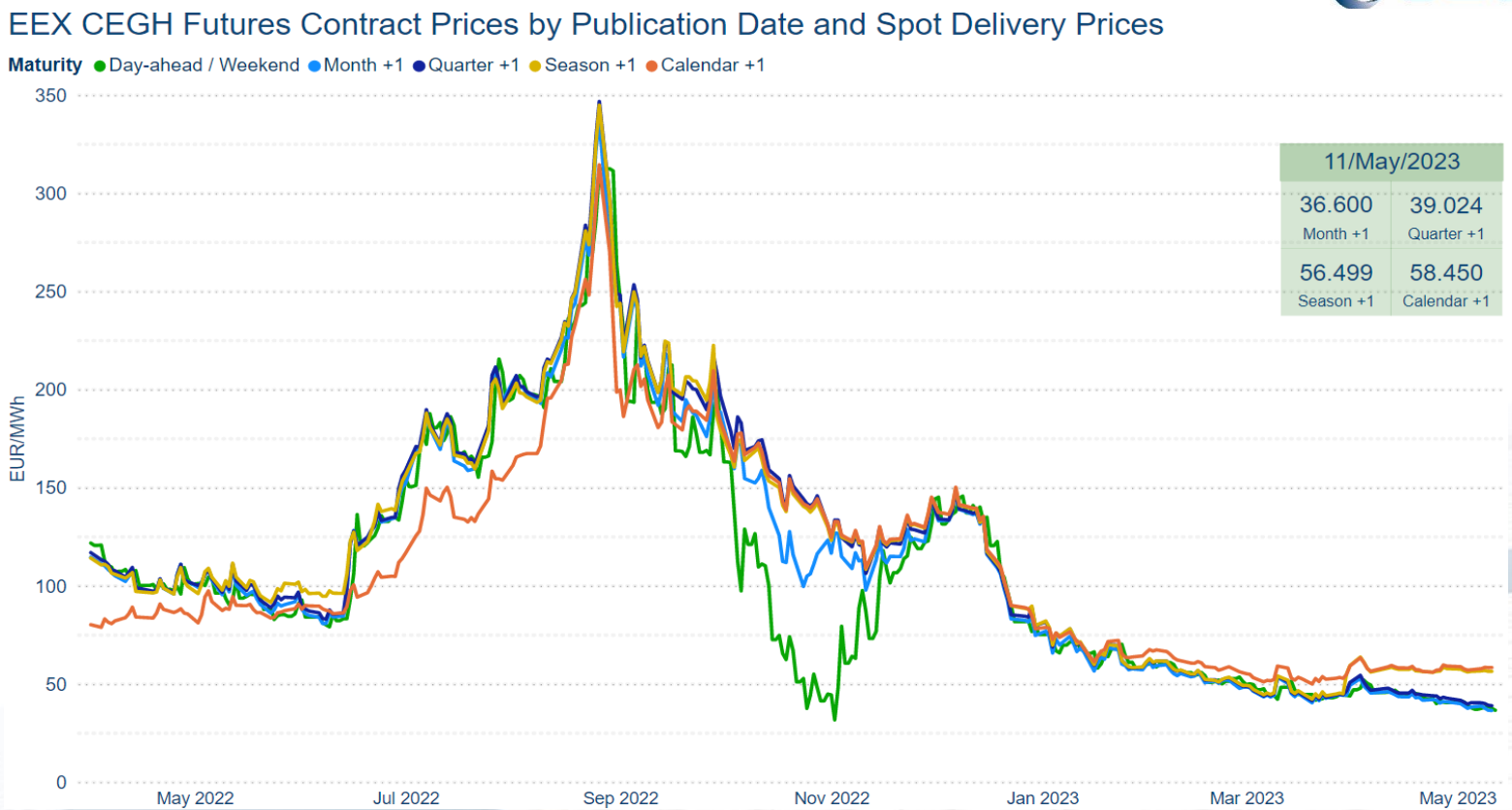


EEX CEGH Austrian Gas Market: Yearly Trading Volume since 2009



	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
Futures Market	-	0.05	0.53	0.30	0.30	2.32	3.51	7.76	20.47	53.19	61.92	72.81	98.09	228.00	70.06
Spot Market	0.01	1.06	2.02	2.76	12.92	18.94	22.96	24.72	68.43	79.46	101.48	92.54	132.82	197.34	60.46

EEX CEGH Austrian Gas Market: Gas Price Development

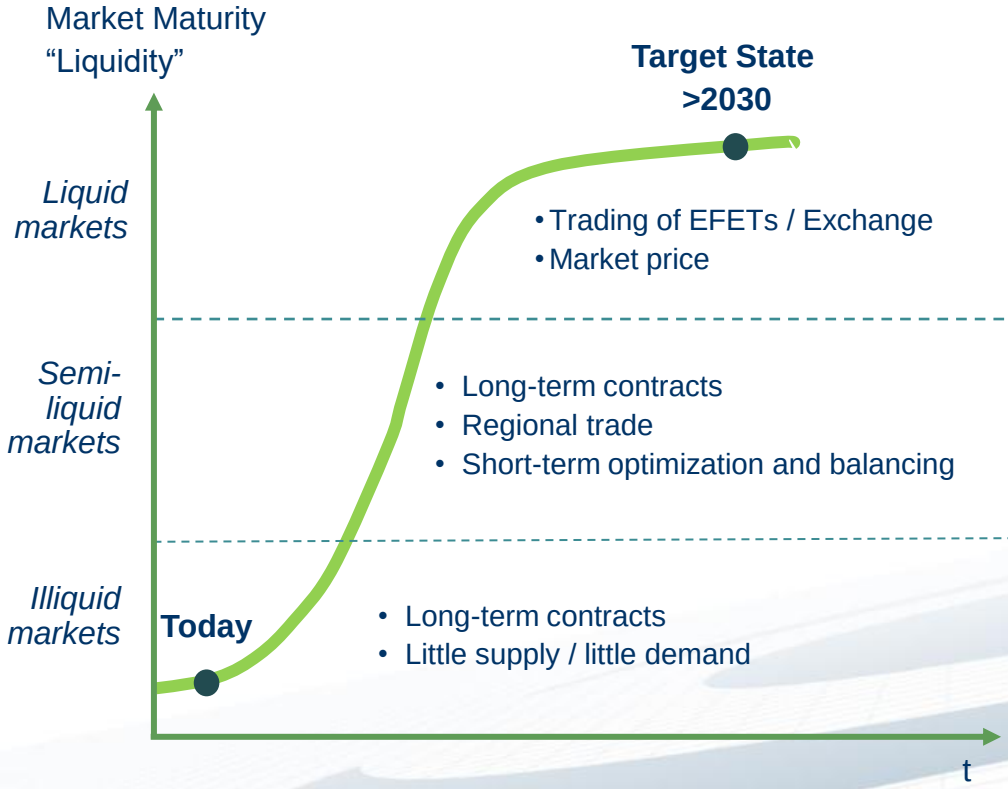


CEGH GreenHydrogen Index

Liquid markets are an important building block for EU biogas targets

- Ambitious European targets for Green Gases incl. biogas, but regulatory and institutional framework conditions are still missing, e.g. national registries for Guarantees of Origin (GOs), rules for cross-border trade, standardization, etc.
- Functioning markets are an important pre-condition for biogas expansion: transparent, robust price signals for efficient resource allocation and long-term investments.
- So far, there is no institutionalized or well-functioning trading in Austria or EU - neither with GOs nor with bundled biomethane.

Development of Liquidity: Different Instruments are needed in different Market Maturity stages



Green hydrogen / GOs of green hydrogen

Useful trading instruments to be offered:

Exchange (financial Clearing / Clearinghouse)

Platform based trading (Broker)

Balancing instruments

Standardized contracts (EFET)

Build-up of institutional & regulatory requirements

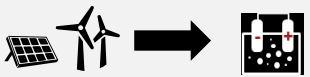
Price Information & Transparency

Auction- / Bulletin-Board / “Physical” Services

CEGH supports the Development of Hydrogen Markets

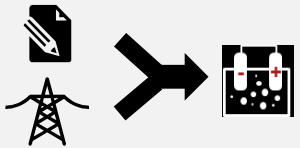
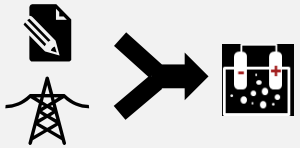
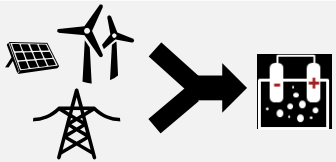
Provision of CEGH Hydrogen Indices	▪ Publication of **CEGH Hydrogen Indices facilitates** monitoring the „cost gap“ between hydrogen and alternative sources of energy supply and enables market participants to evaluate business cases for investing in hydrogen projects. ▪ **Further enhancements of price assessments** planned once the hydrogen market becomes more liquid leading to new requirements by index users (e.g. benchmarking costs of supply, “net-back pricing”).
Set Up of a Marketing Platform	▪ **Launch of the CEGH GreenGas Trading Platform** to facilitate trading of Biomethane Guarantees of Origin (GoOs) with or without biogas for the first time in Austria. ▪ Gradual expansion into other markets in Central - and Eastern Europe planned. ▪ Upgrade of functionalities according to market feedback. ▪ **Addition of trading of Green Hydrogen once Green Hydrogen becomes available.**
Continuous Stakeholder Dialogue	▪ **CEGH engages with key stakeholders within the emerging hydrogen ecosystem** including politicians, regulators, producers and offtakers. ▪ Key areas for alignment include regulatory frameworks (e.g. third-party access to hydrogen infrastructure), market model (entry-/exit system vs. physical hub), balancing code, design of framework agreements etc.

The Main Driving Force for different “Hydrogen Colors" are Regulatory Requirements

	“Grey” H_2	Green H_2	H_2 Blend	Renewable H_2[1]
Illustration				
Electricity procurement	Electricity is procured from the grid, therefore the hydrogen produced does not meet any requirements for labelling	Electricity is procured from the grid and, additionally, GoOs are purchased from market places	Green electricity is either procured via direct line or PPA as well as regular (“grey”) electricity from the grid	Green electricity is either procured via direct line or PPA
(Regulatory) requirements	No additional requirements concerning the operation of the electrolyzer	No additional requirements concerning the operation of the electrolyzer	Balancing of renewable electricity and hydrogen production for min. 40% of the production volume	Hourly balancing of renewable electricity and hydrogen production for 100% of the production volume
CEGH Index	-	CEGH Green Hydrogen Forward Index	CEGH Green Hydrogen PPA 40 Index	CEGH Green Hydrogen PPA 100 Index

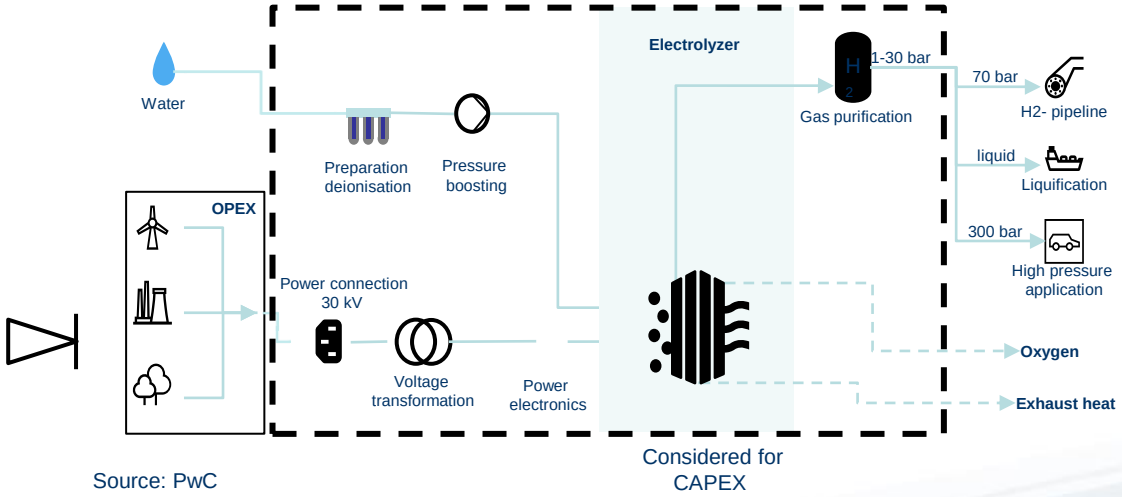
[1]*In line with requirements REDII Delegated Act Article 27.3.*

CEGH Green Hydrogen Indices measure the Value of the various “Shades” of Green Hydrogen

Index	Green Power Supply for Hydrogen Production	Product Definition	Update
CEGH Green Hydrogen Spot Index	 ▪ Sourcing of “grey” power in the day-ahead market ▪ Sourcing of guarantees of origin via exchange / platforms	▪ Over 24 hours optimized average baseload H2 Delivery	▪ Daily
CEGH Green Hydrogen Forward Index	 ▪ Sourcing of “grey” power in forward markets ▪ Sourcing of guarantees of origin via exchange / platforms	▪ Monthly, Quarterly, Seasonal and Yearly Products ▪ Baseload delivery	▪ Daily
CEGH Green Hydrogen PPA 40 Index	 ▪ 40% of green power (renewable PPA) and 60% “grey” power (forward) ▪ Sourcing of guarantees of origin via exchange / platforms	▪ 10 Year Baseload H2	▪ Daily
CEGH Green Hydrogen PPA 100 Index	 ▪ 100% sourcing of green power via power purchase agreements (renewable PPA)	▪ 10 Year Baseload H2	▪ Daily

At the Current State of Market Development, a “Cost-Plus”-Approach is Considered for Hydrogen Indices

Battery Limits applied for Capex Calculation



Source: PwC

- Estimated Capex for electrolyzer is re-assessed on a regular basis
- Consideration of learning curve effects for „forward“ hydrogen price assessments

Cost of green power supply

+ Capex

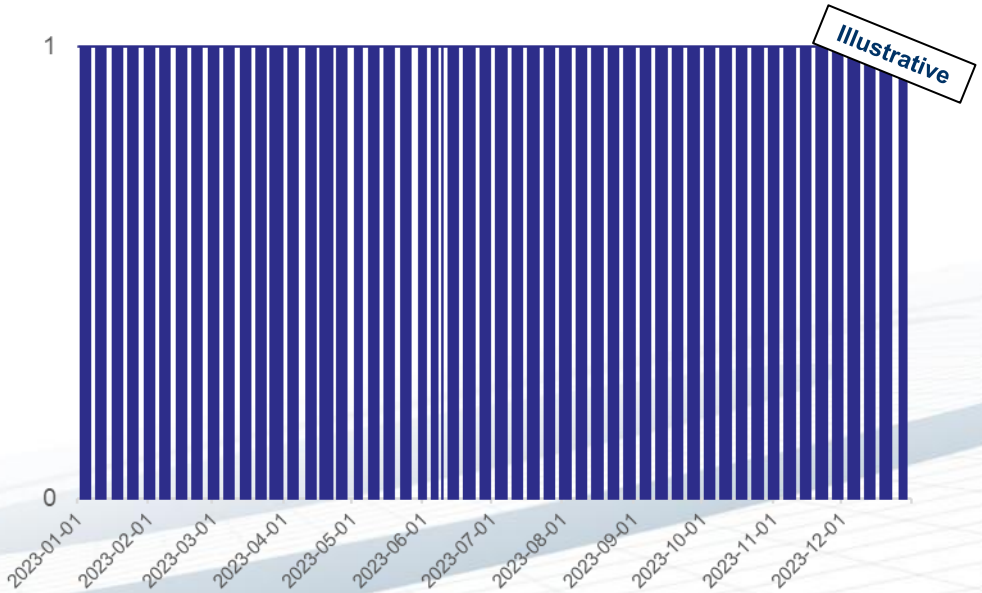
“Cost-Plus”-Value of Green Hydrogen

The Operation of the Electrolyzer for “Market Hours" is determined by Utilization and Price Forward Curve

Modelling electricity procurement costs

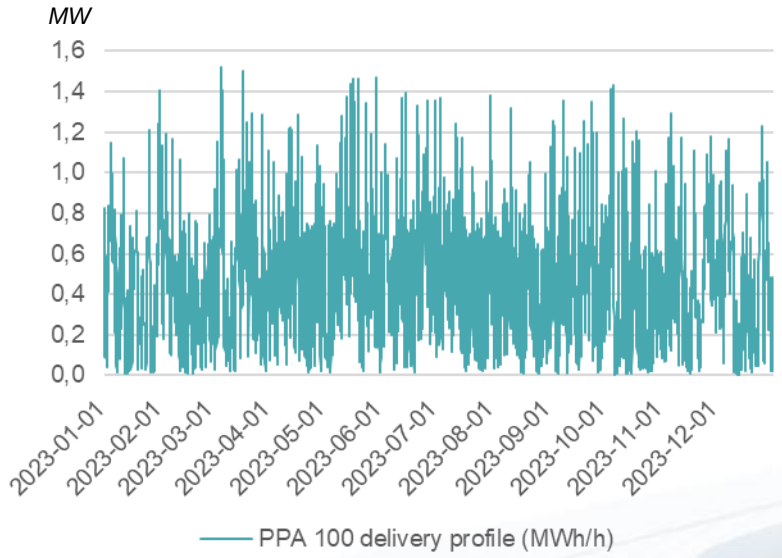
- It is assumed that there is no seasonal demand structure and that the electrolyzer produces 6,000 hours/ year and 500 hours/ month
- These 500 hours are sorted over the individual delivery hours in ascending order according to the respective hourly forward prices
- The basis for optimizing the operation of the electrolyzer is the price forward curve

Optimized electrolyzer production profile



The Difference between the PPA 40 and the PPA 100 Index is additional Procurement of “Cheap” Market Volumes

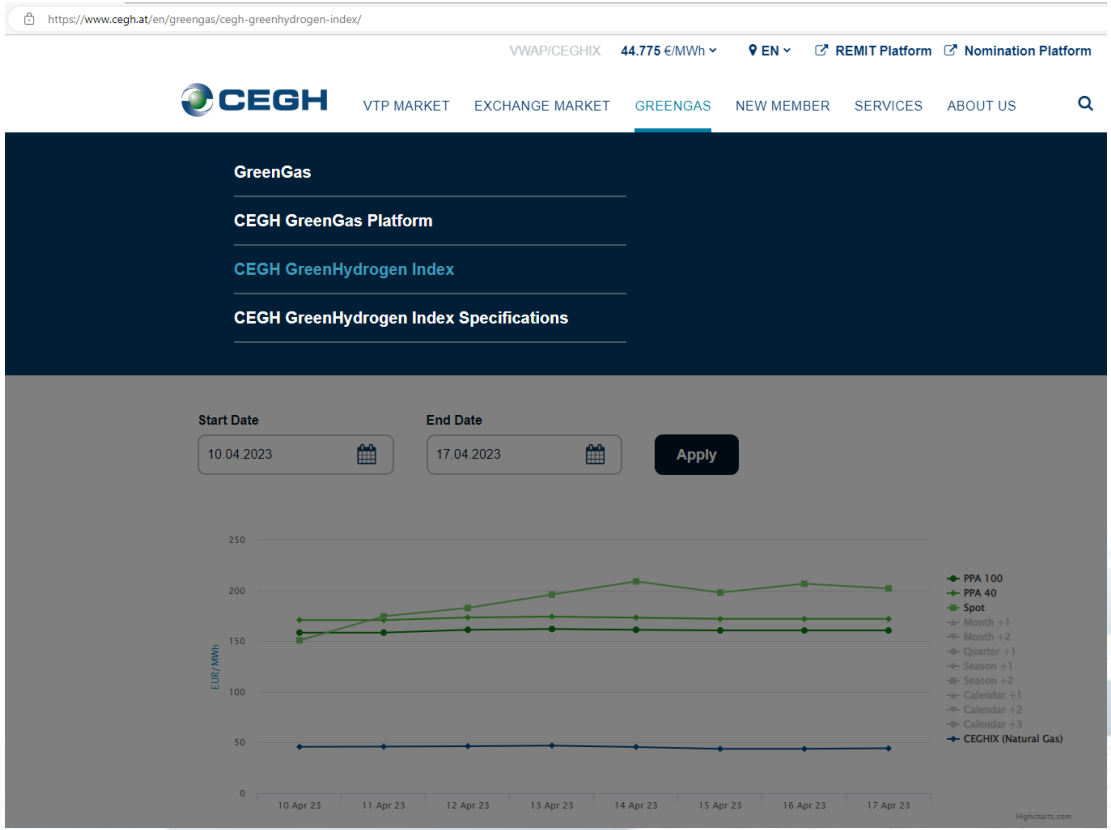
PPA 100 Electricity Procurement



PPA 40 Electricity Procurement

In the CEGH Green Hydrogen PPA 100 Index, the number of full-load hours is reduced to approx. 4,000 leading to an economic lifetime of the electrolyzer of approx. 15 years

Access to CEGH GreenHydrogen Indices is Provided by Using CEGH's existing Website



- Access to CEGH GreenHydrogen Index:

  https://www.cegh.at/en/greengas/cegh-greenhydrogen-index/

- Access to Index specification and Index description:

  https://www.cegh.at/en/greengas/cegh-greenhydrogen-index-specifications/

CEGH GreenHydrogen Indices - Website

Publication date: 11-May-2023

CEGH GreenHydrogen PPA 100 Index

Delivery Period	EUR/MWh
10-Year Baseload	160.748

CEGH GreenHydrogen PPA 40 Index

Delivery Period	EUR/MWh
10-Year Baseload	171.461

CEGH GreenHydrogen Spot Index

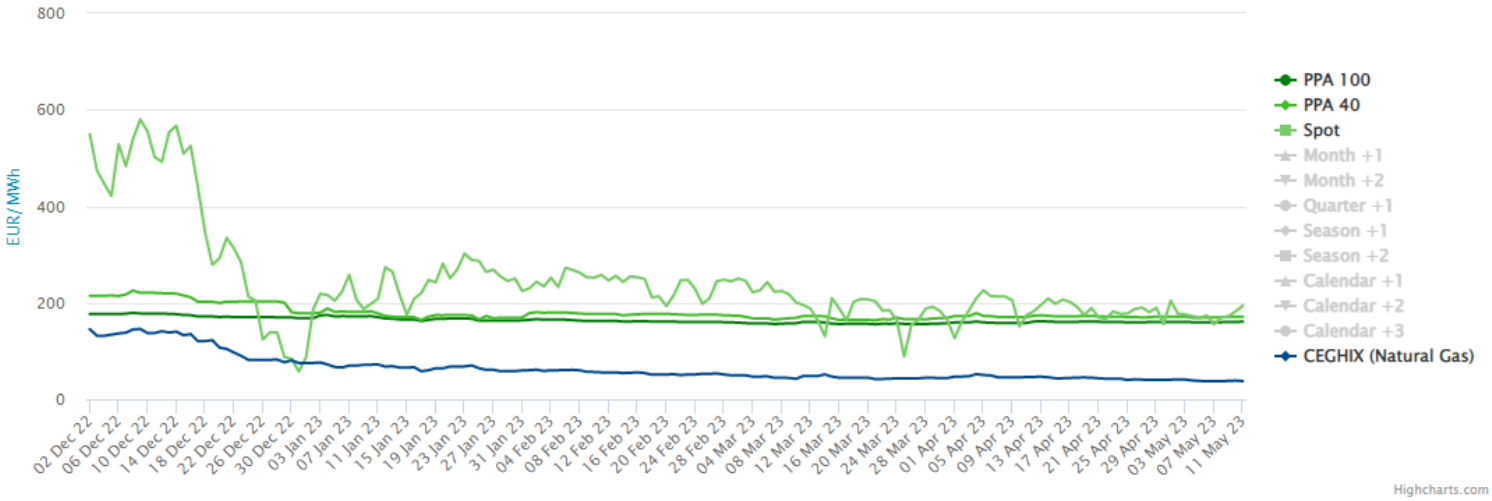
Delivery Period	EUR/MWh
11-May-2023	194.109

CEGH GreenHydrogen Forward Index

Delivery Period	Maturity	EUR/MWh
June 2023	Month +1	167.950
May 2023	Month +2	177.247
Q3 2023	Quarter +1	185.019
Winter 2023	Season +1	257.897
Summer 2024	Season +2	222.687
Calendar 2024	Calendar +1	248.788
Calendar 2025	Calendar +2	209.576
Calendar 2026	Calendar +3	188.411

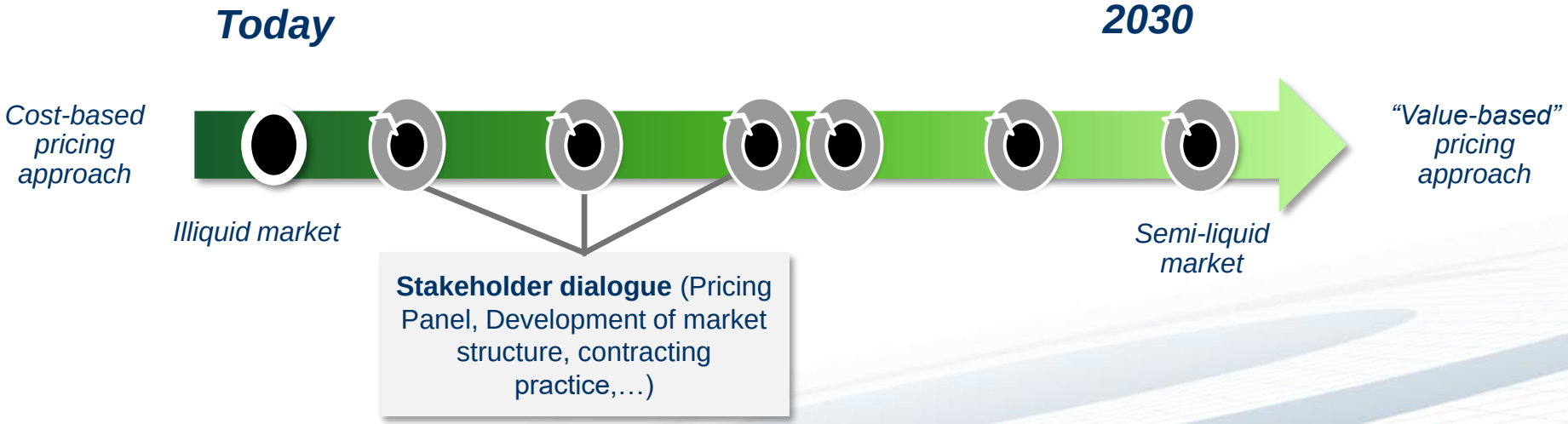
CEGH GreenHydrogen Indices – Graph View

Start Date 01.12.2022 End Date 11.05.2023 Apply



CEGHIX is shown per delivery day

Ongoing Stakeholder Dialogue ensures continuous Alignment of Index Design to evolving Hydrogen Market



Thank you very much for your attention