July 2025

The Case for Hourly Temporal Correlation for RFNBO Hydrogen in Europe

Context

The **EU delegated acts on Renewable Fuels of Non-Biological Origin (RFNBO)** mandate that hydrogen producers demonstrate a *monthly* temporal correlation until 31 December 2029, after which an *hourly* correlation will apply. The monthly temporal correlation requirement means that RFNBO production must take place during the same month as renewable energy generation, while hourly temporal correlation means that RFNBO production must match hour-by-hour as renewable energy is generated.

Some argue that monthly correlation is sufficient to reduce greenhouse gas (GHG) emissions while ensuring lower hydrogen costs. However, analyzing the cost and emission impacts of both approaches in the Netherlands (Bidding Zone NL) and Germany (Bidding Zone DE_LU) shows **that hourly temporal correlation is both viable and environmentally superior for RFNBO hydrogen production.**

The EU aims to become a net-zero emitter by 2050. Upholding hourly temporal correlation after 2029 will not only significantly contribute to this target but also support the EU's energy transition through hydrogen production at a similar price.

Key Findings

Using three metrics (electrolyzer capacity utilization, levelized cost of hydrogen, and GHG emissions), and based on public data from the European Hydrogen Observatory and the ENTSO-E Transparency Platform, the study shows that:

1. **Monthly correlation does not always meaningfully reduce hydrogen costs**, despite slightly higher capacity utilization. Grid power purchases under monthly correlation offset savings by exposing electrolyzer operations to volatile spot prices. For Germany, the levelized cost of hydrogen, i.e. the average cost of producing a hydrogen unit over a plant's lifetime, is the same whether hourly or monthly correlation is used. For the Netherlands, the LCOH of monthly temporal correlation is €/kg 0,36 lower than hourly[i].
2. **Monthly correlation results in RFNBO hydrogen with a carbon intensity higher than low-carbon hydrogen**[ii]. Hourly correlation can reduce GHG emissions by 99% compared with monthly and makes RFNBO hydrogen a true net-zero solution [iii].
3. **Hourly correlation reduces our reliance on coal and natural gas**, while monthly correlation inadvertently continues Europe's reliance on fossil fuels.
4. **Hourly correlation enhances grid flexibility** by aligning the electrolysis process in hydrogen production with real-time renewable generation, reducing curtailment.

Recommendations

These key findings demonstrate that hourly correlation ensures real-time alignment with renewable supply without reducing capacity utilization or increasing costs. Regulators therefore should:

1. **Uphold hourly temporal correlation post-2029** to ensure RFNBO hydrogen's climate integrity.
2. **Implement policy support measures** (e.g., subsidies for storage/PPAs) to mitigate utilization concerns without weakening rules.

Appendix

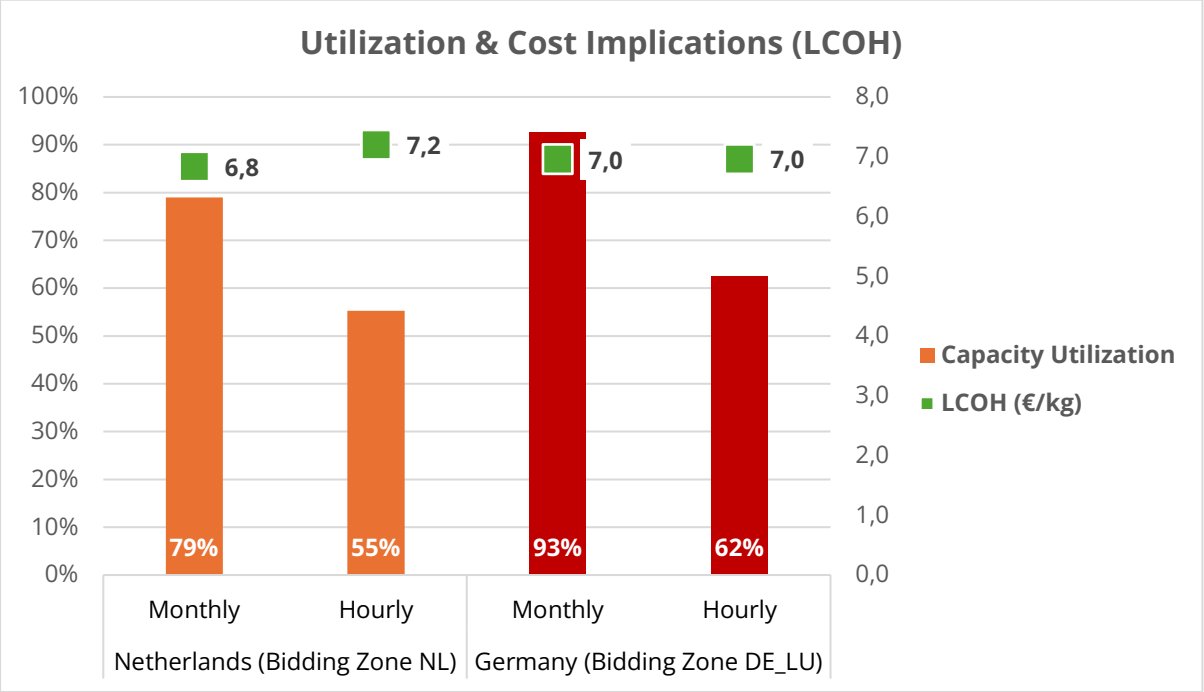
[i] **Utilization & Cost Implications (LCOH)**

Electrolyzer Capacity Utilization: Ratio of actual hydrogen production over the total electrolyzer capacity in 2024.

LCOH: Estimated using the LCOH calculator from the European Hydrogen Observatory. The LCOH calculator makes the following assumptions:

- Cost of capital: 6.00%
- Economic lifetime: 25 years
- CAPEX: €2,310 per kW
- Stack replacement costs: 15% of CAPEX

Metric		**Netherlands** (Bidding Zone NL)	**Germany** (Bidding Zone DE_LU)
Capacity Utilisation	Monthly	79%	92.5%
	Hourly	55.3%	62.4%
LCOH (€/kg)	Monthly	6.84	6.960
	Hourly	7.20	6.964



[ii] The Renewable Energy Directive and the Gas Directive both set a threshold of 28.2 g CO2e/Kg of hydrogen for the certification of RFNBO and low-carbon fuels.

[iii] **Emissions Impact**

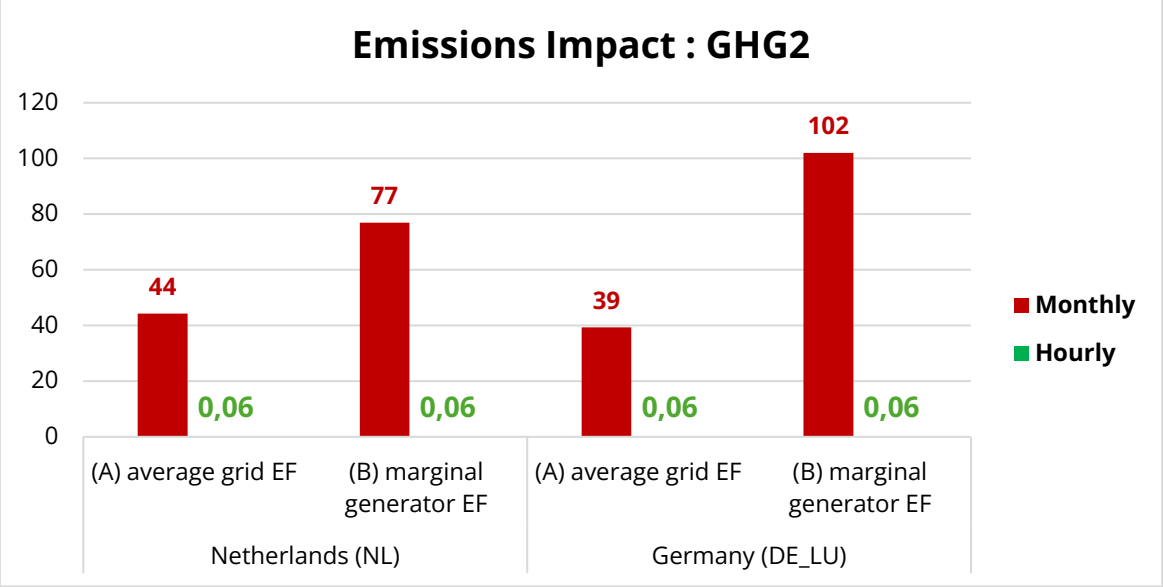
GHG Emissions: Two scenarios assessed:

GHG 1: Upstream (water-related) emissions only.

GHG 2: GHG1 + GHG burden associated with import of grid power with (A) average grid emission factor and (B) marginal generator emission factor.

GHG emissions for marginal producer (coal or natural gas power generation unit) are calculated using methodology in annex of EU RED II Delegated Regulation.

Scenario		Netherlands (NL) (gCO2e/MJ-H2)	Germany (DE_LU) (gCO2e/MJ-H2)
GHG1		0.053 (both)	0.053 (both)
GHG2	**A**	44.3 (monthly) vs. 0.057 (hourly)	39.3 (monthly) vs. 0.055 (hourly)
	B	76.9 (monthly) vs. 0.062 (hourly)	102 (monthly) vs. 0.058 (hourly)



Hourly correlation reduces emissions by 99%+ in GHG2.

The slight increase of emissions in GHG2 vs GHG1 is attributed to the inclusion of the grid power consumption for standby loads.