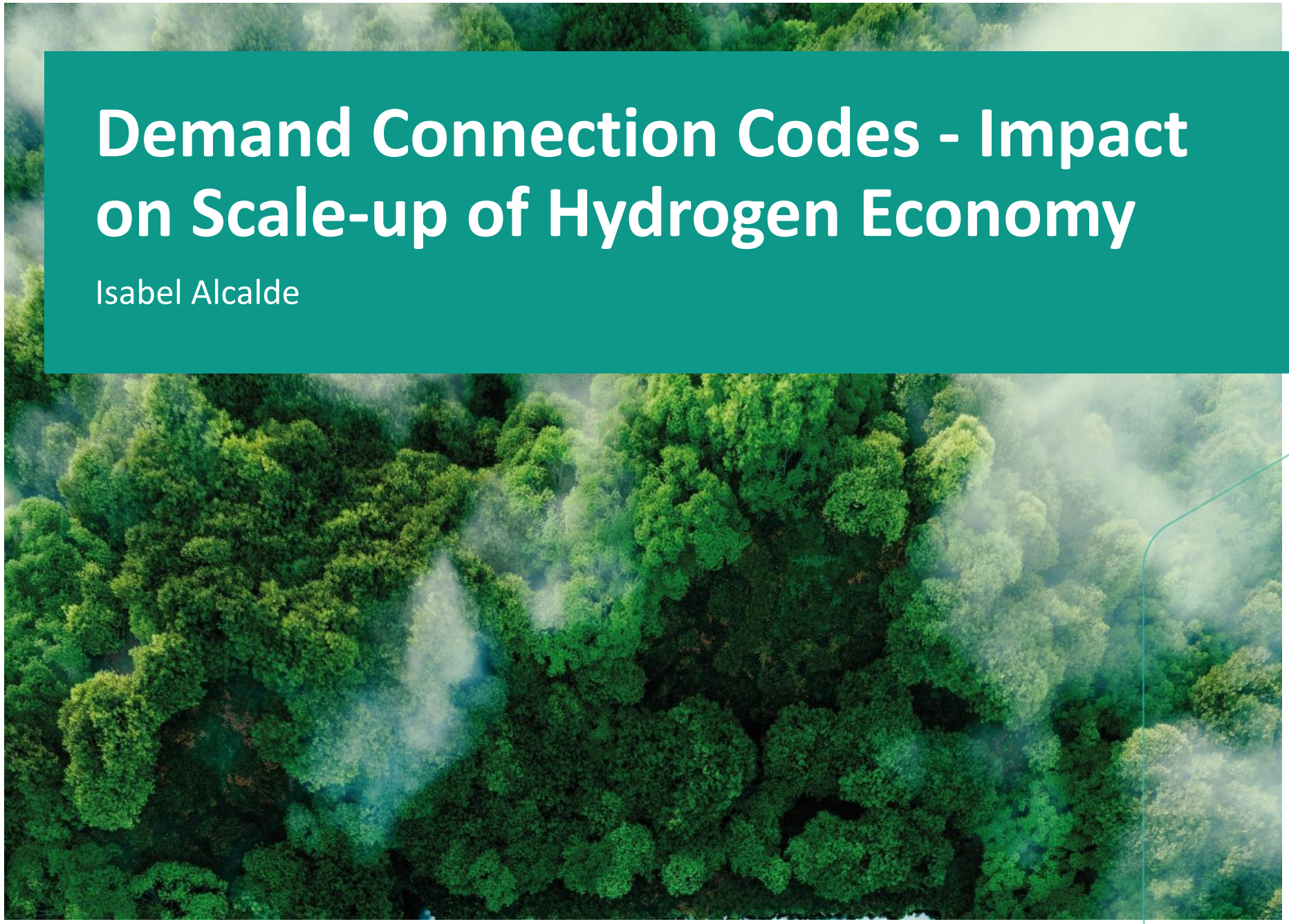

Demand Connection Codes - Impact on Scale-up of Hydrogen Economy

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Introduction

NC DC - Impact on Scale-up of Hydrogen Economy

The regulatory proposal introduced by ACER for revising the Network Code on Demand Connection, includes electrolysers in its scope for the first time.

A particular aspect of the regulation - **the fault-ride-through (FRT) capability requirement** for electrolysers - poses a **significant challenge to the industry**

The **technology needed to fulfil the required standards does not exist,** yet, and must be developed and tested. **This will take more time than the regulation will allow for.**

We believe it is vital to reconsider certain provisions to ensure they support both the stability of the grid **and scaling-up green hydrogen production across Europe**

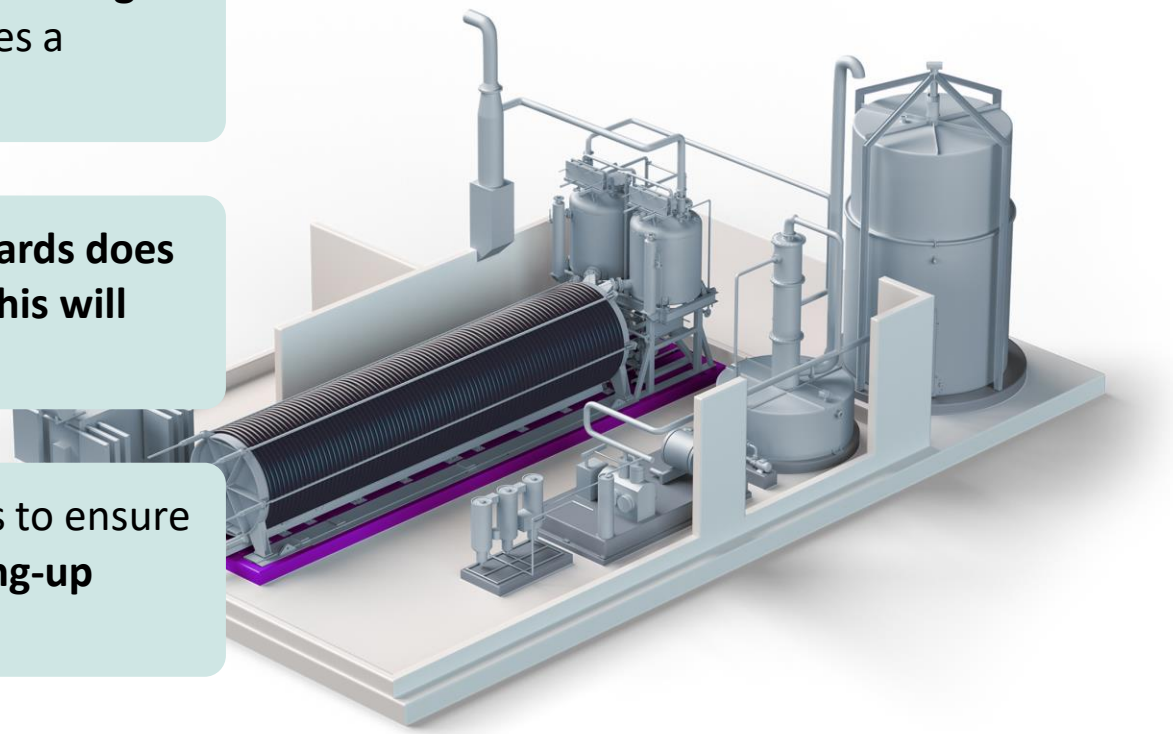
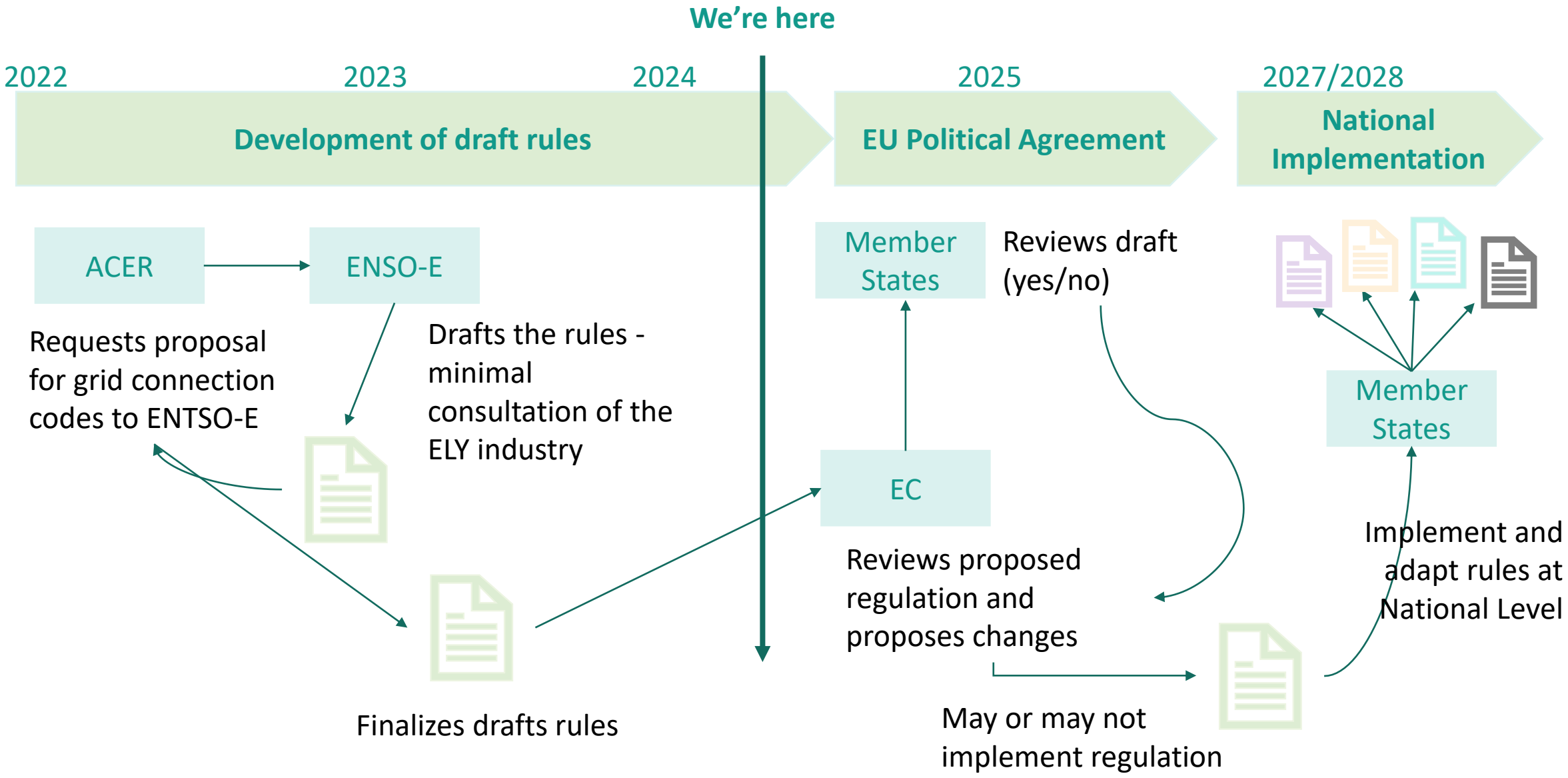


Image: NEL Alkaline Electrolyser

Timeline of approval of the new Demand Connection Codes

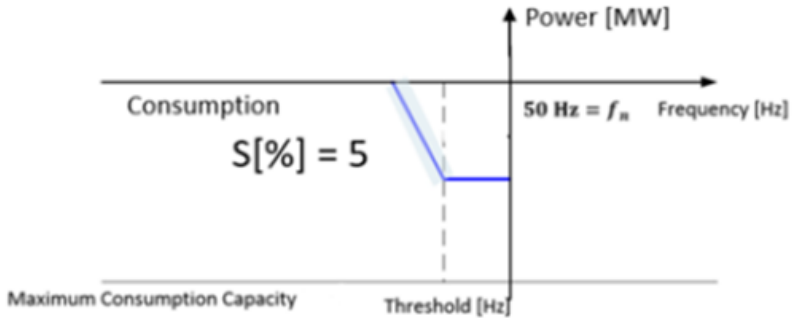


Insecurity on grid connection will lead to further delays on FIDs

The **most critical part of the regulation** is the demand that, in the event of a voltage drop, electrolyser plants must be able to resume full load operation (pre-fault active power level) within seconds, achieving at least 90-100% of their operational capacity.

ACER's proposal:

Figure (3)XX.c



P_{ref} is the actual active power at the moment the LFSM-UC threshold is reached.

Table (4)X.1.4

Time parameters for Figure (4)XX.d for fault-ride-through capability of a power-to-gas demand unit.

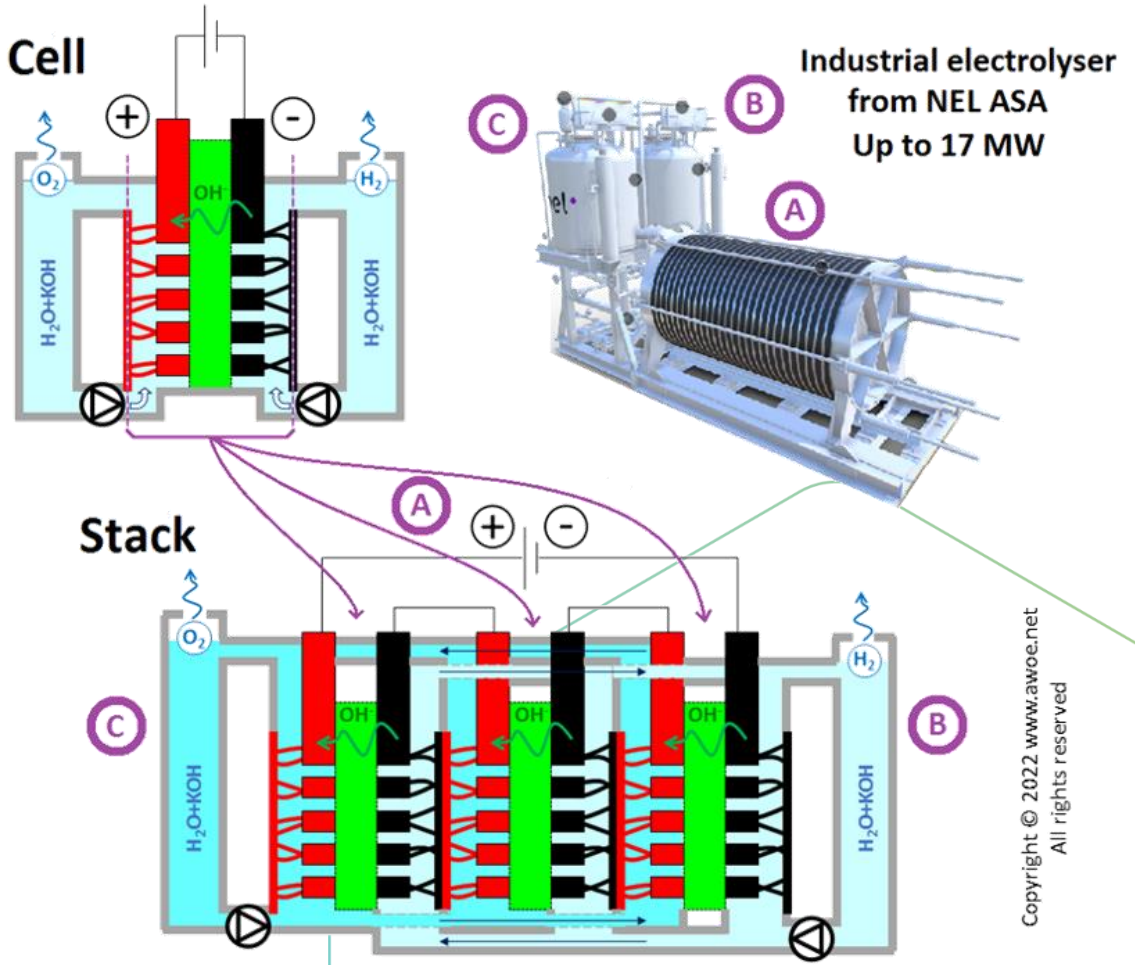
Time parameters (seconds)	
t_{clear}:	0,15
t_{rec1}:	0,15
t_{rec2}:	0,15
t_{rec3}	3,0

Presents a significant technical challenge for manufacturing the electrolysers that will increase costs and delivery times – ramping down Power to Gas facilities

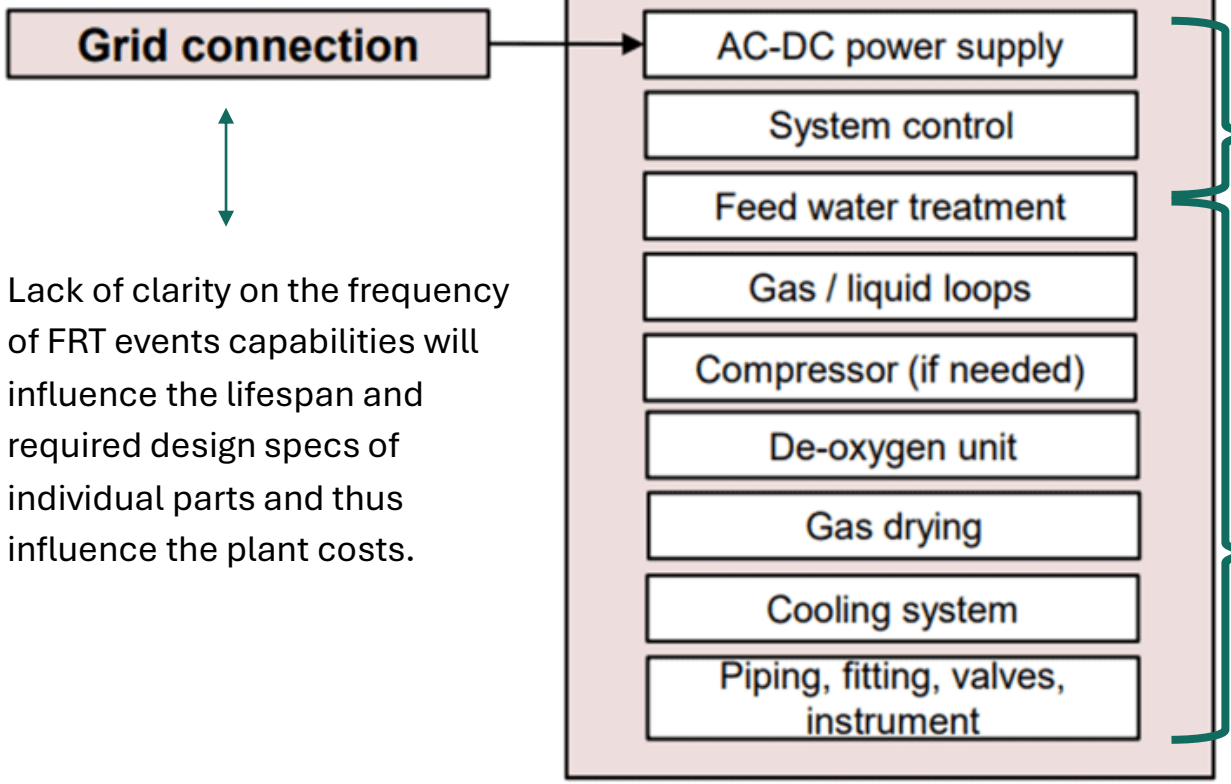
The chemical balance of the stack unit is very delicate

- When an electrical issue occurs, it **directly affects the chemical processes** within the electrolyser stack and unit.
- The chemical reaction is very sensitive and **risks creating of explosive atmospheres**
- **Safety is maintained through a controlled shutdown procedure**, where the stack is purged with nitrogen.
  - The longer the outage lasts, the more difficult it is to maintain or restart the chemical process in a safe manner – and to avoid the need to purge the stack.
  - For ELY, **return of voltage must not be equated with the return of active power consumption,** since the chemical process is just **active or starting at >70% of VN**, delaying Active Power consumption.

This is incompatible with the FRT requirement of active power return within 3 seconds



Stack, electrolyser unit and BOP have different challenges



Lack of clarity on the frequency of FRT events capabilities will influence the lifespan and required design specs of individual parts and thus influence the plant costs.

Stack

Component	Issue
Membrane	Potential damage during power outage (FRT Type 2) due to pressure impact, risk of creating explosive atmospheres

Full electrolyser unit

Component	Issue
STATCOM, Super-Caps and UPS	Voltage could be improved, but technology not available for larger plants. …

BOP

Component	Issue
Power Supply / UPS requirements increase	Higher demand for UPS supply for pump and high power components.

Consequences

Detailed Modelling Requirements: TSOs require detailed modelling to prove that electrolysers can fulfill the FRT requirements. This modeling is highly complex for electrolysers.

Long Planning Times: The technologies necessary to comply with FRT might have implications on mechanical designs, which needs various years of development and test before it can become a market service/grid requirements.

Decline in FIDs: This technologies might increase ELY's manufacturing costs and affect European competitiveness, as investors reduce investment capital due to uncertainty and increase in costs.

Impact on Existing Plants: Planned expansions could be halted due to new grid connection standards

Tender Participation Risks: The lack of certainty about whether electrolysers can meet the new requirements will impact participation in tenders.

Proposal: introducing a multi-year approach

Best practice cases like the process for developing the grid forming capabilities in wind turbines provided **a clear timeline for manufacturers to develop, test and model new technologies**, before verifying compliance and achieving certification. A similar approach could be useful for the ELY manufacturing process: