The International Hydrogen Ramp-up Programme (H2Uppp) of the **German Federal Ministry for Economic Affairs and Climate Action (BMWK)** promotes projects and market development for green hydrogen in selected developing and emerging countries as part of the National Hydrogen Strategy.

In-Depth Analysis of Green H_2 Certification Processes in the EU

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

SAP

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ENGINEERING CONSULTING

Certification is an essential part of the regulatory requirements to trade green PtX products and is therefore crucial for the success of a sustainable hydrogen economy.

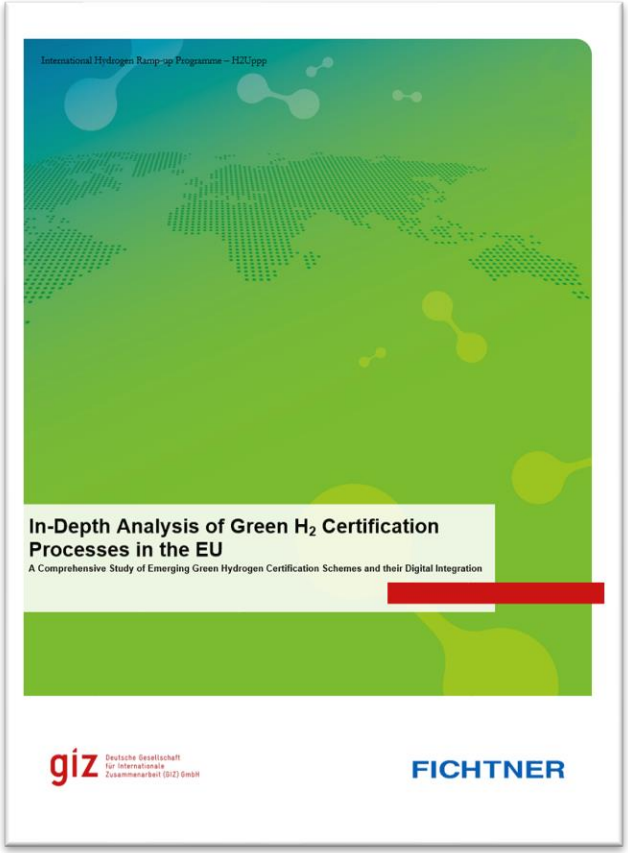
Introduction to the Study

The aim of the study is to ...

- **inform** a wide range of **interested stakeholders**, focusing on the private sector active in the development of **green PtX projects** with the intention of **obtaining** a **green product certificate**,
- **provide** a comprehensive **understanding of the similarities and differences** between the current certification schemes in the EU as targeted support for **regulatory trade requirements** for green PtX products **with partner countries** such as **Brazil**,
- **clarify** issues on **data, requirements and stakeholders** involved in the interest of a future **digitalization of certification** processes for the benefit of **transparency, traceability and cost efficiency**.

The analysis of the study is ...

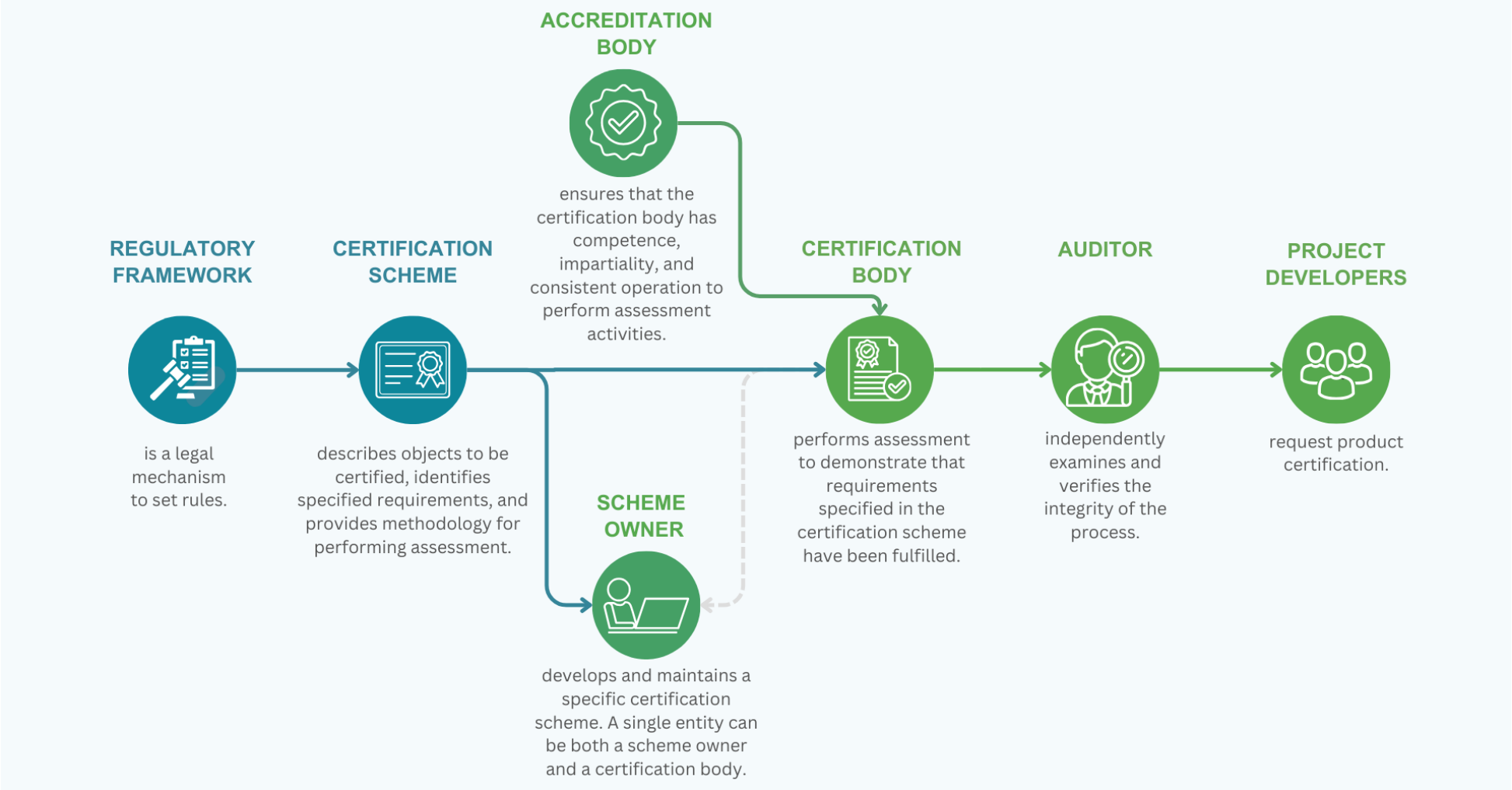
- **divided** for each certification scheme analyzed into an **overview**, a **step-by-step guide** to the certification process and a **case study** with practical relevance.
- **based on** the Fichtner project team's **own interpretation** of publicly available **documents** and on valuable insights from **interviews and workshops** with certification actors,



The report will be available as a free download on the GIZ website in January 2024.

Impartiality and credibility is established through a certification ecosystem with shared responsibilities between the various parties involved.

Introduction to the EU Green Hydrogen Certification Schemes



A thorough understanding of the certification schemes enables a more informed decision about the certification processes.

Introduction to the EU Green Hydrogen Certification Schemes

CertifHy	CertifHy NGC* offers hydrogen certification schemes across Europe and manages certificate lifecycles through a central European database.	Overview, step-by-step guide, case study
TÜVRheinland® Genau. Richtig.	TÜV Rheinland Standard H2.21 for Renewable and Low Carbon Hydrogen caters to industry stakeholders, and TÜV Rheinland acts as an auditor for other certification schemes.	
ISCC International Sustainability & Carbon Certification	ISCC offers a sustainability certification for all feedstocks across various markets, offering a specific certification depending on the target market.	
TÜV SÜD	TÜV SÜD provides CMS 70 Green Hydrogen certification, and also act as an auditor for other certification schemes.	Overview

*NGC= Non-governmental Certification

There are five certification labels in the EU for green hydrogen with differences in their criteria.

Comparison of the EU Green Hydrogen Certification Schemes

	CertifHy™	**TÜV Rheinland**	**ISCC PLUS**	**TÜV SÜD**	
	The CertifHy NGC* Scheme	Standard H2.21	with GHG** Emission Add-On Standard	CMS 70 GreenHydrogen Basic Standard	CMS 70 GreenHydrogen+ Standard
System Boundaries	Well-to-gate	Cradle-to-X where X is to be defined by the customer within the life cycle	Cradle-to-grave or cradle-to-gate	Well-to-gate	Well-to-wheel
Comparator Values of Fossil Fuel Production	**91 g CO_2-eq/$MJ_{LHV,H2}$**	94 g CO_2-eq/$MJ_{LHV,H2}$	Individually calculated or from official, reviewed sources such as RED (94 g CO_2-eq/$MJ_{LHV,H2}$)	94 g CO_2-eq/$MJ_{LHV,H2}$	94 g CO_2-eq/$MJ_{LHV,H2}$
Greenhouse Gas Reduction and PCF* Value**	At least **60 %** of the fossil fuel comparator value (91 g CO_2-eq/MJ)	At least 70 % of the fossil fuel comparator value (94 g CO_2-eq/MJ)	At least 70 % of the fossil fuel comparator value (94 g CO_2-eq/MJ)	At least 70 % of the fossil fuel comparator value (94 g CO_2-eq/MJ)	At least 70 % of the fossil fuel comparator value (94 g CO_2-eq/MJ)
Product Carbon Footprint Method	ISO 14067/14044	ISO 14040/14044/14067	ISO 14040/14044/14067	ISO 14040/14044/14067	ISO 14040/14044/14067

*NGC = Non-governmental certification
**GHG= Greenhouse gas
***PCF= Product carbon footprint

Green hydrogen derivatives are currently certified by only two European certification schemes.

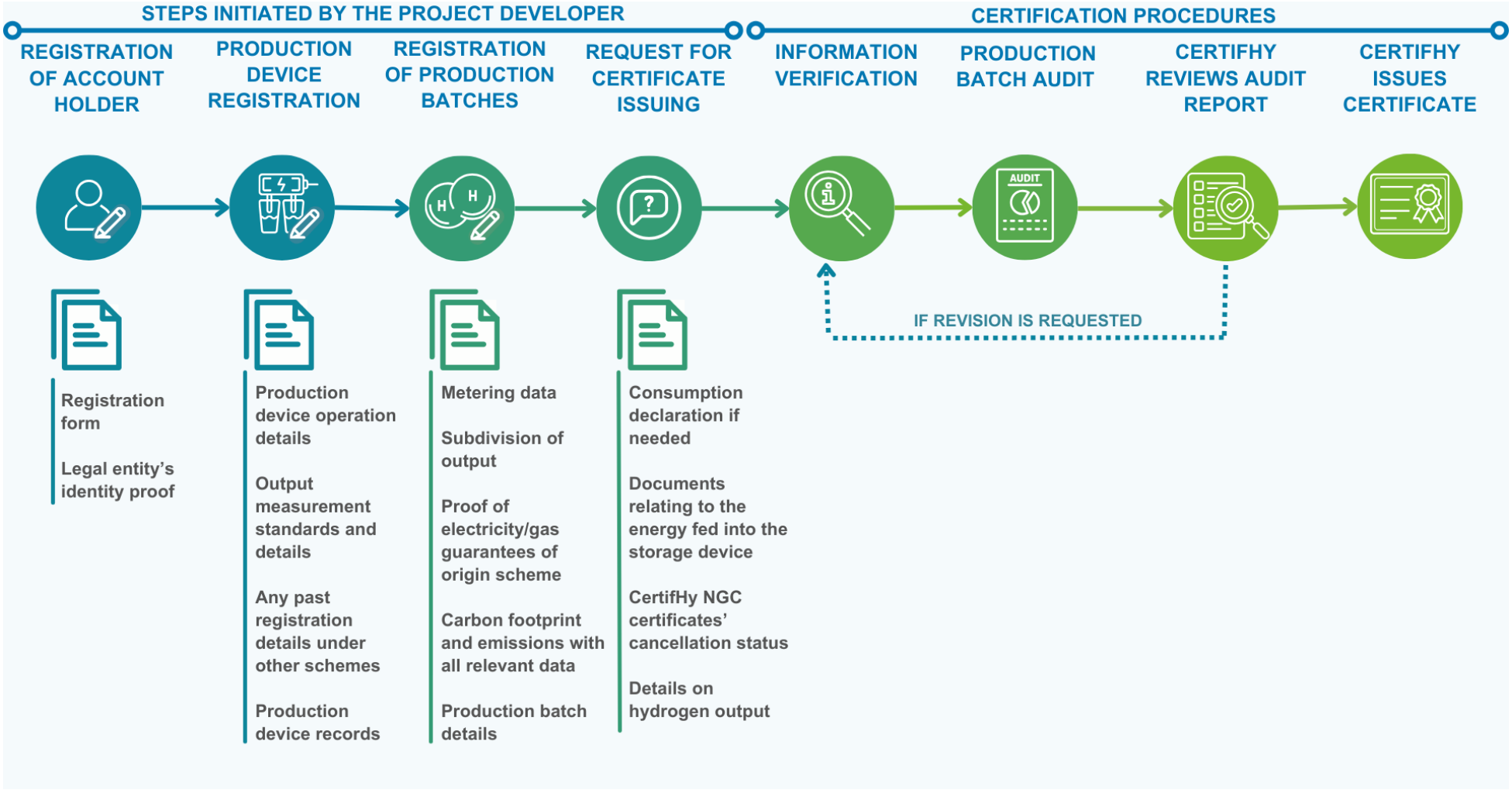
Comparison of the EU Green Hydrogen Certification Schemes

	CertifHy™	TÜV Rheinland	ISCC PLUS	TÜV SÜD	
	The CertifHy NGC* Scheme	Standard H2.21	with GHG** Emission Add-On Standard	CMS 70 GreenHydrogen Basic Standard	CMS 70 GreenHydrogen+ Standard
Chain of Custody	Book and claim	Book and claim, or mass balancing	Mass balancing, physical segregation, or controlled blending	Book and claim, or mass balancing	Mass balancing
Derivatives that Can be Certified	None	All hydrogen derivatives like ammonia, methane, and methanol	All hydrogen derivatives like ammonia, methane, and methanol	Not typically included	Not typically included
Applications of Hydrogen	All kinds of applications, including energy, transportation, chemical conversion, and more.	All kinds of applications, including energy, transportation, chemical conversion, and more.	All kinds of applications, including energy, transportation, chemical conversion, and more.	Use of hydrogen across the entire value chain	Use of hydrogen across the entire value chain

*NGC = Non-governmental certification
**GHG= Greenhouse gas

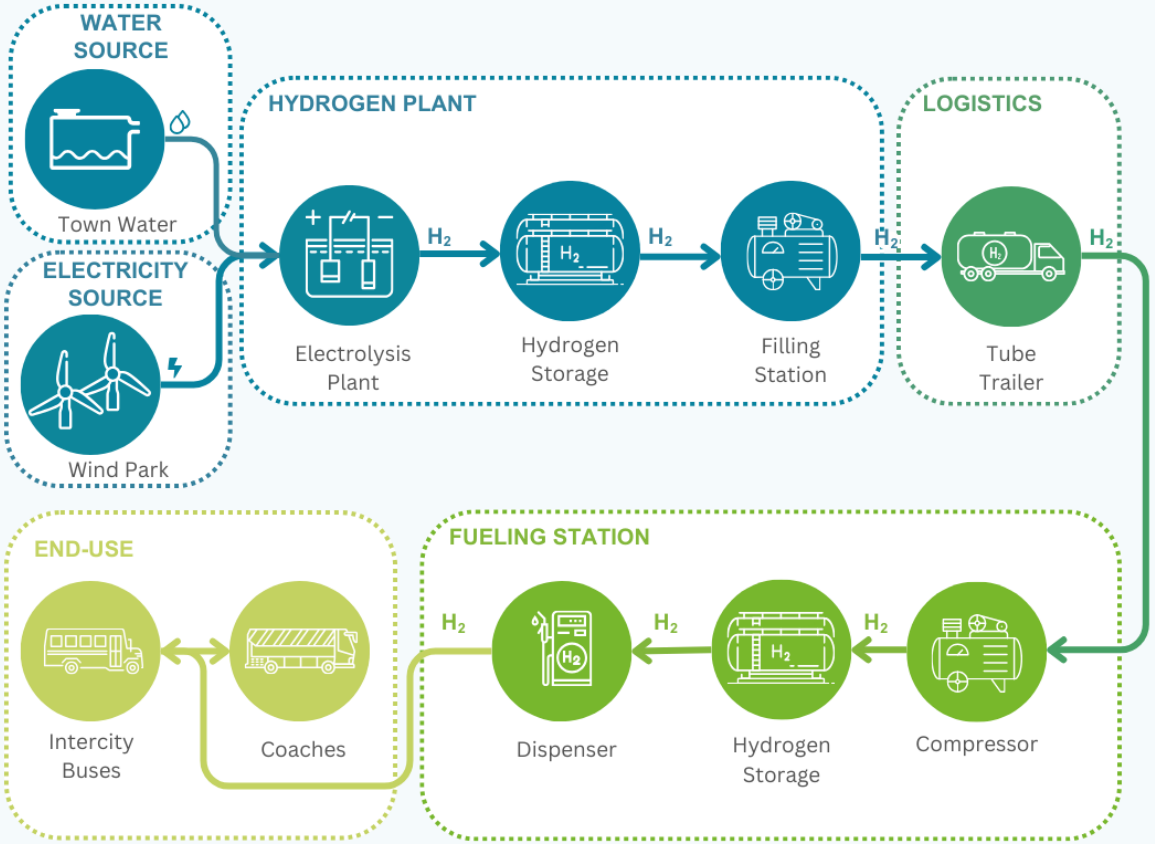
CertifHy NGC requires the registration of production device with its operation details before the production batch registration.

Overview of the Certification Process for CertifHy NGC



Case study showcases a strategy to utilize domestic hydrogen, simplifying the logistical aspects for decentral electrolysis plants.

Overview of the Value Chain for the Case Study on Company A



Hydrogen Production

- Direct electric connection from plant to the wind park
- Raw water provided by the city
- Electrolyser capacity is up to 10 MW

Conditioning and Conversion

- Purification to fuel cell quality
- Compression to tube trailer filling pressure

Storage, Transport and Distribution

- Transport on road in compressed state via tube trailer directly to local offtaker

Unconditioning and Reconversion

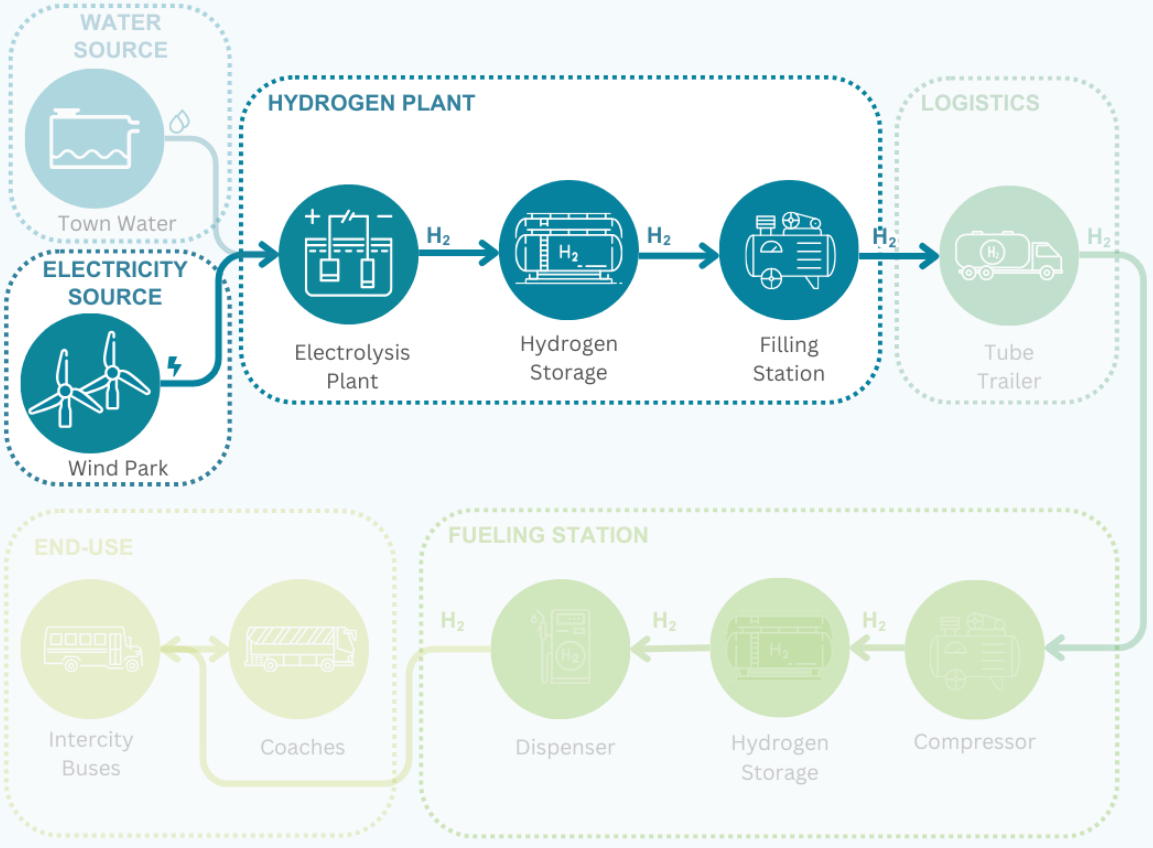
- Compression for bus filling at bus fueling station

Application

- Fuel for intercity and travel buses / heavy duty vehicles

CertifHy NGC can serve as a model for the certification of green hydrogen at a national level in Brazil.

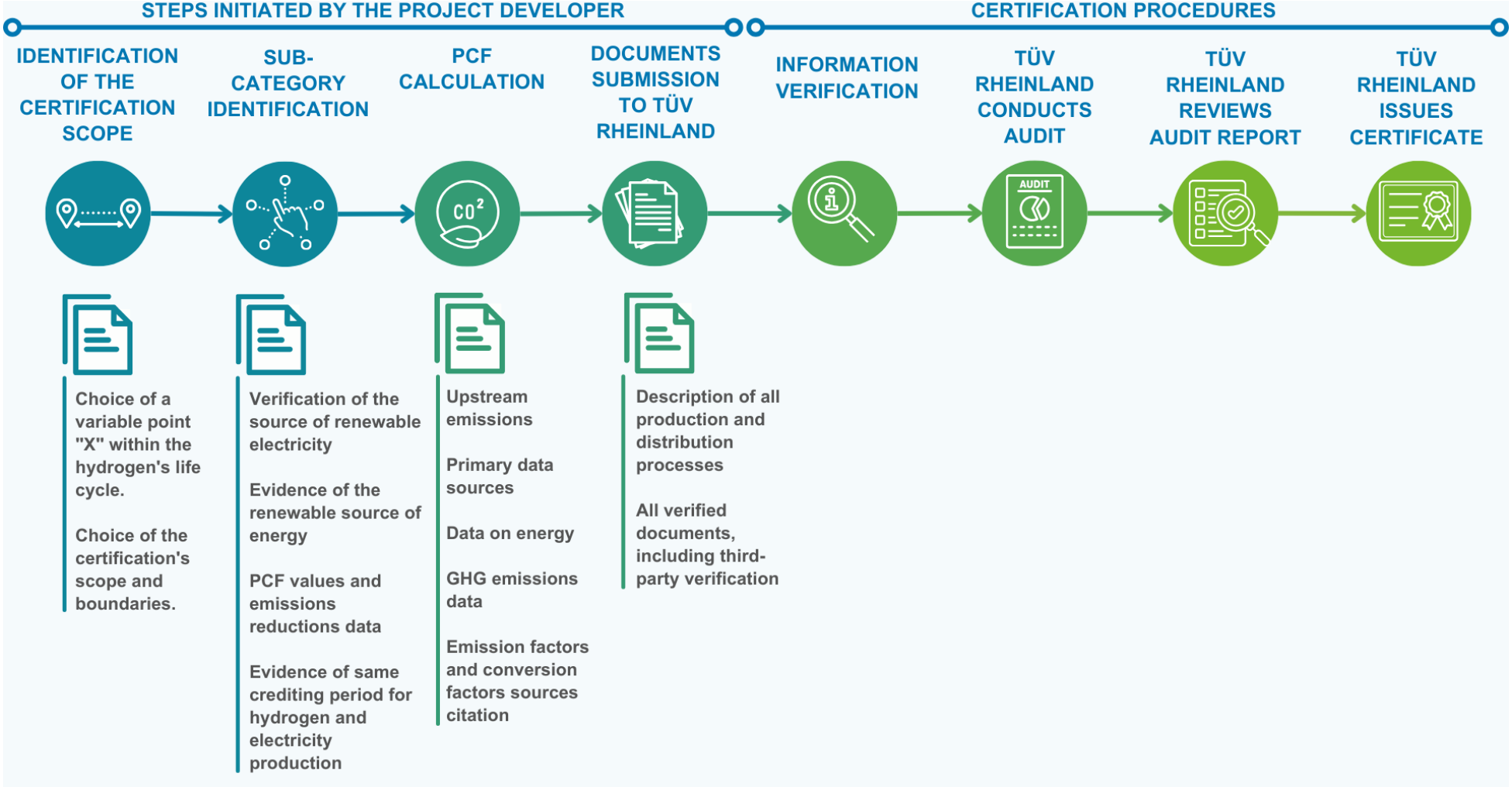
Relevant Stages in the Value Chain and Step-by-Step Certification Guide for Company A



1. **Registration of account holder**
   Submission of registration form and identity proof
2. **Production device registration**
   Submission of electrolysers' operational parameters
3. **Registration of production batches**
   Registration of hydrogen batches
4. **Request for certificate issuing**
   Submission of details of its hydrogen batches
5. **Information verification**
   Approved third party review of production data
6. **Production batch audit**
   Auditor ensures compliance, then compiles and forwards an audit report
7. **CertifHy reviews audit report**
   Audit report is reviewed and cross-referenced
8. **CertifHy issues certificate**
   Issuance of CertifHy NGC certificate

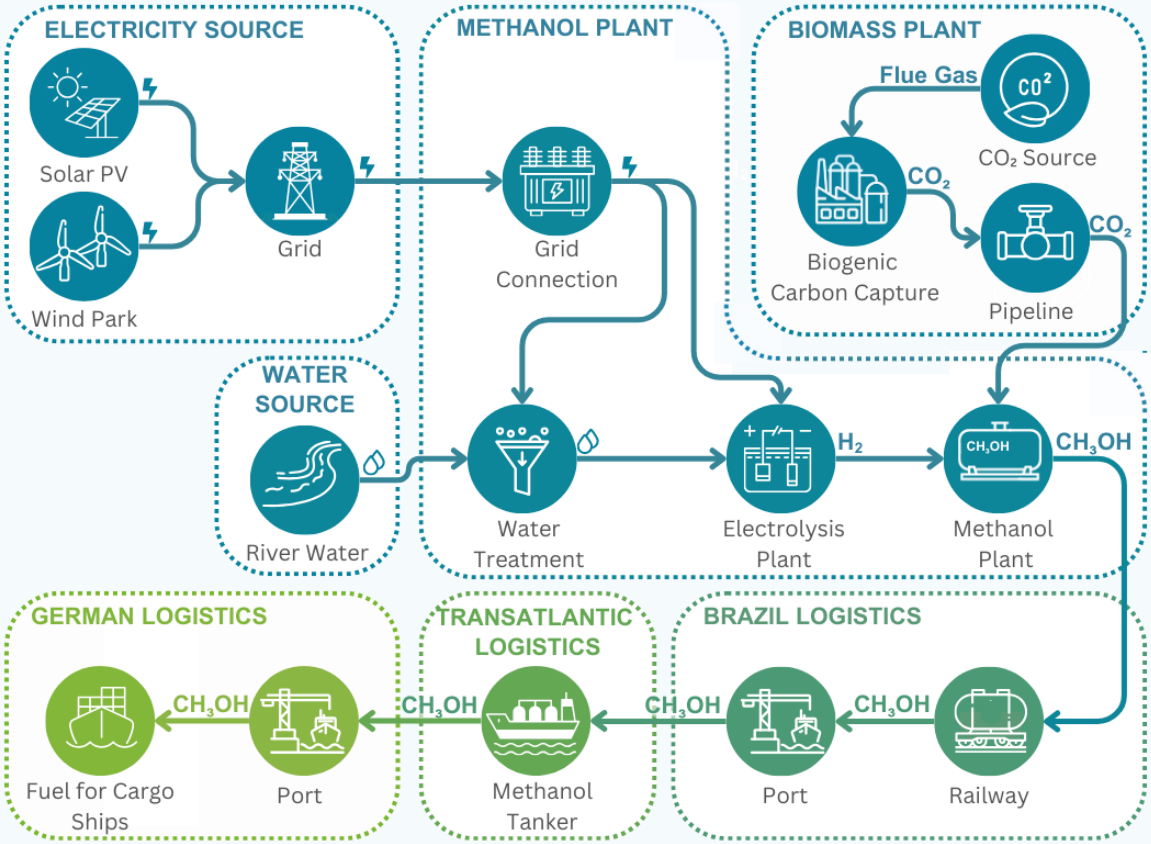
The newest version of TÜV Rheinland standard for green hydrogen aligns with the delegated acts of the Renewable Energy Directive.

Overview of the Certification Process for TÜV Rheinland H2.21



Capturing biogenic CO_2 from biomass plants for methanol production demonstrates circular economy practices.

Overview of the Value Chain for the Case Study on Company B



Hydrogen Production

- Electricity sourced from the grid via PPA (Wind and Sun)
- Raw water taken from a river
- Electrolyser capacity >100 MW

Conditioning and Conversion

- Compression to reactor inlet pressure
- Conversion to methanol with
- CO_2-Feedstock captured from flue gas of biomass plant

Storage, Transport and Distribution

- Transport via methanol tank cars on local railway network for short distance to port

Unconditioning and Reconversion

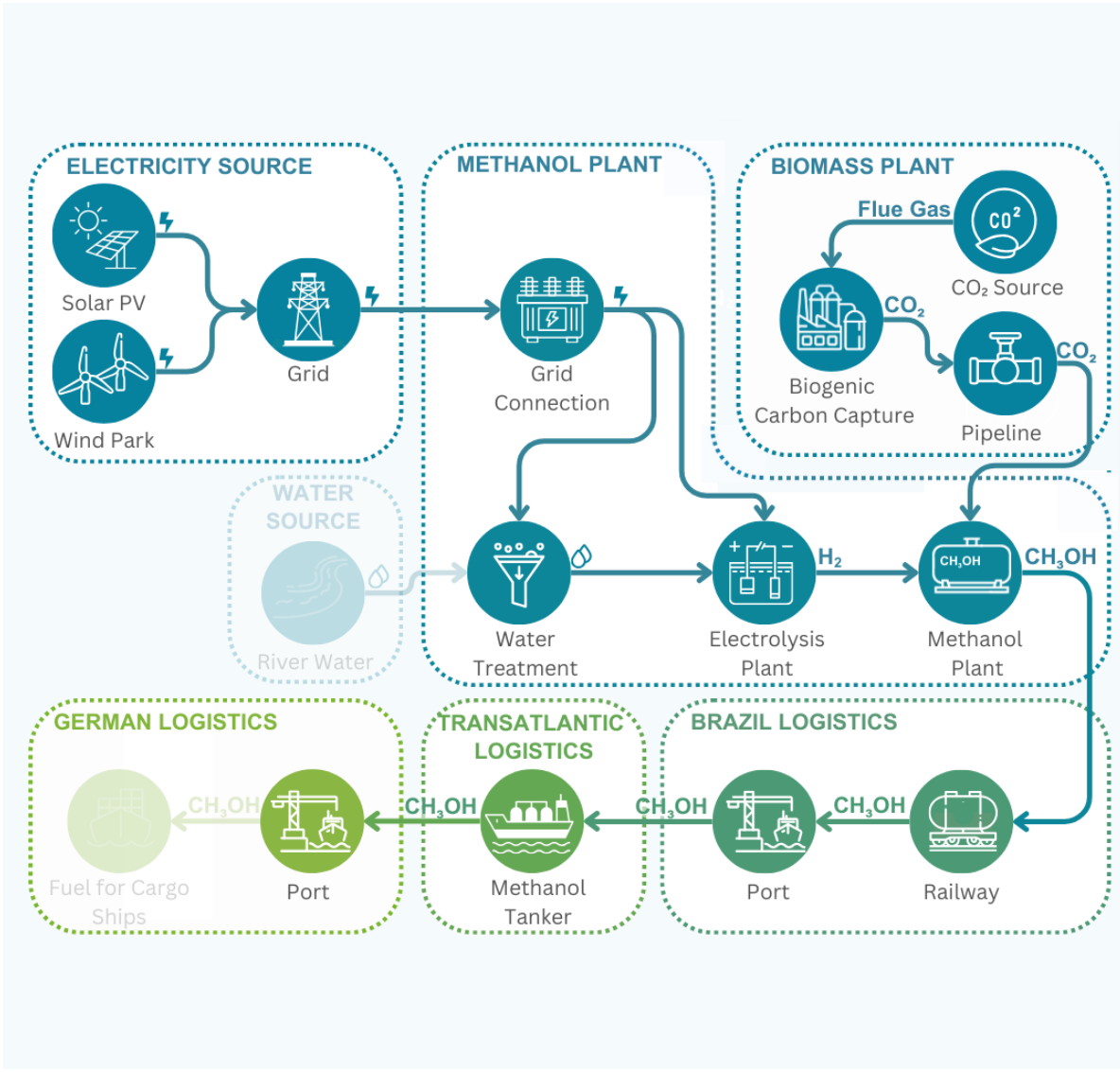
- None, stored and used directly in the importing port

Application

- Fuel for cargo ships

TÜV Rheinland facilitates green certification across the entire value chain of hydrogen and its derivatives, except for the water source.

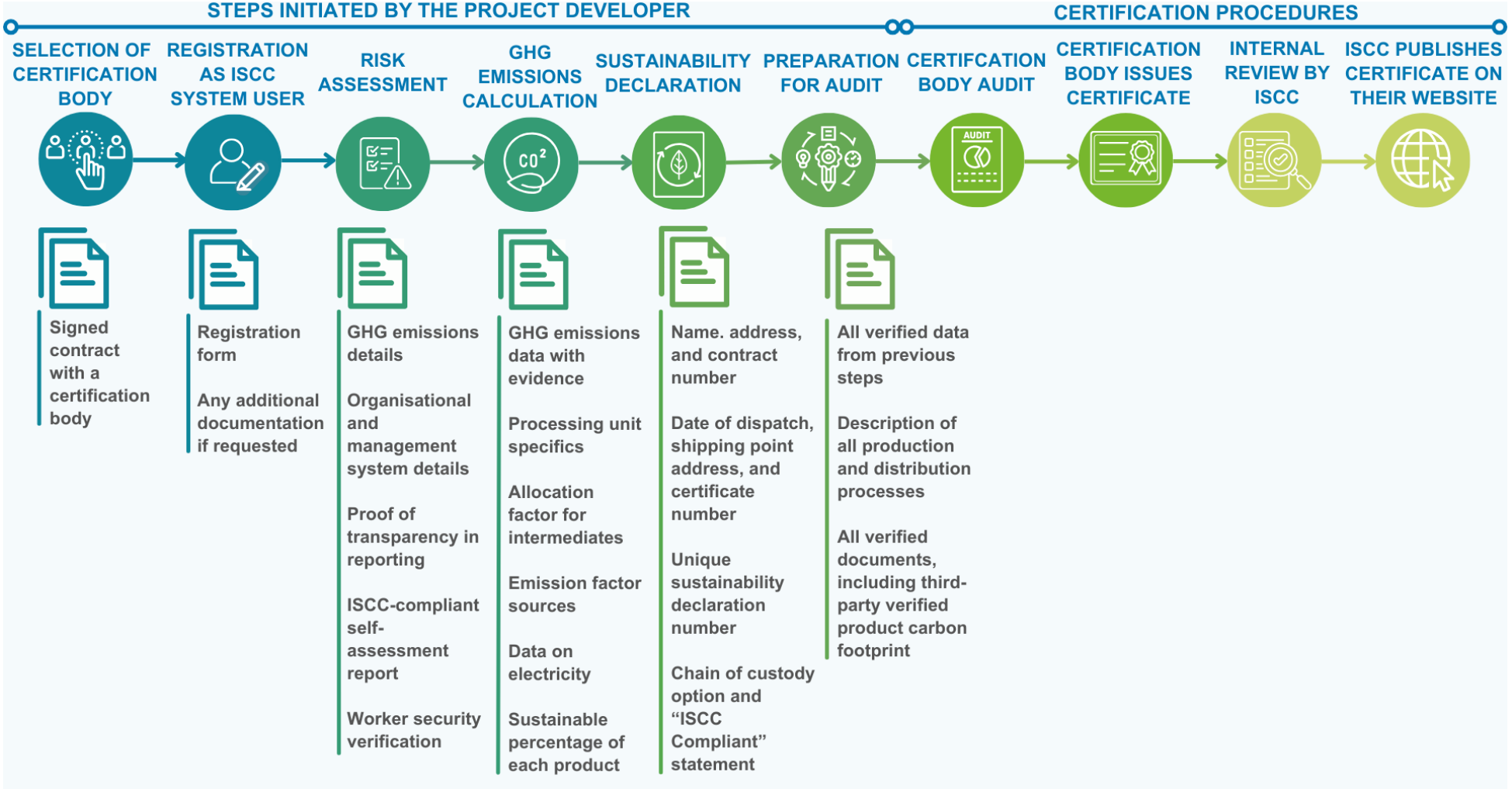
Relevant Stages in the Value Chain and Step-by-Step Certification Guide for Company B



1. **Identification of the certification scope**
   Company decides "X" as well-to-wheel
2. **Sub-category identification**
   Company opts for RFNBO sub-category
3. **PCF calculation**
   Company calculates PCF for both hydrogen and methanol and gets third-party verification
4. **Document submission**
   Company compiles all required data
5. **Information verification**
   TÜV Rheinland conducts a "desk research" on the provided materials
6. **TÜV Rheinland conducts audit**
   Auditor from TÜV Rheinland verifies all processes physically or virtually
7. **TÜV Rheinland reviews audit report**
   TÜV Rheinland checks compliance to certification standards
8. **TÜV Rheinland issues certificate**
   Certification granted with the test mark "Renewable Hydrogen- RFNBO".

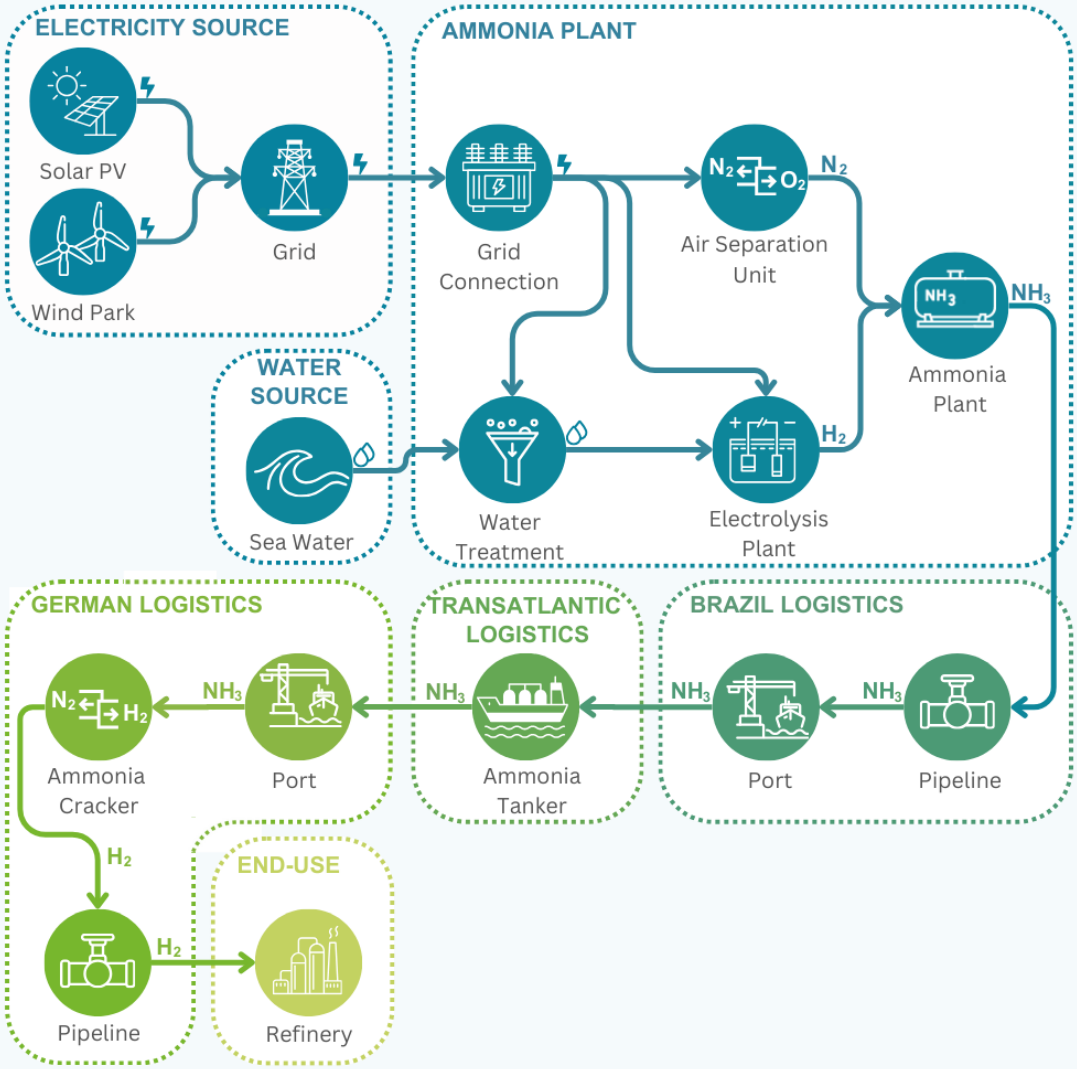
ISCC delegates both the certification process and issuance to recognized certification bodies, which are selected by the project developers.

Overview of the Certification Process for ISCC PLUS



The location of large production plants near a harbor with the possibility of water desalination is an advantageous concept for ammonia export.

Overview of the Value Chain for the Case Study on Company C



Hydrogen Production

- Electricity sourced from the grid via PPA (Wind and Sun)
- Raw water taken from the sea
- Electrolyser capacity >500 MW

Conditioning and Conversion

- Compression to reactor inlet pressure
- Conversion to ammonia with
- N_2-Feedstock separated from air

Storage, Transport and Distribution

- Transport via short distance pipeline to port for export

Unconditioning and Reconversion

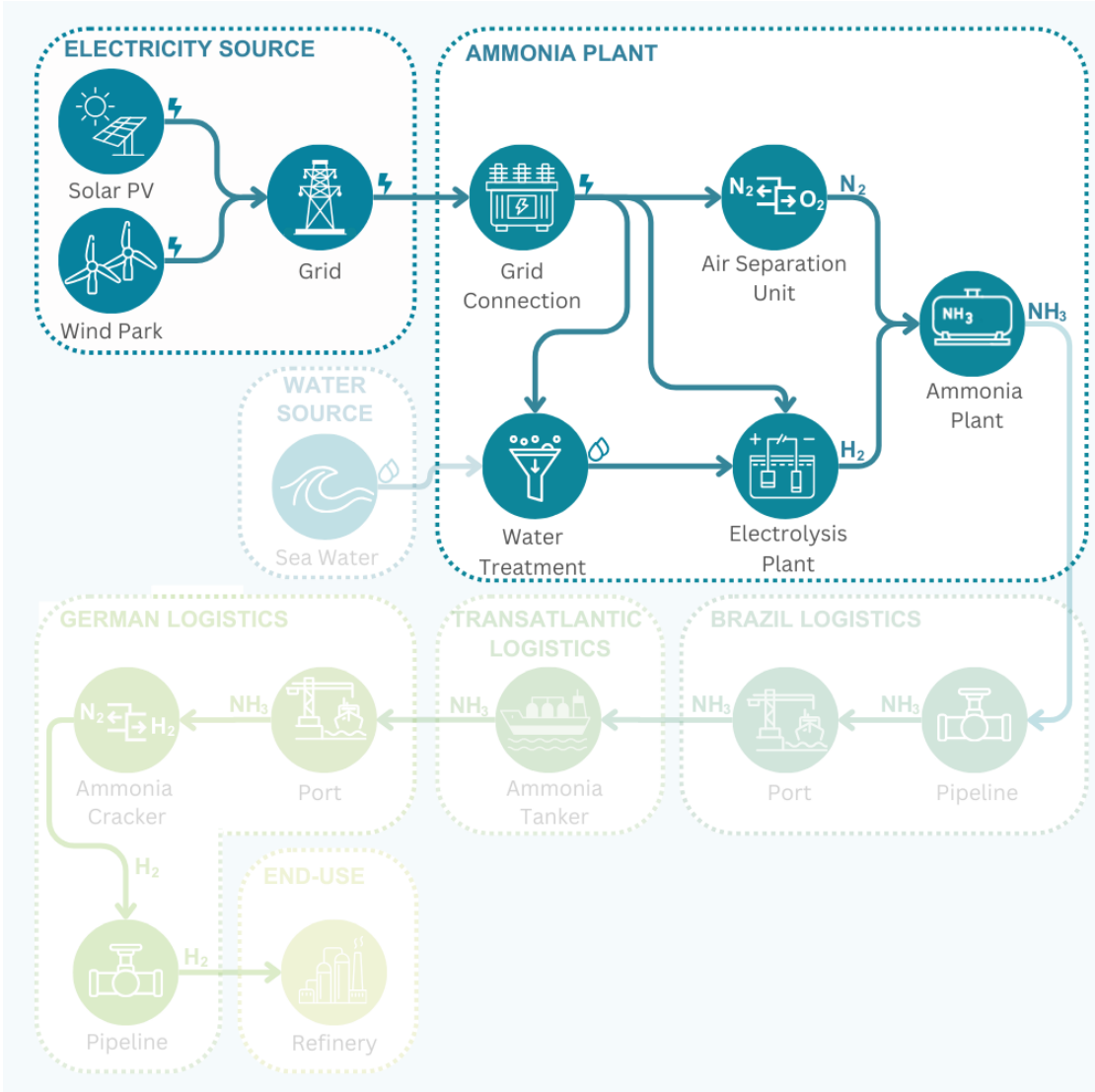
- Cracked to hydrogen and transported to offtaker via pipeline

Application

- Feedstock for refineries

The materiality threshold aids in the practical execution of real-world projects, while ensuring credibility of the certification process.

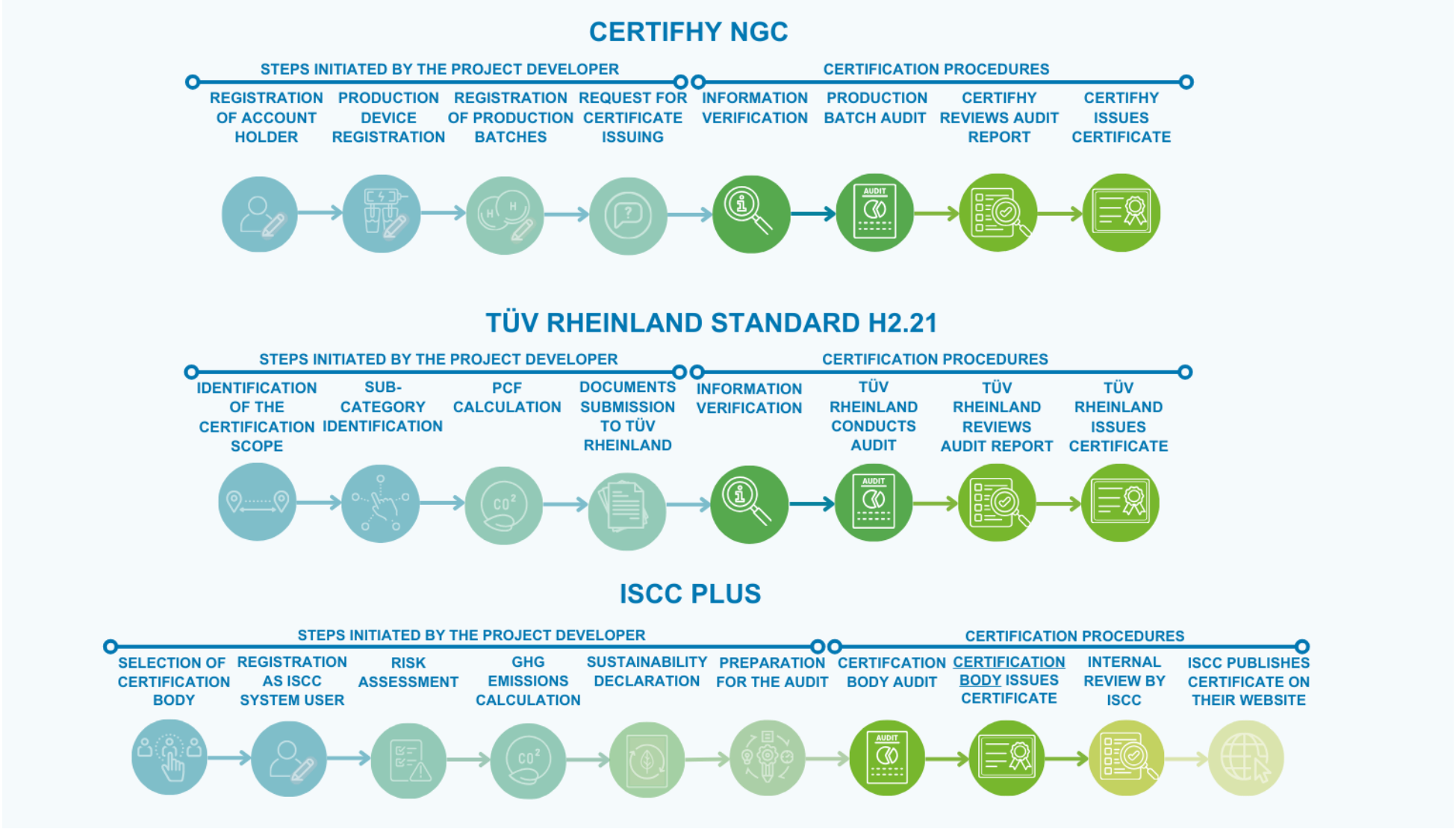
Relevant Stages in the Value Chain and Step-by-Step Certification Guide for Company C



1. **Selection of certification body**
   Selection of certification body recognized by ISCC
2. **Registration as ISCC system user**
   Registration with ISCC, receival of a guide on audit requirements, and payment of relevant fees
3. **Risk assessment**
   Conduction of an internal risk assessment and verification by chosen certification body
4. **GHG emissions calculation**
   Company decides to add voluntary GHG emissions and chooses well-to-gate as system boundary
5. **Sustainability declaration**
   Preparation of sustainability declaration and verification by auditors
6. **Preparation for the audit**
   Company conducts internal audits using ISCC templates.
7. **Certification body audit**
   Compilation of all verified data and documents
8. **Certification body issues the certificate**
   Company receives ISCC certificate; certification body forwards audit report to company and ISCC
9. **Internal review by ISCC**
   ISCC conducts internal review of the audit documents
10. **ISCC publishes certificate**
    ISCC uploads all valid certificates to their website

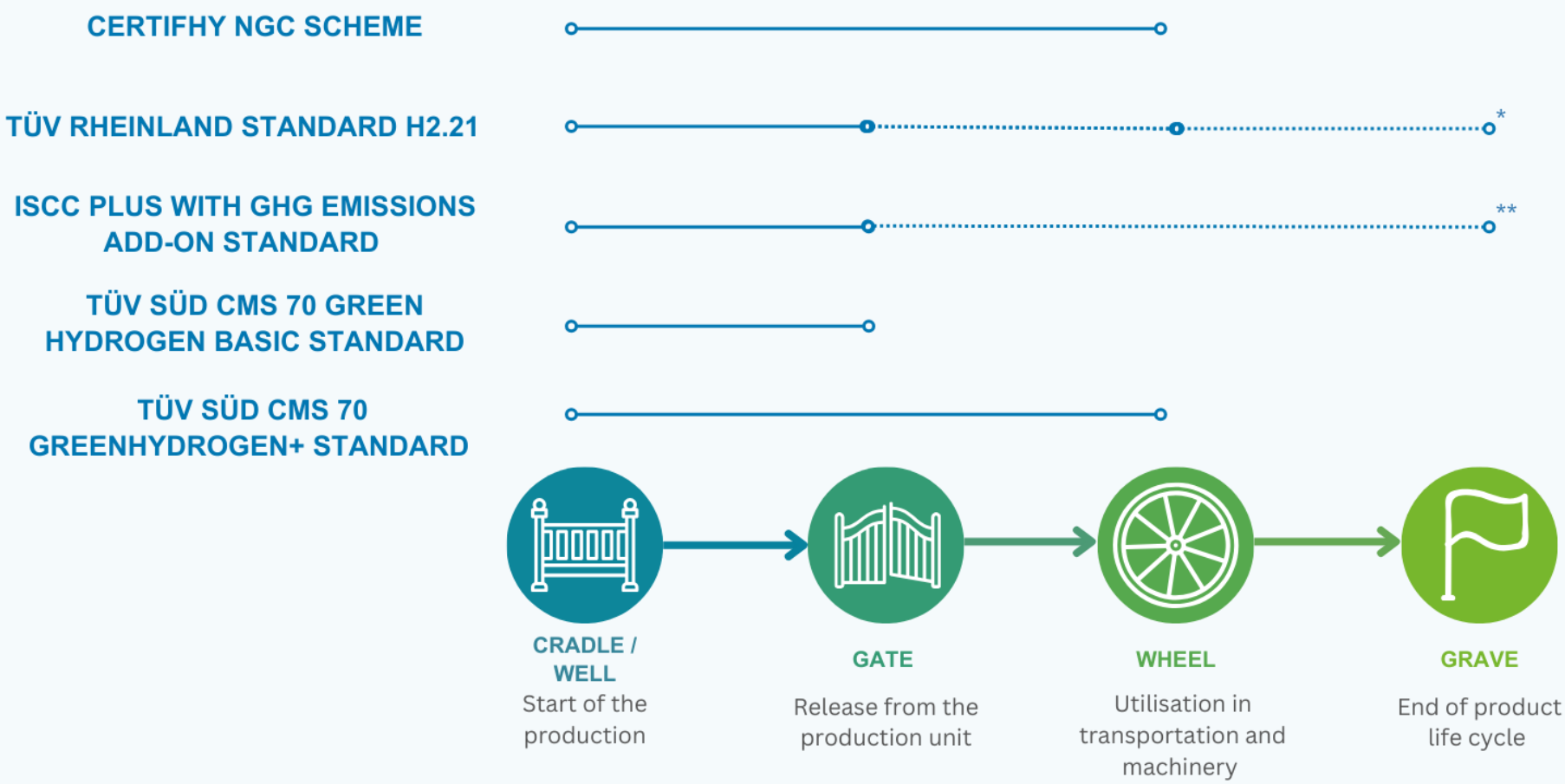
Despite the lack of harmonization between certification processes, product auditing, audit report review and certificate issuance are consistent.

Key Study Findings



Variations in system boundaries define certification schemes' applicability to a certain case, tailoring them to specific contexts and user needs.

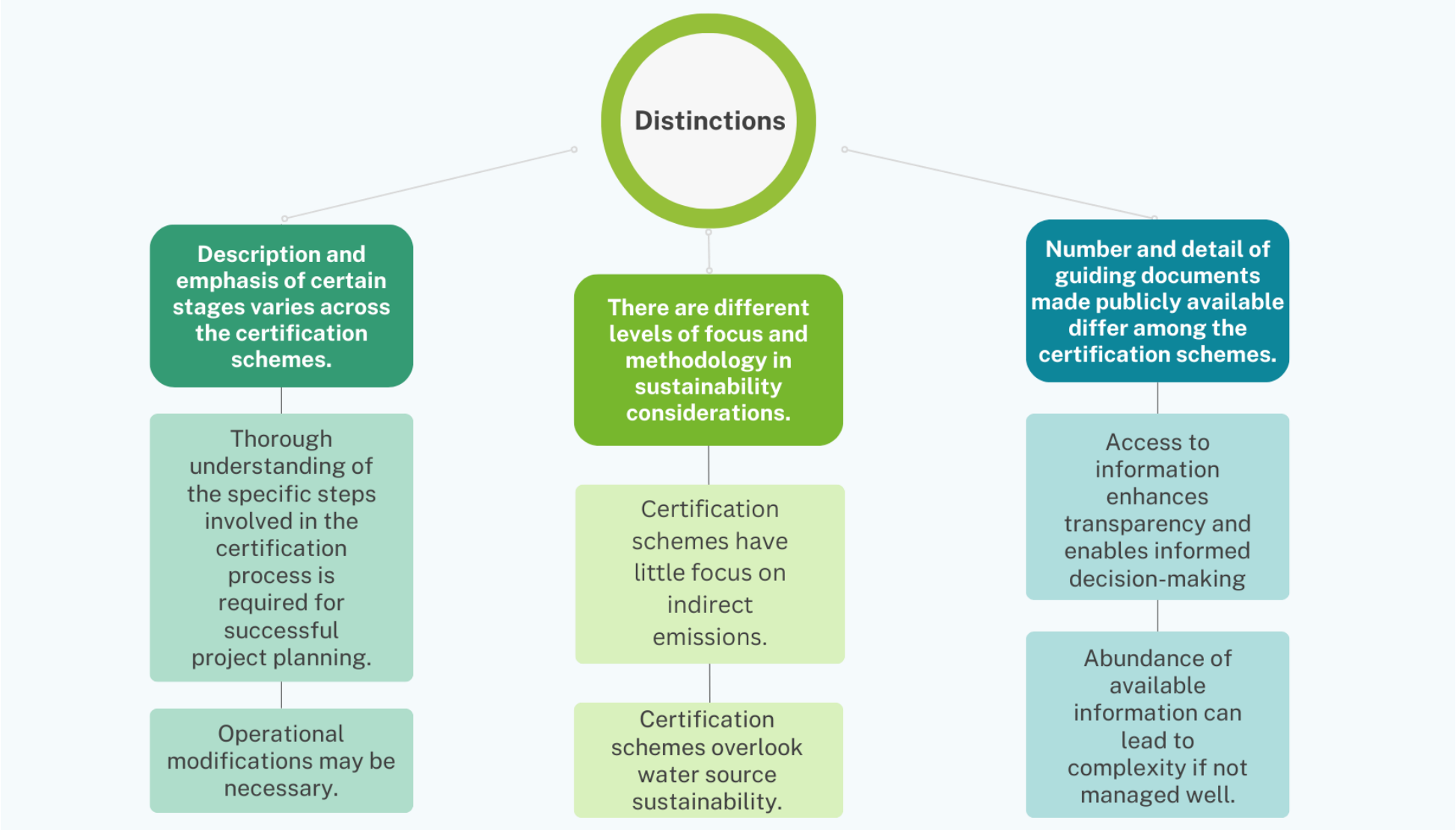
Key Study Findings



*TÜV Rheinland performs certification between cradle and point X, which is to be defined by the customer between cradle and grave
** ISCC PLUS has two system boundaries options for certification: cradle-to-grave and cradle-to-gate

Later adjustments to the project administering required to meet certification criteria may be costly and time consuming to implement.

Key Study Findings



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Thank you!

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