university of groningen / faculty of law / groningen centre of energy law and sustainability

Regulation related to Hydrogen

Linking legal reality to real life trough metrology?

Prof. Dr. Lorenzo Squintani
Chair of Energy Law
University of Groningen

What is (energy) law?

Descriptive: What the law is and how it works

Empirical



Normative: what the law should be

Doctrinal

Who has rights and obligations?

Subjects

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How to exercise this rights and obligations?

Procedures

How to assess whether energy law contributes to a sustainable society



Brundtland Report



Social-Ecological Resilience



Millennium Ecosystem Assessment





Gaines 2014

A normative framework with 4 criteria:





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ENERG
energia · ενεργεια


Hoax vagen.

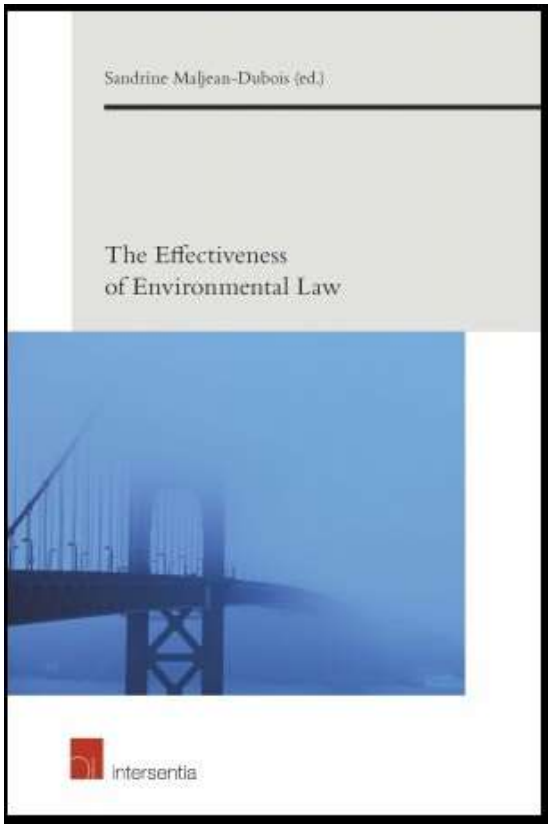



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Offsetting
Airlines
Airlines offering
setting schemes


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Law vs Reality



- Legal effectiveness
- Behavirourl effectiveness
- Real-life effectiveness

- Regulatory approaches:
  - Quality Standards (nature and water law)
  - Immission limit values (air quality law)
  - Emission limit values (climate law)
  - Technical standards (energy law)

Real life effectiveness

Legal effectiveness

- Regulatory phylosofies:
  - Ecosystem based (nature and water law)
  - Science based (air quality law)
  - Policy based (climate law, energy law)
  - Market based (cliamte law, energy law)

Real life effectiveness

Legal effectiveness



Real life effectiveness

Proxi

Legal effectiveness = real life effectiveness

Legal effectiveness

Real life effectiveness

Proxi

Proxi

Legal effectiveness

X = Regulatory approaches
Y = Regulatory philosofies



Where it goes wrong:

Real life effectiveness

EQS

ELV

ELV

ELV Tech.

Legal effectiveness

Art 2 PA

Art 3 ff. PA

Art 4 EU-CL

EU ETS + ESR

Policies based

EED+FQD+ED+GD ETS + ESR+CBANR+…



IPCC



6:162BW



Paris Agreement:

- Article 2: “Holding the increase in the global average temperature to **well below 2 °C** above pre-industrial levels and pursuing efforts to limit the temperature increase to **1.5 °C** (…)”
- Article 3: “As **nationally determined contributions** to the global response to climate change, all Parties are to undertake (…) **ambitious efforts** (…)”

EU Climate Framework

- Regulation (EU) 2021/1119
  - 2050 → netto-zero emissions (art. 1)
  - 2030 → at least 55 % GHG reduction compared to 1990 (art. 4(1))
- Operationalised by:
  - Governance Regulation (EU) 2018/1999
  - ETS Directive
  - Effort Sharing Regulation
- Supported by:
  - Indurstrial Emissions Directive;
  - Renewable energy sources Directive;
  - Etc.; etc.;
- Implemented in 27 MS
  - Extra territorial effects by means of trade instruments (e.g. CBAN Regulation)

Green molecules transition

- 2020 EU hydrogen strategy - COM(2020) 301 final
  - H2 share of 13-14% by 2050 in EU
- REPowerEU Plan - COM(2022) 230 final
  - 10 million tonnes of domestic renewable hydrogen production by 2030
  - 10 million tonnes of imported renewable hydrogen by 2030
- RES (III) Directive - Directive (EU) 2018/2001
  - Art. 25(1) targets for RES in transport, linked to fuels including RFNBOs
  - Art. 27(3) and Art. 28(5) → legal basis delegated acts

Delegated acts

- ***First Delegated act – Comm. Delegated Regulation (EU) 2023/1184***
  - Defines condition for hydrogen, hydrogen-based fuels or other energy carriers to be considered RFNBO
    - Additionality
    - temporal and geographic correlation
    - Certificates

Second Delegated act – Comm. Delegated Regulation (EU) 2023/1185

- Methodology for calculating life-cycle greenhouse gas emissions for RFNBOs
  - E = e i + e p + e td + e u – e ccs
  - determined by dividing the total emissions of the process covering each element of the formula by the total amount of fuel stemming from the process
  - If a fuel is a mix → all (fuel) types shall be considered to have the same emission intensity
    - Exception for RFNBOs only partially replacing a conventional input in a process → proportional basis
- Clarifies how to calculate the greenhouse gas emissions of renewable hydrogen or its derivatives in case it is co-produced in a facility that produces fossil-based fuels
  - Annex .15

Second Delegated act – Comm. Delegated Regulation (EU) 2023/1185

- Allows for 4 methods as regards GHG emissions from electricity (Annex .5+.6)
  - JEC WTW v5 (Prussi et al, 2020)
- GHG emissions from the elastic inputs that are not obtained from an incorporated process:
  - Part B of this Annex
  - latest version of the JEC-WTW report, the ECOINVENT database, official sources such as the IPCC, IEA or government, other reviewed sources such as the E3 and GEMIS database and peer reviewed publications
- Emissions from water → Covered by Annex .8?

What about further standardization?

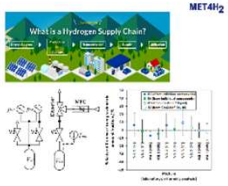
1. OIML R140 Measuring systems for gaseous fuel
2. OIML R137 Gas Meters
3. ISO 15105 Plastics — Film and sheeting — Determination of gas-transmission rate –
4. ISO 2782 Rubber, vulcanized or thermoplastic — Determination of permeability to gases
5. ISO 14687 Hydrogen fuel quality — Product specification
6. ISO 21087 Gas analysis — Analytical methods for hydrogen fuel — Proton exchange membrane (PEM) fuel cell applications for road vehicles
7. ISO 16664 Gas analysis — Handling of calibration gases and gas mixtures — Guidelines
8. ISO 15112 Natural gas — Energy determination
9. ISO/AWI 19880-9 Gaseous hydrogen — Fuelling stations — Part 9: Sampling for fuel quality analysis



MET4H2

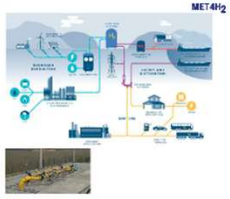
HEALTH, SAFETY AND ENVIRONMENT (WP1)

- Primary standards for leak flow rate measurements (10^{-9} to 10^{-5}) mol s^{-1}
- Characterisation methods for permeation analysis of sealings, liners etc. at (-40 to 120) °C, (0.1 to 10) MPa, (10 to 90) % RH
- Validation protocols and test rigs for hydrogen sensors (hydrogen and impurity content)
- Measurement standards for measuring odorant levels in hydrogen enriched natural gas and hydrogen (sulfurous and sulfur-free odorants)



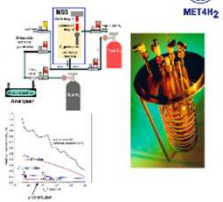
FLOW MEASUREMENT (WP2)

- Overview of the state-of-the-art in flow metering of hydrogen and hydrogen blends
- Intercomparison of flow measurement standards for hydrogen-enriched natural gas
- Flow standards for domestic gas meters for hydrogen, including assessment of impurity impact (up to 2 %)
- Development of metrological traceability chains for large-scale hydrogen transportation



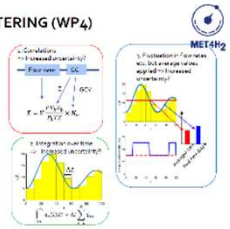
HYDROGEN QUALITY (WP3)

- Development of gas sampling methods for online and offline use
- Humidity standards for the amount fraction water in hydrogen (up to 6 MPa)
- Measurement standards for impurities typical for alkaline electrolysers (e.g., chlorine, hydrogen chloride, and water)
- Measurement standards for hydrogen quality during transportation (e.g., odorisation compounds, ammonia)



UNCERTAINTY IN FISCAL METERING (WP4)

- Development of a framework for the uncertainty evaluation of the total quantity and energy provided
- Evaluating serial correlation in flow and energy
- Uncertainty of approximating the time-integration by a summation
- Risk: assuming independence makes that uncertainty shrinks with more observations than actually justified
- At the end of the day: non-credible uncertainties



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How to make energy law more adaptive?

- Step 1: choose a modular normative paradigm for balancing the 3Ps
- Step 2: from sectorial to integrated energy law
- Step 3: base the system on principles
- Step 4: socio-technical-economical innovation oriented rules
- Step 5: automatize the system



Models to adapt regulations:

- IPCC → Science based model
- BREFs → Stakeholders based model
- COPs → Policy based model

Automatize the system:

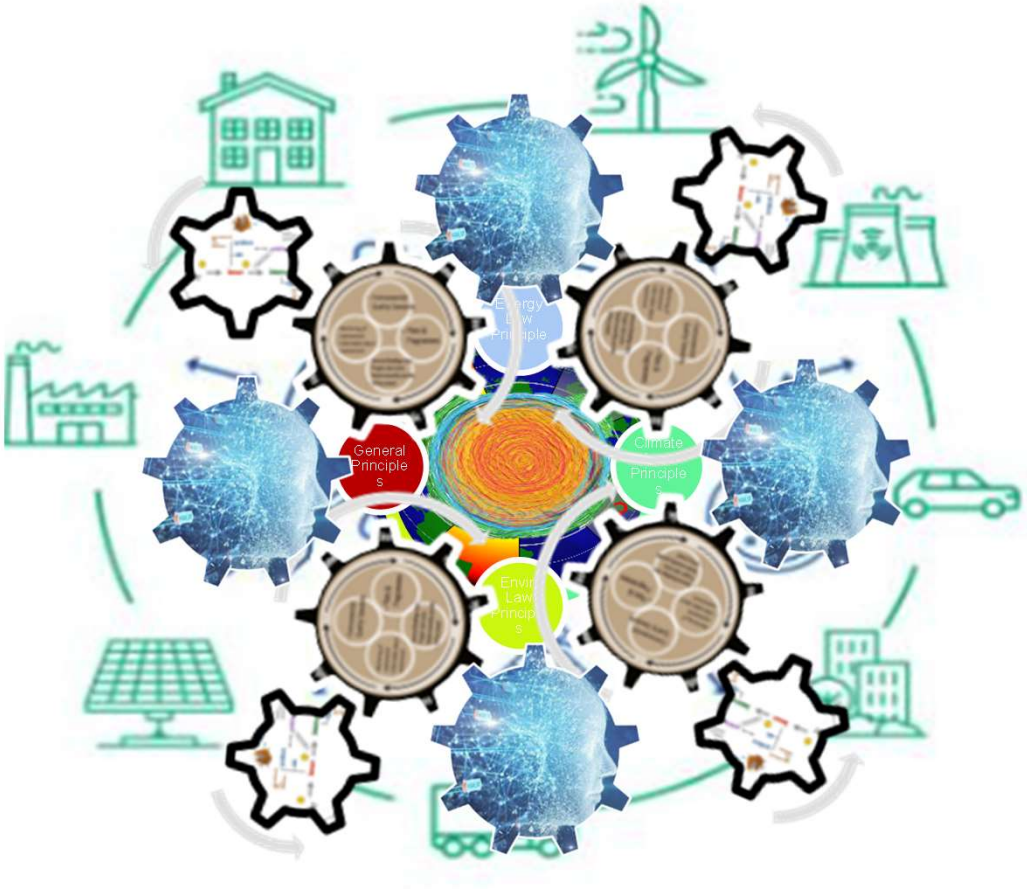
› IPCC → Science based mode

› BREFs → Stakeholders based

› COPs → Policy based model



Design for an adaptive energy market regulation:



1. Ecosystem based
2. Integrated
3. Principles based
4. Innovation oriented
5. Automatised, where appropiate

Thanks for your attention!