Clean Energy European Metrology Network and energy transition

P. A. Giuliano Albo[1], Fabian Plag[2] , Burkhard Beckhoff[1], Søren Alkærsig Jensen[3], Teresa Orellana-Perez[4], Rod Robinson[5], João Alves e Sousa[6], Marijn van Veghel[7]

[1] Istituto Nazionale di Ricerca Metrologica, Strada delle Cacce 91, IT-10135 Torino, Italy, (a.albo@inrim.it)
[2] Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, D-38116 Braunschweig, Germany
[3] Danish Fundamental Metrology A/S, Kogle Allé 5, DK-2970 Hørsholm, Denmark
[4] Bundesanstalt für Materialforschung und -prüfung, Unter den Eichen 87, D-12205 Berlin, Germany
[5] National Physical Laboratory, Hampton Rd, Teddington, Middlesex, United Kingdom
[6] Instituto Português da Qualidade, Rua António Gião 2, PRT-2829-513 Caparica, Portugal
[7] VSL B.V., Thijsseweg 11, NL-2629 JA Delft, Netherland

Metrology and Measurements

20 May
1875

Metrology means ensuring the measurements are expressed in terms of the **units as defined by the International System of Units (SI)**

20 May
2019

Units of measurements are **disseminated** by National Metrology Institutes (NMI) to Calibration Laboratories that perform instruments calibrations.

The **dissemination** process is straightforward for fundamental units of measurements but it **is not the same for derived units**.

In some cases the metrological traceability of the measurements could be difficult to be maintained. In those cases, an **international agreement in the form of normative is adopted**.

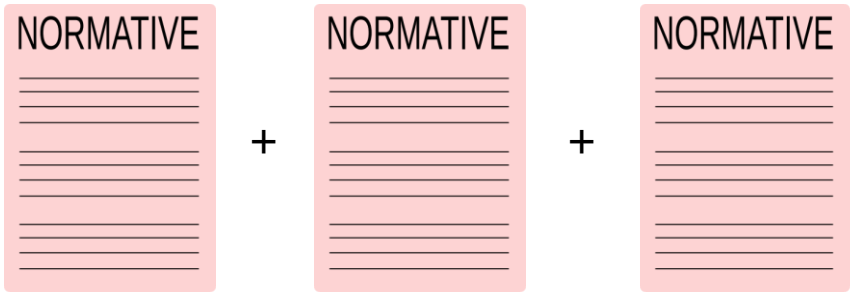
ISO International Organization for Standardization

COMITATO ELETTROTECNICO

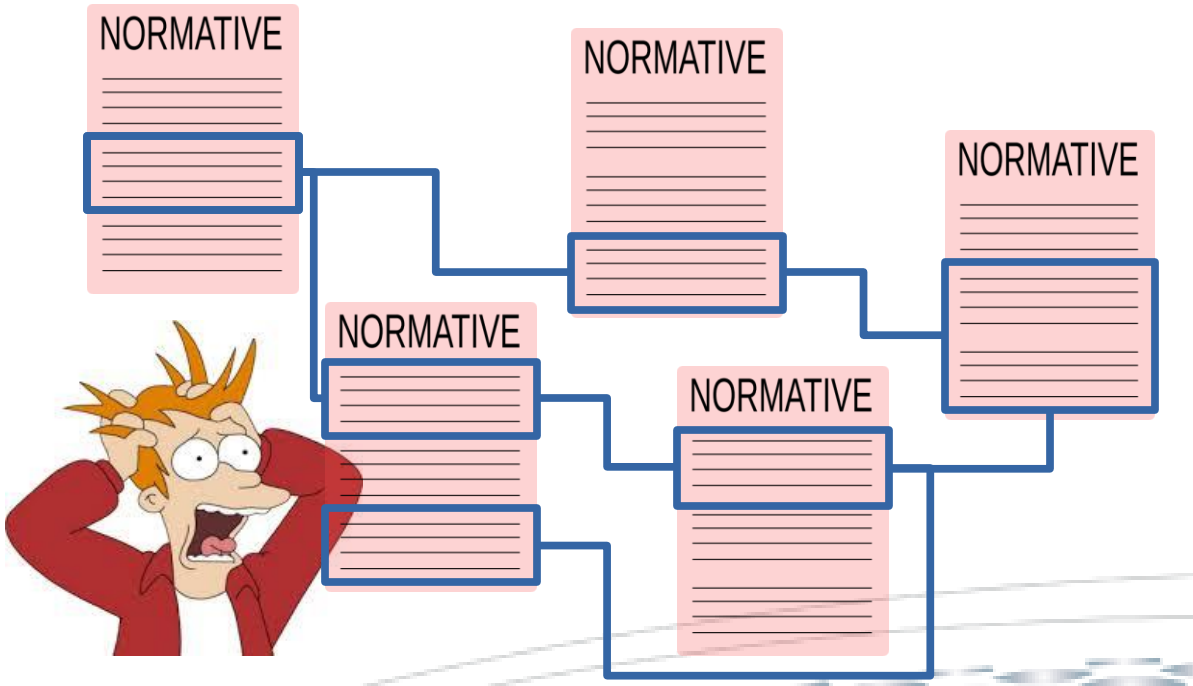
UNI ENTE ITALIANO DI NORMAZIONE

CEN EUROPEAN COMMITTEE FOR STANDARDIZATION

Entropy of the normative



In a frame of a consolidated agreement, normative has been updated time by time to match the need of manufactures, industry and traders.



In a transition frame, available normative is **temporary adapted** to the application context for **preventing to stop the activities** till updated specific documents are published after having followed the **development process** in the **Standardization Bodies working groups**.

The entropy generated in this frame is (**not rigorously**):

$$S = k_A \ln\left(\binom{N_1}{k_1}\binom{N_1}{k_1}\cdots\binom{N_n}{k_n}\right) = \sum_{i=1}^{N} S_i$$

Even **small values of entropy creates risk for the investments**.

I am joking! Don't try this at home!

Clean Energy Metrology Network for supporting Green Deal policy framework

Establish a regular **dialogue with European Institutions**, **Stakeholders** and **International Standardization bodies**

European Green Deal **policy framework**

Development of the **Strategic Agenda** and the **Strategic Research Agenda** (to support funding of urgent scientific research)

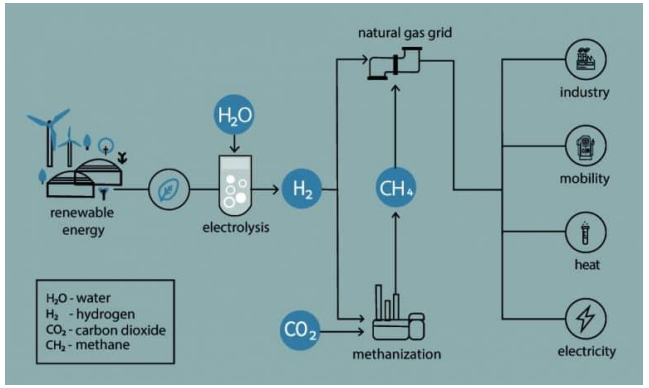
Engaging **stakeholders** for agreeing on the **prioritization** of the activities.

Development of a **plan for a multidisciplinary and sustainable European Metrology Network**

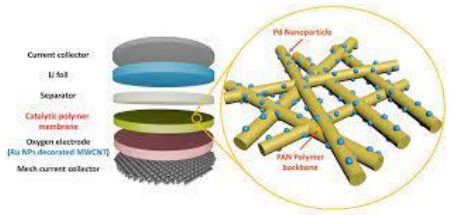
Clean Energy topics... but not limited to

wind

photovoltaic

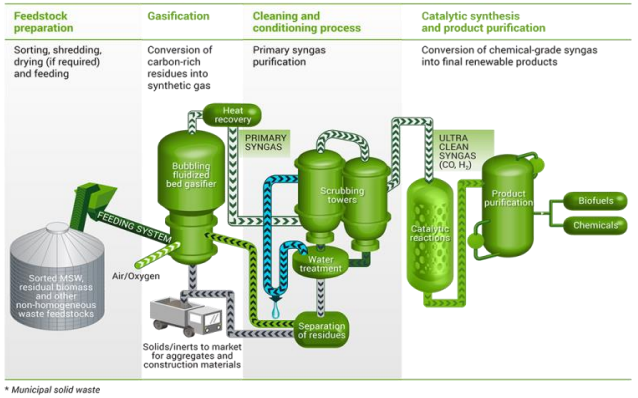


power to X

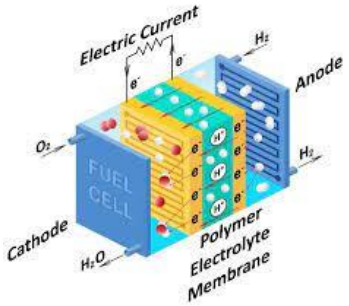


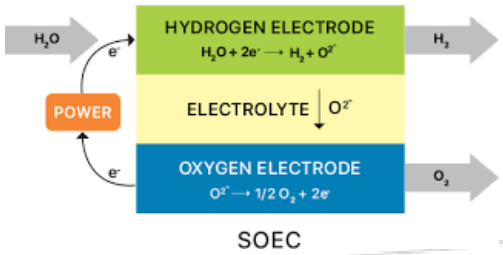
energy storage

geothermal



green fuels





fuel cells

Interactions with international standardization bodies

Standards Committee / Working Group	Partners involved	Likely area of impact / activities undertaken by partners related to standard / committee
ISO TC201 SC10	PTB	Technical draft e.g. on the qualification of novel battery material standards by physically traceable X-ray Spectrometry
ISO/TC4/TC60/TC213	INRiM	Mechanical engineering technical committees involved in activities of designing wind turbines.
IEC TC88	INRiM	Wind turbines
IEC TC4/TC114	INRiM	Hydraulic turbines and Marine energy – Wave and tidal energy converters
IEC TC82	PTB, INRiM	Solar photovoltaic energy systems
IEC TC117	INRiM	Solar thermal electric plants
IEC TC 21/SC 21A	PTB, NPL	Batteries
IMEKO TC20	PTB, IPQ	Measurements of energy and related quantities

Standards Committee / Working Group	Partners involved	Likely area of impact / activities undertaken by partners related to standard / committee
EURAMET TC-T	PTB, INRiM	Technical committee for thermometry
EURAMET TC-PR	PTB	Technical committee for photometry and radiometry
EURAMET TC-MC	PTB	Technical committee for metrology in chemistry
EURAMET TC-EM	VSL	Electrical aspects of generation, storage and conversion
EURAMET TC-IM	DFM	Validation of digital twins and A.I. of energy systems.
EURAMET TC-L	DFM	Dimensional analysis of wind turbines.
IEC TC 105	NPL	Fuel cell technologies

Conclusions

Kick starting the EMN on Clean Energy

Web based hub for efficient and continuous collaboration

Organization of **events** for supporting Stakeholders activities

Maintain an active **dialog with other EMN**

Enforcing the European Metrology infrastructure