NMi at DC on tour

Presentation

Trust, Accuracy and Sustainability in Metrology & Measuring Technology

Trusted Technical Experts in Metrology and Measuring Technology

Advise

Insight for 1st-time success once development activities reach the testing and approval phase

Test

Examine measurement devices for critical compliance and qualification requirements

Inspect

Ensure mass production quality and identify critical issues before product market entry

Certify

Dispense trusted NMi seal of approval for market access to Europe, the UK and beyond

Calibrate

Evaluate and adjust the precision and accuracy of vital equipment

Long trusted resource

NMi: a leading player in the ATICC market with ample potential for future growth

1820
19 Calibration Offices open in the Netherlands to check and inspect goods in the interest of fair trade.

1937
The Dutch government adopts the 'Weights and Measures' Act

1989
'Netherlands Measurement Institute' (NMi) established

2017
NMi divests its gaming department to increase focus on metrology TIC services

2018
NMi relocated its HQ from Dordrecht to Delft for increased commercialisation

2020
NMi acquired by LLCP, to further build on NMi's leading market position

2021
Young Calibration acquisition strengthens UK presence

2022
Chamois Metrology acquisition adds measuring equipment sales and repairs

2022 and beyond
Continued strategic organic and acquired growth positioned to address the full ATICC value pipeline of current and evolving market demands

What is happening with DC in the legal metrology field

Agenda

- How is international legislation organised
- OIML
- Eichrecht
- IEC
- Cenelec
- Major safety-topics
- Future, DC at NMi

- Webinar EV charging standards in motion

THE CURRENT WAR

THE TALE OF AN EARLY TECH RIVALRY

DC

DIRECT CURRENT

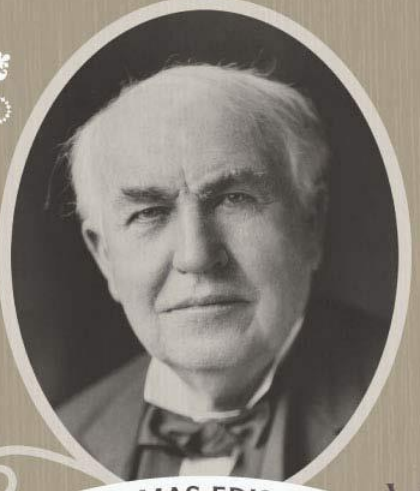
The flow of electricity is in one direction only. The system operates at the same voltage level throughout and is not as efficient for high-voltage, long distance transmission.

Direct current runs through:

- Battery-Powered Devices
- Fuel and Solar Cells
- Light Emitting Diodes

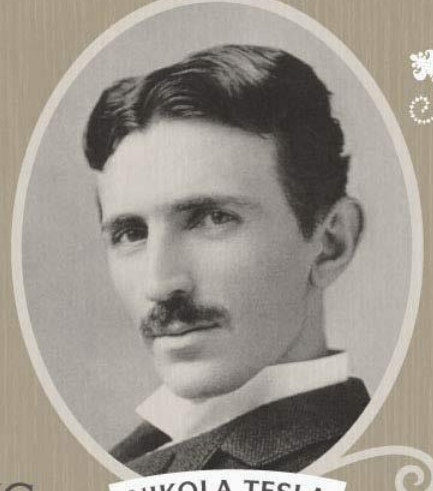
"[TESLA'S] IDEAS ARE SPLENDID, BUT THEY ARE UTTERLY IMPRACTICAL."

- THOMAS EDISON



THOMAS EDISON

VS.



NIKOLA TESLA

You would have never found two geniuses so spiteful of each other beyond turn-of-the-century inventors Nikola Tesla and Thomas Edison. They worked together—and hated each other. Let's compare their life, achievements, and embittered battles.

AC

ALTERNATING CURRENT

Electric charge periodically reverses direction and is transmitted to customers by a transformer that could handle much higher voltages.

Alternating current runs through:

- Car Motors
- Radio Signals
- Appliances

"IF EDISON HAD A NEEDLE TO FIND IN A HAYSTACK, HE WOULD PROCEED AT ONCE... UNTIL HE FOUND THE OBJECT OF HIS SEARCH. I WAS A SORRY WITNESS OF SUCH DOINGS, KNOWING THAT A LITTLE THEORY AND CALCULATION WOULD HAVE SAVED HIM 90 PERCENT OF HIS LABOR."

- NIKOLA TESLA

1847	BORN	1858
Milan, Ohio	BIRTHPLACE	Smiljan, Croatia
Wizard of Menlo Park	NICKNAME	Wizard of the West
Home-schooled and self-taught	EDUCATION	Studied math, physics, and mechanics at The Polytechnic Institute at Gratz
Mass communication and business	FORTE	Electromagnetism and electromechanical engineering
Trial and error	METHOD	Getting inspired and seeing the invention in his mind in detail before fully constructing it
DC (Direct Current)	WAR OF CURRENTS: ELECTRICAL TRANSMISSION IDEA	AC (Alternating Current)
Incandescent light bulb; phonograph; cement making technology; motion picture camera; DC motors and electric power	NOTABLE INVENTIONS	Tesla coil - resonant transformer circuit; radio transmitter; fluorescent light; AC motors and electric power generation system
1,093	NUMBER OF US PATENTS	112
0	NUMBER OF NOBEL PRIZES WON	0
1	NUMBER OF ELEPHANTS ELECTROCUTED	0
1931—Passed away peacefully in his New Jersey home, surrounded by friends and family	DEATH	1943—Died lonely and in debt in Room 3327 at the New Yorker Hotel

LATE BLOOMER

Thomas Edison, the youngest in his family, didn't learn to talk until he was almost 4 years old.

FALLING OUT

Edison promised Tesla a generous reward if he could smooth out his direct current system. The young engineer took on the assignment and ended up saving Edison more than $100,000 (millions of dollars by today's standards). When Tesla asked for his rightful compensation, Edison declined to pay him. Tesla resigned shortly after, and the elder inventor spent the rest of his life campaigning to discredit his counterpart.

"Genius is one percent inspiration and ninety nine percent perspiration."

-Thomas Edison

EDISON FRIES AN ELEPHANT

In order to prove the dangers of Tesla's alternating current, Thomas Edison staged a highly publicized electrocution of the three-ton elephant known as "Topsy." She died instantly after being shocked with a 6,600-volt AC charge.

WAR OF CURRENTS OFFICIALLY SETTLED

In 2007, Con Edison ended 125 years of direct current electricity service that began when Thomas Edison opened his power station in 1882. It changed to only provide alternating current.

NOBEL PRIZE CONTROVERSY

In 1915, both Edison and Tesla were to receive Nobel Prizes for their strides in physics, but ultimately, neither won. It is rumored to have been caused by their animosity towards each other and refusal to share the coveted award.

SOURCES: CHENEY, MARGARET. "TESLA: MAN OUT OF TIME" | UTH, ROBERT. "TESLA: MASTER OF LIGHTNING." | THOMASEDISON.COM | PBS.ORG | WEB.MIT.EDU | WIRED.COM

A COLLABORATION BETWEEN GOOD AND COLUMN FIVE

How is international legislation organized?

Up till now most countries make use of the MID (2014/32/EU).

Electricity meter described in Annex V.

Problems:

- There are no requirements for an EVCS as a whole
- Originally the MID was not intended to cover DC meters
- No certification regime for “fast” chargers (DC)
- Specific aspects are not covered (like resetting of registers, energy loss)
- A Charging System is intended for direct sales rather than being a utility measuring instrument

OIML

Organization to prepare Recommendations for legislation.

The member states have the moral obligation to implement those Recommendations nationally.

R 46 – Recommendation for electricity meters


INTERNATIONAL RECOMMENDATION

OIML R 46-1/-2

Edition 2012 (E)

Active electrical energy meters.
Part 1: Metrological and technical requirements
Part 2: Metrological controls and performance tests

Compteurs actifs d'énergie électrique.
Partie 1: Exigences métrologiques et techniques
Partie 2: Contrôles métrologiques et essais de performance

OIML R 46-1/-2 Edition 2012 (E)

OIML

ORGANISATION INTERNATIONALE DE MÉTROLOGIE LÉGALE

INTERNATIONAL ORGANIZATION OF LEGAL METROLOGY

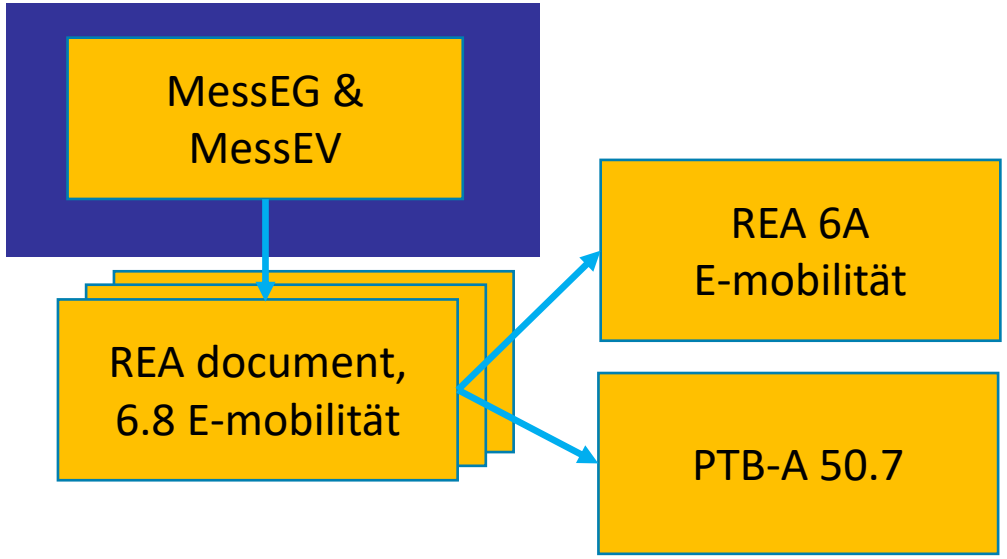
New Guide in preparation for EV Charging Systems

- Functional requirements
- Test conditions aligned with practical conditions
- Covers both AC and DC chargers

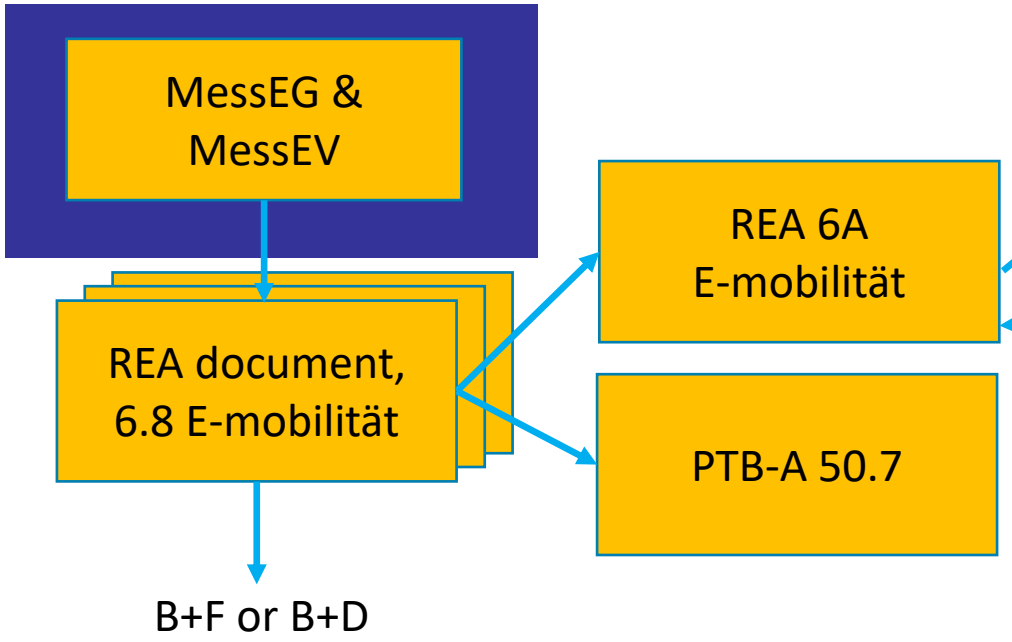
How is international legislation organized?

Some countries have national legislation.

Germany: Eichrecht



German legislation EVCS



- an electricity meter
  - AC kWh-meter = MID approved, class A
  - DC kWh-meter (German approval, REA 6.5);
- software (WELMEC 7.2 type U);
- a local indicating device;
- an internal clock;
- a local data storage;
- a local printer (optional);
- devices for client identification;
- data communication output (to backend systems);
- cryptographic signature;
- ancillary devices;
- possibly a SMGW (1 January 2021).

VDE Anwendungsregel

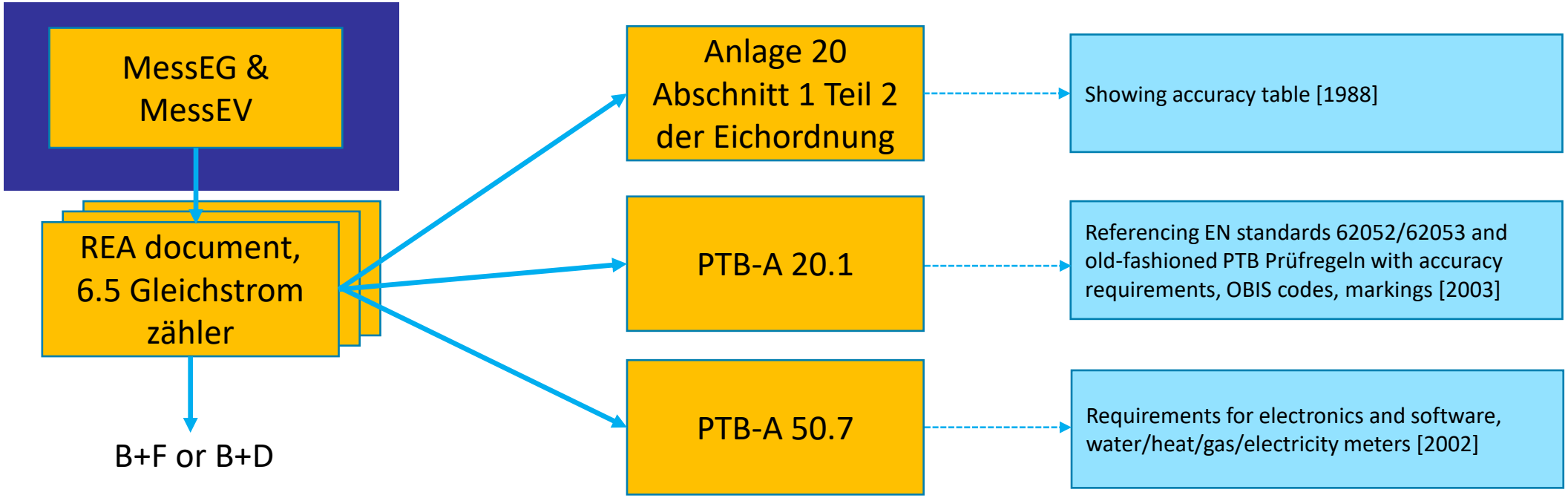
- construction
- indication
- messkapsel
- communication
- security

Annex A - *normative*
- DC meters
- (62053-41 used as basis)

Annex B - *informative*
- EN 50470 for AC
- EMC / climate for station

Annex C - *normative*
Charging station with time measurement function

German legislation DC meters

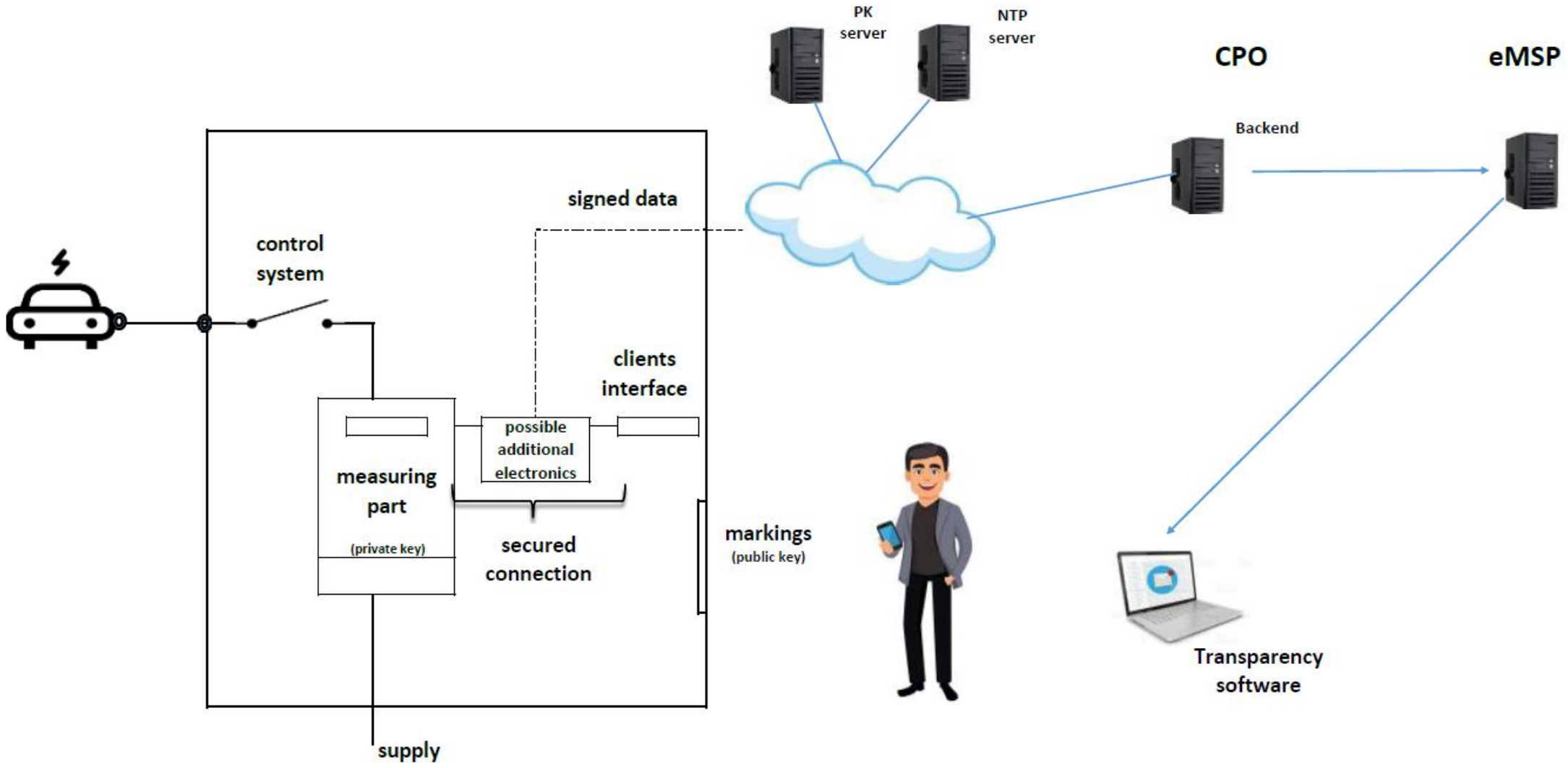


Module B method, applied at NMi

- VDE Anwendungsregel, Annex A / EN 62053-41 / EN 50470-4
- WELMEC 7.2
- WELMEC 11.2

- Clock EN 62054-21
- OBIS codes 62056-61
- German markings

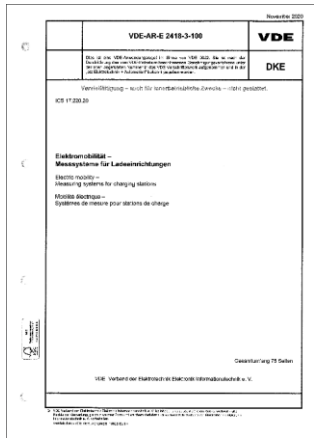
German Eichrecht



German Eichrecht

Two other developments:

VDE Anwendungsregel VDE-AR-E 2418-3-100 (2020-11)


November 2020

VDE-AR-E 2418-3-100

VDE

DKE

Vervielfältigung – auch für innerbetriebliche Zwecke – nicht gestattet.

ICS 17.220.20

Elektromobilität –
Messsysteme für Ladeeinrichtungen

Electric mobility –
Measuring systems for charging stations

Mobilité électrique –
Systèmes de mesure pour stations de charge

Gesamtumfang 75 Seiten

VDE Verband der Elektrotechnik Elektronik Informationstechnik e. V.

Interpretation sheet prepared by committee of Notified Bodies (Merkblatt)

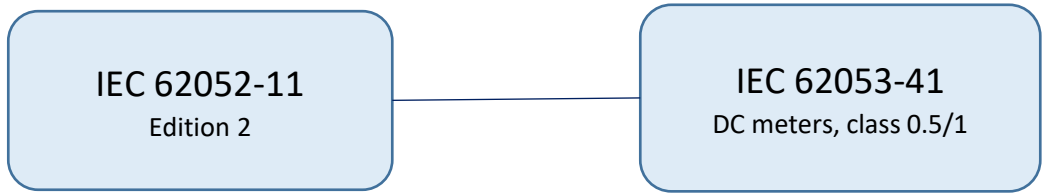
Steps of developments for DC meters

	General requirements	Particular requirements	
IEC	62052-11 Edition 2	62053-41 DC meters, class 0,5 and 1	
	General requirements	Active Energy	
CENELEC	EN 62052-11 Edition 2	50470-4 DC meters	

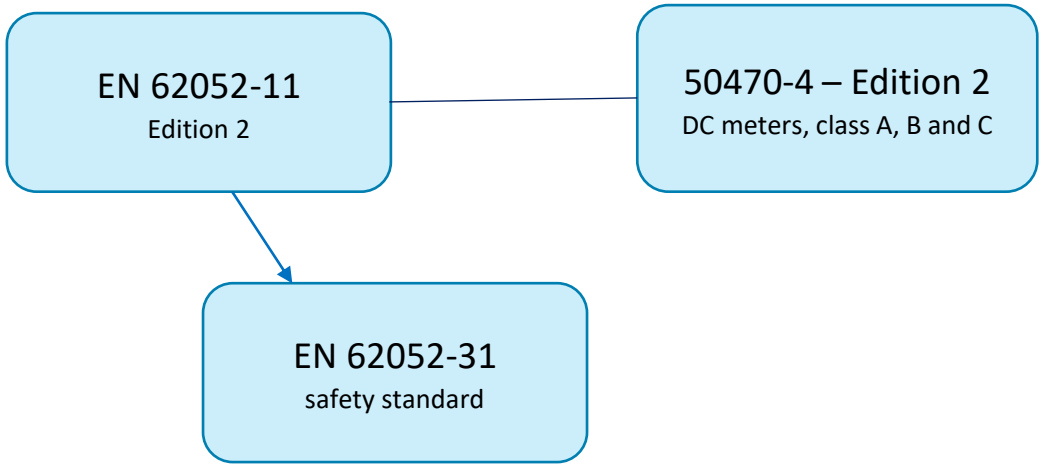
Can we use these standards to certify DC meters?

Harmonised standards kWh DC?

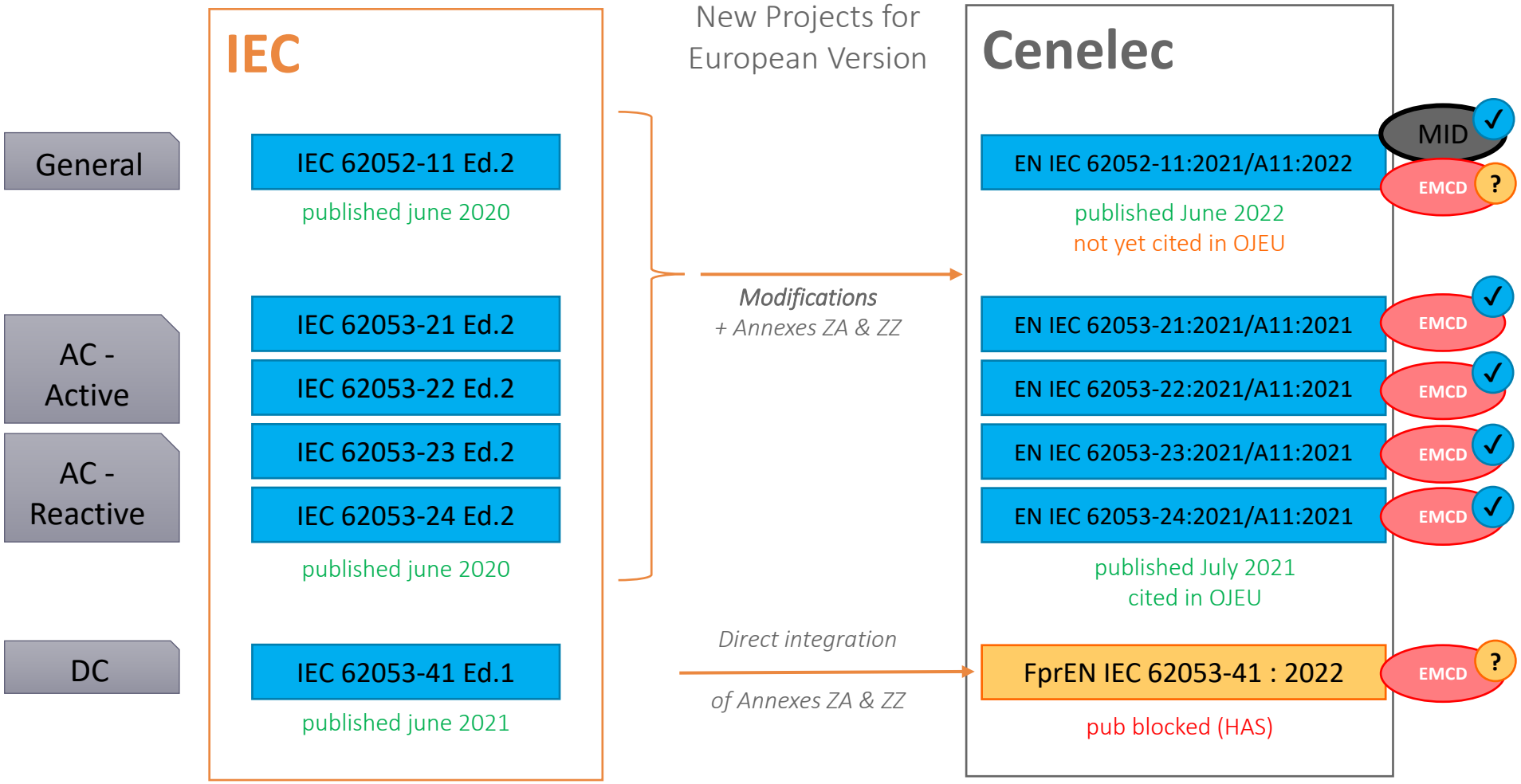
Current IEC standards:



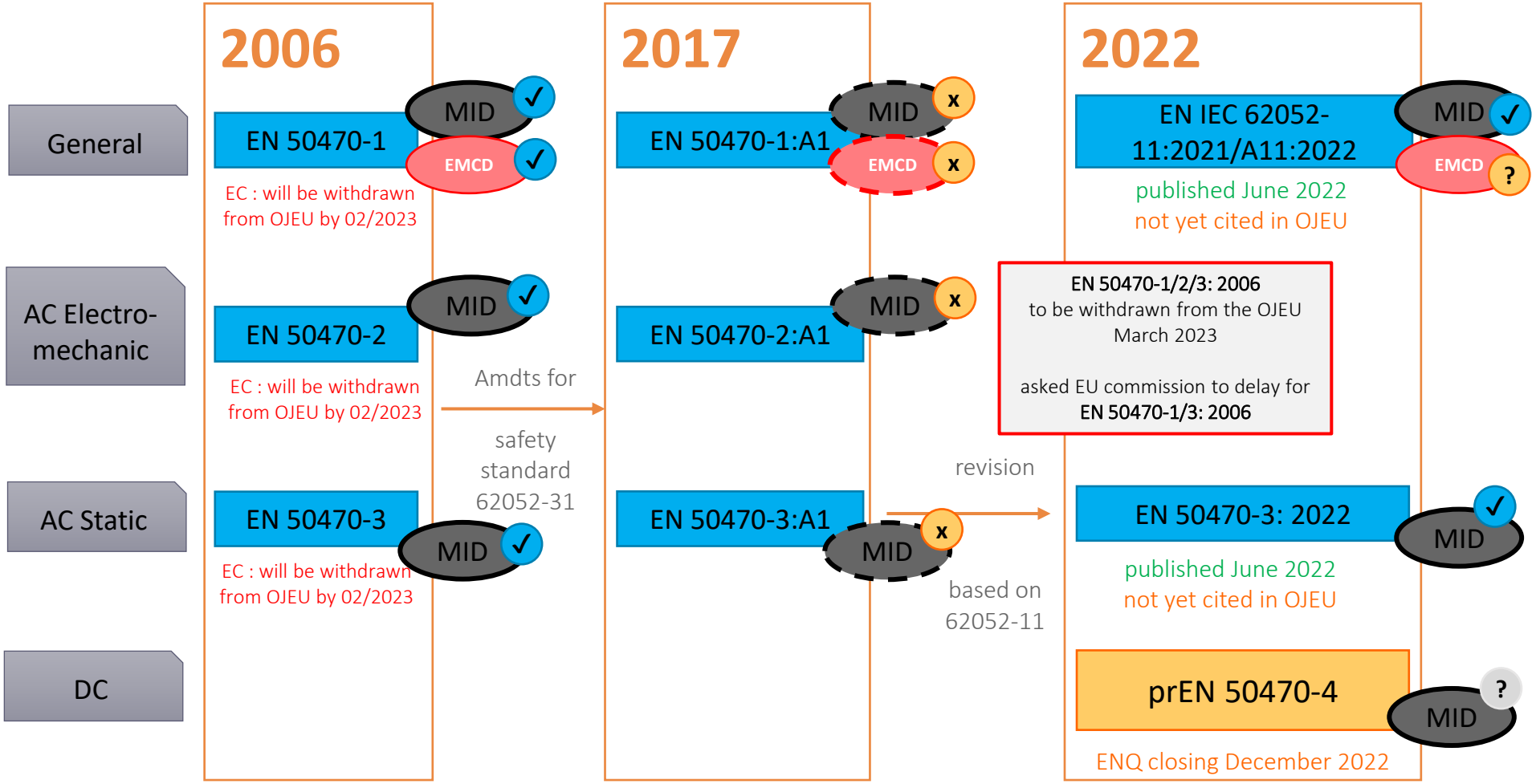
Under development for application with the MID:



Status of IEC based standards



Status of European standards



Approve DC meters under the MID?

Traditional view: the MID doesn't cover DC electricity meters

Several arguments to change that view:

- The MID describes meters for 'active electrical energy'. Both AC and DC meters are within the scope.
- The requirements can be fulfilled for both type of meters.
- Mandate M/541 requests for DC meter standards for the implementation of the present MID.

NMi's Certification Board is positive towards issuing MID approvals for DC meters

Legal requirements are complex, but…

- Interpretation of German Eichrecht is stabilized
- Multiple initiatives in different countries, harmonization is pushed within WELMEC
- New OIML Guide is about to be published, might act as a basis for international legislation
- Standardization committees are providing standards for DC meters
- The MID can be used to issue European approvals for DC meters
- For countries outside Germany, the gap for the certification of DC chargers can be filled to a great extent by certifying the internal DC meter

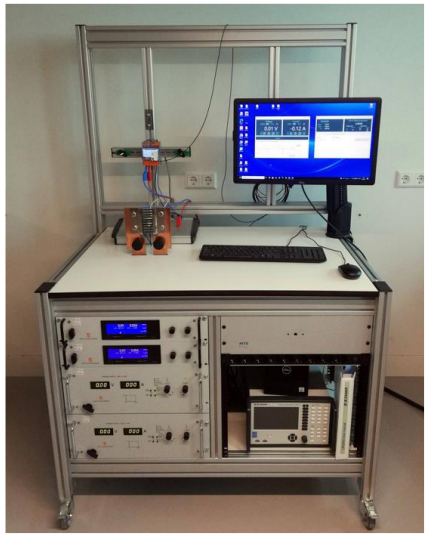
Future

- Standardization and harmonization
  - More implementation of law and legislation, follow the market
  - Necessary for growth and innovation

- Measuring energy conversion losses
  - Who will pay and how can we be sure
  - Challenge for utilities

- Measuring DC in-house
  - Consumer? Prosumer!
  - PV, ESS, V2G/X

DC at NMi



Current set-up

Voltage	up to 1320 V
Current	up to 800 A
Power accuracy	0,1%

Q4 2022

Voltage	up to 1500 V
Current	up to 1200 A
Power accuracy	0,1%

Webinar link

- Webinar can be found here!

- **Topics:**
- Calibration & measurement standards for EVCS
- Data security considerations
- EV Manufacturers and CPO conformity concerns
- Developing efforts within WELMEC and OIML
- Current EVCS testing and certification options
- **Speakers:**
- . Henri Schouten, NMI
  . Dr. Matthias Grote, Software Alliance for E-mobility
  . Matthijs van der Wiel, Agentschap Telecom
  . Roland van der Put, FastNed
  . Sean Lui, J.D., Tesla

Summary

- IEC TC13: publication of IEC 62053-41 for DC meters
- CENELEC TC13: work on 50470-4 for DC meters, under the MID
- IEC TC13: revision of safety standard 62052-31, include DC meters
- German Application Rule: VDE-AR-E 2418-3-100

Thanks for your attention