Intertek

Valued Quality. Delivered.

Recent Development of Portable Fuel Cells and News from Annex 35

3 December, 2015

Dr. Maria Wesselmark, Intertek Semko

Intertek - An Extensive Global Network

Intertek
Valued Quality. Delivered.

More than **100** countries

More than **1,000** laboratories and offices

over **38 000** people

- Battery Centers of Excellence
- Battery Testing Labs
- Energy Storage Advisory Group

+ 65 Related Labs Globally

Intertek Energy Storage

Valued Quality. Delivered.

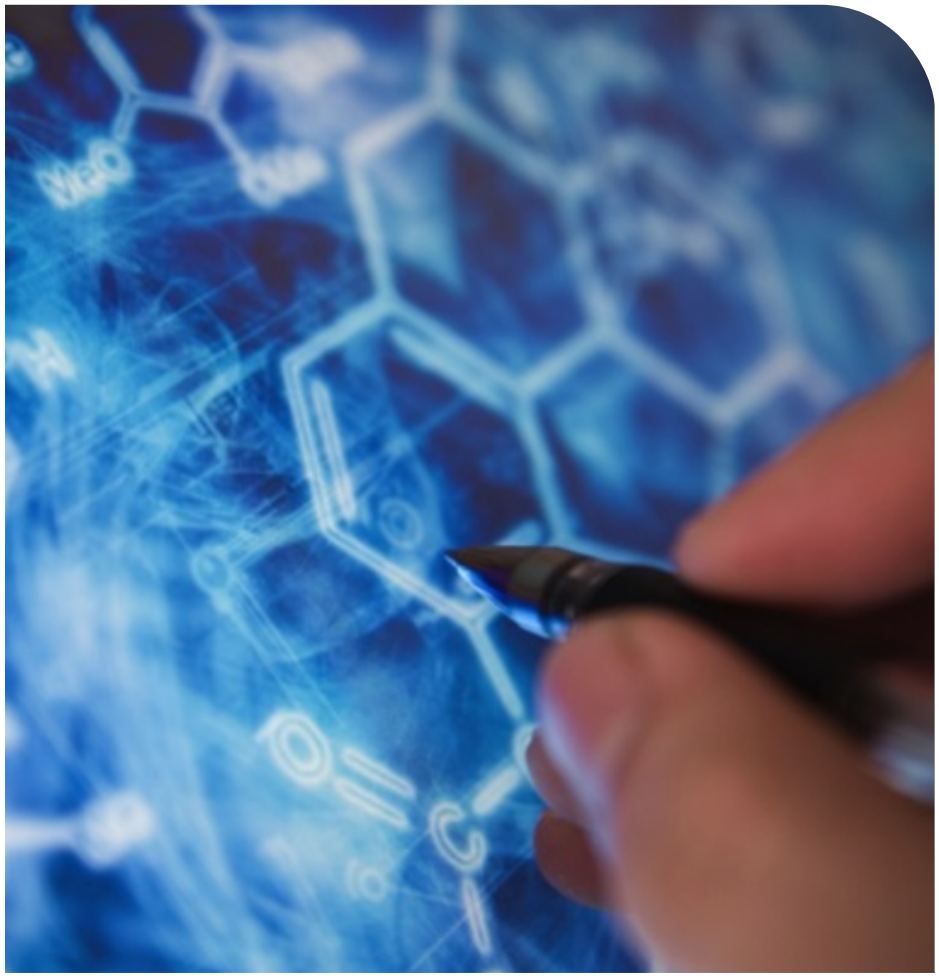
In 2009 Intertek Semko AB acquired the entire business assets of Sagentia Catella AB.

Intertek's Global Centre of Excellence for Batteries and Fuel Cell.

Over 50 years track record in evaluating power sources, applications ranging from hybrid vehicle to cellular phone and medical devices.

Industry-leading test lab facilities; unique scope and breadth of testing capability.

For more info:
www.intertek.com/energy-storage



Portable Fuel Cells

Intertek
Valued Quality. Delivered.

Fuel cells for portable applications:

- That the systems are designed to be held by hand during operation.
- To be transported by one person.
- To be transported easily from one location to another (transportable) and for transport purposes (light traction).

Portable fuel cell systems can be found in the leisure, industry and defence markets.

Annex 35, Fuel Cells for Portable Applications

Intertek
Valued Quality. Delivered.

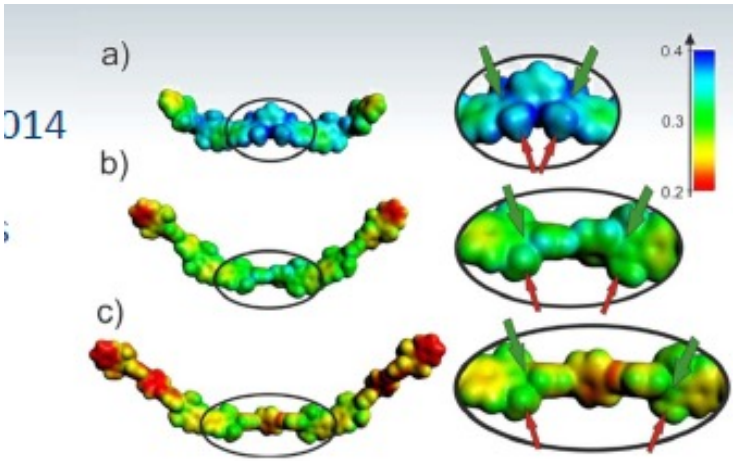
- The overall objective of IEA Annex 35 is that through international cooperation, support development of portable fuel cells to commercialization.
- Last meeting was held in September 2015 at Next Energy, Oldenburg Germany.
- The meeting covered portable fuel cell activities in the participants' respective countries and their own on-going activities in the area.

COUNTRY	COMPANY	NAME
Austria	Technische Universität Graz	Victor Hacker
Canada	Department of National Defence	Christina Bock
Canada	NRC	Ed Andrukaitis
Denmark	Dantherm Power A/S	Per Balslev
Germany	Fraunhofer Institut Chemische Technologien	Carsten Cremers
Germany	NEXT ENERGY	Alexander Dyck
Germany	Forschungszentrum Jülich GmbH	Martin Müeller
Italy	CNR-ITAE	Fabio Matera
Japan	AIST	Akiteru Maruta
Korea	KIER	Sang-Kyung Kim
Sweden	Intertek	Maria Wesselmark

Annex 35, Fuel Cells for Portable Applications

Intertek
Valued Quality. Delivered.

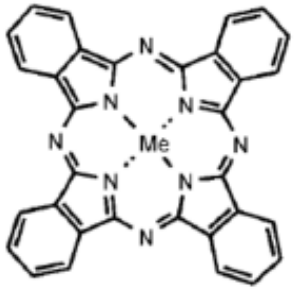
The participants of Annex 35 are mainly research institutes and the activities are often focusing both on fundamental material development but also on larger fuel cell systems for a specific application for military, space and consumer market.



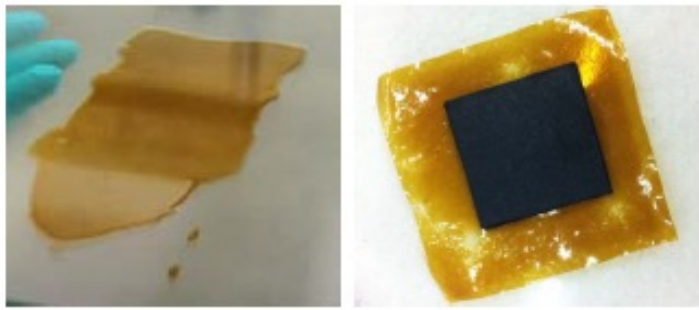
Henkensmeier et al., Int. J. Hydrogen Energy, DOI: 10.1016/j.ijhydene.2013.07.091

Focus of on-going material research activities:

- Alkaline Alcohol Fuel Cells
- Platinum free catalysts
- Alternative membrane
- Hydrogen storage



Phthalocyanine

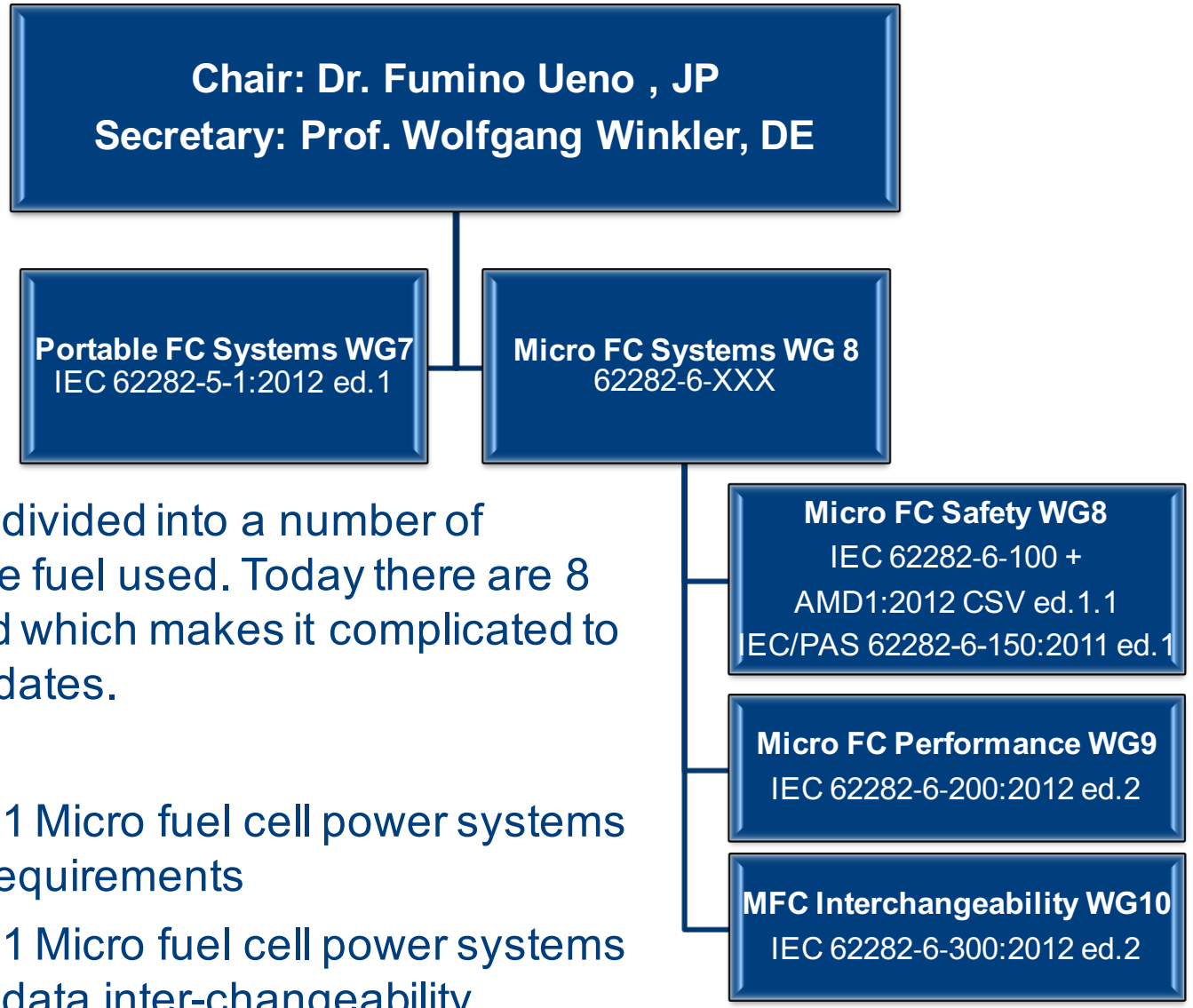


IEC 62282 WG Structure
Portable and Micro Fuel Cell Systems

Intertek
Valued Quality. Delivered.

IEC

- Standardization work on portable and micro fuel cells (IEC 62282) has resulted in five documents.



- IEC 62282-6-100 will be divided into a number of different standards for the fuel used. Today there are 8 Appendix to the standard which makes it complicated to handle changes and up-dates.
- Draft documents:
  - IEC 62282-6-101 ed.1 Micro fuel cell power systems - Safety - General Requirements
  - IEC 62282-6-400 ed.1 Micro fuel cell power systems - Safety - Power and data inter-changeability

Fuel Cell Standards IEC 62282: IEC TC 105

Intertek
Valued Quality. Delivered.

Standardization work on portable and micro fuel cells (IEC 62282) has resulted in five documents:

- IEC 62282-5-1:2012 ed.1 Portable fuel cell power systems – Safety
- IEC 62282-6-100:2010 + AMD1:2012 CSV ed1.1 Micro fuel cell power systems – Safety
- IEC / PAS 62282-6-150:2011 ed1 Micro fuel cell power systems - Safety - Water reactive compounds (UN Division 4.3) in Indirect PEM fuel cells
- IEC 62282-6-200 ed.2 Micro fuel cell power systems - Performance test methods
- IEC 62282-6-300 ed.2 Micro fuel cell power systems - Fuel Cartridge Inter-changeability

IEC 62282-6-100 will be divided into a number of different standards for the fuel used. Today there are 8 Appendix to the standard which makes it cumbersome to update the standard, if any part needs to be changed.

Draft documents:

- IEC 62282-6-101 ed.1 Micro fuel cell power systems - Safety - General Requirements
- IEC 62282-6-400 ed.1 Micro fuel cell power systems - Safety - Power and data inter-changeability

NCs are invited to nominate additional experts (especially for the different fuels and technologies) via the IEC Experts Management System

TC 105 decided to split IEC 62282-6-100 into a general part IEC 62282-6-101 accompanied by fuel type specific parts IEC 62282-6-102, 6-103, 6-104, etc. (currently included in annexes A, B, C, etc. of IEC 62282-6-100). The benefit would be that future additions and revisions could be handled more easily. See also document 105/276/INF, 2010-06. The present RR is intended to initiate project 62282-6-101.
Other RRs will be circulated in due time for other fuel type specific parts 62282-6-102, -6-103, etc.

The existing IEC 62282-6-100 will be withdrawn at a future date as and when all its contents have been published in the new format IEC 62282-6-101, -6-102,-6-103, etc.

A selection of fuel cells is already available on the market!

A Selection of Micro Fuel Cell Products

Intertek
Valued Quality. Delivered.

- Portable chargers are addressing cost-sensitive customers (<<100 €)
- Cartridge access is important to the end user
- Latest products: JAQ by MyFC/ Kraftwerk by Ezelleron

Horizon Fuel Cell Technologies

BRUNTON

NEAH power systems

myFC

ezelleron

Intelligent Energy

myFC Launching JAQ

myFC PowerTrekk 1.0
Hybrid system

Charger system
Output Power: 2,5 W
(1500 mAh in battery)

Output voltage: 5 V
Weight: 173 g

Cartridge system
Output Power: 1200 mAh

myFC PowerTrekk 2.0
Hybrid system

Charger system
Output Power: 6,5 W
(3800 mAh in battery)

Output voltage: 5 V
Weight: 290 g

Cartridge system
Output Power: 1400 mAh

myFC JAQ
Fuel Cell only

Charger system
Output Power: 5 W

Output voltage: 5 V
Weight: 200 g

Cartridge system
Output Power: 1800 mAh

Zero CO_2 emissions - end to end.

A Selection of Military Portable Products

Intertek
Valued Quality. Delivered.

- Propane and methanol fuels
- HTPEM, DMFC and SOFC system
- 50 – 300 W system
- Serial Production by UltraCell and SFC Energy
- Protonex in acquisition by Ballard
- SAFCell and UltraCell have signed a worldwide licensing agreement

Horizon Fuel Cell Technologies

UltraCell HIGH POWER MICRO FUEL CELLS™ A Bren-Tronics Company

SFC ENERGY

Protonex

Ultra ELECTRONICS

SAFCell

A Selection of Consumer Portable Products

Intertek
Valued Quality. Delivered.

BOC
A Member of The Linde Group

- Silent operation and no particulate emissions
- Longer runtimes than batteries
- SFC in serial production, launching EFOY GO and EFOY Pro 12000 Duo

Horizon
Fuel Cell Technologies

SFC ENERGY

truma
More comfort on the move

Ultra ELECTRONICS

SAFCell

Summary: Portable Fuel Cell Trends

Intertek
Valued Quality. Delivered.

- A branded, more thought-out concept is presented and products are better tailored to meet the market needs.
- Standards and regulations for micro fuel cells and fuel cell cartridges is in place to facilitate product launch.
- A wide range of new products are launched and serial production has started.
- Several of the companies working on military applications broadens their product portfolio with industrial and commercial applications.
- PEMFC is the key technology used for portable and micro fuel cell systems, however different fueling solutions are used.

Thank you!

Intertek
Valued Quality. Delivered.

Questions

Contact Info:

Maria.wesselmark@intertek.com

+46 708 752002

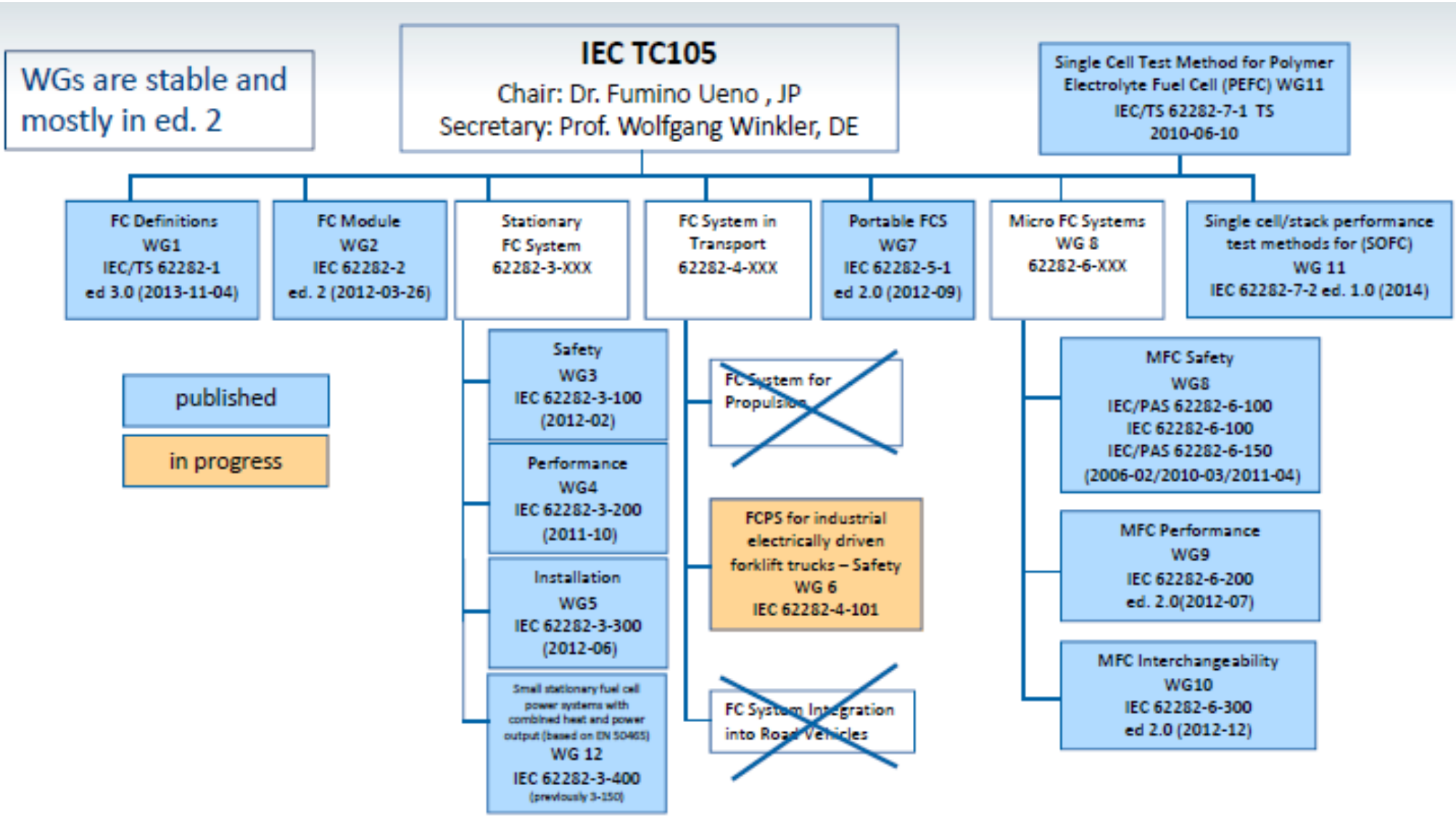
Intertek

Valued Quality. Delivered.

Valued Quality. Delivered.

Working Group Structure IEC 62282

Intertek
Valued Quality. Delivered.



Source: Dr. Alexander Dyck, NextEnergy