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Karoliina Meurman / Finnish safety and chemical agency

26th January 2021

ALBATTS online Workshop: Future Job Roles and Skills in Stationary Battery Storage: Battery Safety, Grid & Telecom Applications

Turvallisuus- ja kemikaalivirasto (Tukes)

Who am I?

Senior Officer / Tukes

- Market surveillance of extinguishers, smoke alarms etc.
- Fire safety and extinguishing methods of lithium ion batteries

Karoliina Meurman
26.1.2021

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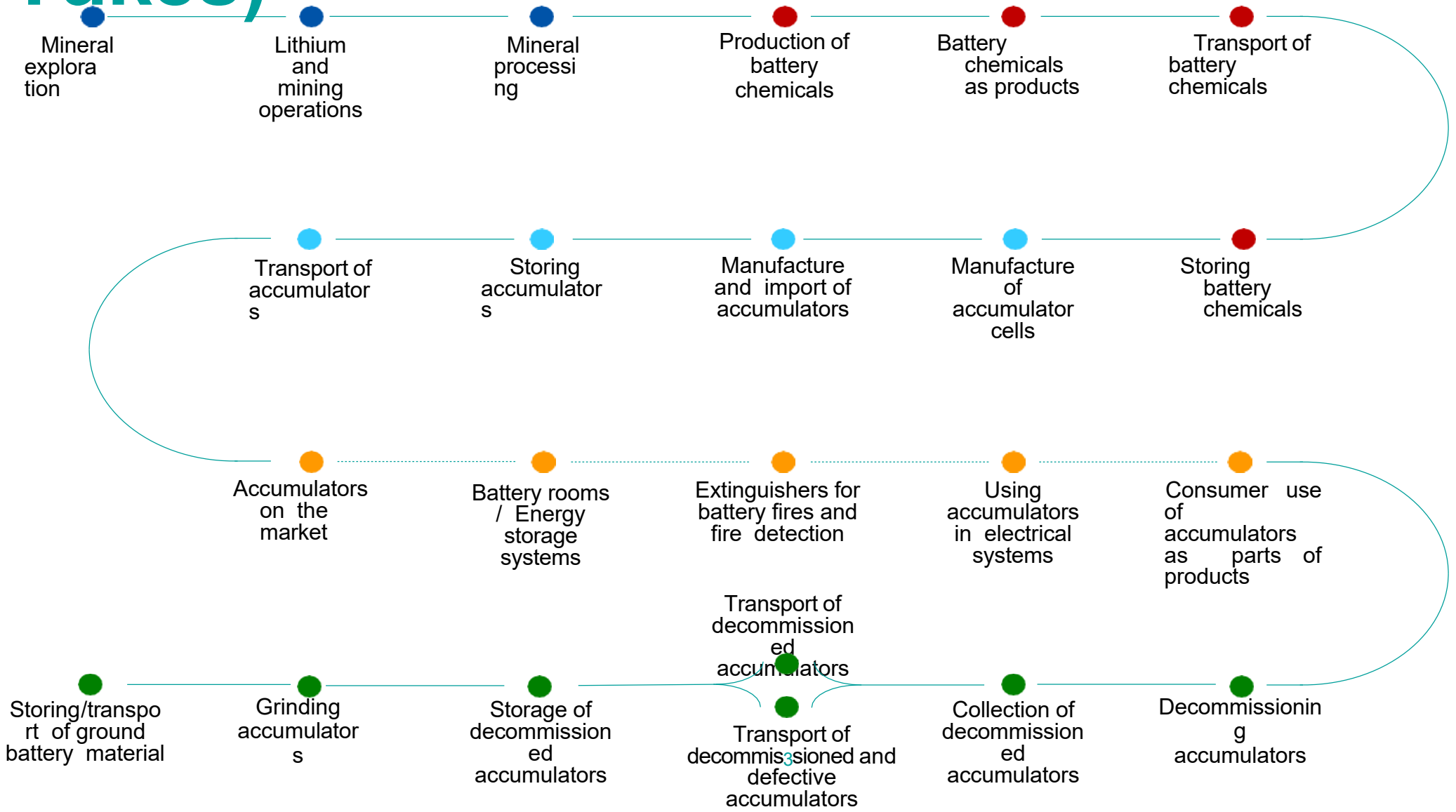
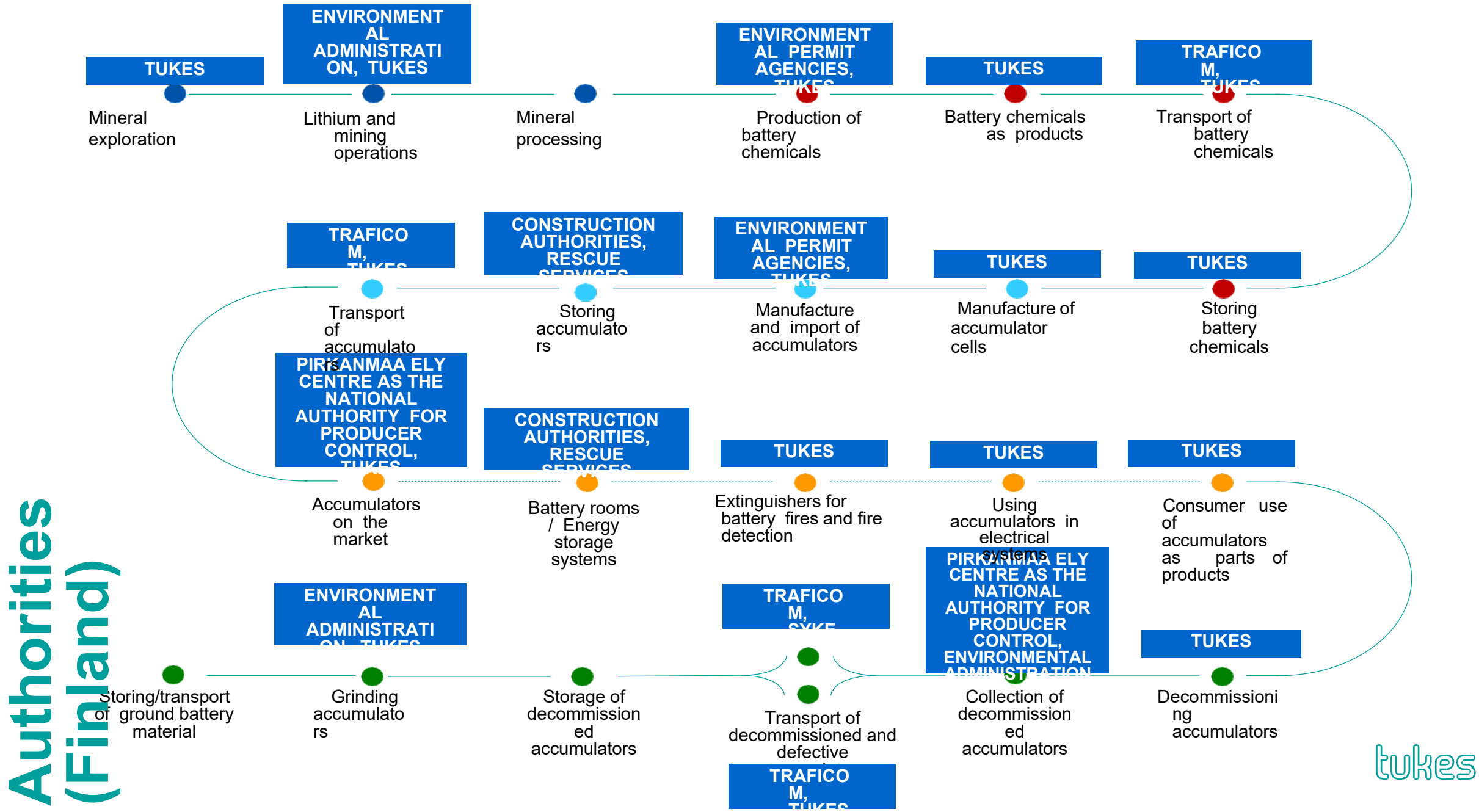
Life cycle of lithium ion batteries (by Tukes)




Authorities (Finland)
TUKES
Mineral exploration
ENVIRONMENTAL ADMINISTRATION, TUKES
Lithium and mining operations
Mineral processing
ENVIRONMENTAL PERMIT AGENCIES, TUKES
Production of battery chemicals
TUKES
Battery chemicals as products
TRAFICOM, TUKES
Transport of battery chemicals
TUKES
Storing battery chemicals
TUKES
Manufacture of accumulator cells
ENVIRONMENTAL PERMIT AGENCIES, TUKES
Manufacture and import of accumulators
CONSTRUCTION AUTHORITIES, RESCUE SERVICES
Storing accumulators
TRAFICOM, TUKES
Transport of accumulators
PIRKANMAA ELY CENTRE AS THE NATIONAL AUTHORITY FOR PRODUCER CONTROL, TUKES
Accumulators on the market
CONSTRUCTION AUTHORITIES, RESCUE SERVICES
Battery rooms / Energy storage systems
TUKES
Extinguishers for battery fires and fire detection
TUKES
Using accumulators in electrical systems
TUKES
Consumer use of accumulators as parts of products
PIRKANMAA ELY CENTRE AS THE NATIONAL AUTHORITY FOR PRODUCER CONTROL, ENVIRONMENTAL ADMINISTRATION
Collection of decommissioned accumulators
TUKES
Decommissioning accumulators
TRAFICOM, SYKE
Transport of decommissioned and defective
TRAFICOM, TUKES
Storage of decommissioned accumulators
ENVIRONMENTAL ADMINISTRATION, TUKES
Grinding accumulators
Storing/transport of ground battery material
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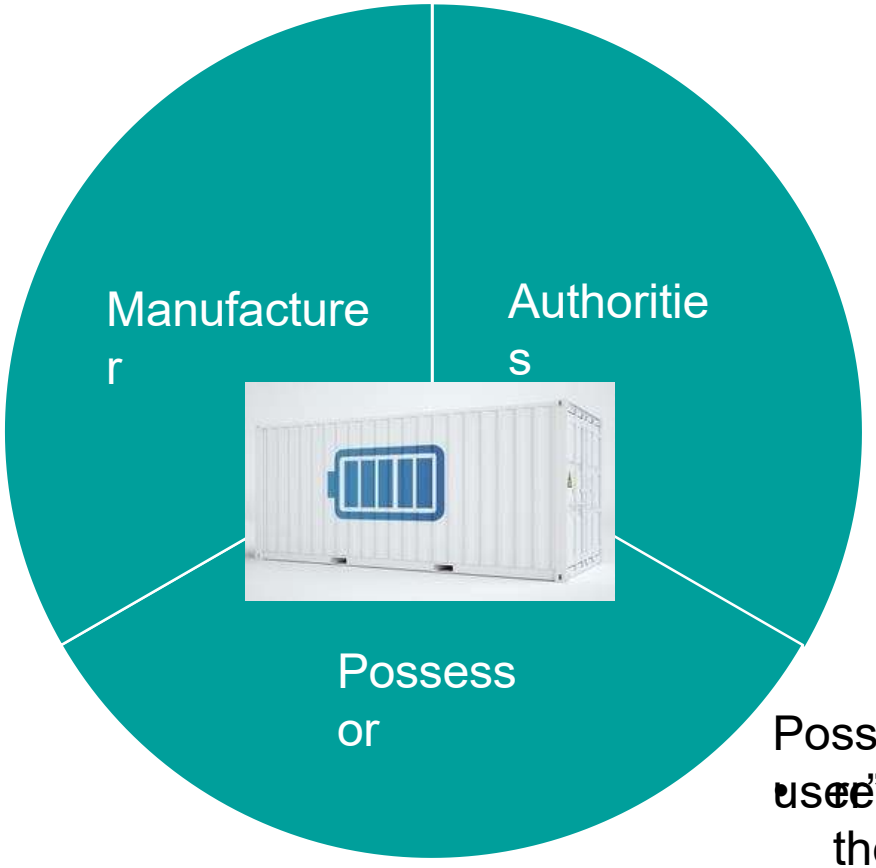
Knowledge and roles of different parties

Manufacturer
- responsible for the safety of the product
- knows the legislation, standards etc.
- gives relevant information to users and authorities



Authorities
- legislation and laws
- market surveillance
- delivering and gathering information
- guidance

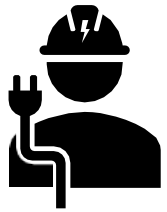
Possessor (”owner / user”)
- responsible for the system in use
- installation
- maintenance
- right use

Stationary energy storage systems: legislation

- As products: Not very well covered by existing EU legislation
- Installation standards exist:
  - HD 60364 Low-voltage electrical installations (CENELEC)
  - EN 50110-1 Operation of electrical installations - Part 1: General requirements (CENELEC)
  - IEC 60364 Electrical Installations for Buildings
  - Safe working methods when working with electrical installation in key role!
- National regulations for
  - Maintenance program and periodic inspections of electrical installations and apparatus
  - Competence of electrical company:
    - in Finland the company has to be registered (i.e. “accepted”) by Tukes

Competence of electrical companies (in Finland)

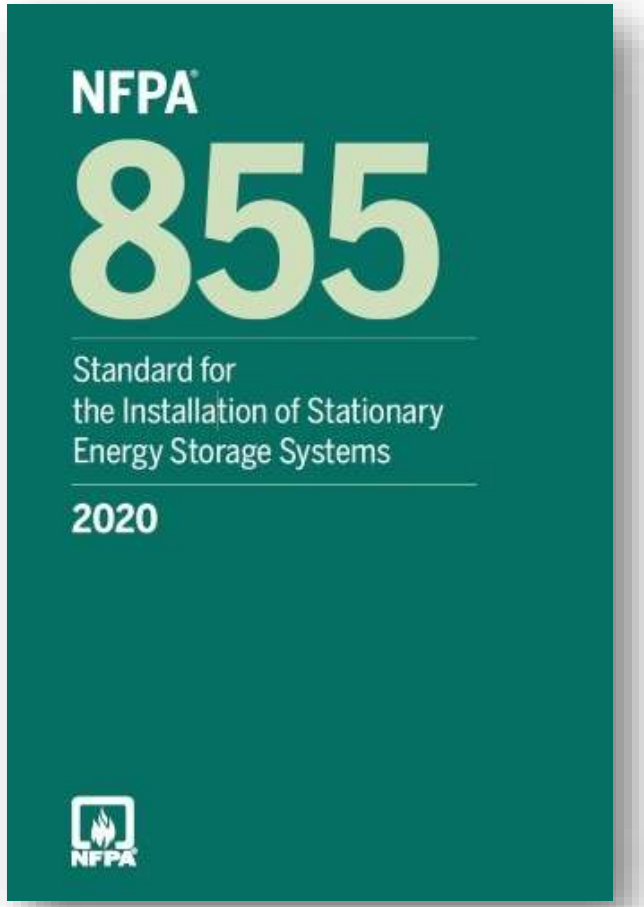
- Company needs a certified supervisor of electrical works with adequate electrical qualification:
  - electrical qualification 1, S1: all electrical works
  - electrical qualification 2, S2: up to 1000 V electrical works
  - electrical qualification 3, S3: repair of electrical equipment
- To get electrical qualification person has to
  - have adequate education
  - have adequte experience of electrical works
  - pass electrical safety examination



- Most demanding requirements for S1, ”easiest” for S3
- Company has to have adequate instruments and tools to perform electrical works
- https://tukes.fi/en/electricity/electrical-works-and-contracting

Standards for energy storage systems

- NFPA 855 Standard for the Installation of Stationary Energy Storage Systems
- IEC 62619 Safety requirements for secondary cells and batteries containing alkaline or other non-acid electrolytes as well as secondary lithium cells and batteries
- VDE AR 2510-50 Application guide specifying safety requirements for energy storage systems with lithium batteries
- IEC 62485-5 Stationary (Li-ion) secondary batteries and battery systems up to 1.5 kV DC
- VDE-AR-E 2510-2 Stationary electrical energy storage systems provided for Connection to the low voltage network
- IEC 62620 Accumulators and batteries containing alkaline or other non-acid electrolytes - Lithium batteries and batteries for industrial applications



Proposal: EU regulation of batteries

EUROPEAN
COMMISSION

Brussels, XXX
COM(2020) 798/3

2020/353 (COD)

Proposal for a

REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

concerning batteries and waste batteries, repealing Directive 2006/66/EC and amending Regulation (EU) No 2019/1020

(Text with EEA relevance)

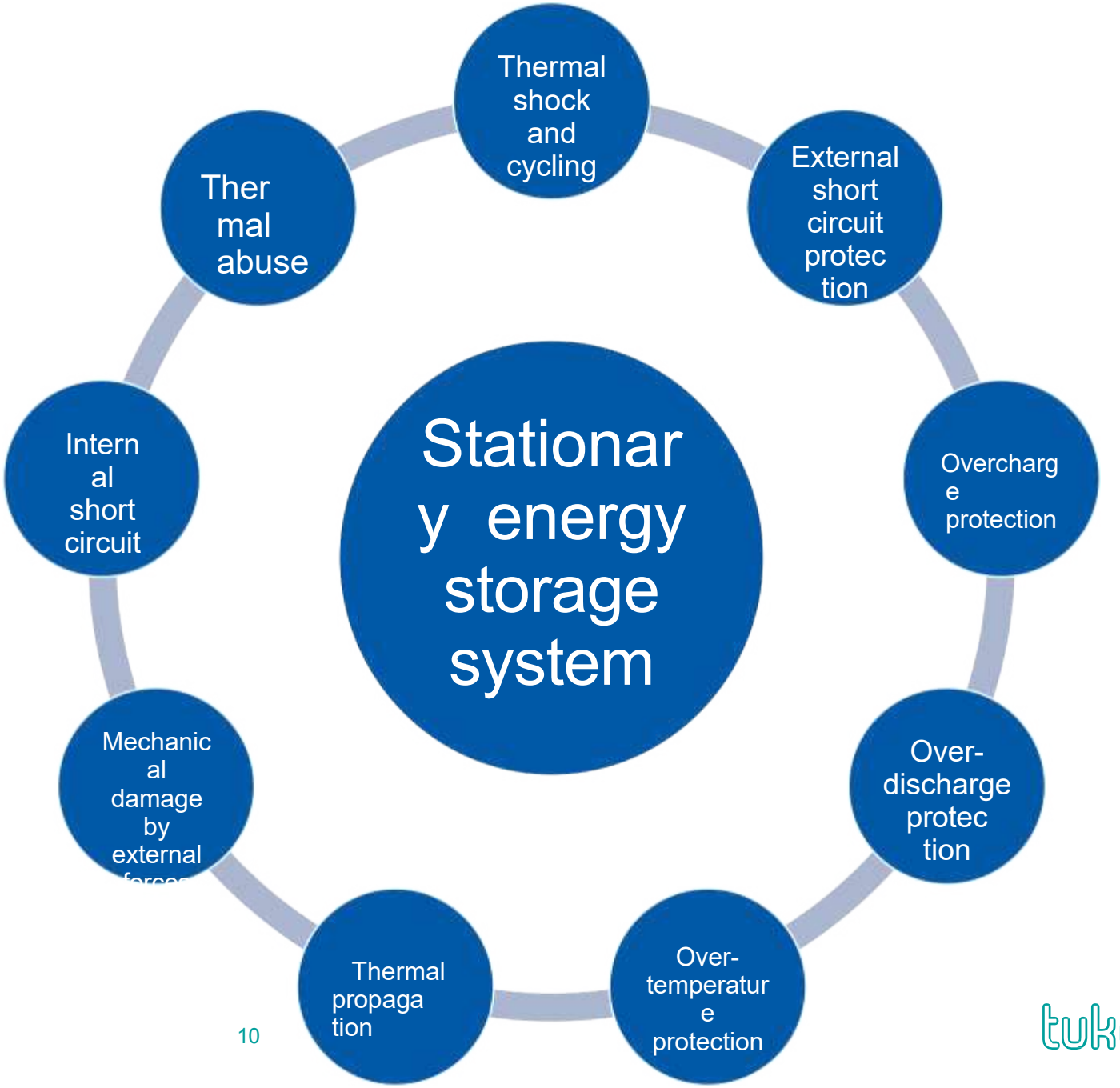
{SWD(2020) 334} - {SWD(2020) 335} - {SEC(2020) 420}

- Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL **concerning batteries and waste batteries**
  - Link to proposal and annexes

- ***Chapter II:*** safety requirements for stationary battery energy storage systems (Article 12, together with Annex V)
- "Shall be accompanied by technical documentation demonstrating that they are safe during their normal operation and use"

Proposal: Safety requirements (Annex V)

- “Shall be accompanied by evidence that they have been successfully tested for the safety parameters laid down in Annex V”



What if fire occurs ...?

- Fire is very difficult to extinguish
- Propagation of thermal runaway between the cells / modules has to be stopped
- Possible risk of gas explosion

https://www.koreatimes.co.kr/www/tech/2018/12/133_260560.html

Automatic fire suppression systems:

- Water: effective cooling effect
- Inert gasses: could work if enough space between modules

Conclusions

What knowledge is needed to establish the best possible safety level of stationary energy storage systems?

- general knowledge of regulations and standards regarding batteries
- general knowledge of battery safety issues
- operators (and users): knowledge on responsibilities of safety and regulations during different phases of the life-cycle
- knowledge of practical safety issues during different phases of the life-cycle

Thank You!

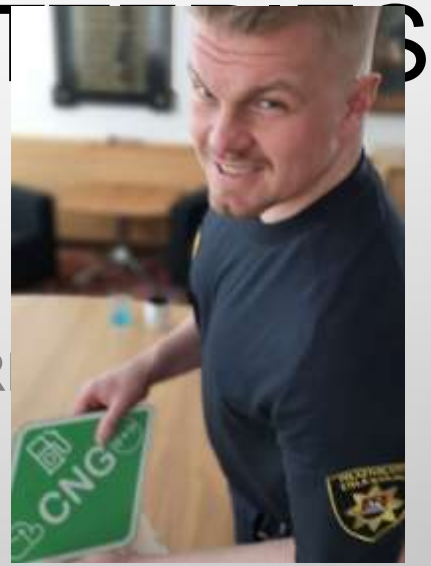
karoliina.meurman@tukes.fi

OPERATING MODELS IN EMERGENCY SITUATIONS OF WITH BA

MIKKO SAASTAMOINEN

SHIFT OFFICER

RESCUE DEPARTMENT OF SOUTH KAR



MIKKO SAASTAMOINEN

- SHIFT OFFICER, RESCUE DEPARTMENT OF SOUTH KARELIA
- HEAD EXTRICATION INSTRUCTOR OF ROAD RESCUE IN RESCUE DEPARTMENT OF SOUTH KARELIA
- HEAD EXTRICATION INSTRUCTOR OF RALLY AND ROAD RESCUE IN FINNISH ASSOCIATION OF FIRE OFFICERS
- FINNISH MEMBER OF CTIF EXTRICATION AND NEW TECHNOLOGY COMMISSION
- FIREFIGHTER OF THE YEAR 2020, FINLAND

EXAMPLES OF EV INCIDENTS

- OCTOBER 2013 – EV CAUGHT FIRE AFTER HITTING METAL DEBRIS IN THE USA.
- MARCH 2017 – EV CAUGHT LIGHT AT CHARGING STATION IN CHINA.
- OCTOBER 2017 – EV CAUGHT FIRE IN AUSTRIA AFTER HITTING CONCRETE BARRIER.
- DECEMBER 2017 – EV CAUGHT FIRE IN GERMANY AND WAS ULTIMATELY IMMERSED IN WATER.
- MARCH 2018 – EV CAUGHT FIRE WHILST CHARGING IN THAILAND.
- MAY 2018 – EV DROVE OFF ROAD IN USA HITTING CONCRETE WALL

+ALSO SEVERAL CASES IN FINLAND 2018-2020, WHEN EV WAS IN CHARGE

HOW THEY IGNITE

- HTTPS://WWW.YOUTUBE.COM/WATCH?V=BQWH4YUYJUE

HOW TO EXTINGUISH BATTERY FIRE

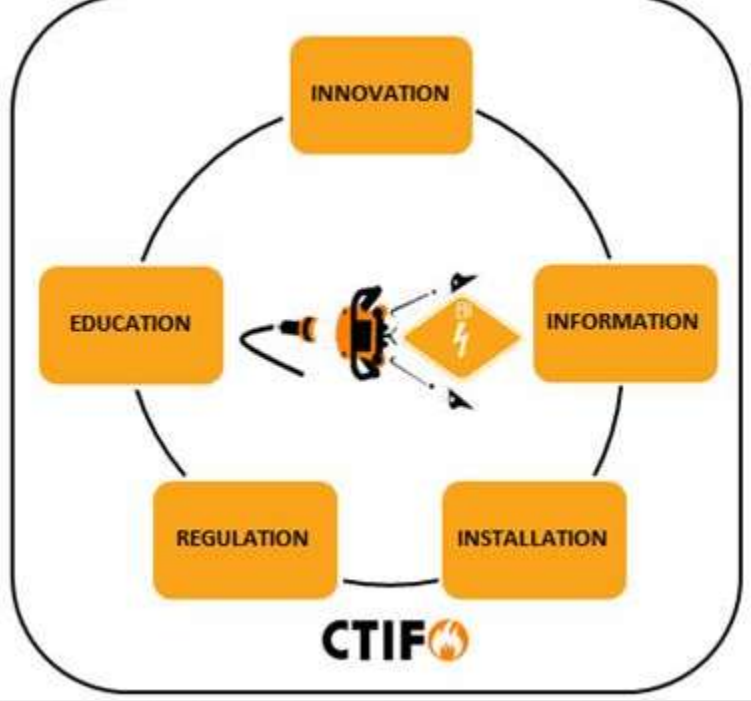
- ELECTRICAL HAZARD – ISOLATE
- BATTERIES INACCESSIBLE
- SAFE TO USE WATER
- BATTERY FIRES DIFFICULT TO EXTINGUISH & CAN REIGNITE
- CONTAMINATION CONTROL
- CONSIDER A CONTROLLED BURN – IF POSSIBLE

THIS IS ONE SOLUTION… OR IS IT?

- BLOCKS ANY FIRE EVEN LITHIUM BATTERY FIRE
- CONTROLS FIRE IN ANY CAR WITHIN SECONDS
- THE MOST EFFICIENT SOLUTION FOR ISOLATING FIRE IN ELECTRIC CARS
- DELIVERED IN A SMARTBAG AND REQUIRES NO MAINTENANCE

CHAIRMAN: TOM VAN ESBROECK, BELGIUM

THE CTIF COMMISSION FOR "EXTRICATION AND NEW TECHNOLOGY" IS TRYING TO ENCOURAGE AND PROMOTE THE COOPERATION BETWEEN FIRE SERVICES AND OTHER EMERGENCY SERVICES AROUND THE WORLD.



CTIF

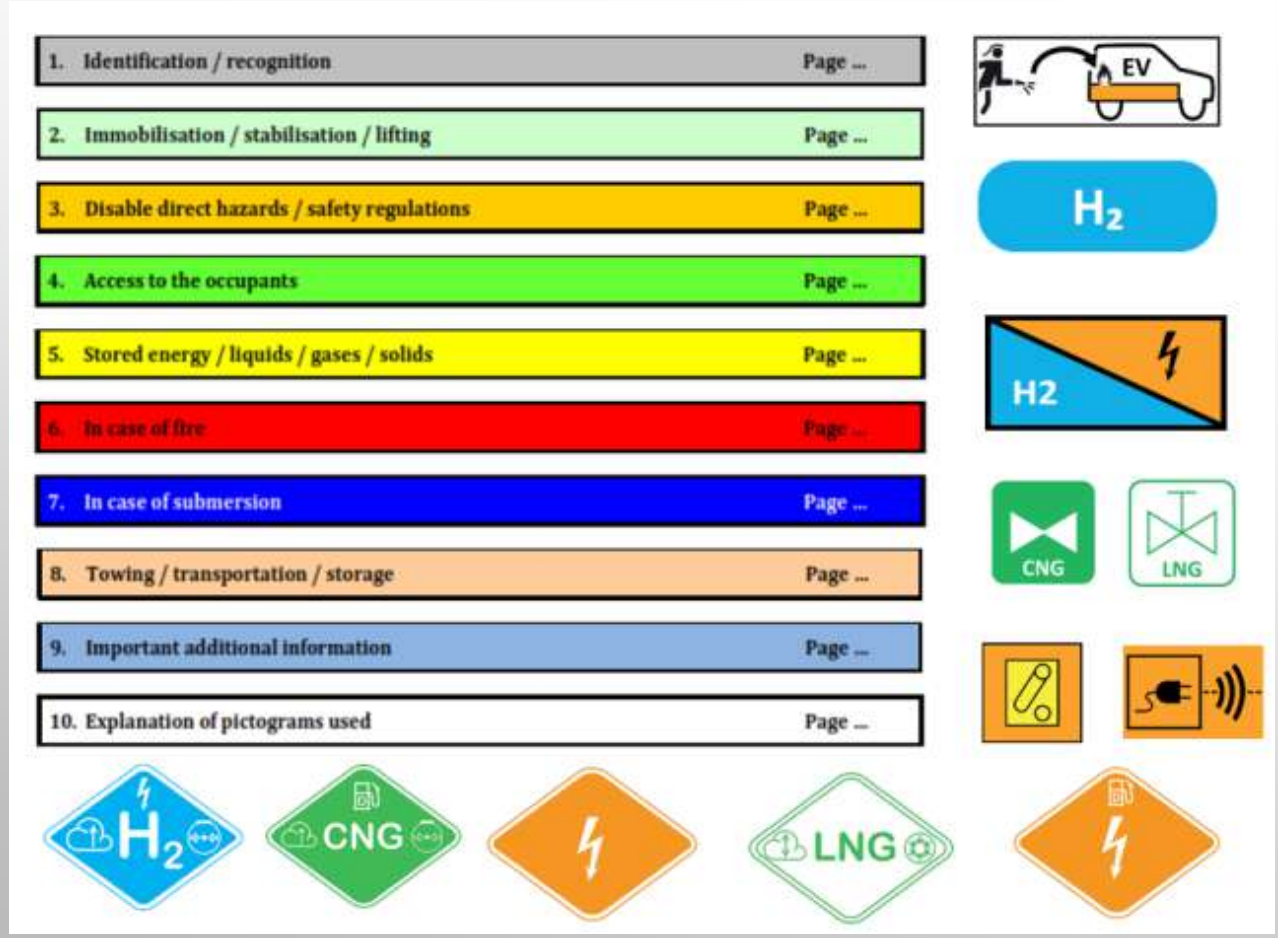
THE INTERNATIONAL COMMISSION IS ACTIVE IN THREE WORKING FIELDS:

1. EXTRICATION & ROAD SAFETY (UN DECADE)

2. ENERGY STORAGE SYSTEMS (BATTERIES, SOLAR PANELS, ...)

3. SMART TECH (ROBOTS, SELF-DRIVING CARS, DATA TRANSMISSION, ...)

ISO 17840, STICKERS (TO IDENTIFY), PLATES, RESCUE SHEETS…THE MOST DANGEROUS PHRASE IN LANGUAGE IS: "WE'VE ALWAYS DONE IT THIS WAY!"

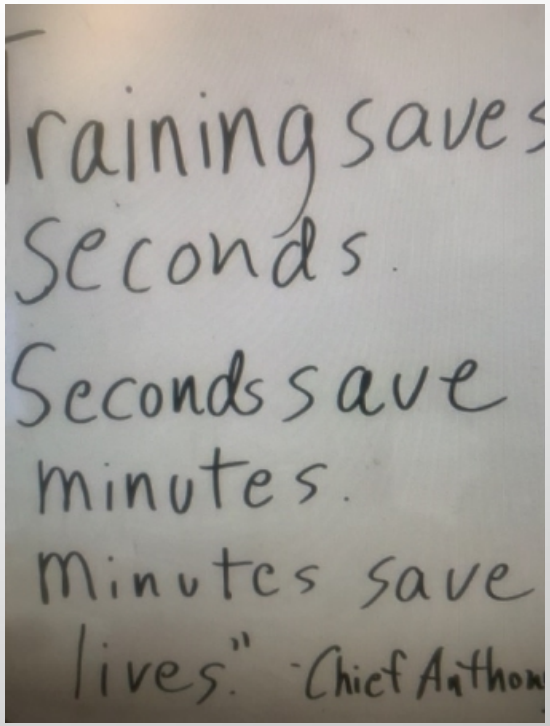


WE NEED TESTING, TRAINING AND SHARING INFORMATION

SUOMEN PALOPÄÄLLYSTÖLIITTO
FINLANDS BRANDBEFÄLSFÖRBUND

CTIF
Est. 1900

CTIF
COMMISSION FOR EXTRICATION & NEW TECHNOLOGY



QUESTIONS?
THANK YOU

Empowering the Future.

Stationary Workshop – On and Off-grid Applications
ALBATTS

26 January 2021

efacec Empowering the future

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Alliance for Batteries Technology, Training and Skills
Co-funded by the Erasmus+ Programme of the European Union

Agenda

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Efacec Positioning

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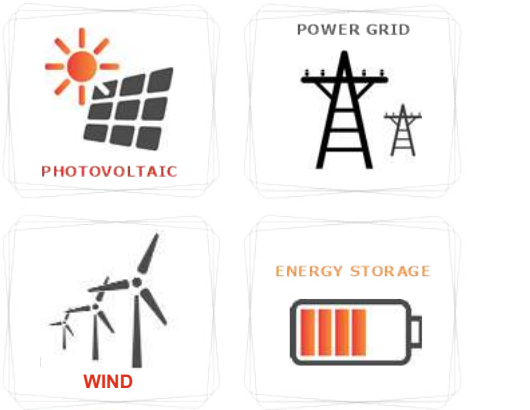
Efacec positioning

Energy Storage

Pre-feasibility and design tool

- Design-to-Automation
- Optimal sizing and technology
- Levelized cost of Storage analysis
- Operational detail
- Modular approach
- Integrated multiple resources design



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Utility scale battery inverters

EFASOLAR storage

- 4-quadrant operation
- Real time management
- DC & AC protection
- Flexible battery interface
- Compatible with several battery technologies
- Grid Support capability
- Extended support using Efacec international structure

Control and Management

ES CONTROLLER

ES MANAGER

- Human-machine interface
- Integrated control and management solution
- Optimization of multiple resources
- Resource management based on generation forecasts
- Standard interface to high level hierarchical systems

Battery Energy Storage System

Battery Integration

Inverters + Control + Transformers + Switchgear + Enclosure + SCADA

Market Perspective and Applications

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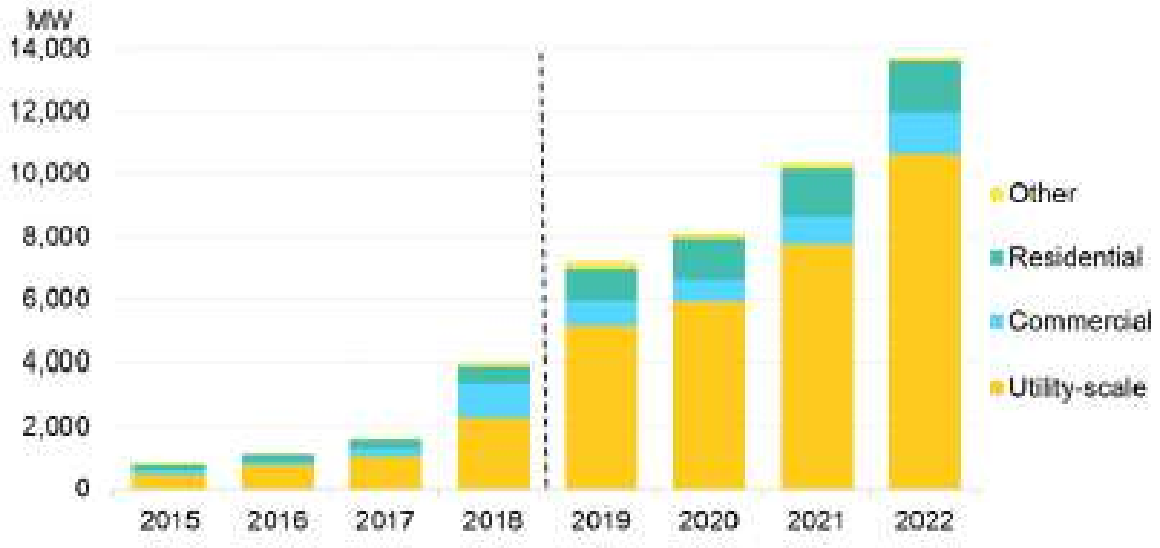
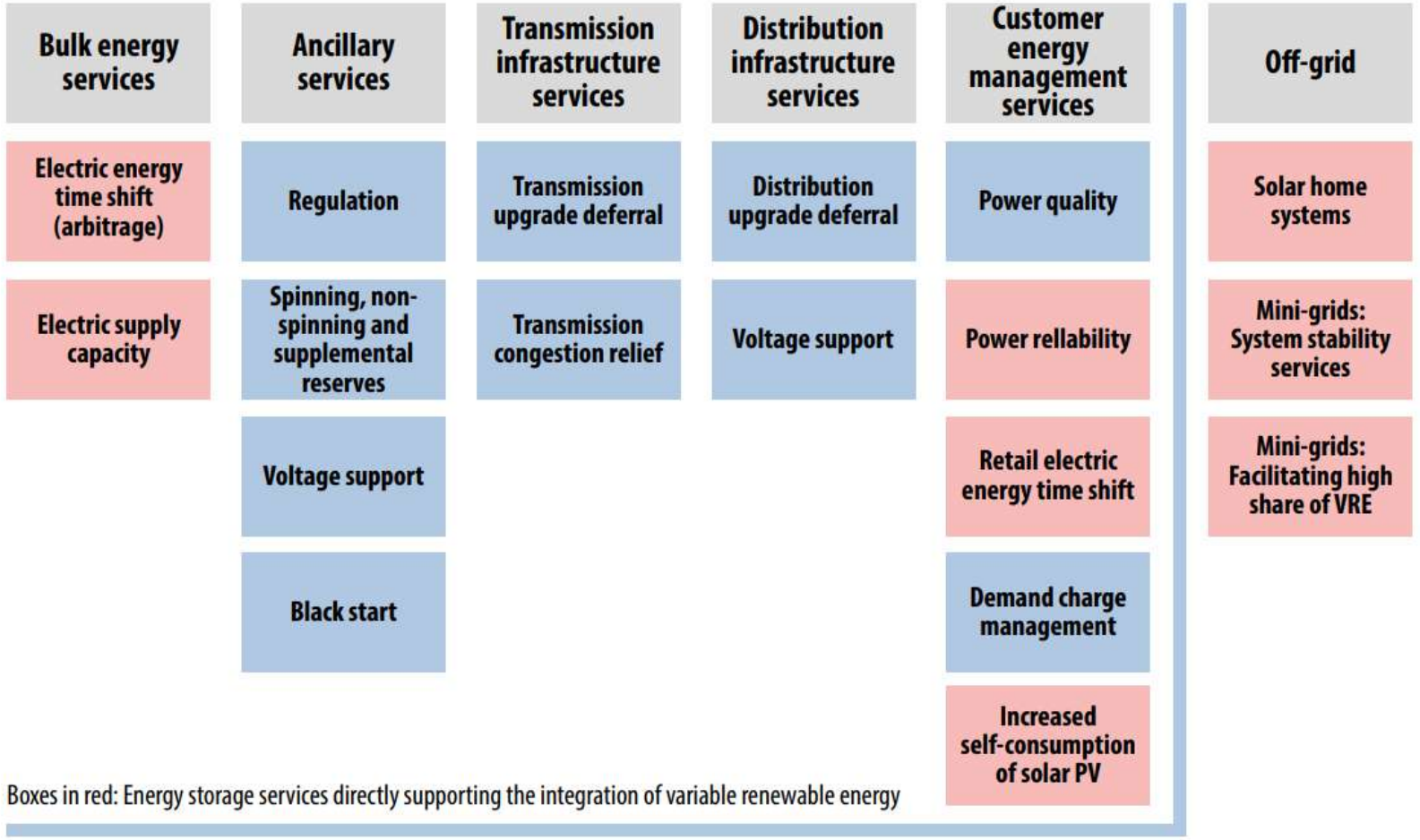
Market Perspective



Source: Bloomberg NEF

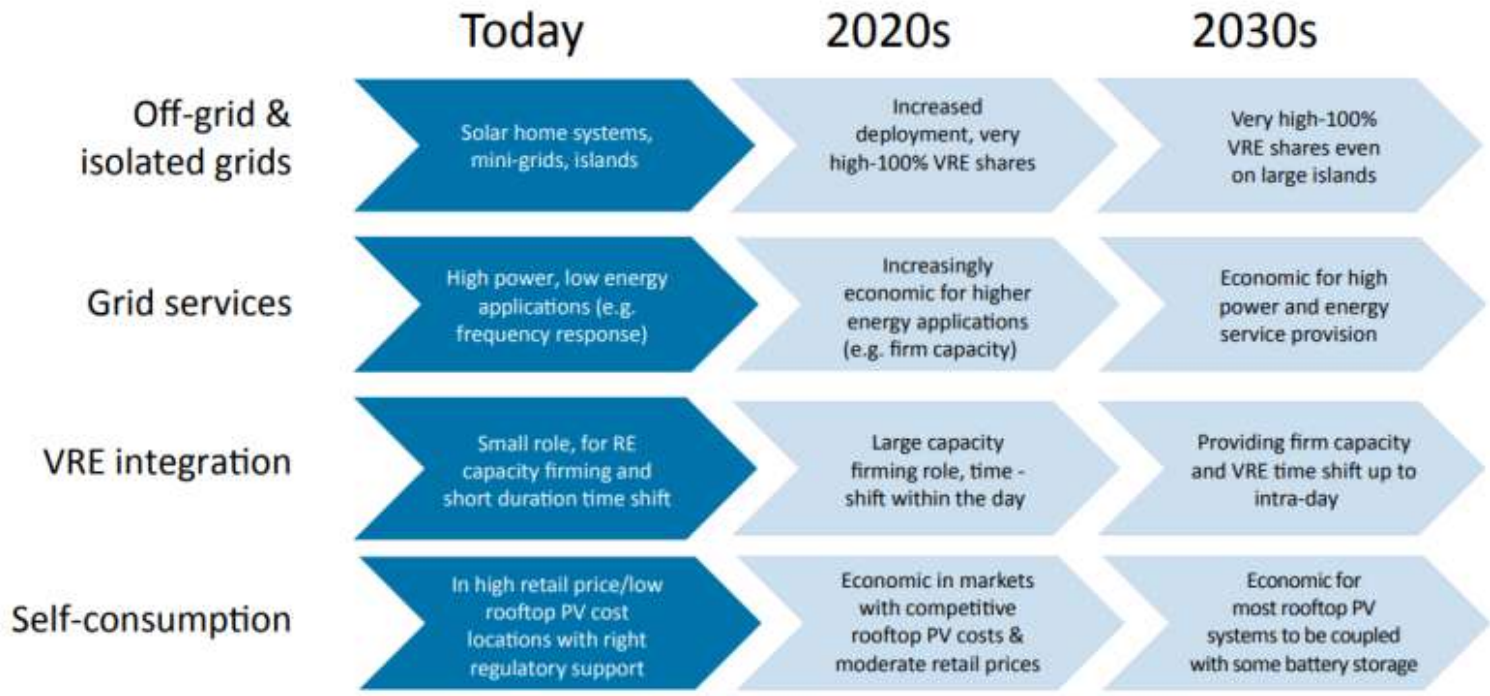
- Main battery technology is the Lithium-ion family;
- Lithium-ion battery costs fell about 87% in the last decade, also stimulated by the mobility sector;
- Higher integration of renewables will be following by growing stationary battery storage adoption due to the need for flexibility;
- Trend for higher energy to power ratio;
- Software based optimization for market differentiation.

Applications



Source: IRENA, 2017

Challenges and perspectives



Source: IRENA

- Integration of renewables and continuous decarbonization
- Growing electrification
- New market designs and business models

European and Portuguese Regulation

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European Regulation

	Legislative act	Main aspects
Energy Performance in Buildings Directive	Directive 2018/844	Domestic indicator (2030/40/50), residential buildings should ensure optimum ESS
Renewable Energy Directive	Directive 2018/2001	Integration in transmission and distribution grid; building regulations to allow local storage
Energy Efficiency Directive	Directive 2018/2002	Inclusion of ESS parameters in a report (by 1st january 2021)
Governance of the Energy Union Regulation	Regulation 2018/1999	ESS considerable aspect for: “Internal Energy Market”, “Integrated reporting on Energy Security”national energy and climate progress reports
Electricity Regulation	Regulation 2019/943	Non-discrimination; integrate small-size participants; non market-based redispatching
Electricity Directive	Directive 2019/944	Not subject to double charges/disproportionate licensing requirements (article 15)

Relevant approaches are under the EU energy area legislation:

Clean Energy for all Europeans package

EU Green Deal

Upcoming future:
“Legislation on batteries in support of the Strategic Action Plan on Batteries and Circular Economy”

Portuguese Regulation

Clean Energy for all Europeans package legislative acts, related Portuguese legislative transpositions and main ESS aspects.

European Legislative act	Portuguese legislation	Main ESS aspects
Renewable Energy Directive (2018/2001)	DL 162/2019	Enabling the aggregation among producers: **collective self-consumption;** double charging avoidance
Governance of the Energy Union Regulation (2018/1999)	PNEC 2030	Create the legal framework that allows a **strong energy storage implementation** (2020-2021)

Portuguese Regional legislative act that approaches ESS technologies adoption

Regional legislation	Legislative act	Main ESS aspects
Azores	RDL nº 14/2019/A	Support investments in electric energy storage through a percentual **monetary incentive** (projects in UNESCO Biosphere Reserve areas)

- EU and national legislations once hampered ESS adoption recent legislation is fostering ESS empowerment (*e.g.*: self-consumption approach)
- A meticulous follow up of the legislation should be done to take advantage of the legal opportunities (*e.g.*: DL 162/2019)
- The growth of this market will trigger the legislation regarding ESS sustainability, a **cradle-to-cradle** approach will be of major importance (New Circular Economy Action Plan)

Job Roles and Competences

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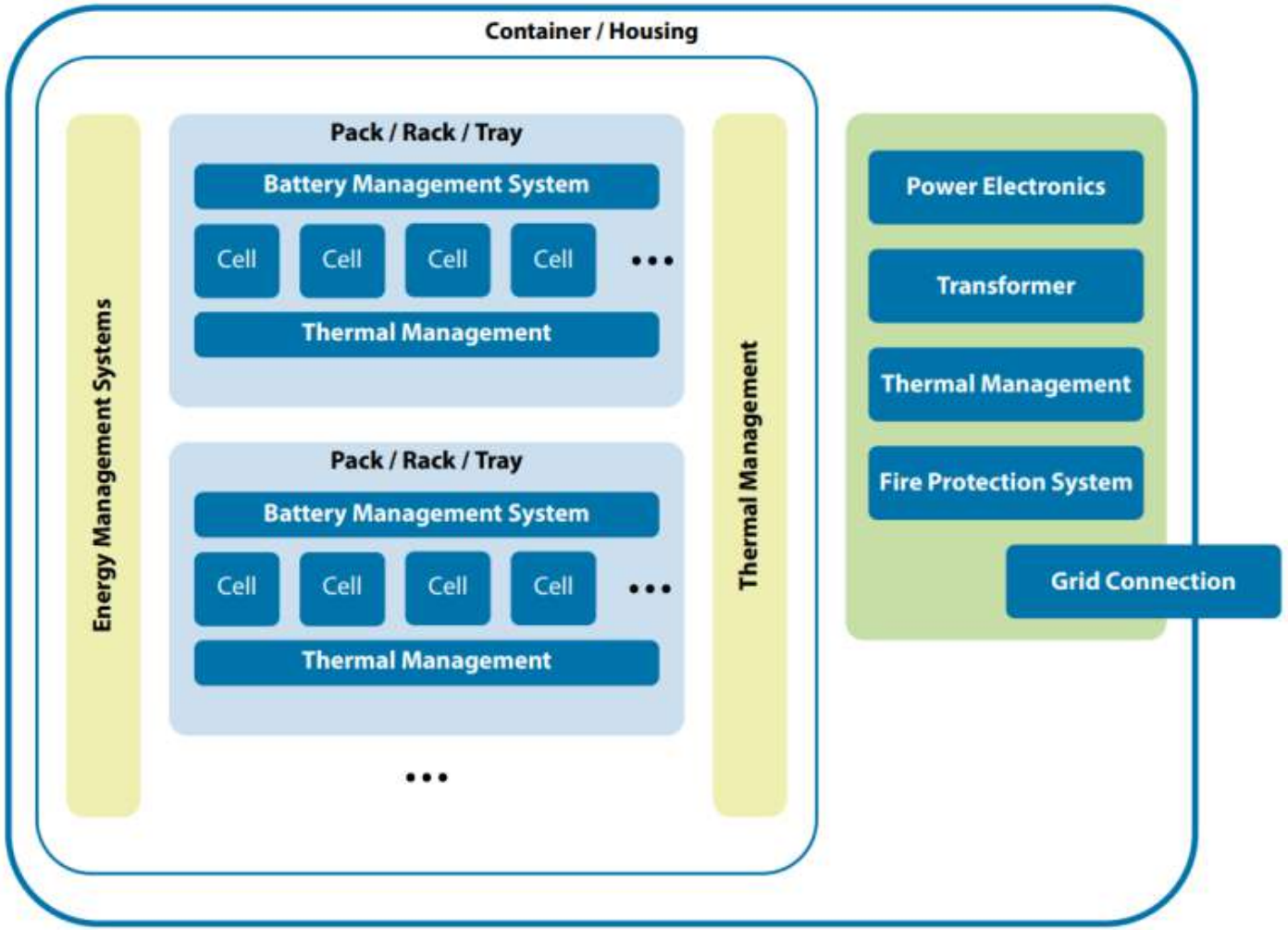
Components and competences



Source: IRENA

- Electrochemical
- Power electronics
- Software development
- Power Systems
- Algorithms and energy applications

Stationary Energy Storage

Job Roles

BMS

Battery Storage

- Manufacturing related
- Electrochemical engineer
- Product design
- Electrical technicians

Power conversion

- Power Electronics engineers
- Digital Control engineer
- Thermal simulation engineer
- Electrical technicians

Grid Interface

- Electrical engineers
- Automation engineer
- IoT and communication
- Asset manager

Integration

- Thermal simulation engineers
- Electromechanical technicians
- Electrical technicians
- Product designer

Control and Management

- Software engineers
- Algorithm developers
- Data analysist & AI
- Communication interfaces

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Conclusion

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Conclusion

- Stationary energy storage involves multiple complex components that require adequate expertise to continue improvements in safety and performance;
- Several competences are key for an adequate integration and development of stationary energy storage;
- Multiple job roles will be needed to address all needs that will be further stressed by the increase of the market;
- More jobs will be created, with further needs for training and knowledge-sharing;

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Obrigado!
ismael.miranda@efacec.com
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Empowering the future

Telia | Towers

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THE CASE OF 5G BASE STATIONS

Jussi Havela
26th January 2021

CONTENT

- About the Company
- Current Technologies
- Drivers of the Change
- Practical Implications for the Market
- Future Skills

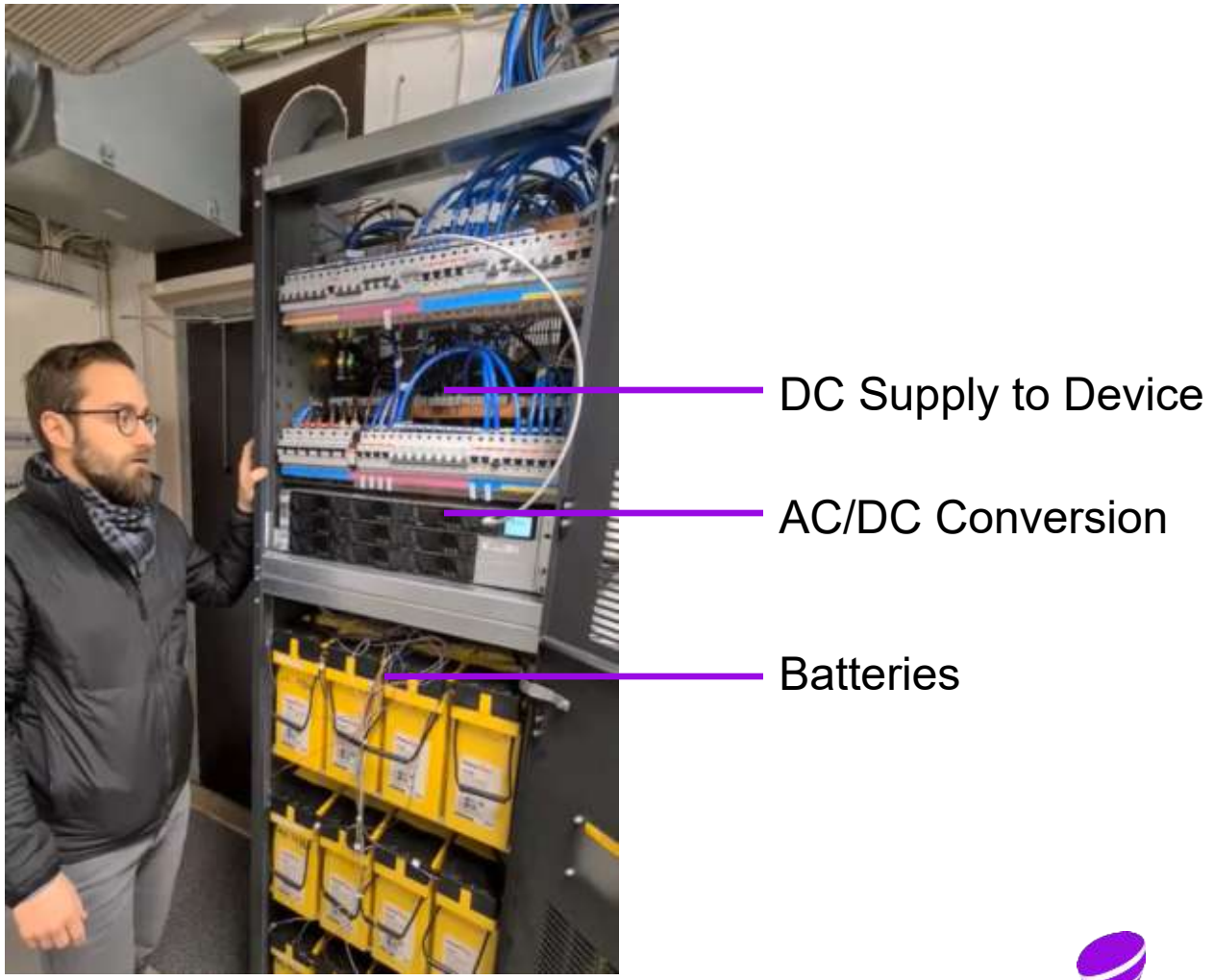
TELIA TOWERS FINLAND

- Independent Towerco, subsidiary of Telia Finland
- Providing services for all wireless network operators in Finland
- Wide site coverage across Finland

Public

CURRENT ENERGY SUPPLY AND STORAGE SOLUTION

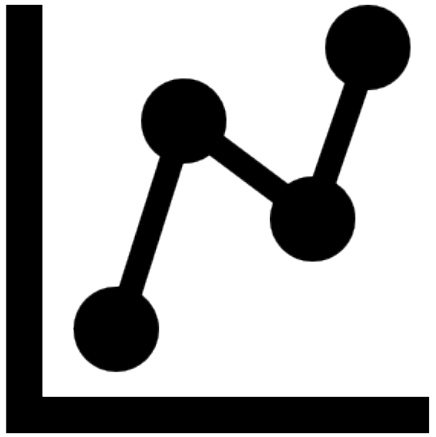
- Mobile base stations operate on DC voltage
- Each site has rectifier converting grid power suitable for telecom devices
- Back-up done with batteries
- Regulated business environment



Public

DRIVERS OF THE CHANGE

- Increase in telecom base station power consumption
- Sustainability targets
- Transformation of energy market
- Emerging technologies
- Price pressure



Public

WHAT THIS MEANS FOR THE PLAYERS AT THE MARKET

MANUFACTURERS

- Improved & tailored offering
- Further R&D
- Packaging
- Quantification of benefits for market needs

SERVICE PROVIDERS

- Service vs. Maintenance
- Remote access & monitorability
- Role of IT skills will further raise

MOBILE / TOWER OPERATORS

- Adopting new tehcnologies (e.g. LiFePo batteries)
- Sustainability targets
- Overall competitiveness

->Increasing demand for professionals on all levels at electrical field

->Digital transformation will challange the status quo

->All steps of the value chain need to posses wider & deeper skill set!

Public

THANK YOU! TO FIND OUT MORE:

- www.telia.fi/operators/teliatowers
- www.linkedin.com/in/jussihavela