

IFIW 2017
HONGKONG
FIRE
ACADEMY

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A VIEW INTO THE NEAR
FUTURE OF
FIREFIGHTING

WHAT'S OUR GOAL TODAY?

- ▶ Firefighter Safety
- ▶ Reducing Near Misses
- ▶ Have NO LODD
- ▶ how? create safer workplace, by...
- ▶ Teaching fire dynamics
- ▶ Creating awareness on B-SAHF
- ▶ We train on essentials



WHAT ARE WE FOCUSING ON TODAY?

- ▶ Interior fire attack.
- ▶ Flow Path
- ▶ Smoke is Fuel
- ▶ Door management (close the door)
- ▶ Ventilation tactics insight
- ▶ Did I forget something?



SOLAR PANELS

- ▶ Encouraged to use
- ▶ Green energy
- ▶ Subsidized by Government
- ▶ Relatively cheap
- ▶ Refund by electricity companies
- ▶ Many homes have them
- ▶ Still increasing



SOLAR PANELS / PHOTOVOLTAICS / PV

- ▶ Are solar panels dangerous ?
- ▶ But creating danger when having a attic fire
- ▶ Cover them and no power left



SOLAR PANELS

- ▶ People starting to store energy
- ▶ Battery packs in residential homes
- ▶ Located at attics, garage, cellars



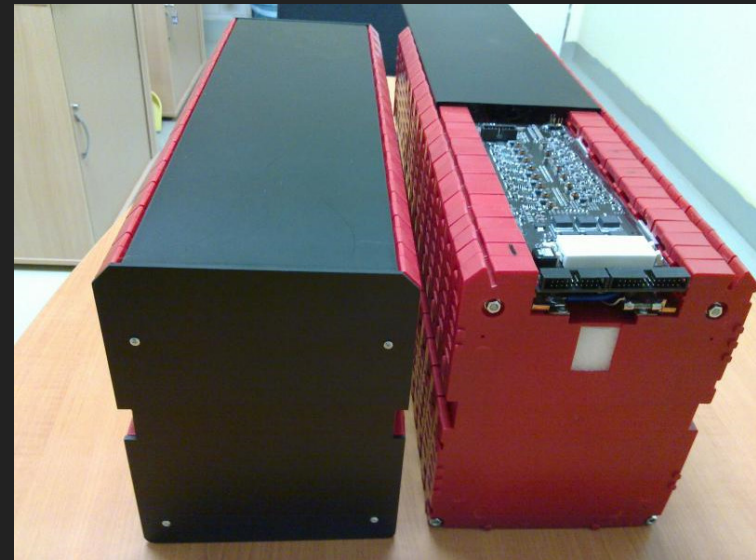
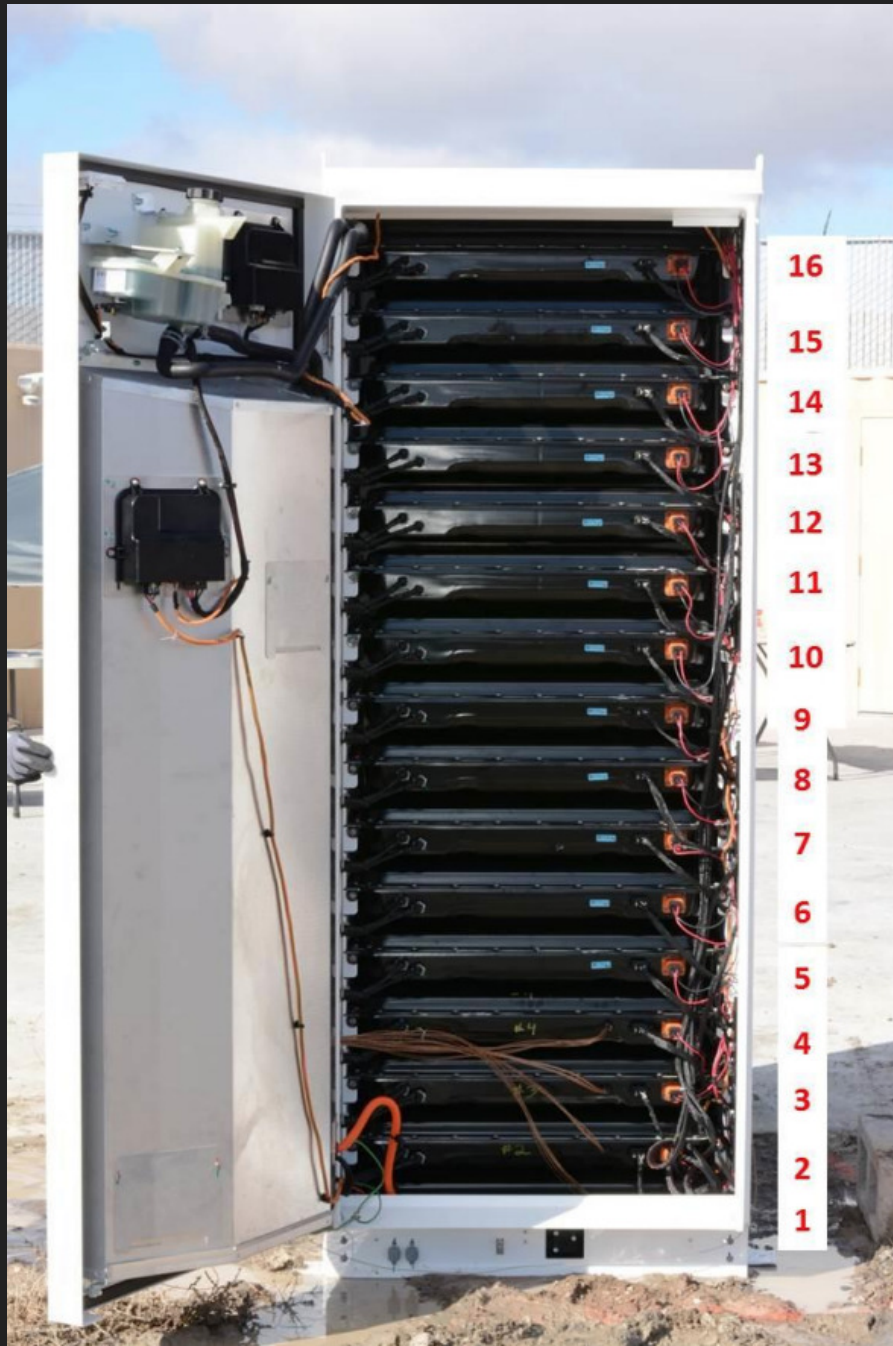
STORAGE SYSTEMS

- ▶ These type of energy storage systems are made failsafe
- ▶ All types of safety features
- ▶ All have undergo safety tests
- ▶ The Tesla energy storage (Powerpack) has been tested by Tesla & NFPA

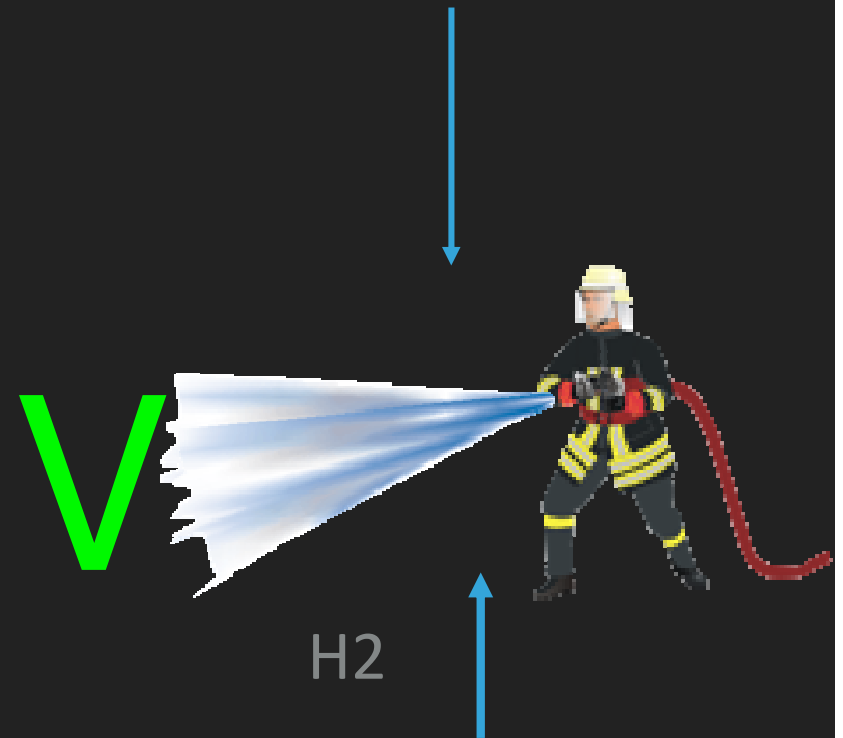
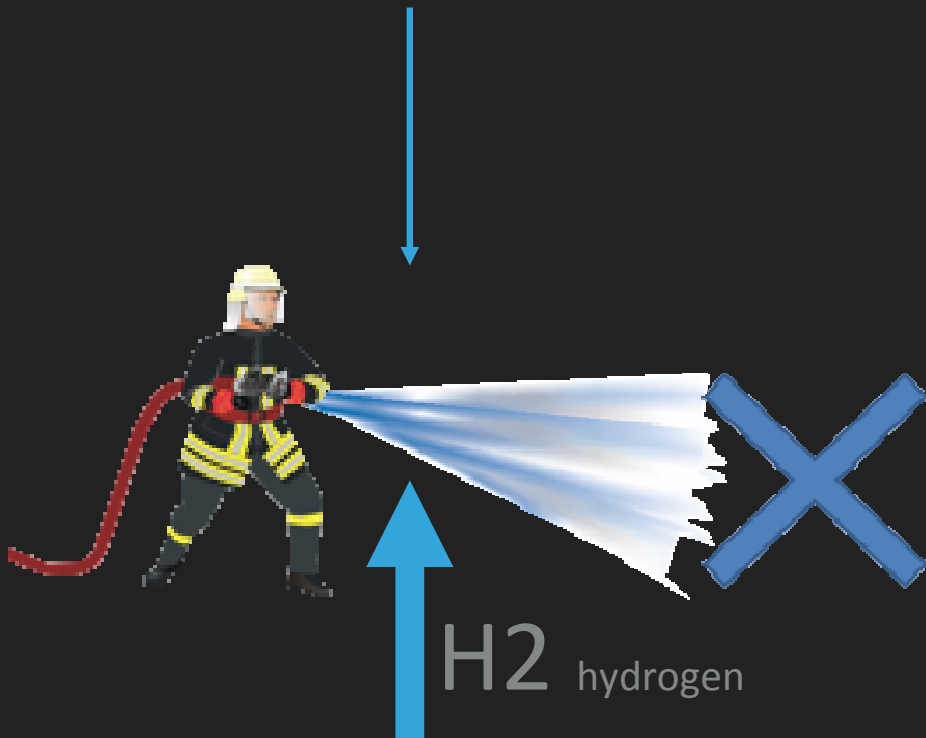
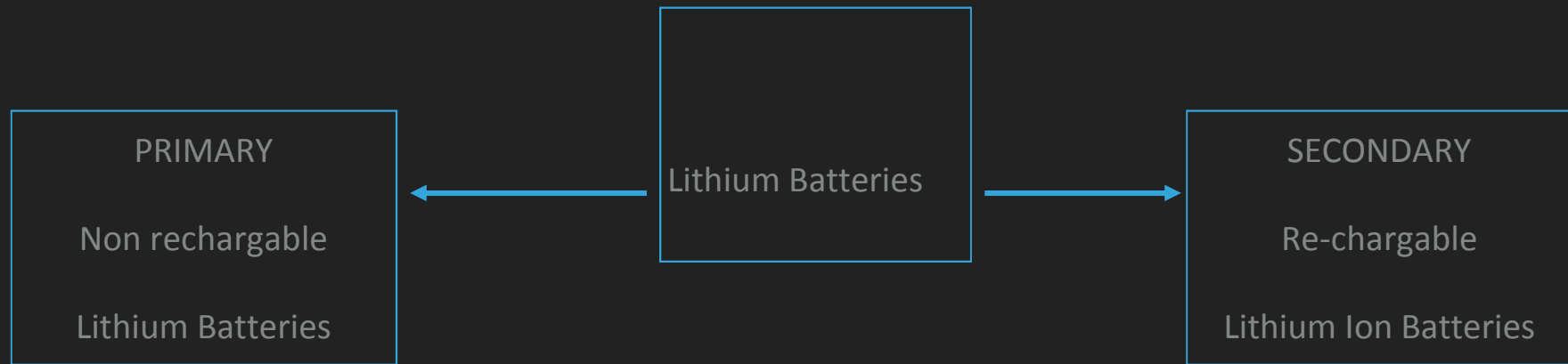
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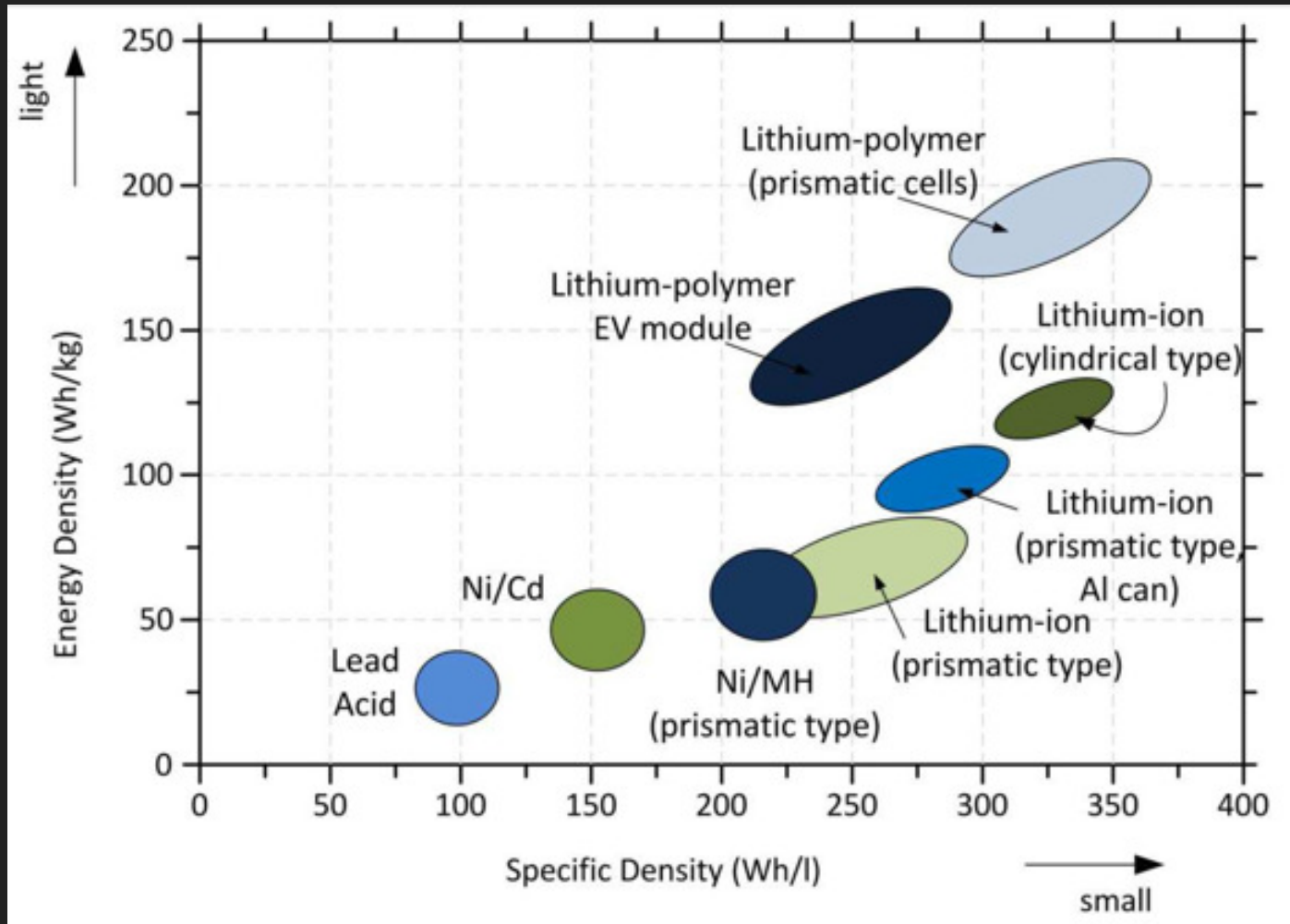


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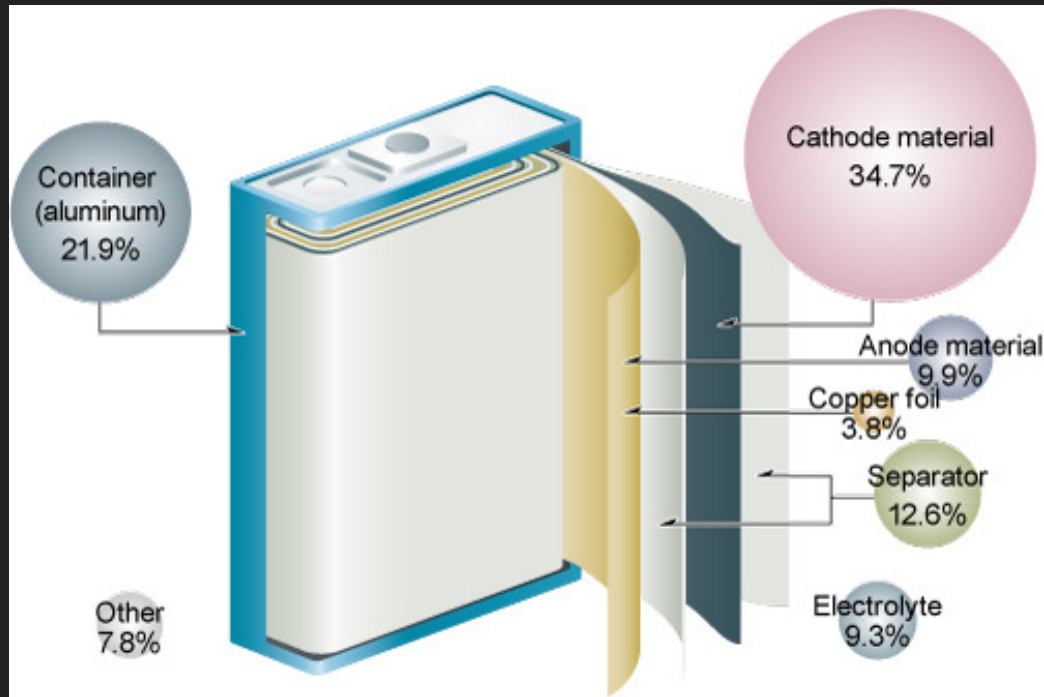


WHAT ARE LITHIUM BATTERIES

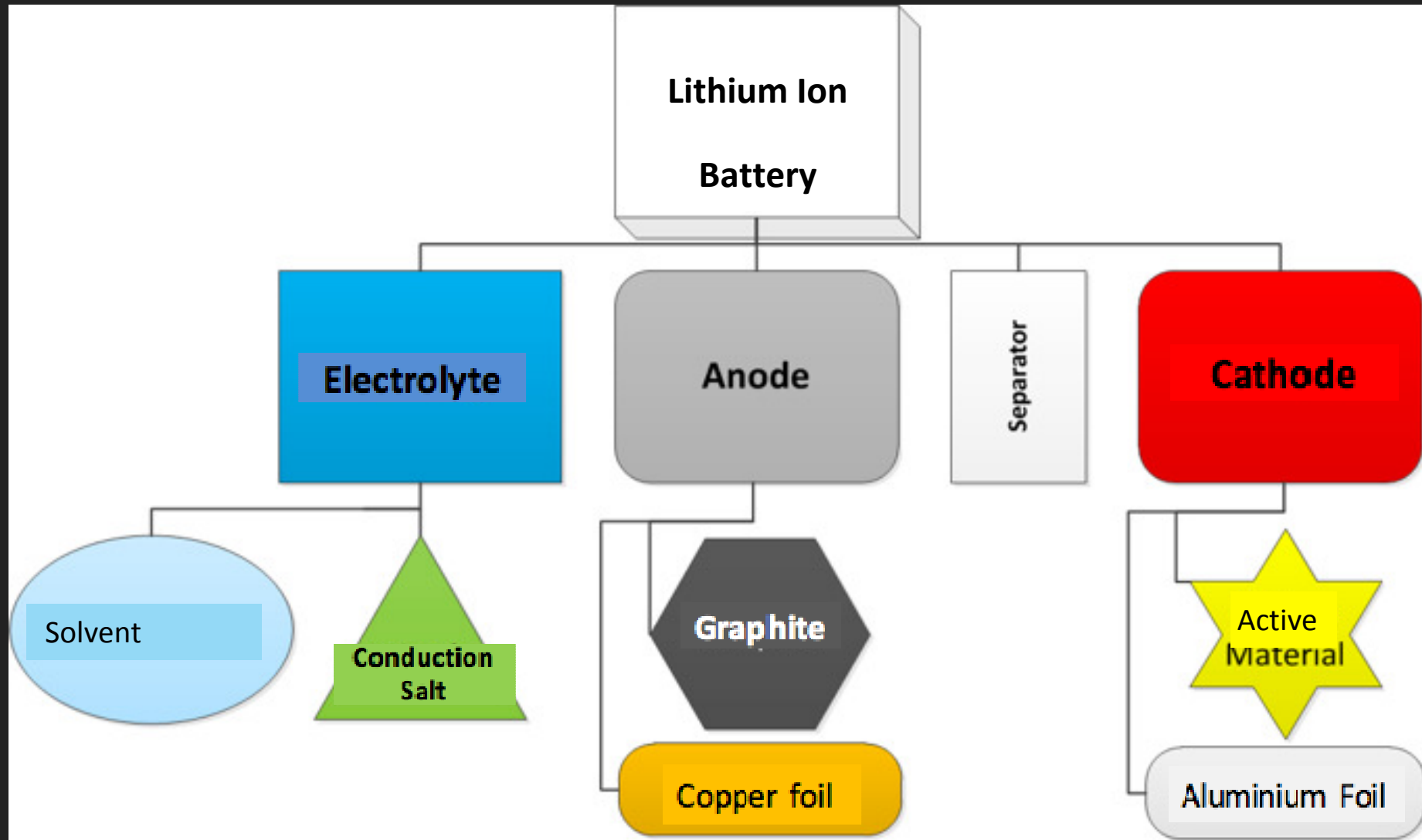




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LITHIUM BATTERIES



NEED TO KNOW

- ▶ Electrolyte consists of:
 - ▶ LiPF_6 Conductor Salt = Lithium HexafluorPhosphate
 - ▶ Solvent = Ethylene carbonate
 - ▶ When in decomposition state it forms 2HF or 3HF
 - ▶ HydrogenFluor or HydroxyFlavone - Highly corrosive and Toxic
 - ▶ Occurs during Thermal runaway

THERMAL RUNAWAY

- ▶ When happens a thermal runaway?

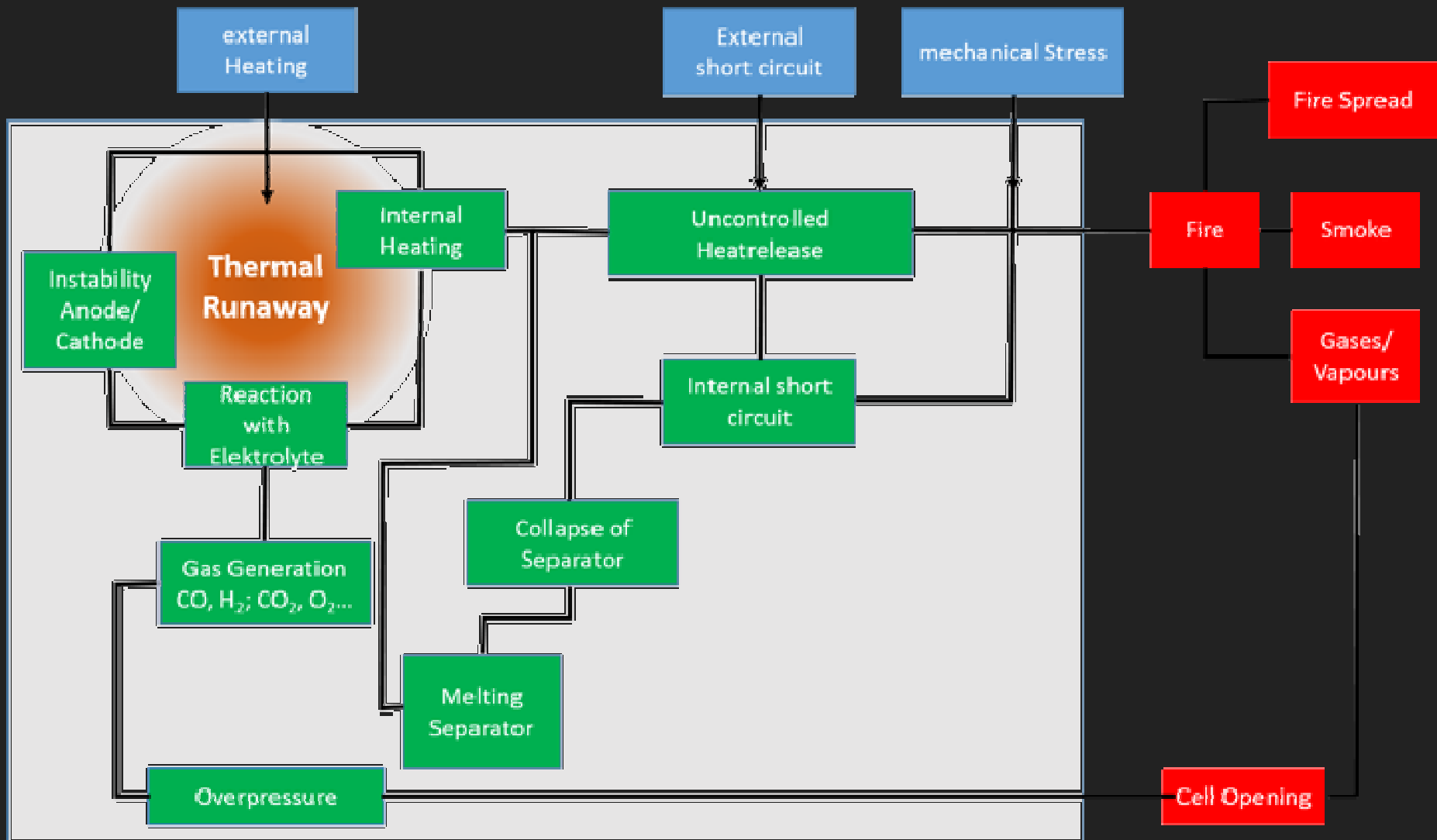
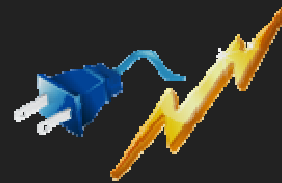
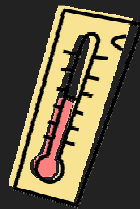
Cathode: ≥ 130 °C and $x < 0,5$ Reaction between Electrolyte und Li_xCoO_2

Reaction:



Increasing Temperature:





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- ▶ Fire at a storage building and garage door company, in Germany.

WHEN DANGEROUS?

- ▶ Depends on SOC (state of charge)
 - ▶ all Li batteries at least 25% SOC
 - ▶ Highest danger when fully charged
 - ▶ When partially charged and heated beyond critical temp cell temp suddenly increased to max temp of 740C - 1075C

OUR HAZARDS

Small amounts of Li-Ion-Batteries are no problem for the fire service!

Larger quantities of batteries
can explode (?)
cause hazards by HF-Generation
(today no valid information about the concentration)

Storage of large quantities of Li-Ion-Batteries need a deluge sprinkler system
To reduce the HF-Contamination of the Fire Fighters
To reduce the risc of explosion
To reduce the velocity of thermal runaway spread
(normal sprinklers are to slow)

Firefighters need more distance to burning batteries than to other solid fuels

Use the water to wash out the corrosive and toxic gases

OUR (FUTURE) PROBLEM

- ▶ We don't know who has Energy storage batteries at home.
- ▶ We don't know where it's placed.
- ▶ Potential danger - electricity - chemical hazard - explosion

WHAT'S UP NEXT.....

LITHIUM-ION BATTERY
STORAGE
OUR FUTURE DANGER?

▶ Thank you!

▶ References: Many thanks goes to Prof. Dr Roland Goertz of the University of Wuppertal, Germany

The slide displays the following information:

Extinguishing Agent	Suitability
Water	best „extinguishing“ agent
Water with gelling agent	suitable
Dry Powder	not suitable
(low expansion) Foam	suitable
Carbon dioxide	not suitable

Additional text on the slide includes: 'ERGEBNISSE DER LÖSCHVERSUCHE AN MODELLSYSTEMEN', 'BERGISCHE UNIVERSITÄT WUPPERTAL', 'Prof. Dr. Roland Goertz', and 'Lehrstuhl für Abwehrenden Brandschutz'.