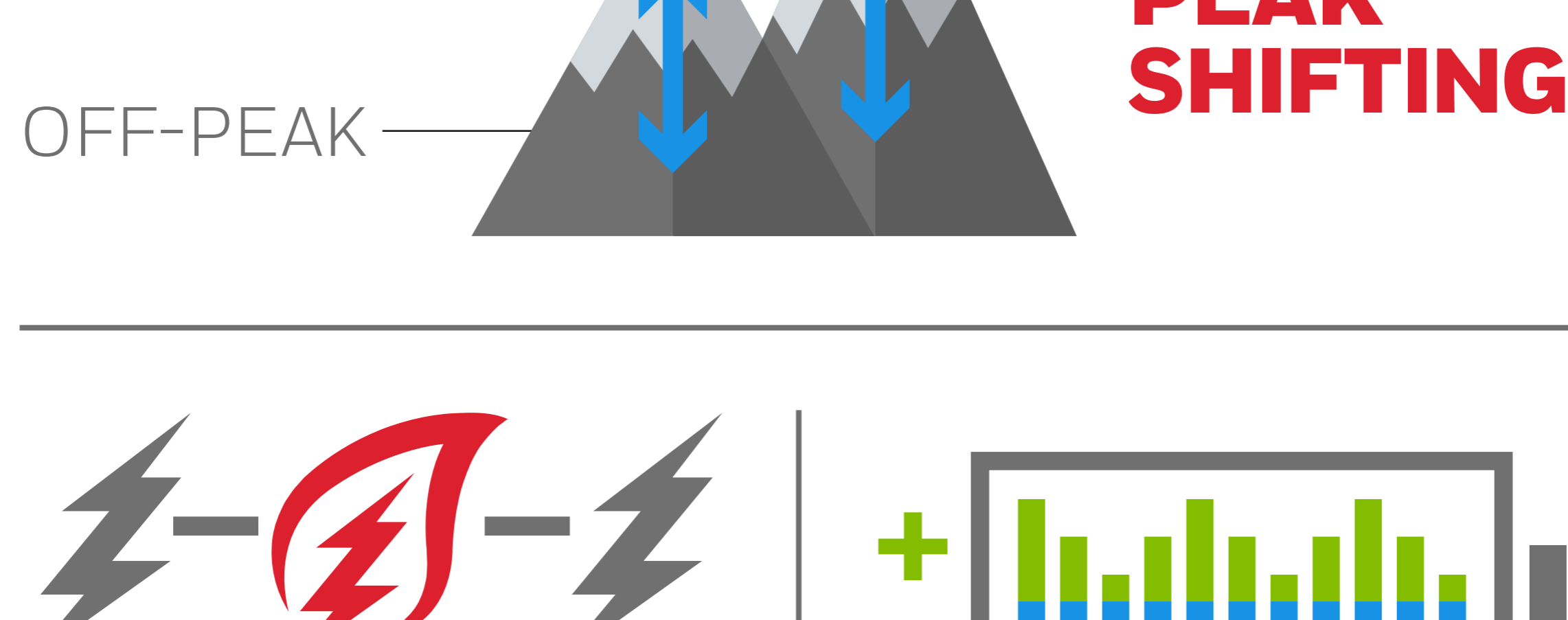


BURNING TRUTHS ABOUT LI-ION BATTERY FIRES

Li-Ion battery storage: the answer to green, smart grids



BUT THE THREAT IS REAL

23 

LI-ION BATTERY ENERGY STORAGE SYSTEM (BESS) FIRES IN SOUTH KOREA (2017-2018)¹

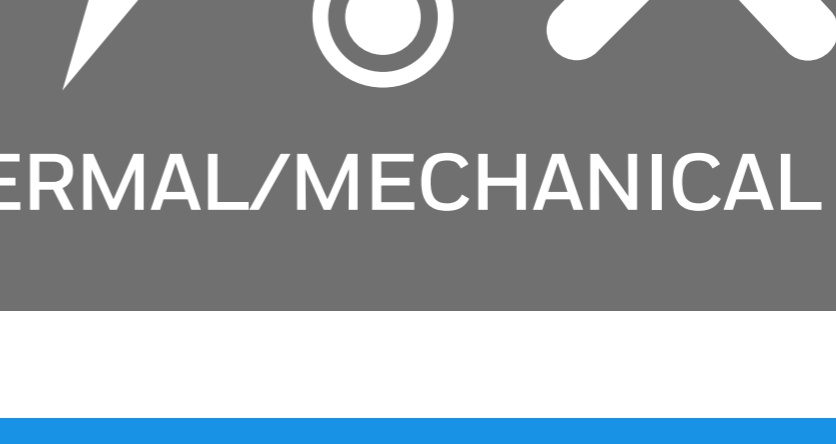
4 

FIREFIIGHTERS SEVERELY INJURED BY BESS EXPLOSION IN ARIZONA, US (2019)²

20MW 

BESS DESTROYED BY FIRE IN LIVERPOOL, UK (2020)³

Li-ion battery fires happen in 4 stages

1 | **ABUSE FACTOR**  ELECTRICAL/THERMAL/MECHANICAL

2 | **OFF-GAS** 


3 | **SMOKE** 

4 | **FIRE**
THERMAL RUNAWAY 

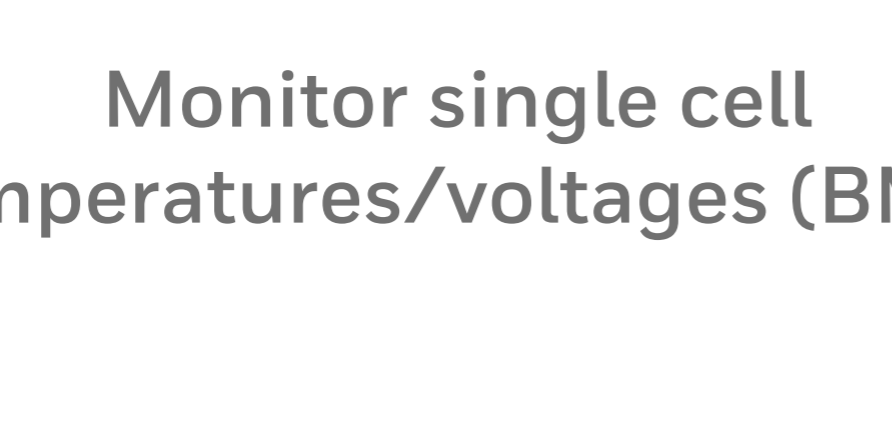
Key risks and challenges include:

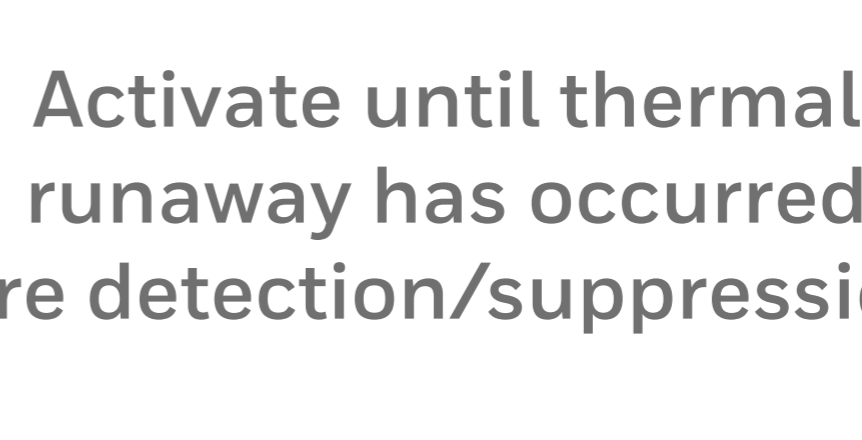
 **FORMATION OF EXPLOSIVE GAS/VAPOUR MIXTURES**

 **FORMATION AND DISPERSION OF TOXIC GAS CLOUDS**

 **INTENSE HEAT FIRES**
DIFFICULT TO EXTINGUISH

Existing technology cannot:

 Monitor single cell temperatures/voltages (BMS)

 Activate until thermal runaway has occurred (fire detection/suppression)

Off-gas detection, the OPTIMUM Li-ion BESS fire prevention technology

OFF-GAS SENSOR AVERAGE ACTIVATION TIMES⁴

06:10 BEFORE THERMAL RUNAWAY
MINS SECS

08:18 BEFORE CELL VOLTAGE SENSORS
MINS SECS

08:39 BEFORE LEL SENSORS
MINS SECS

Learn more at <https://hwll.co/advanced-detection>

1. <http://www.businesskorea.co.kr/news/articleView.html?ridno=41012>
2. https://ulfirefightersafety.org/docs/Four_Firefighters_Injured_in_Lithium_Ion_Battery_ESS_Explosion_Arizona.pdf
3. <https://www.energy-storage.news/news/fire-at-20mw-uk-battery-storage-plant-in-liverpool#:~:text=Carnegie%20Road%20BESS%20in%20Liverpool,when%20completed%20in%20early%202019.&text=The%20fire%20caused%20that%20what%20smoke%20from%20the%20incident>
4. <https://www.dnng.com/maritime/publications/Technical-Reference-for-Li-Ion-Battery-Explosion-Risk-and-Fire-Suppression-report-download.html>