Issues and Challenges of Battery Asset Management for Operational Safety Virtual Roundtable

The virtual roundtable event, "Issues and Challenges of Battery Asset Management for Operational Safety," held on 30 September 2024, was attended by 207 delegates and was an outstanding success. It was jointly organized by the Maintenance and Reliability Engineering, the Institute of Innovation, Science and Sustainability (IISS), and the Centre for Smart Analytics (CSA) at Federation University Australia and the Gippsland Chapter of the Asset Management Council Australia (AMC), a technical society of Engineers Australia. The event was supported by leading universities and industries. Experts from around the world, including Australia, discussed various aspects of this field and emphasized the need for global collaboration and cooperation to reduce costs and risks while enhancing performance, including operational safety. Excellent feedbacks received from delegates.

Dr. Anne Gibbs, CEO of the Asset Management Council, delivered the welcome address. It was an honor to facilitate this outstanding event. Distinguished panel members provided insights into this complex issue, highlighting research and collaboration for a way forward:

North of Europe (Scandinavia) Perspective:

- Prof. Uday Kumar, Head of Division, Research: Operation and Maintenance, Division of Operation, Maintenance and Acoustics, Luleå University of Technology, Sweden.
- Prof. Ramin Karim, Operation and Maintenance, Division of Operation, Maintenance and Acoustics, Luleå University of Technology, Sweden.

Europe and UK Perspective:

- Prof. Rakesh Mishra, School of Computing and Engineering, Co-Director, Centre for Thermofluids, Energy Systems and High-Performance Computing, Member of the Centre for Engineering Materials, The University of Huddersfield, UK.
- Prof. Nigel Schofield, School of Computing and Engineering, Member of the Centre for Efficiency and Performance Engineering, The University of Huddersfield, UK.

Indian Perspective:

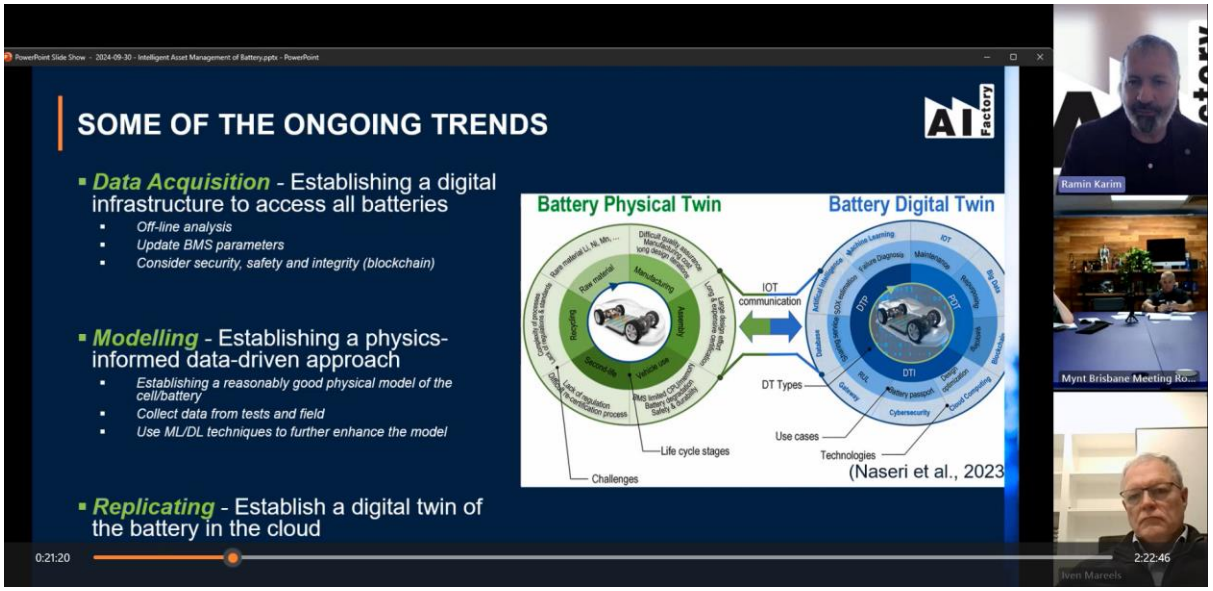
- Prof. Jhareswar Maiti, Indian Institute of Technology, Kharagpur, India.
- Prof. Raghuvir Pai, Manipal Academy of Higher Education, India.
- Dr. S.R.S. Prabaharan, Founder & CEO, Inventus Battery Energy Technologies Pvt. Ltd., Chennai, India.

Australian Perspective:

- Prof. Joarder Kamruzzaman, Director, Centre for Smart Analytics, Federation University.
- Mr. Erik Vandenberg, Australian Project and Asset Management Services, Australia.
- Mr. Gary Radford, Managing Director, Mynt Energy Tech, Australia.
- Mr. Vipu Mathew, Fixed Plant Maintenance and Reliability Engineer, and Mr. Tonderayi Damba, Reliability & Asset Integrity Engineer, BHP, Australia.
- Mr. Abdallah Al-Sahar, Operations and Maintenance Engineer, Zenobe Energy, Australia.
- Mr. Ani Chakraborty, CEO, Bestech Australia.
- Ms. Jenny Ratsep, Engineering Systems Leader, Energy Australia.

Recording in **https://fedflix.federation.edu.au/media/t/1_775yp00c.** Please feel free to send me email (g.chattopadhyay@federation.edu.au) for any additional info.

Screenshots from virtual round table.


PowerPoint Slide Show - 2024-09-30 - Intelligent Asset Management of Battery.pptx - PowerPoint
SOME OF THE ONGOING TRENDS
AI Factory
Data Acquisition - Establishing a digital infrastructure to access all batteries
Off-line analysis
Update BMS parameters
Consider security, safety and integrity (blockchain)
Modelling - Establishing a physics-informed data-driven approach
Establishing a reasonably good physical model of the cell/battery
Collect data from tests and field
Use ML/DL techniques to further enhance the model
Replicating - Establish a digital twin of the battery in the cloud
Battery Physical Twin
Battery Digital Twin
IOT communication
DT Types
Use cases
Technologies
Life cycle stages
Challenges
(Naseri et al., 2023
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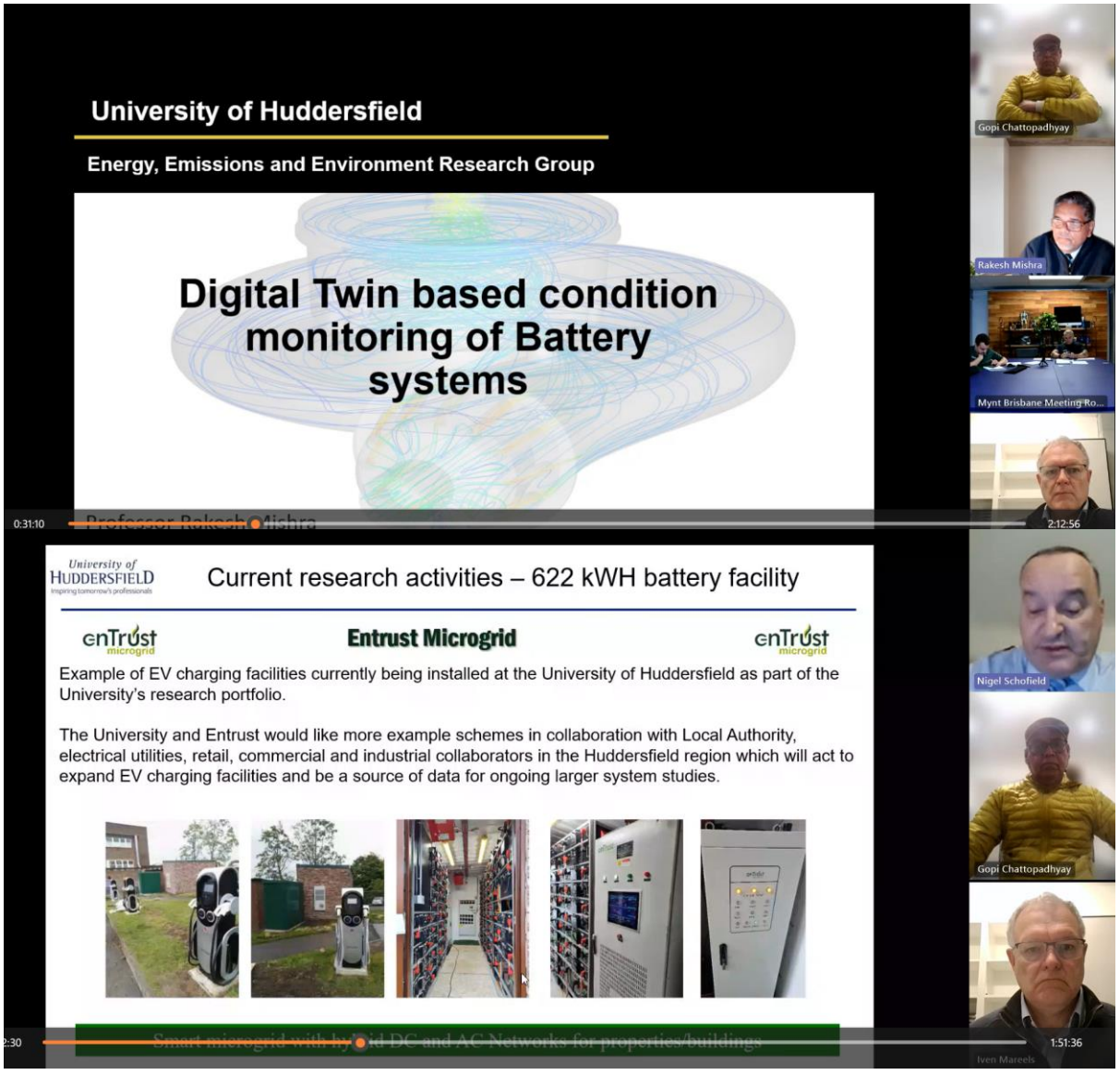
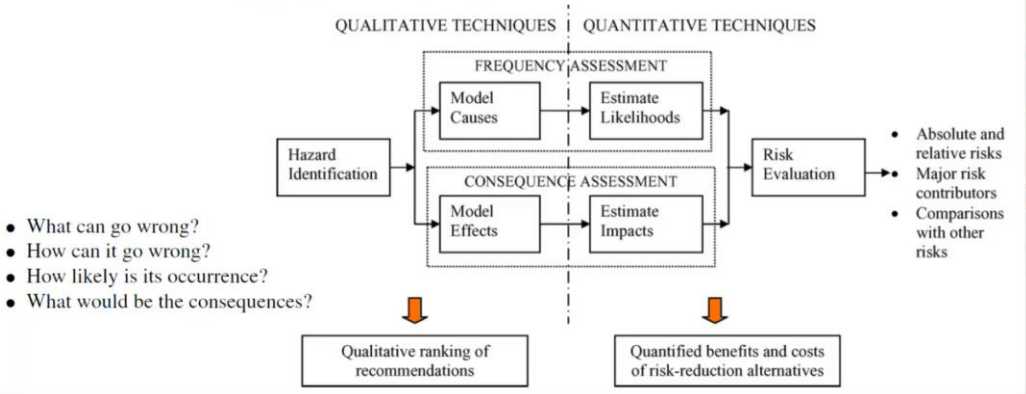
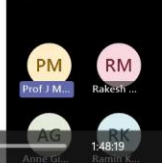
2:22:46
Ramin Karim
Mynt Brisbane Meeting Ro...
Iven Mareels


University of Huddersfield
Energy, Emissions and Environment Research Group
Digital Twin based condition monitoring of Battery systems
Professor Rakesh Mishra
0:31:10
2:12:56
Gopi Chattopadhyay
Rakesh Mishra
Mynt Brisbane Meeting Ro...
University of HUDDERSFIELD
Current research activities – 622 kWH battery facility
enTrust microgrid
Entrust Microgrid
Example of EV charging facilities currently being installed at the University of Huddersfield as part of the University's research portfolio.
The University and Entrust would like more example schemes in collaboration with Local Authority, electrical utilities, retail, commercial and industrial collaborators in the Huddersfield region which will act to expand EV charging facilities and be a source of data for ongoing larger system studies.
Smart microgrid with hybrid DC and AC Networks for properties/buildings
2:30
1:51:36
Nigel Schofield
Gopi Chattopadhyay
Iven Mareels

Risk Assessment Process





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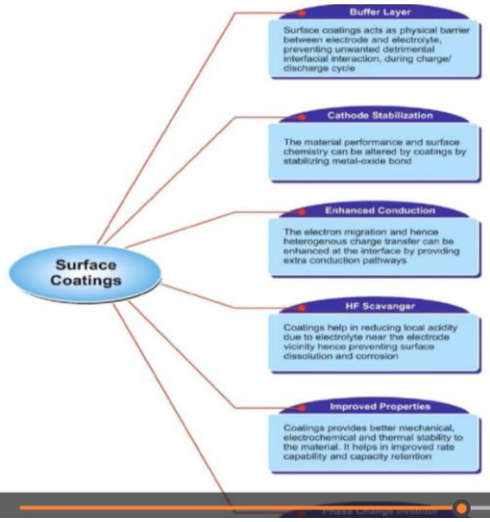


Roles of surface coatings on cathode materials

1:10:34 1:33:32

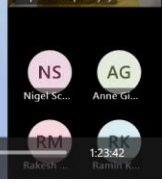
Challenges ahead

As we see more storage projects become operational, the big question is **"how to maximize your assets?"**

Focusing on three core themes –
- Revenue & Trading,
- Lifecycle of the battery and
- Optimization tools.

Demand Sectors:
- ESS (Energy Storage System) – Stationary
- Automobile (EVs)
- Air transportation
- Railways
- Space

- **Safety**
- **Inadvertent Abuse**
- **Energy Density (Wh/kg) : > 500Wh/kg**
- **Reliability**
- **Calendar life time**
- **Environmental effect**
- **Cost ($ per kWh)**
- **Limitations**



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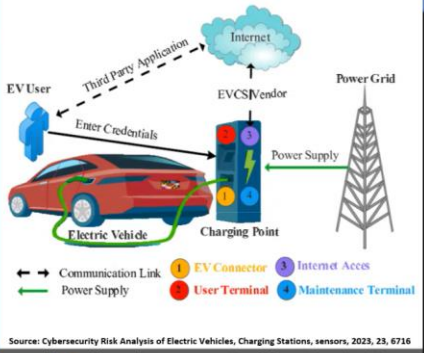
Battery Security

Electric Vehicle Charging Station vulnerability points

- **EV connectors:** Attackers exploit the weakness of communication protocols to introduce malware or manipulate charging settings
- **User terminals:** compromise to authentication systems can lead to significant consequences to user accounts, facilitating billing and tracking
- **Internet connections:** attackers can gain unauthorized access to the connected network, extending beyond the charging infrastructure
- **Maintenance terminals:** can deactivate charging sessions, causing inconvenience and potential disruptions for EV owners

EV Charging Infrastructure

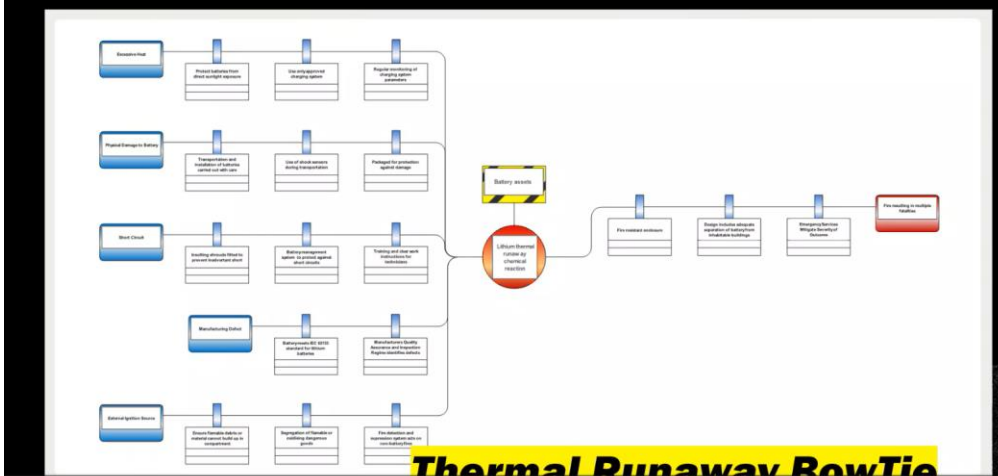


Source: Cybersecurity Risk Analysis of Electric Vehicles, Charging Stations, sensors, 2023, 23, 6716

1:38:28

Joarder Kamruzzaman

NS Nigel Sc... FP Dr SRS. ...
RM Rakesh ... RK Ramin K...
MS Matt Stu... Erik Van...
TS Tony Saj... JR Ratsep, J...
KD Kai Dong AS Anne Gi...



Thermal Runaway BowTie

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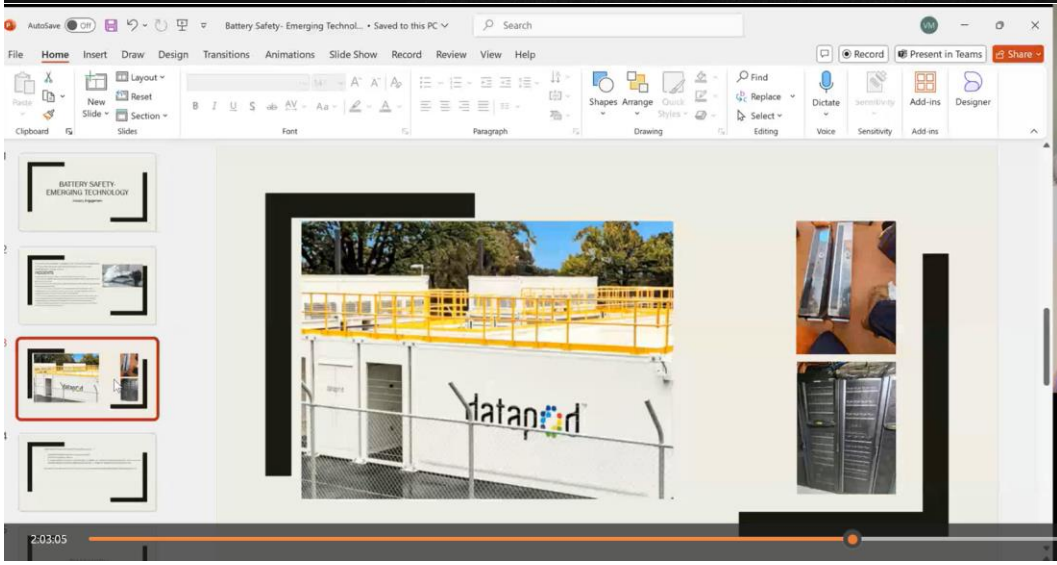
Erik Vandenberg

Gopi Chattopadhyay

NS Nigel Sc... FP Dr SRS. ...
RM Rakesh ... Joarder ...



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Narottam Das

Vipu Mathew

MR Mynt Bri... Joarder ...
Erik Van... Dr SRS. ...
0:41:01

Ways and methods to mitigate risk with battery assets.

- Monitoring battery assets effectively using smart software that is developed for this purpose. Smart charging software can monitor activity of charge / discharge, and record the SOC.
- Real-time condition monitoring. Temperature and power meters can detect faults and unusual spikes or dips, and act to prevent possible incidents.
- Preventive maintenance. Similar to other assets, this activity help maintaining battery units in good condition and point to potential breakdowns.
- Assets upgrade, replacing aging lithium-ion batteries with advanced lithium iron phosphate. The new combination comes with more safety rating. It will not catch fire and less likely to overheat.

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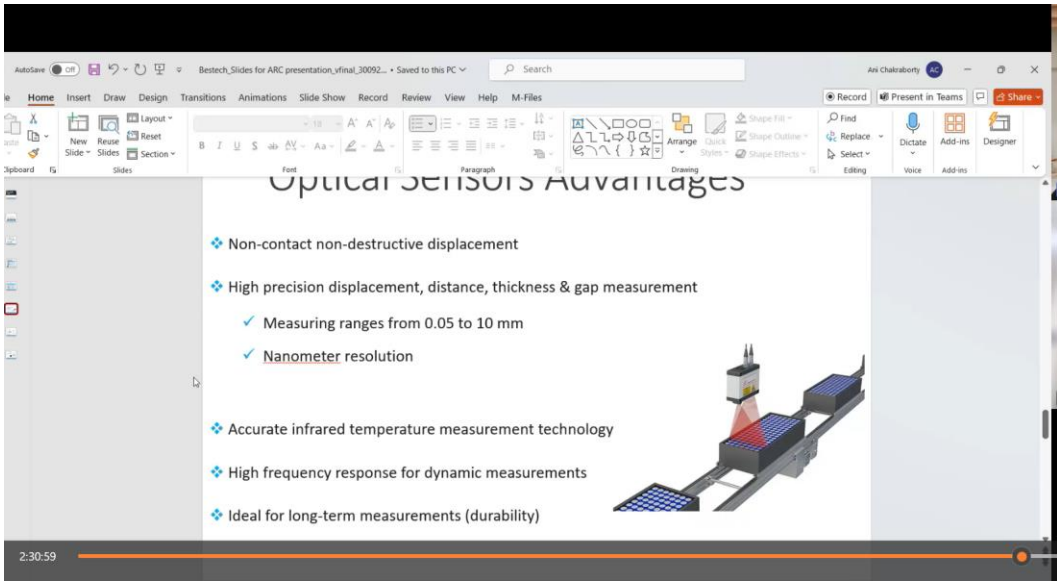
Abdallah Al-Sahar
Gopi Chattopadhyay
VM Vipu Ma...
Erik Van...
FP Dr SRS...
Joarder ...



2:30:59 0:13:07

Ani
Gopi Chattopadhyay
VM Vipu Ma...
Erik Van...
FP Dr SRS...
Joarder ...

Benefits of Standard

1. Clear requirements
2. Awareness of hazards
3. Clarity of responsibility
4. Certainty in Emergency Response
5. Baseline to measure assurance against

2:39:11 0:04:55

Ratsep, Jenny
Gopi Chattopadhyay
AA Abdallah...
Joarder ...
Erik Van...
Ani