AIST
Create the Future, Collaborate Together

Report of Technical Session in the 7th RD20 Conference

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Director of the Department of Energy and Environment
AIST, Japan

October 3rd, 2025

Technical Session

Moderators

TS plenary

Dr. Michio Kondo
(AIST, Japan)

Number of &TS registrations: 100 in-person, 251 online, 351 total

Number of participants in-person: 72

Maximum number of online viewers: 130

Number of speakers: 24 from 11 countries and regions

- Held on September 30 and October 1, 2025
- Plenary session – morning of September 30
- Three thematic sessions – afternoon of September 30 and October 1
  - ✓ TS #1: Synthetic fuels including a wide range of resources, conversion processes and products
  - ✓ TS #2: Energy storage with a focus on grid-scale storage for renewables
  - ✓ TS #3: AI and digitalization to accelerate research for energy technology innovation, development and deployment

TS #1

Dr. Thabo Hlalele
(CSIR, South Africa)

TS #1

Dr. David Harris
(CSIRO, Australia)

TS #2

Dr. Pierre SERRE-COMBE
(CEA, France)

TS #2

Dr. Ratih Damayanti
(BRIN, Indonesia)

TS #3

Dr. Tomonori Honda
(AIST, Japan)

TS #3

Dr. Sangjin Choi
(KIER, Korea)

Plenary Session: High level talk on energy and environment

Moderator

Dr. Michio Kondo
(AIST, Japan)

- During the morning plenary session, four speakers provided excellent overviews of their respective research institutions, their international collaboration and activities, and RD20's contributions to G20.

Dr. Koichi Matsuoka
(AIST, Japan)
Talk 1: AIST's Latest International Collaboration

Dr. Thabo Hlalele
(CSIR, South Africa)
Talk 3: RD20 contribution to South Africa's G20 Presidency

Dr. Jean-Francois Houle
(NRC, Canada)
Talk 2: Resources, Resilience and Sustainability: NRC Innovation Supporting Canada's Energy Future

Dr. Stéphane Sarrade
(CEA, France)
Talk 4: Return of Experiment on International Research Collaboration

TS #1: Synthetic fuels including a wide range of resources, conversion processes and products

Moderator

Dr. Thabo Hlalele
(CSIR, South Africa)

Moderator

Dr. David Harris
(CSIRO, Australia)

Dr. Randy Cortright
(NREL, US)

Talk 1: Synthetic fuels- opportunities and challenges spanning biomass, e-fuels and solar fuels

Mr. Adam Tuck
(NRC, Canada)

Talk 2: Advanced Hydrogen Production and Transport Technologies

Dr. David Harris
(CSIRO, Australia)

Dr. Tata Sutardi
(BRIN, Indonesia)

Talk 6: Biofuel Development from Biomass Stock

Dr. Yu Katayama
(Osaka Univ, Japan)

Talk 3: Electrochemical Ammonia Synthesis Under Ambient Conditions – NEDO Research and Development Program for Promoting Innovative Clean Energy Technologies Through International Collaboration

Dr. Mike Colechin
(Cultivate Innovation Ltd/UKERC, UK)

Talk 4: The potential role for biomass as a long-duration store of energy

Dr. Claudia Bassano
(ENEA, Italy)

Talk 7: Sustainable Aviation Fuels in Italy: opportunities and research challenges faced by ENEA

Prof. Sary Awad
(CNRS, France)

Talk 8: Sustainable fuels production for shipping and aviation sectors from microalgae via Hydrothermal pathway: insights from COCPIT project

TS #1: Conclusions of the discussions

TS#1 Overview: The session discussed synthetic fuels including various types of biofuels and SAF, and hydrogen.

- Biofuel development is uneven globally, with varying resource constraints and technological maturity across countries.
- It was stated that scaling up is a major challenge, with many companies succeeding at the laboratory level but not at the pilot plant level.
- Common global challenges, such as feedstock availability and balancing economic and social benefits, were also emphasized.
- The importance of international cooperation and knowledge sharing was underscored, with the UK-Japan partnership cited as an example.
- Examples of cooperative models where countries jointly provide funding and technology were also shared.

Topics for Future Consideration:

- Needs for technological research included the importance of techno-economic and life cycle assessments,
- Necessity for TRL (Technology Readiness Level) or Manufacturing Readiness Level (MRL) evaluations and mission-oriented approaches.

TS #2: Energy storage with a focus on grid-scale storage for renewables

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Moderator

Dr. Pierre SERRE-COMBE
(CEA, France)

Moderator

Dr. Ratih Damayanti
(BRIN, Indonesia)

Prof. Emmanuel Baudrin
(CNRS, France)
Talk 1: Overview of Redox flow technologies, challenges, and opportunities

Dr. Callum MacIver
(UKERC / University of Strathclyde, UK)
Talk 4: Security of supply challenges for a weather dependent GB electricity system and the role for storage at scale

Dr. Katie Harrison
(NREL, US)
Talk 2: Safe, Long-Life Batteries for Behind-the-Meter Grid Storage

Dr. Julie Mougin
(CEA, France)
Talk 5: Role of Hydrogen for large Scale Energy Storage

Dr. Euis Djubaedah
(BRIN, Indonesia)
Talk 3: Challenges and Opportunities in Advancing Energy Storage Technologies in Indonesia

Dr. Friedrich Mendler
(Fh-ISE/AIST, Germany)
Talk 6: Scaling Hydrogen Production and Storage: Lessons from Supply Chain Optimisation Across all Spatial Scales

TS #2: Conclusions of the discussions

TS#2 Overview: The session discussed technical, economic, and regulatory challenges and opportunities in large-scale energy storage, including hydrogen, batteries, and grid management, emphasizing international collaboration.

- Technologies such as hydrogen (including ammonia-based storage) and redox flow batteries were highlighted for their roles in decarbonizing industry and enhancing grid flexibility.
- New business models and market designs are essential to support the integration of emerging technologies and players.
- Key barriers include limited domestic manufacturing, high capital costs, technical and material challenges, regulatory issues, and safety concerns like battery recycling.
- International collaboration, especially for accelerating battery development in countries was emphasized.

Topics for Future Consideration:

- The modularity of energy storage technologies and harmonized regulations are crucial for scaling and replicating projects across regions.
- Demonstration projects play a vital role in reducing costs, validating technologies, and enabling broader deployment.
- Policy design must reflect the specific market realities of different technologies, especially for long-duration and hydrogen storage.
- A shared long-term international vision is needed to guide the development of reliable, low-cost, and environmentally sound energy storage solutions.

TS #3: AI and digitalization to accelerate research for energy technology innovation, development and deployment

Moderator

Dr. Tomonori Honda
(AIST, Japan)

Moderator

Dr. Sangjin Choi
(KIER, South Korea)

Dr. Ray Grout
(NREL, US)
Talk 1: AI applications for energy and energy R&D

Dr. Aidan Rhode
(Imperial College London/UKERC, UK)
Talk 4: Enhancing Electricity System Resilience with AI, Digital Twins and Digitalisation Technologies

Dr. Jehyun Lee
(KIER, South Korea)
Talk 2: Identifying Strategic Research Partners through Data-Driven Analysis of the Renewable Energy Technologies

Prof. Mohamed Tahar MABROUK
(Imt Atlantique/CNRS, France)
Talk 5: Hybrid Modeling for Smarter Energy Systems: Physics Meets AI

Dr. Hideki Shimada
(AIST, Japan)
Talk 3: Data-Driven DSR Control Technology for Energy Sharing–NEDO Research and Development Program for Promoting Innovative Energy and Environmental Technologies Through International Collaboration

Dr. Scott Smith
(NRC, Canada)
Talk 6: Autonomous Laboratory: Self-driving labs to accelerate battery cathode material discovery

TS #3: Conclusions of the discussions

TS#3 Overview: First RD20 session on AI. Identified AI's potential to accelerate the clean energy transition and common challenges (Data, Trust, Talent).

Discussion Pillar	Key Challenges Raised	Potential Collaboration Areas Discussed
BUILDING TRUST	Concerns over AI model reliability/security; data quality & availability constraints.	Potential for joint development of standardized AI model benchmarking.
ACCELERATING INNOVATION	Duplicative efforts in developing advanced platforms like autonomous labs.	Possibility of sharing pre-competitive common tools and code; exploring consortiums.
DEVELOPING TALENT	Shortage of interdisciplinary researchers skilled in both energy and AI.	Potential to expand researcher exchanges and AI-focused training (e.g., Summer School).

Topics for Future Consideration:

- Addressing the dual challenge: AI for Energy & Energy for AI.
- Need for continued dialogue based on TS#3 discussions to explore concrete international collaboration actions.

Thank you for your kind attention.