An Australian Government Initiative

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Clean Energy Innovation Centre
R&D Forum
Energy Storage
Renewable Energy and the Grid

Rowan Gilmore

Australian Institute for Commercialisation

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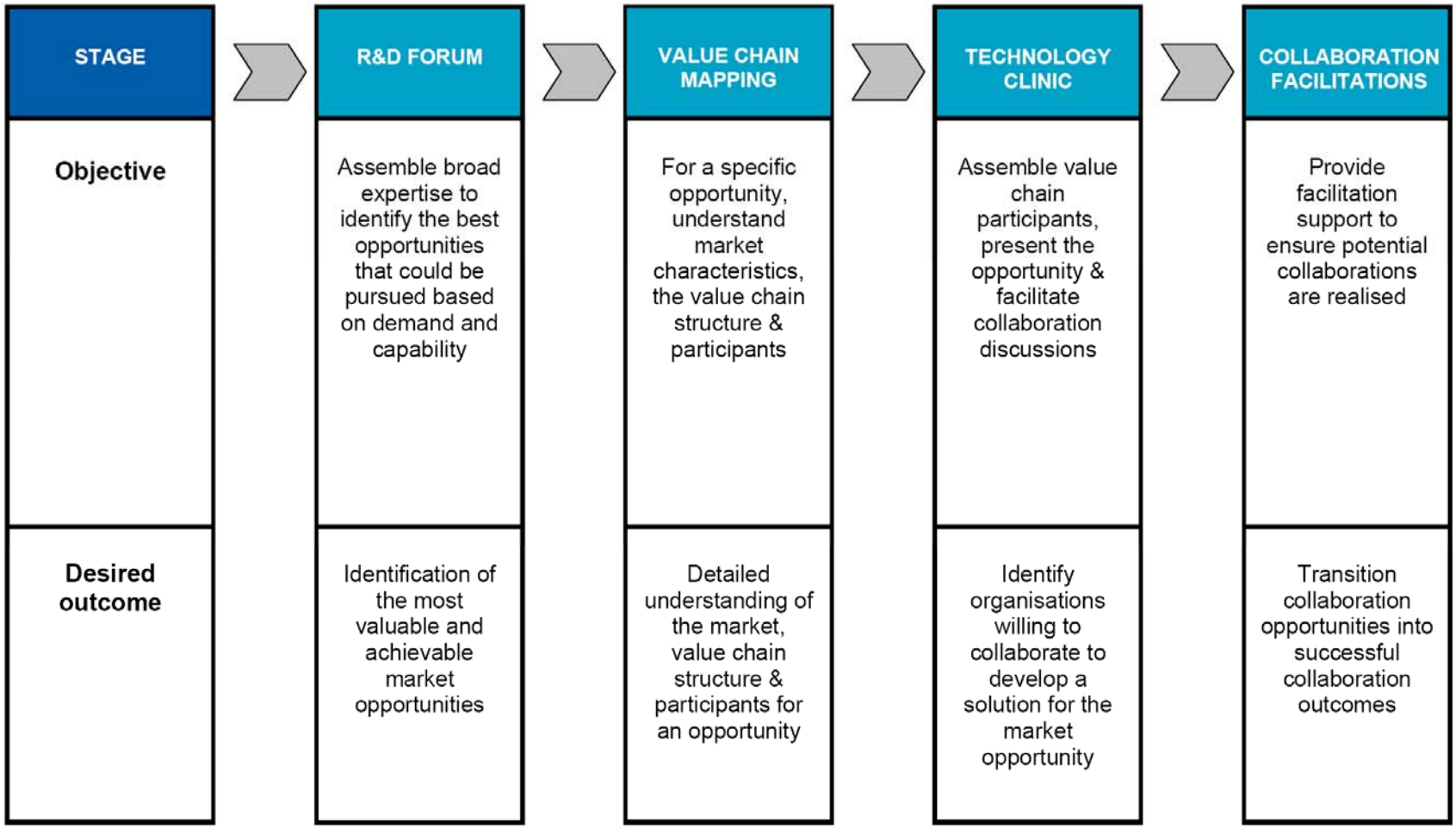
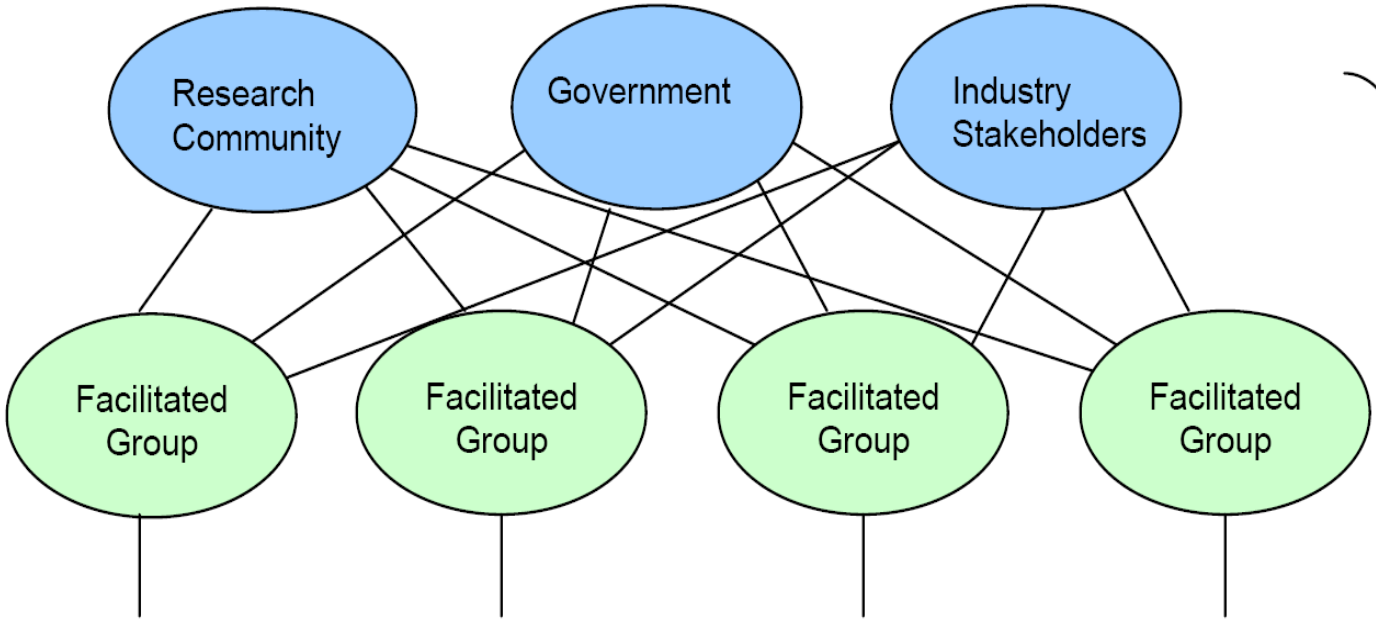
AIC Industry Development Framework



WHAT ARE THE MOST PROMISING TECHNOLOGY OPTIONS TO MEET THE ENERGY STORAGE NEEDS OF ELECTRICITY GENERATORS AND GRID OPERATORS?



What are the greatest challenges and needs industry is facing?

What are the possible technological solutions?

Identification of the Greatest Opportunities for Australia's Competitive Advantage

Stage 1

R&D FORUM:

Frames the industry problem and seeks alternative solutions

Stage 2

VALUE CHAIN MAPPING:

Selects most promising market opportunity

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Assemble Value Chain Players for selected market opportunity

What are the forces shaping the value chain?

How can collaboration strengthen the links?

Outcomes:

1. R&D alignment
2. Collaboration
3. Technology Transfer
4. Industry innovation
5. Progress towards market solutions
6. Firm growth

Stage 3

TECHCLINIC:

Facilitates a collaborative effort towards meeting the market opportunity

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Focus is SME Growth

- This CEIC activity is specifically focused on creating new opportunities for Australian SMEs
- 16 leading Australian energy storage SMEs are here today
- This is to ensure both their views and capability are central to opportunities pursued
- The Industry Development Framework will:
  - Help SMEs understand market opportunities
  - Provide a platform to present themselves to value chain influencers
  - Provide an opportunity to collaborate with Large Corps, MNCs and ROs
  - Connect SMEs into new value chains
  - Leverage SME flexibility and capability as vehicles to take new solutions to market
  - Help to align research programs to industry needs

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Agenda – R&D Forum, Energy Storage

8:30 – 9:00am	**Registration and Welcome**
9:00 – 9:20am	**Introduction and Objectives**
9:20 – 9:50am	**Presentations: (2 x 10 mins)** **The problem –** *Generator & Industry Needs and Market Demands* ▪ *Mr Simon Gamble – Hydro Tasmania* ▪ *Mr Michael Ison – Aust. Aluminium Council*
9:50 – 10:30am	**Presentations: The State of Play in Australian R&D (4 x 10 mins)** ▪ Electrical R&D. Smart Grids & Distributed Storage – *Prof Tony Vassallo* ▪ Electrochemical/Chemical R&D – *Em Prof Maria Skyllas-Kazacos* ▪ Electrical R&D. Electric Vehicle Arrays – *Prof Peter Wolfs* ▪ Thermal R&D – *Dr Jim Smitham*
10:30– 10:50am	**Morning Tea and Networking Session 1**
10:50– 12:50pm	**Facilitated Information Gathering**
12:50– 1:00pm	**Who's Who Along the Value Chain**
1:00 – 1:40pm	**Sandwich Lunch and Networking Session 2**
1:40 – 2:15pm	**Conclusions and Next Steps**
2:15 – 3:00pm	**Ongoing Networking (optional)**

Presentations

- **Mr Simon Gamble - Energy Storage and Renewables**

  Manager Technology and Commercialisation - Hydro Tasmania

- **Mr Michael Ison - Industry and Energy Storage**

  Manager Policy and Research, Australian Aluminium Council.

- **Professor Tony Vassallo - Energy Storage Research, Smart Grids and Distributed Storage**

  Delta Electricity Chair in Sustainable Energy Development; School of Chemical & Bimolecular Engineering; The University of Sydney

- **Emeritus Professor Maria Skyllas-Kazacos AM - Electrochemical Energy Storage, International State of Play**

  School of Chemical Sciences and Engineering; University of New South Wales

- **Professor Peter Wolfs - Electric Vehicle Array Energy Storage and the Grid**

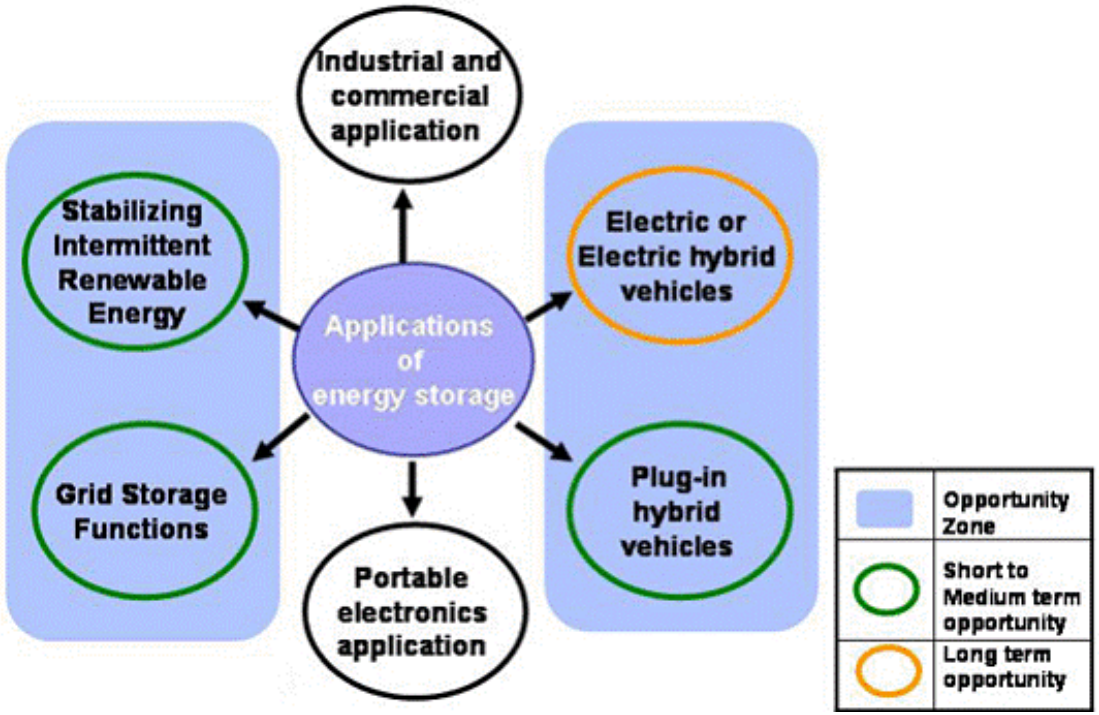
  Western Power Chair; Electrical and Computer Engineering; Curtin University WA

- **Dr Jim Smitham - Thermal Energy Storage State of Play**

  Acting Director; Energy Transformed Flagship; CSIRO

Energy Storage – Market Segmentation

- **Applications for Energy Storage**



Source: Strategic Assessment for the European Market for Energy Storage Technologies". Frost & Sullivan. Dec 2008

Energy Storage - Market Segmentation

By Market Needs

Grid Stabilisation

Peak shaving

Component failure backup

Renewable Generator Sources

Wind

Hydro

Solar PV

Solar Thermal

Concentrated Solar

Geothermal

Ocean/River

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Energy Storage - Market Segmentation

By Storage Technology Solutions

CHEMICAL
Hydrogen
Biofuels
Liquid Nitrogen
Oxyhydrogen
Hydrogen Peroxide

ELECTROCHEMICAL
Batteries
Flow Batteries

ELECTRICAL
Capacitors
Superconducting magnetic

THERMAL
Phase Change
Seasonal Hot Water
Cryogenic Liquid Air
Liquid Nitrogen
Solar pond
Hot Bricks
Steam accumulator
Fireless locomotive

MECHANICAL
Compressed air
Flywheel
Hydraulic Accumulation
Pumped Hydro
Spring

BIOLOGICAL
Starch
Glycogen

Some Market Facts & Figures

→ Global Market Size

- Current market for grid energy storage is at US$2.4B
- Storage market will increase to $3.3B by 2013 at compound annual growth of 6.6%
- Future market for battery technologies alone is $50B if 10% of wind farms used this form of storage
- Automotive super-capacitor sales growth at 50%pa from 2010
- Flywheel energy storage system market was valued at $58.8M in 2008. Expected to grow at 12 % (CAGR) till 2015

→ Global Investment Activity

- From $661M of VC investments in 38 green energy deals in Q1 2009
  - $121M of this was for energy storage companies.

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Thank you for your participation

For further details about today or next steps contact:

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