New Zealand's Progress towards Hydrogen and Fuel Cell Commercialisation

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APEC PATH Workshop

Honolulu, Hawaii, 16 May, 2005

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Coverage

New Zealand Government Policy on Hydrogen

Areas of Activity

Work on Hydrogen

Work on Fuel Cells

Future Plans

Key Points

NZ Government Policy

Policy Outcomes Addressed

- Sustainable use of Natural Resources,
- Reduction in emissions from Energy and Transport,
- Wealth from new Knowledge-based Industries,
- Innovative Manufacturing and Service Enterprises.

Move to a Hydrogen Rich Energy Economy

Science and Technology Focus

- Coal Combustion and Gasification,
- Gas Separation and Cleanup,
- Fuel Cell and Electrolyser Engineering,
- Electro-technology and Power Electronics,
- Mathematical, technical and Economic modeling,
- Renewable Energy transformation technologies,
- Dynamic Modeling of Hydrogen uptake in NZ.

Hydrogen & Fuel Cell RD& D

Hydrogen energy research

- Production
- Storage and transportation
- Utilization

Hydrogen and distributed energy system integration

- Integrated distributed energy systems
- Renewable Energy forms,
- Combined Heat and Power (CHP)

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Work on Hydrogen and Fuel Cells

- **Hydrogen**
  - **Research Projects 7**
  - **Demonstration Projects 3**
  - **Codes and Standards 0**
- **Fuel Cells**
  - **Research Projects 1**
  - **Demonstration Projects 4**

Work needed on Codes and Standards

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Demonstrations

- Hydrogen RAPS, Rural Community, 2kW,
- Methanol Fuel Cell, Captive Power, 2kW,
- Grid interactive CHP Fuel Cell, 1kW,
- Wind Based RAPS Alkaline Fuel Cell, 2kW.

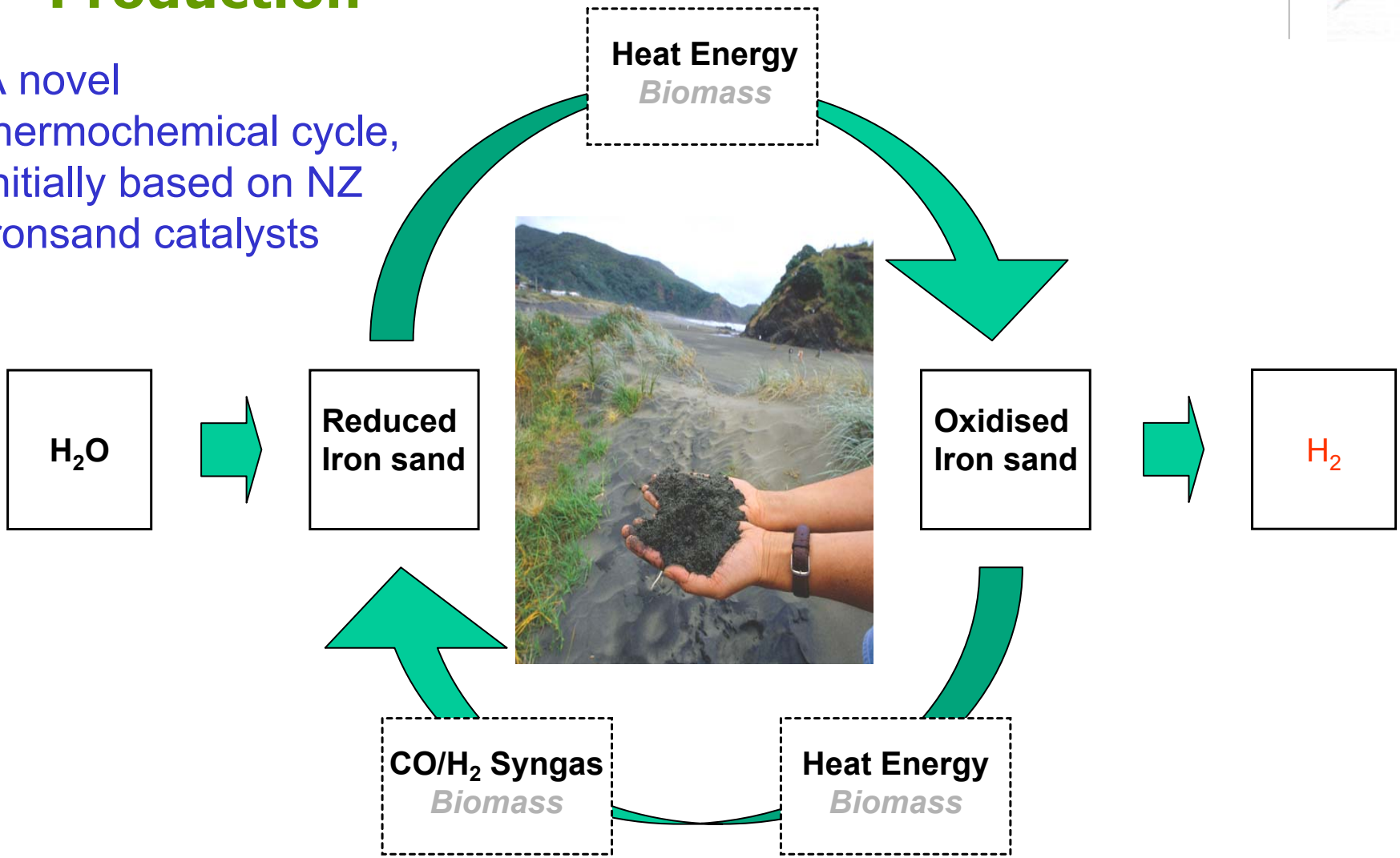
All Small Units Involved

Research

- Hydrogen Production from NZ Coals,
- Fuel Cell System Integration,
- Associated Carbon Dioxide Sequestration,
- Water Electrolysis from Renewable Energy,
- Photo Electrochemical Hydrogen Production,
- Hydrogen Storage in Light Metal Hydrides,
- Hydrogen Storage in “sponge” Materials,
- Thermo Chemical Hydrogen Production.

Production

A novel thermochemical cycle, initially based on NZ ironsand catalysts



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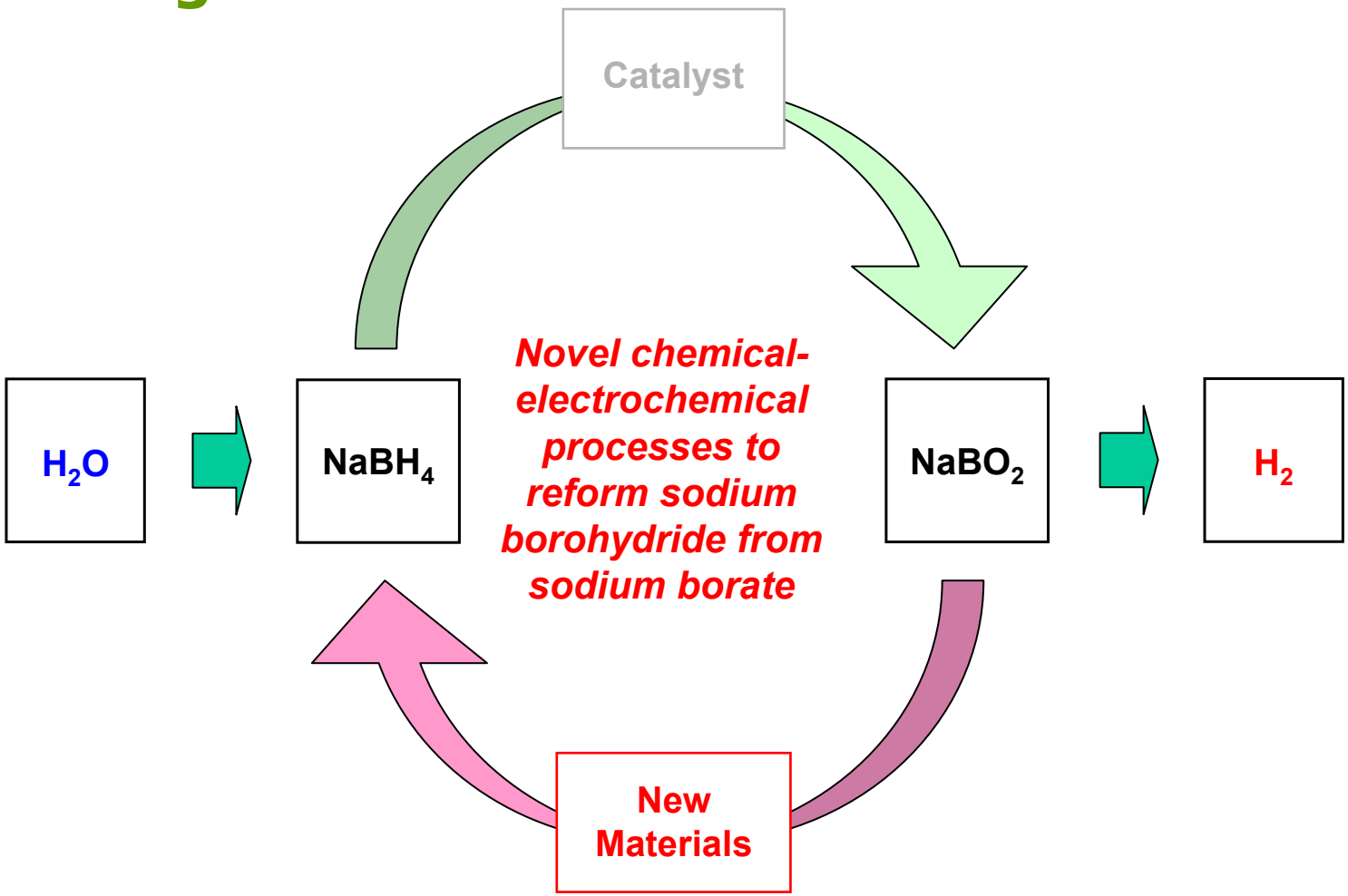
Storage


Catalyst
H_2O
$NaBH_4$
Novel chemical-electrochemical processes to reform sodium borohydride from sodium borate
$NaBO_2$
H_2
New Materials

Utilization

Alkaline fuel cells

- System integration
- Balance of plant
- Electrodes

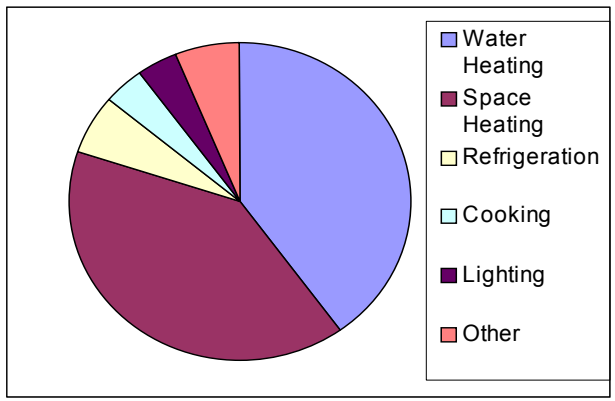
Distributed generation

- Micro Scale CHP
- Alcohol fuel reformers

Hydrogen Workshop for APEC Economies

Totara Valley, New Zealand
Hydrogen distributed energy

- **Integration of hydrogen technologies,**
- **Wind-electrolyzer-pipeline Hydrogen storage and delivery of household energy,**
- **Electricity – H2 fuel cell,**
- **Water heating – Hydrogen combustion**



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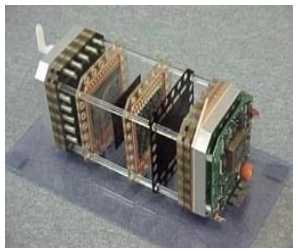
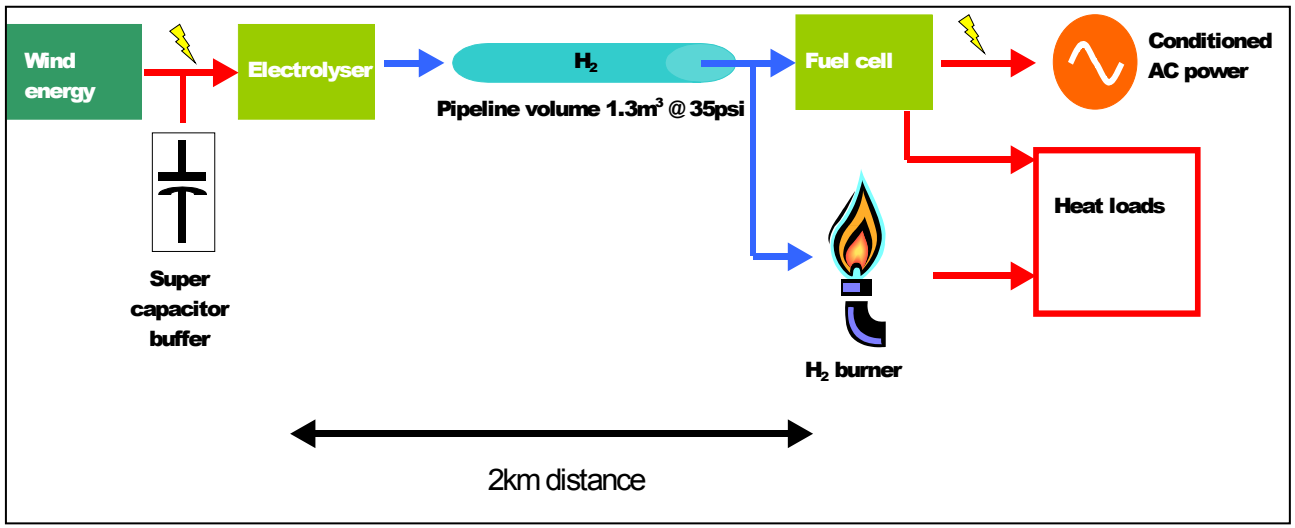
Totara Valley Farming Community, New Zealand – System Configuration





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Demonstrations and Field Trials

US DoD Residential PEM Fuel Cell Demonstration Project.

(Intl. Antarctic Centre, Christchurch, New Zealand)

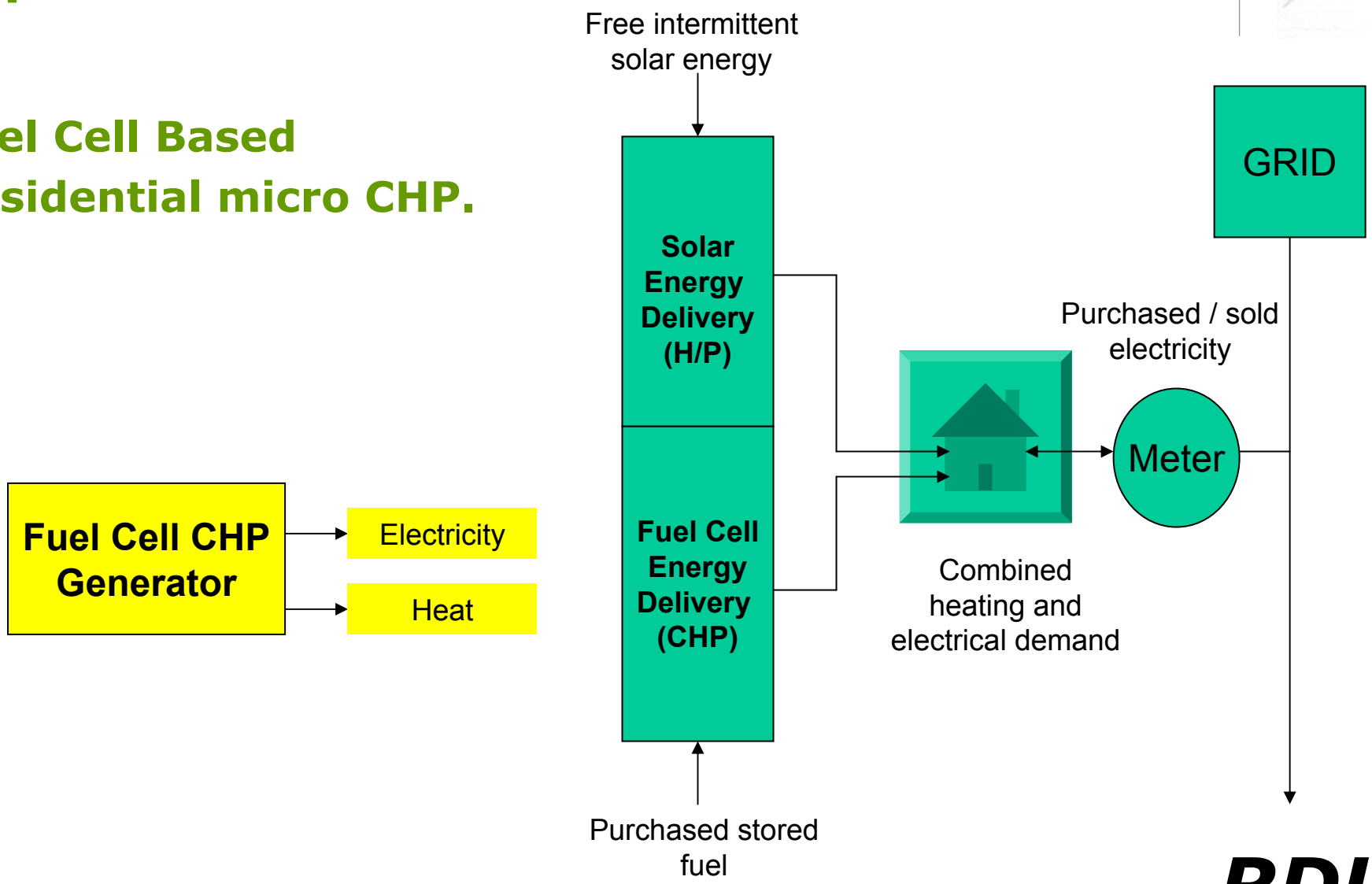
- 2kW Fuel Cell, battery charging and lighting,
- Dual Fuel – methanol reformer with hydrogen cylinder backup.

Residential SOFC demonstration

- 1kWe grid connected integrated CHP energy system.

Proposed New Initiative

Fuel Cell Based Residential micro CHP.



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Key Points

New Zealand is Pursuing Hydrogen and Fuel Cells

- **In Line with Government Policies on:**
  - **Sustainable Energy Supply,**
  - **National Self Reliance in Energy,**
  - **Environmental Protection,**
  - **Development of Knowledge based Industries.**

No Work yet on Hydrogen Codes and Standards.

Currently only about US$ 5 million pa in RD & D.

- **Expected to Increase in Future.**

First Commercial Units targeted for 2012.