Optimal Co-Planning of Hybrid Energy Hubs and Integrated Electricity-Hydrogen Transmission Infrastructure

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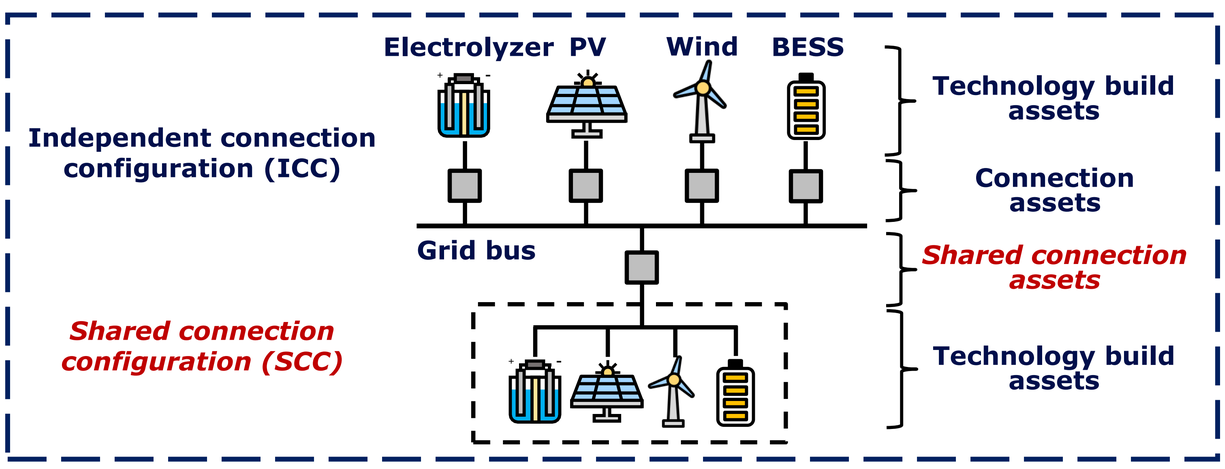
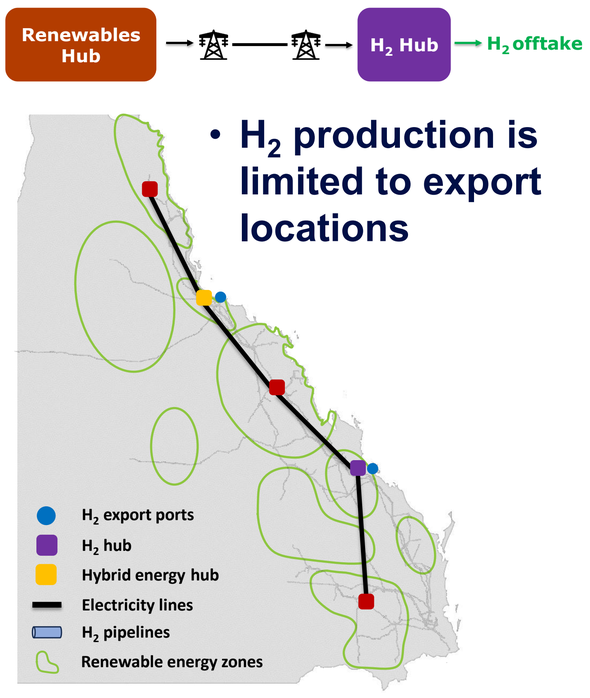
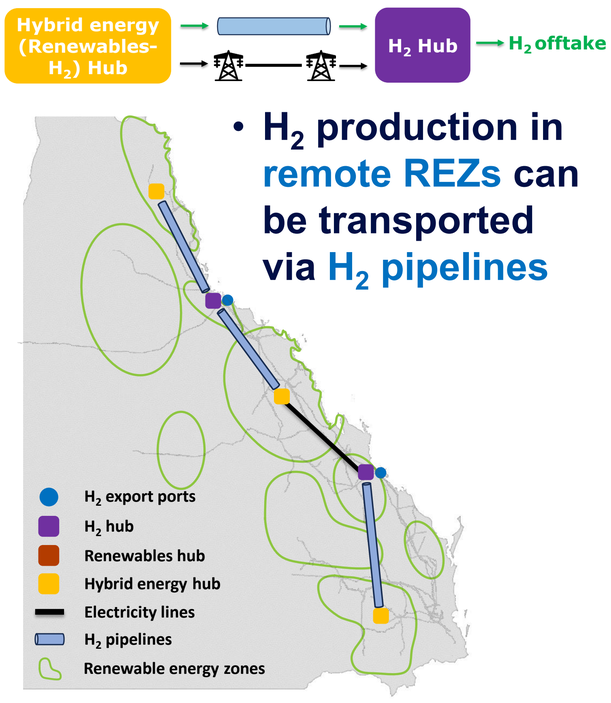
1. Hybrid energy hubs

- **Hybrid energy hubs** co-locate technologies behind a ***common*** grid connection in ***shared connection configuration (SCC)***
- **SCC** enables the shared use of connection assets, **reducing their capacity** required for grid connection, compared *to independent connection configuration (ICC)*
- Hybrid energy hubs are important to **Renewable Energy Zone (REZ)** development and can influence **transmission system design**

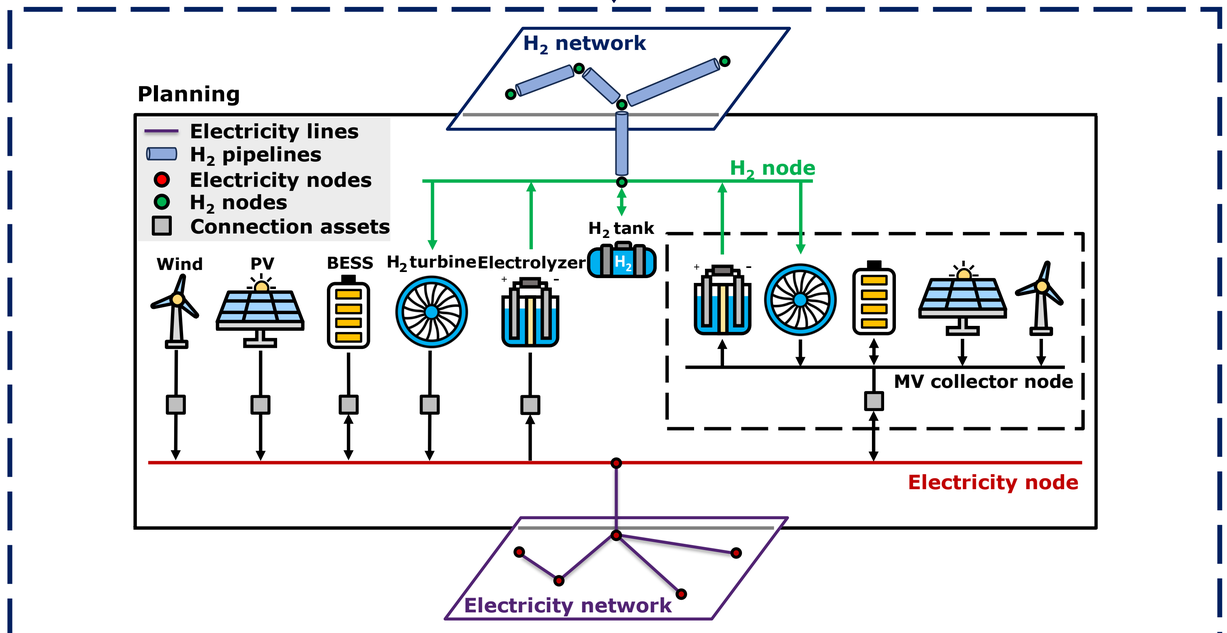


2. Integrated hybrid energy hubs and transmission



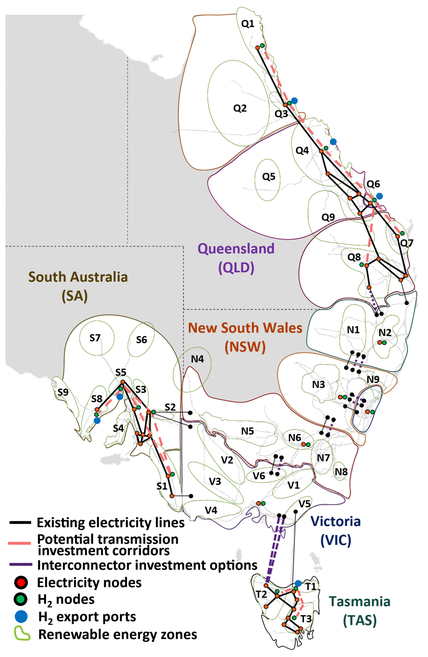


Co-planning of hybrid energy hubs and electricity-H_2 transmission offers potential for cost savings and greater flexibility in generation, production, and transport



Co-planning model of hybrid energy hubs and integrated electricity-H_2 transmission infrastructure

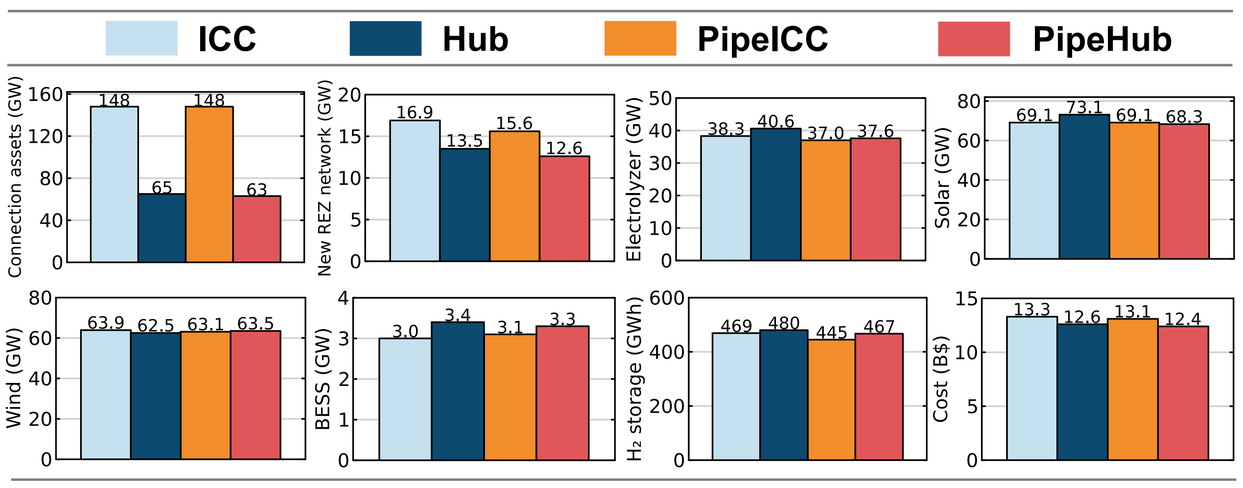
3. Case study application



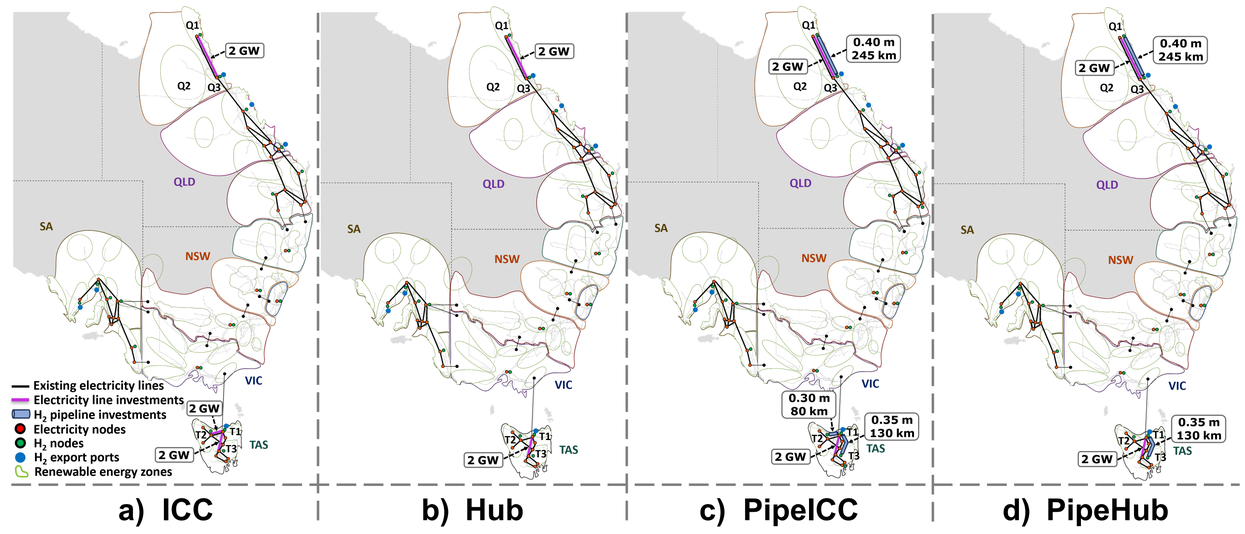
- **Optimise development on the east coast of Australia**
- **Involve 36 envisaged REZs**
- **4 case studies comparing**
  - **Connection configuration: Independent (ICC, PipeICC) vs Shared (Hub, PipeHub)**
  - **Transmission system: Electricity (ICC, Hub) vs Electricity + H_2 (PipeICC, PipeHub)**

4. Results

- **Hybrid energy hubs *reduce* the required capacity of connection assets and REZ network expansion**
- **Hybrid energy hubs integrate *larger* storage capacities**
- **H_2 pipelines *displace* local H_2 storage tank investments**



- **Hybrid energy hubs with optimised shared connection assets *displace* electricity-H_2 transmission investments**
- **H_2 pipelines *displace* electricity transmission investments**



5. Key remarks

- **Hybrid energy hubs can displace transmission by reallocating savings from shared connection assets towards storage to accommodate more renewables**
- **H_2 pipelines can offset more costly electricity transmission and storage, and shift the development of hybrid energy hubs to remote REZs**
- **Co-panning of both improves the utilisation of existing and new assets, achieving the lowest total system costs**

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