HILT CRC

HEAVY INDUSTRY LOW-CARBON TRANSITION COOPERATIVE RESEARCH CENTRE

RP3.007 - UNLOCKING INVESTMENT IN ENERGY INFRASTRUCTURE FOR NET ZERO INDUSTRIAL HUBS

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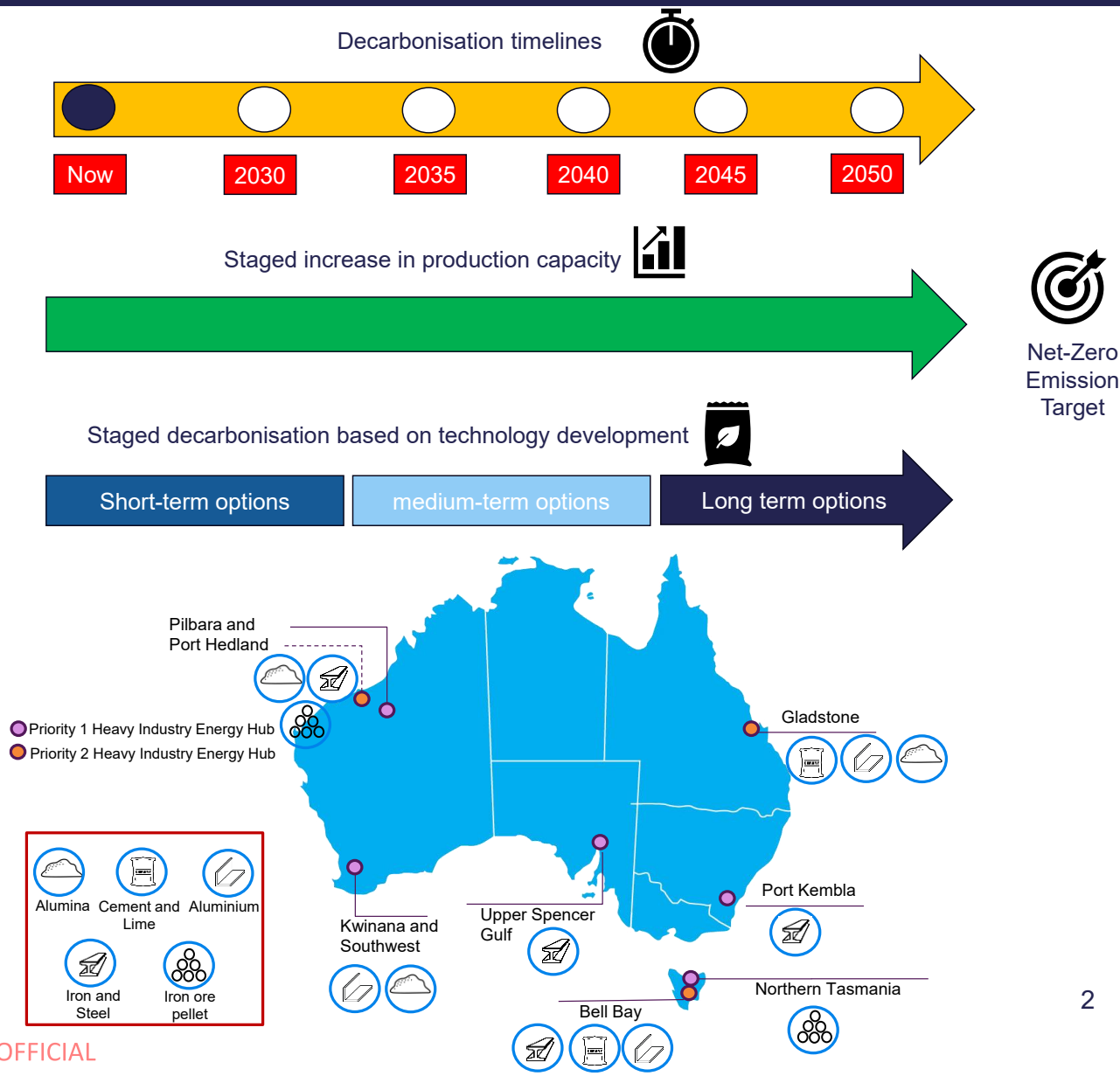
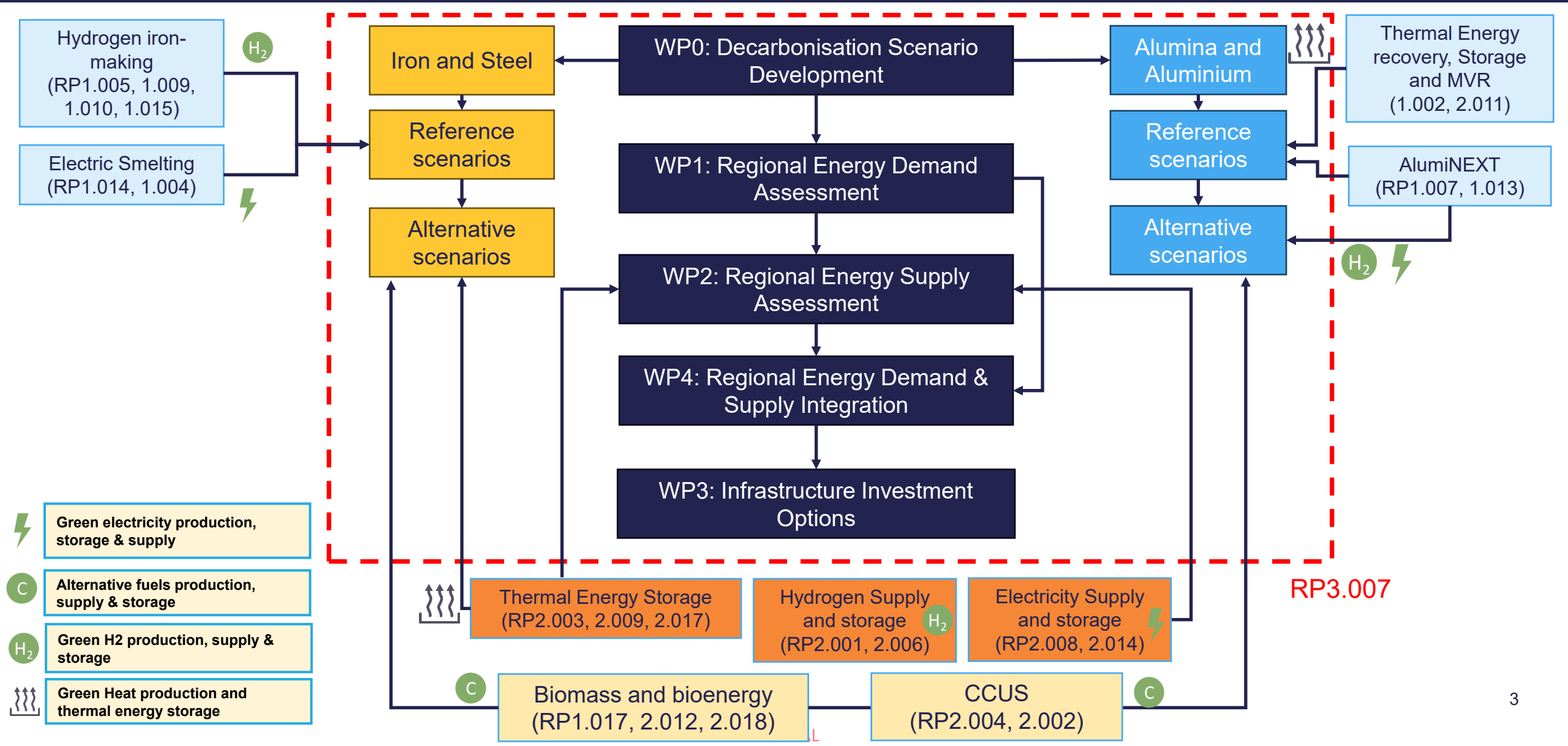
NEEDS & DRIVERS

- The transition towards a sustainable energy system will require significant investment in new energy infrastructure.
- This transition should begin with adopting technologies closest to the market and gradually transition to those currently under development.
- Short-term options could be adoption of more energy-efficient technologies or using transitional fuels where possible.
- The transition of Australia's heavy industrial sectors to a net-zero carbon future demands a comprehensive, regionally specific approach to energy system transformation.

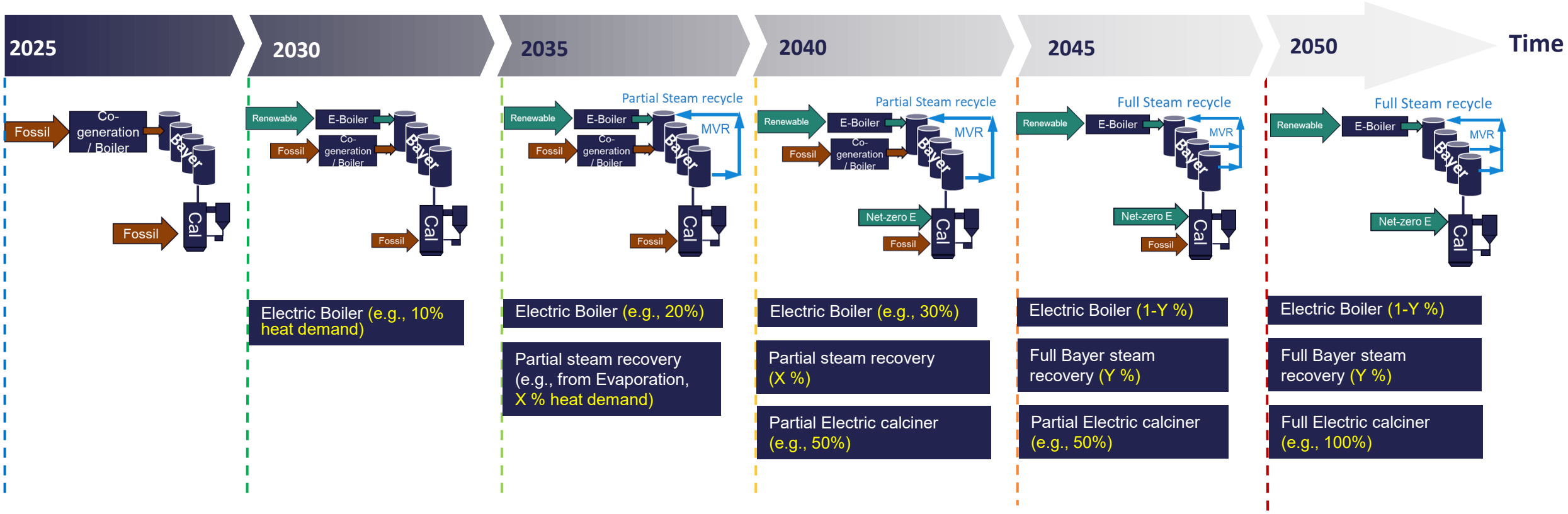


Energy infrastructure for net-zero industrial hubs

PROJECT STRUCTURE AND LINKS TO EXISTING PROJECTS



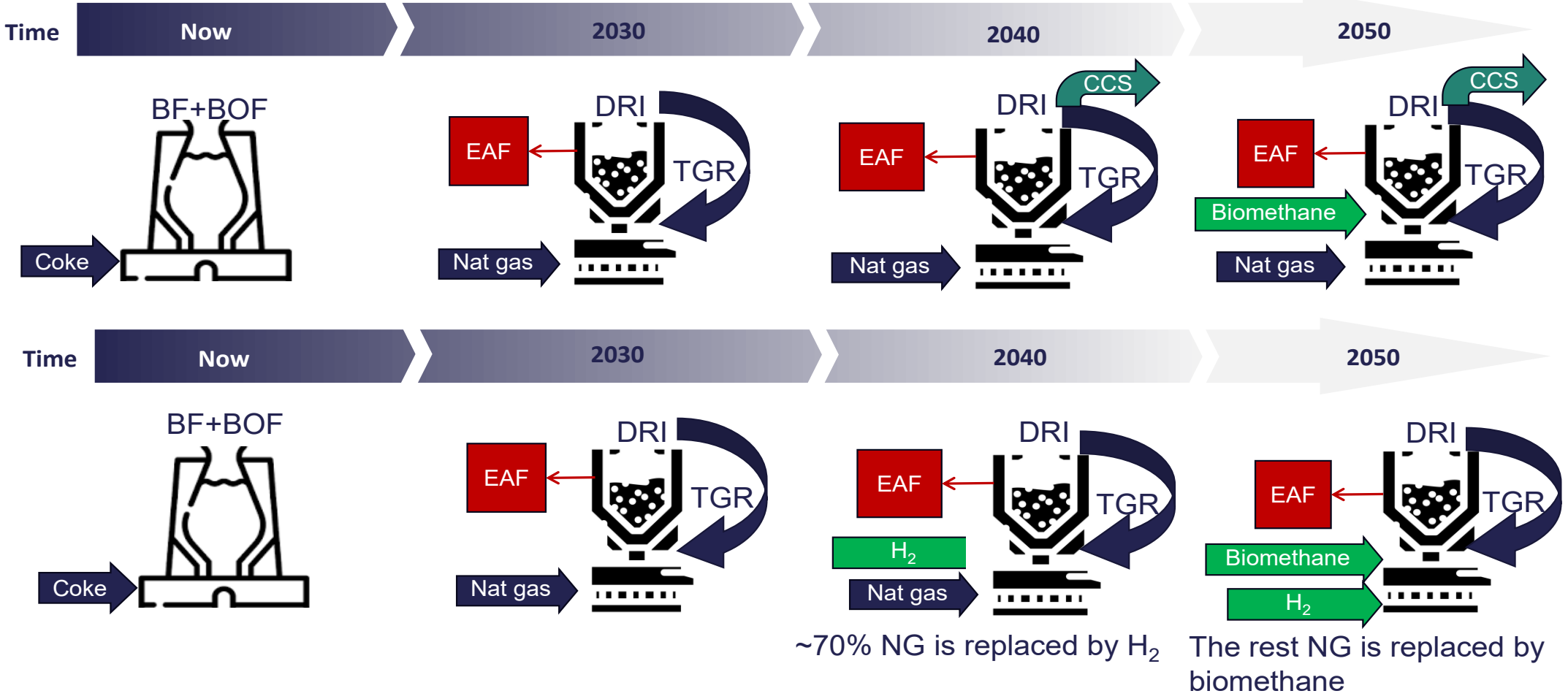
EXAMPLE: PROPOSED SCENARIO FOR NET-ZERO GIBBSITE-RICH ALUMINA (LOW T/P DIGESTION)



- Proposed Reference scenarios for decarbonisation of gibbsite-rich ore in alumina refinery.
- Scenarios are preliminary and will be refined through stakeholder engagement process.
- The CO_2 emission reduction profile and also the energy profile/mix is developed.
- Scenarios will be tailored based on the specific requirements of region (Scale, type of ore etc).

*Disclaimer: The decarbonisation scenarios presented here do not represent the strategic plans or projections of any specific entity within the region.

EXAMPLE - REFERENCE PATHWAYS OF NET-ZERO STEEL PRODUCTION IN WHYALLA



BF: Blast Furnace, BOF: Basic Oxygen Furnace, EAF: Electric Arc Furnace, DRI: Direct Reduced Iron

- Scenarios are preliminary and only for magnetite ores and will be further refined through stakeholder engagement

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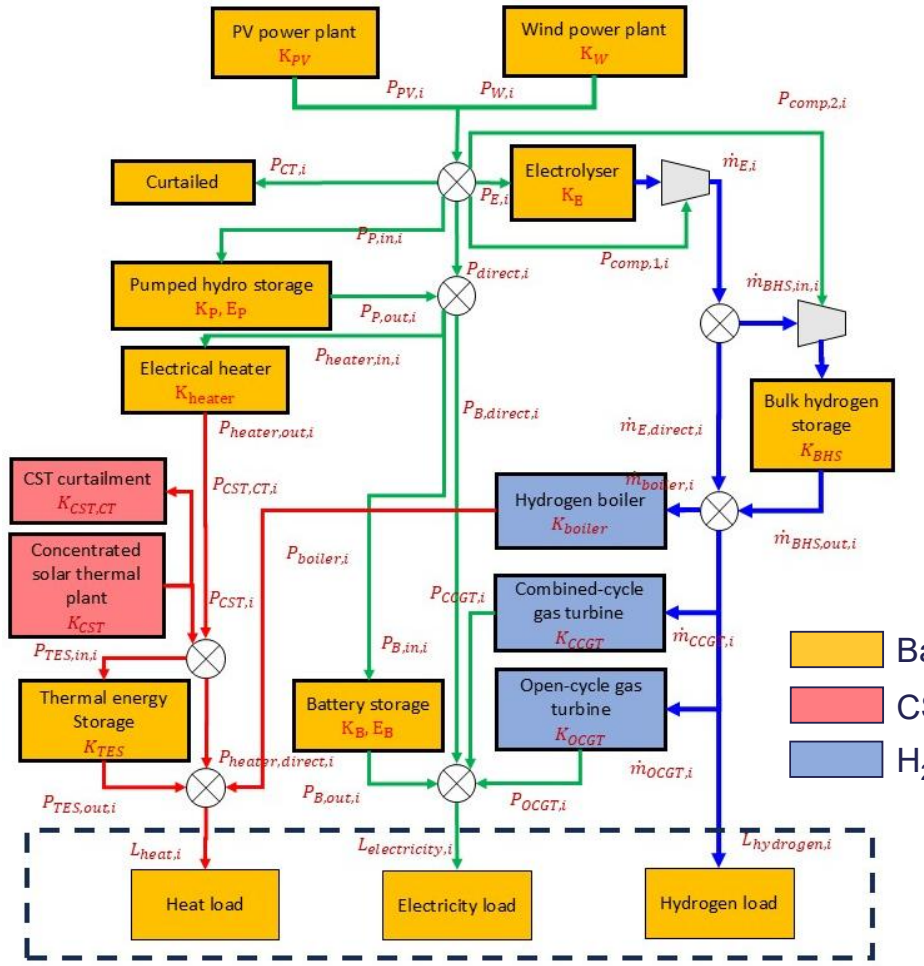
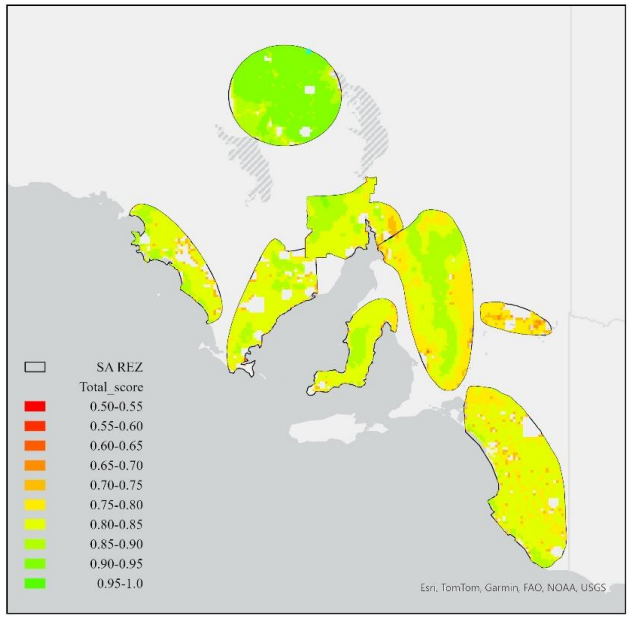
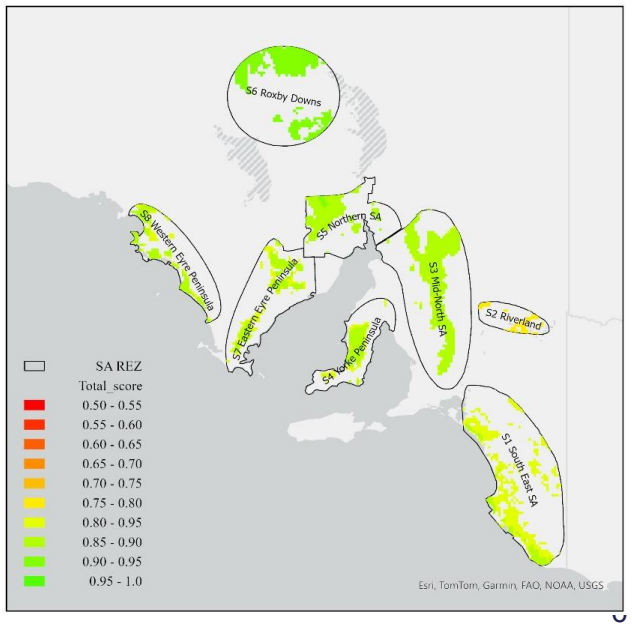
WP 2: DEVELOPMENT OF A HYBRID ENERGY SUPPLY MODEL



- Energy supply model, here illustrated for a preliminary and generic process.
- A linear programming model is developed using Python and MiniZinc to obtain the optimal solution.
- The model takes solar and wind traces as inputs.
- The objective function is to minimise the Levelised Cost of Energy (LCOE).
- Created a grid with a spatial resolution of approximately 4 km, consistent with the resolution of the wind resource data.

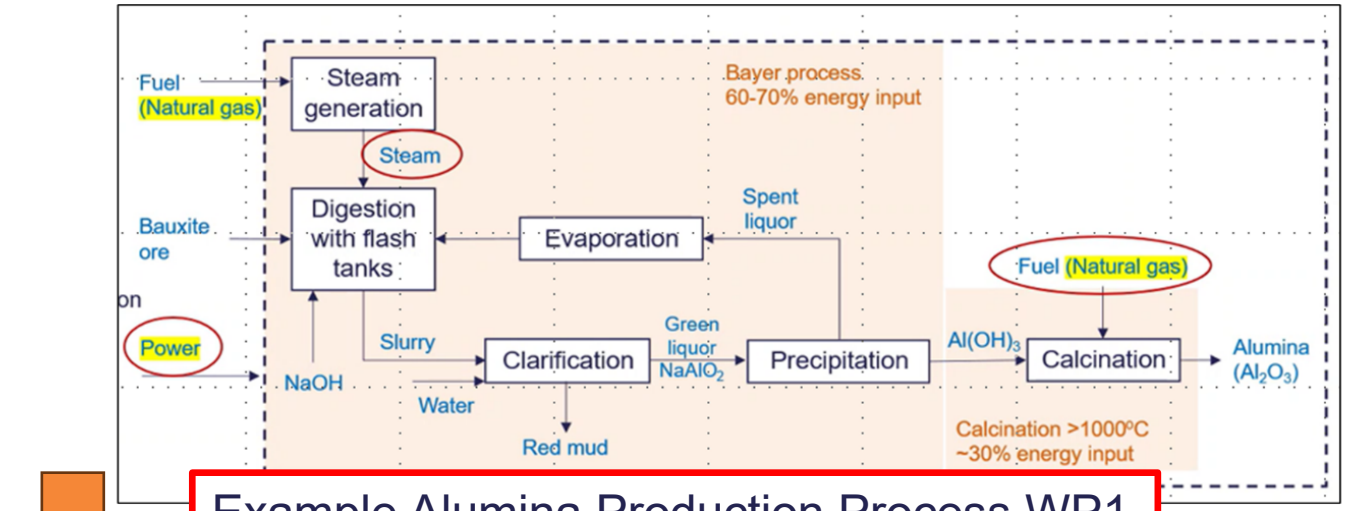
Total scoring maps for all grid cells across South Australia excluding unavailable areas. The polygons represent AEMO's Renewable Energy Zones (REZ)s.



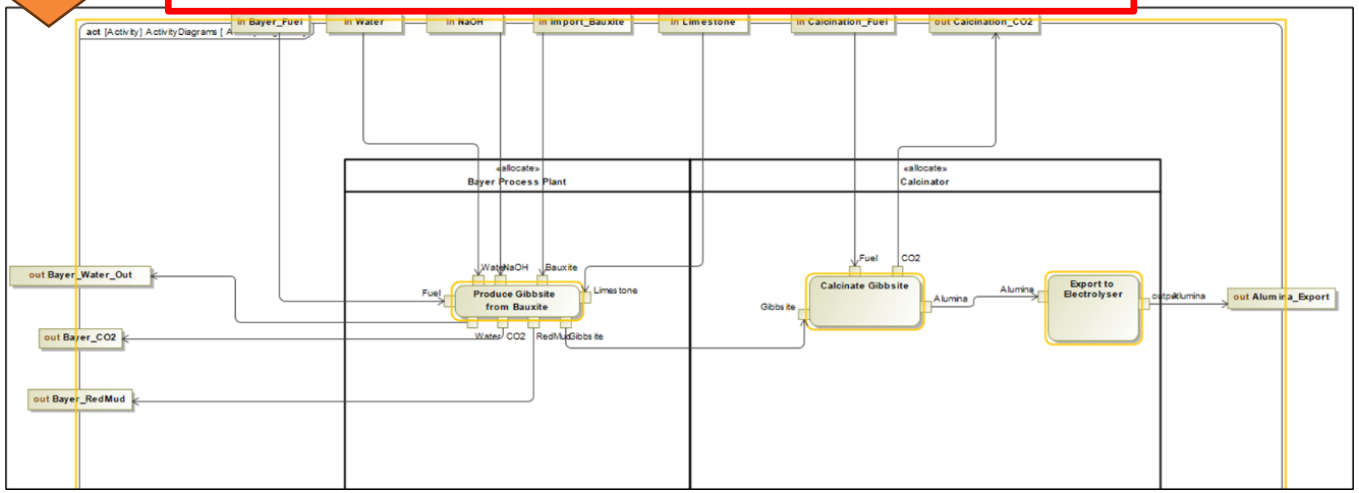


WP1, WP2 & WP 4: INTEGRATION OF ENERGY SUPPLY AND DEMAND INTO A SINGLE OPERATIONAL MODEL

- Integrated energy demand and supply models for optimal net benefit operation.
- This part of the project relies on Model-Based Systems Engineering (MBSE) approach to develop holistic, coherent and scalable multi-energy model.
- MBSE creates a unified digital model of the entire energy ecosystem, including all energy types, inputs, outputs, and related systems.



Example Alumina Production Process WP1



Example Alumina Production Process WP4

EXPECTED OUTCOME

- **Regional Energy Assessments:**
  - Tailored energy demand and supply projections for regional hubs, considering factors like industry type, technology adoption and product development
- **Investment Prioritisation:**
  - Cost-effective infrastructure by identifying the optimal energy for each hub, considering factors like technology, timing and total costs
  - Co-investment justification and the regional benefits
- **Integrated Energy Systems:**
  - Optimised energy management that can efficiently manage energy supply and demand across different sources and users
- **Technology Adoption and de-risking:**
  - Accelerated technology deployment
  - De-risk and remove barriers such as cost and uncertainties

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DE-RISKING DECARBONISATION FOR HEAVY INDUSTRY

Thanks for your attention

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