

**PROJECT TEAM** Xue Feng Dong<sup>1</sup> (Lead), Raymond Longbottom<sup>1</sup> (Lead), Brian Monaghan<sup>1</sup>, Paul Zulli<sup>1</sup>, Sheng Chew<sup>2</sup>, Ruwan Brell<sup>2</sup>, Peter Austin<sup>2</sup>

<sup>1</sup> University of Wollongong, Wollongong, NSW. Email: xuefeng@uow.edu.au and rayl@uow.edu.au

<sup>2</sup> BlueScope Steel

## PROJECT AIM

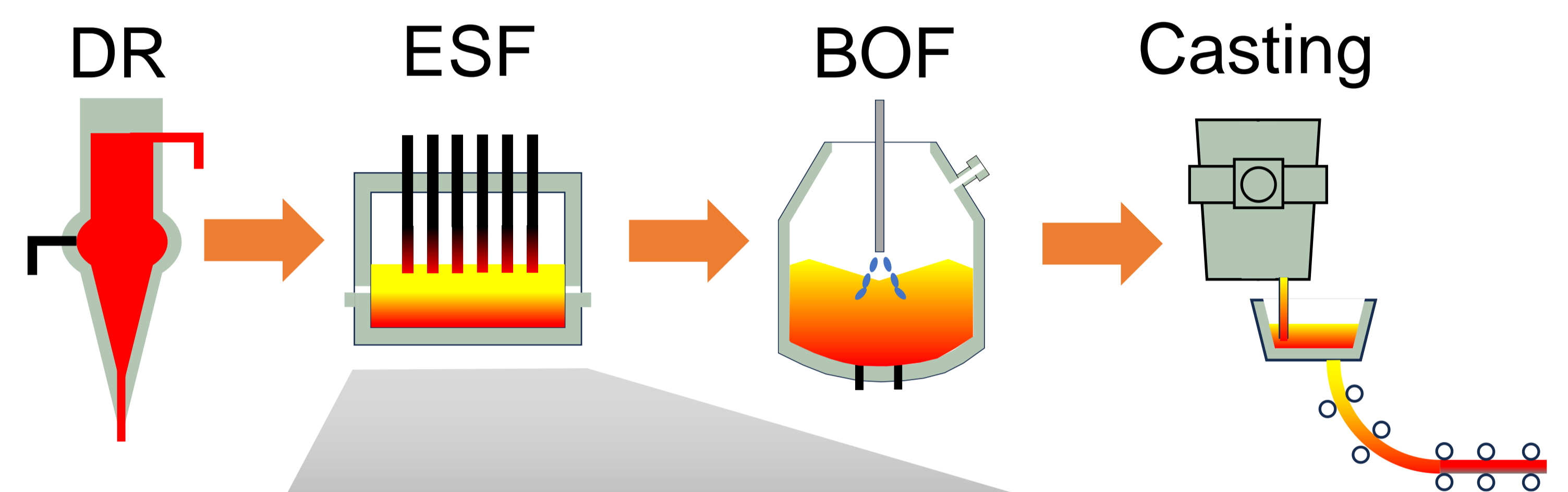
The Project will evaluate the metallurgical behaviours, performance and viability of direct-reduced Pilbara ore products for use in the electric smelting furnace (ESF) process to produce hot metal.

## PROJECT OVERVIEW

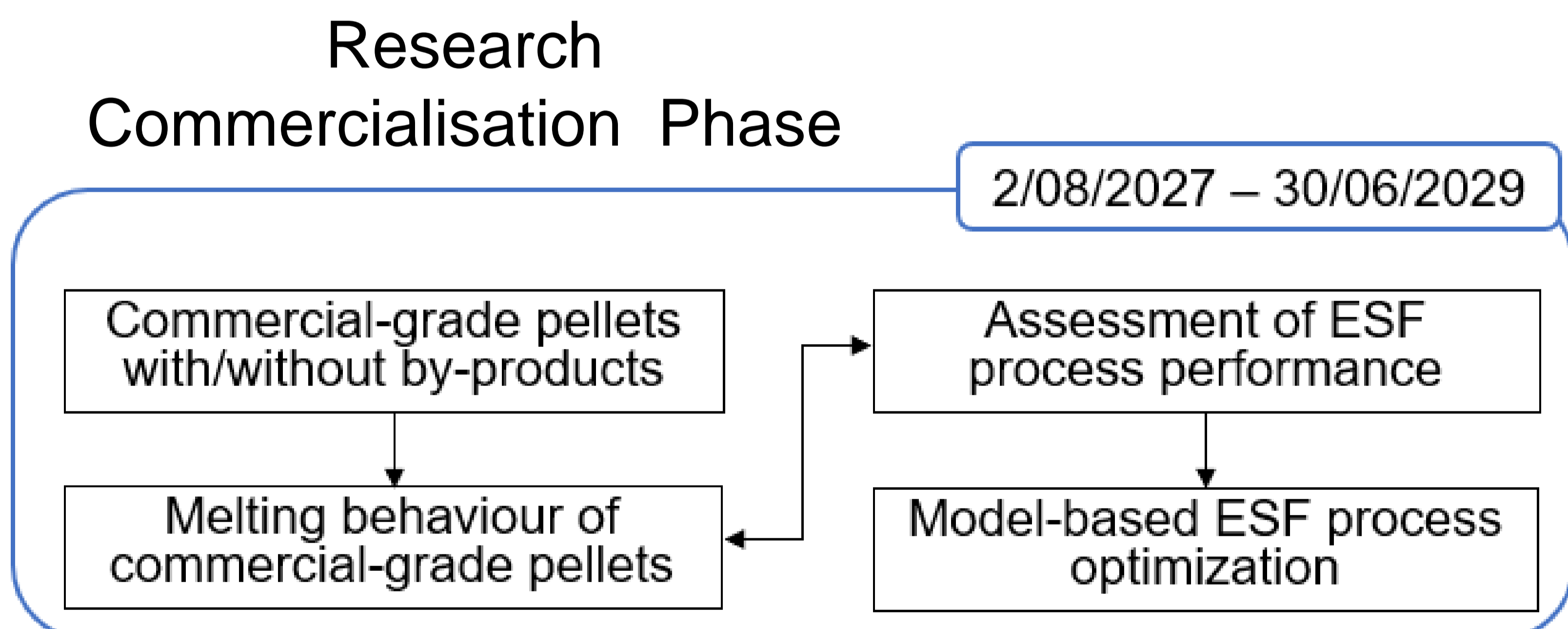
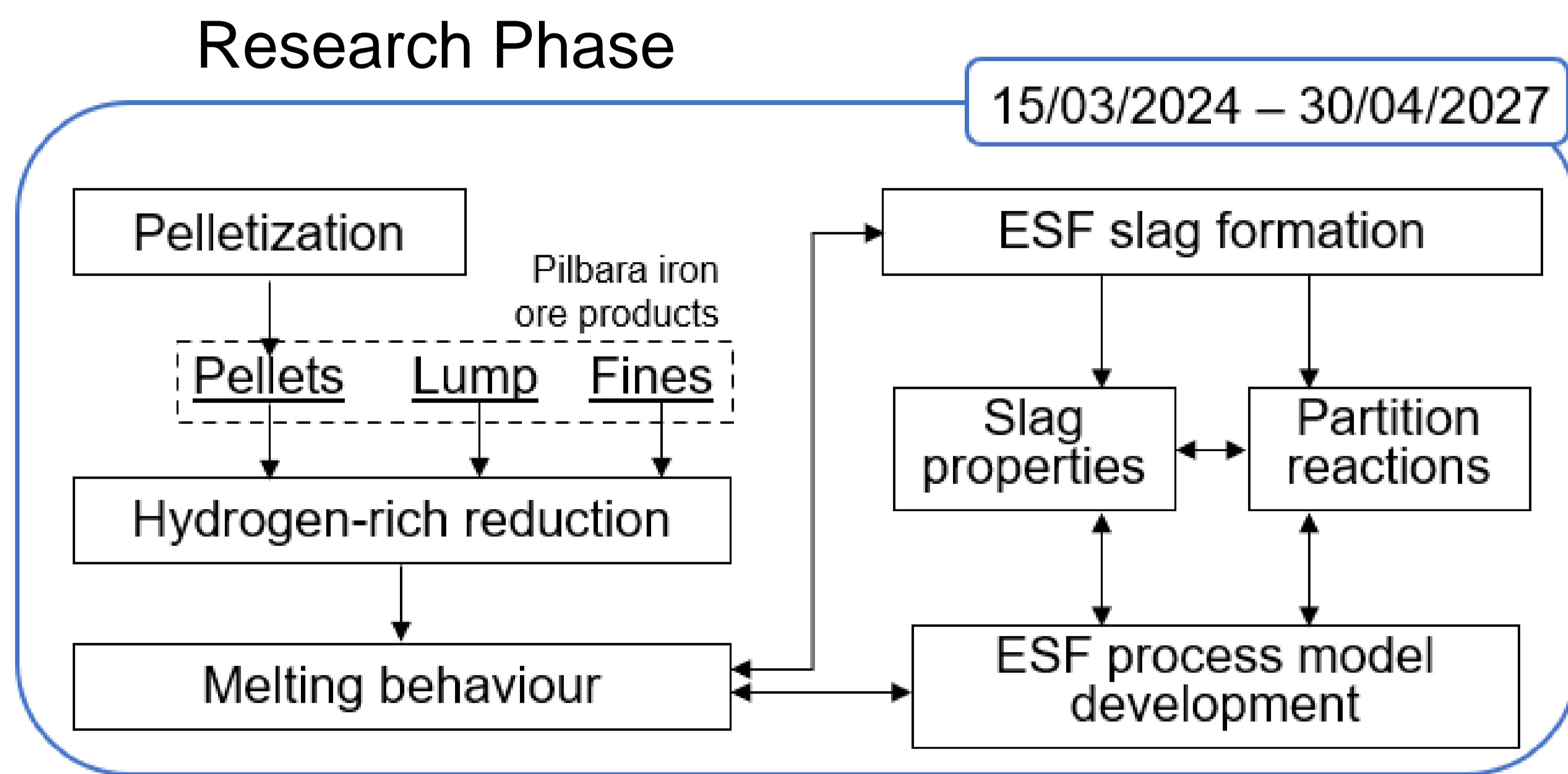
The Project Aim will be achieved through combining high-temperature experimental and computational modelling within two research phases. The Project will be pursued in partnership with BlueScope.

## KEY TECHNOLOGY

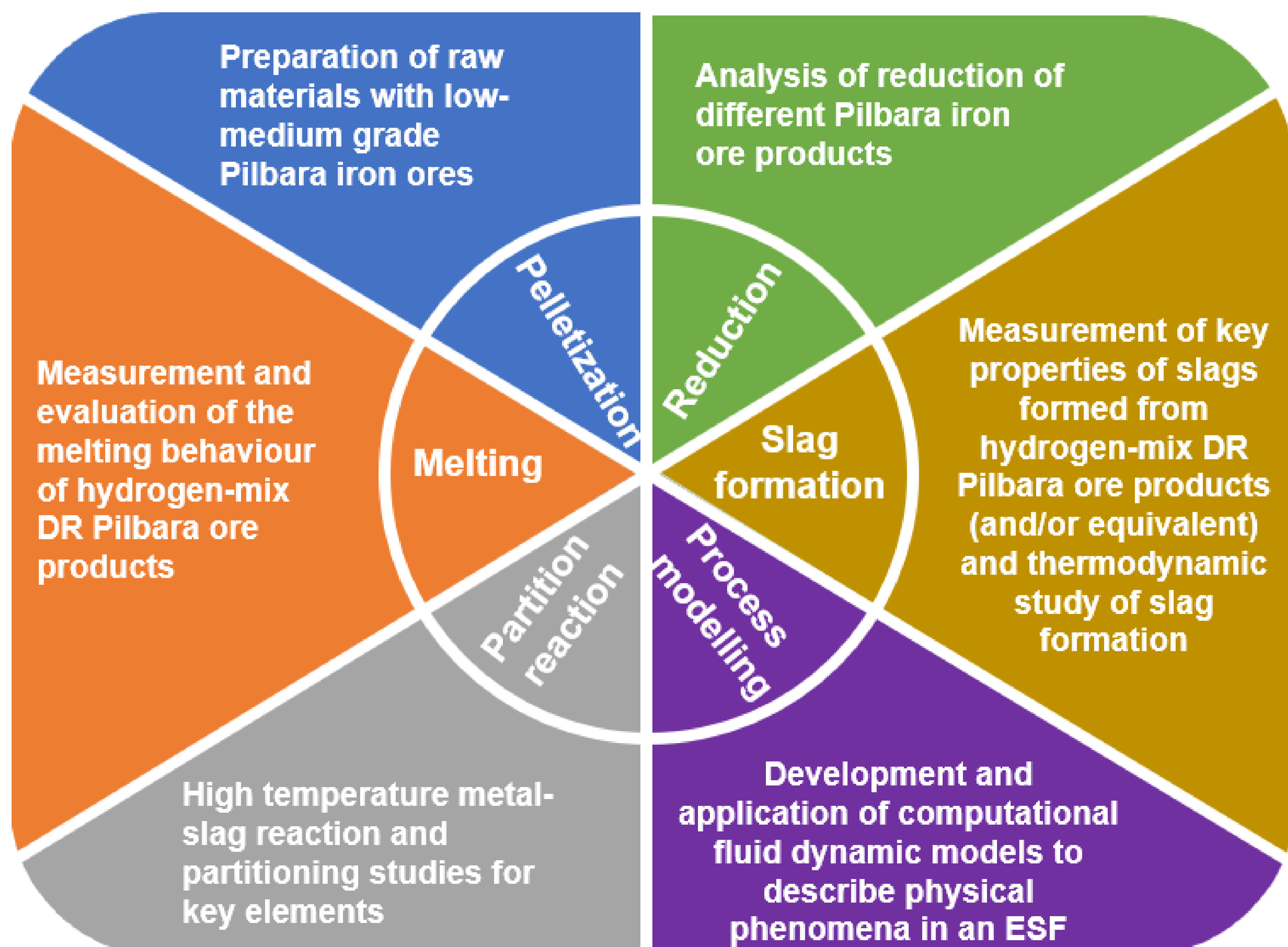
Development of the **ESF process technology** combined with direct-reduced iron process technology using higher levels of hydrogen, represents a breakthrough pathway for hot metal production through an innovative steelmaking route *viz.* Direct Reduction (DR)-ESF-Basic Oxygen Furnace (BOF).



Melting bath in an operating ESF for iron sands  
(<https://teara.govt.nz/en/iron-and-steel>)



## METHODS AND EXPECTED RESULTS



## POTENTIAL BENEFITS OF DR-ESF-BOF ROUTE

- Emissions Abatement
  - Normal reduction of CO<sub>2</sub> emissions up to 50%<sup>[1]</sup>
  - Near-zero emissions potential\*
  - Efficient energy and material usage
- Utilisation of low-medium grade iron ore
- Reaching up to 12% of global steel production by 2050<sup>[2]</sup>

\* Utilisation of green hydrogen, renewable electric energy and bio-carbon  
<sup>[1]</sup> Natural gas - based DR - ESF - BOF route, [https://www.bluescope.com/content/dam/bluescope/corporate/bluescope-com/investor/documents/2023\\_BlueScope\\_Presentation\\_Investor\\_Day\\_September.pdf](https://www.bluescope.com/content/dam/bluescope/corporate/bluescope-com/investor/documents/2023_BlueScope_Presentation_Investor_Day_September.pdf)  
<sup>[2]</sup> Fleischanderl A. 9th Int. Conf. on Sci. and Techn. of Ironmaking. Bremen, Germany; 2022

## NEXT STEPS

- Preparation of raw materials with low-medium grade Pilbara iron ores
- Thermodynamic study of slag formation
- Development of computational fluid dynamic simulation models for the ESF process