



INNOVATION FUND

Driving clean innovative technologies towards the market

AAL SEB: Using flexible electrical demand to facilitate higher levels of renewable energy

The Innovation Fund is 100% funded by the EU Emissions Trading System



Project summary

The AAL SEB project aims to partially decarbonise the production of high-pressure steam used in Aughinish Alumina's aluminium refinery, by substituting existing gas-fired boilers with an electric boiler powered during peak renewable production. The project will enable the use of renewable electricity that would otherwise be constrained or curtailed. The 25 MW high pressure electric boiler will replace close to 10% of the current demand for steam at the site and avoid 5% of GHG emissions compared to a conventional technology.

COORDINATOR

Aughinish Alumina Ltd

LOCATION

Ireland Aughinish Island, Askeaton, Co. Limerick

SECTOR

Non-ferrous metals

AMOUNT OF INNOVATION FUND GRANT

EUR 4 238 896

RELEVANT COSTS

EUR 7 064 827

STARTING DATE

01 January 2022

PLANNED DATE OF ENTRY INTO OPERATION

Q3 2023

The choice of electrification over alternative fuels

The project will be the first application of a high-pressure electric boiler within an energy intensive industry. Whilst to date the operating limit of electric boilers has been 30Barg¹, the high pressure and high voltage boiler used in this project will operate at 62Barg. Electrification is the most convenient of all the alternative options for replacing the gas-fired boiler and to produce high-pressure steam. The electric boiler will offer larger power capacity than current hydrogen-based technologies, will not rely on raw material availability that usually constrains bio-methane and will avoid the logistical challenges of biomass.

The plant's constant steam demand will be guaranteed by using already proven smart controls, enabling the interaction of the electric boilers (operated by a non-constant supply of renewable energy) with the existing CHP steam generation.

Supporting larger renewable penetration through dispatchable demand

The AAL SEB project will deliver zero-carbon heat, representing close to 10% of the current demand for steam of the alumina plant, thereby avoiding 5% of GHG emissions.

The benefits from commissioning the electric boiler are economic for both the company and the local electricity supply chain: it will (1) operate during times of high renewable generation (i.e. when wholesale prices are low); (2) reduce the need for wind generation curtailment (i.e. the wind farms located in the same grid constrained area as Aughinish will operate at higher output levels); and, (3) offer demand response services to the grid operator (reducing the need for peak electricity generation from fossil fuel generators).

Large scale-up potential within industries with high-pressure steam needs

The project has good potential for further on-site expansion, based on the on-site demand for steam. There is also a large potential for transferring the innovative solution to other sites of the aluminium production company that operates in 13 different countries.

The technology is not associated with any significant resource constraints, making it easily replicable in other industrial sectors requiring high-pressure steam to reduce their reliance on natural gas (e.g. dairy, food, beverage and pharmaceutical). In those sectors in Ireland only, electric boilers operating 33% of the year could save 1.4 million tCO₂ per year.

1 Barg is a unit for measuring gauge pressure (i.e., absolute pressure minus atmospheric pressure)