



Best practice in RFCS projects COAL

RFCS Summit 2022



Brussels 21-22 March 2022

CoalTech2051 - An RFCS Accompanying Measure on European coal research in light of EU policy objectives to 2050 and future global trends in coal use - 794369

The project developed a strategic agenda for RFCS aligned with the EU's Energy Union vision and established a European Network to support the energy transition in the coal regions..



CoalTech2051 History

This project prepares the ground for and creates a European Network for Clean Coal Technologists by initiating the activities that such a network should undertake with technical experts – workshops, working group meetings and strategic reports.

The project will establish the network with a structure that allows it to continue beyond the project end date. The structure must therefore reflect the likely income from members of the network and its future activities.

CoalTech2051 main objectives

- To disseminate and promote results from projects supported by the RFCS at workshops;
- to develop, and present in the project report, a strategic research agenda in collaboration with the RFCS Coal Advisory Group that will help establish the future research priorities for the RFCS Research Programme; and
- to establish a self-sustaining European Network of Clean Coal Technologists that would enable the ongoing promotion and success of the Programme after the project has ended.

Data sheet CoalTech2051



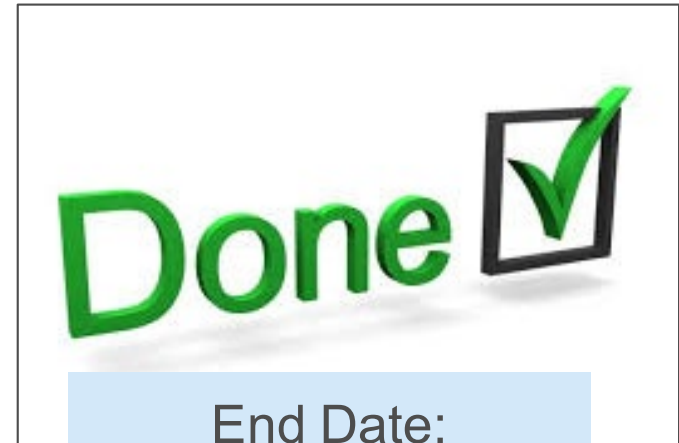
Start Date:

01/07/2018



EU Grant

€ 365,660



End Date:

30/06/2020

[THE FUTURE OF COAL | a project supported by the European Union \(coaltech2051.eu\)](http://coaltech2051.eu)



GreenDealCO2 – 709694

The project identifies pathways for the retrofitting of end-of-life coal power plants to biomass, alternative solid fuels and hydrogen, while introducing new business plans for the coal industry.

Project history

Project has started very successful with promising results for the design and implementation of the European Green Deal

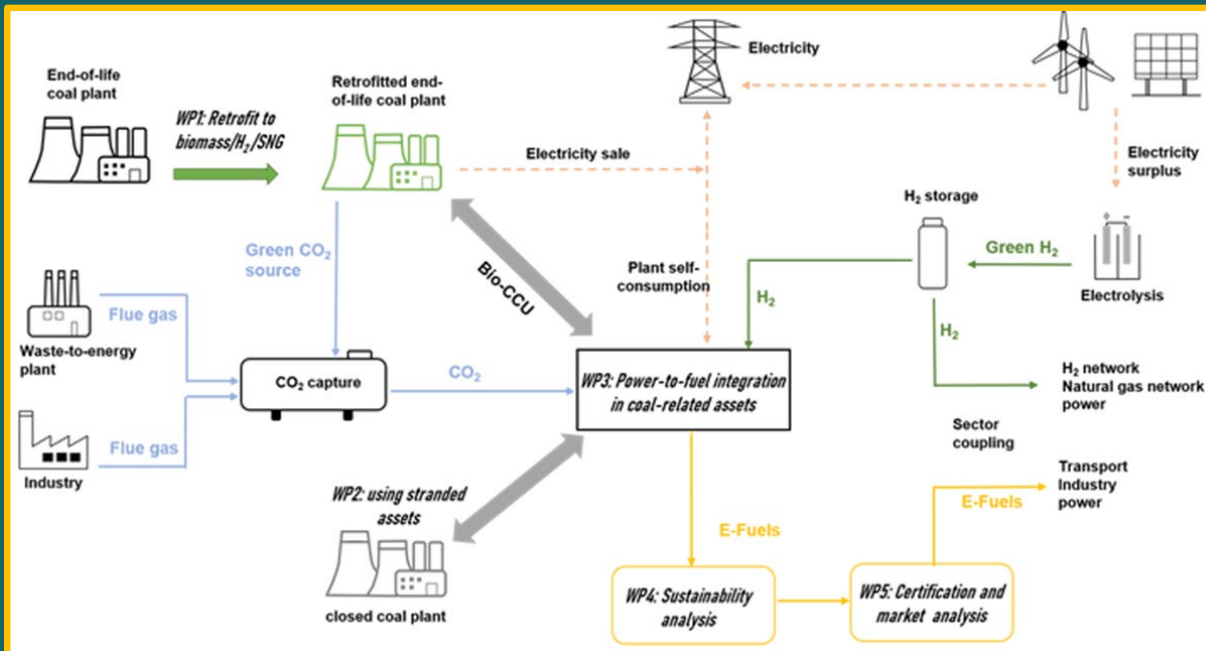
Project opens a new possibility towards independent energy supply

Started with preliminary considerations in the project RECCP we will reach TRL 4-5 with the project GreenDEALCO2

The success of the project is to be continued

Our ambition is the further development of our concepts towards real applications

□ With the support of the RFCS 'Big ticket for coal' we aim to reach TRL 7-8



The key outcomes of GreenDealC02

Management and coordination

- Kick-off meeting in June and big workshop in October 2021
- Launch of a storage platform for facilitated data exchange between the partners
- Launch of our website

Retrofitting of end-of-life coal power plants:

- Greek coal power plant with good conditions was defined
- Technical and economical calculations and evaluations are in progress
 - active exchange and discussions between the partners
 - perfect complementation with each other through the individual areas of expertise

Data sheet GreenDealCO2



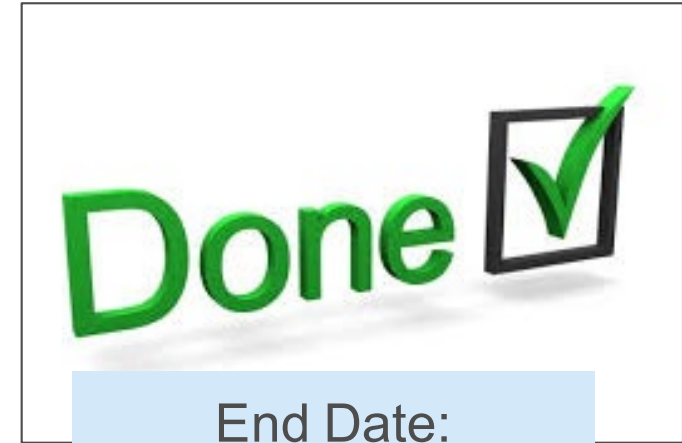
Start Date:

01/08/2021



EU Grant

€ 1,535,886



End Date:

31/07/2024

[GREANDEALCO2_Funding & tenders \(europa.eu\)](https://europea.eu)

[GreendealCO2/](#)

METHENERGY PLUS - Methane recovery & harnessing for energy & chemical uses at coal mine sites- 754077

Project proposed integrated approaches for upgrading methane emissions from working shafts and abandoned mines in a potential source of clean energy and chemicals.



European
Commission



Research Fund
for Coal & Steel



Universidad de Oviedo
Universidá d'Uviéu
University of Oviedo

METHENERGY Plus partners

To achieve these targets, the project is composed of eleven partners from seven different countries (Spain, United Kingdom, Greece, Sweden, Poland, Czech Republic and Slovenia), highlighting the collaboration of both, universities and research centers, as well as companies in the coal and natural gas sectors.

METHENERGY Plus main goal

The final goal of the project is to propose integrated approaches from the optimization of VAM and AMM extraction procedures to the fully upgrading of the methane contained in these streams.

For this purpose, the project includes in-situ geological studies, experimentation at lab scale, and computer-aided simulation and optimization processes.

- WP1** Optimisation of the ventilation systems
Working conditions and geological features
- WP2** Adsorption technologies for methane recovery in VAM
- WP3** Membrane technologies for methane recovery in VAM
- WP4** Combustion technologies
- WP5** Chemical upgrading of VAM
- WP6** Evaluation and integration

Data sheet - MACOPilot



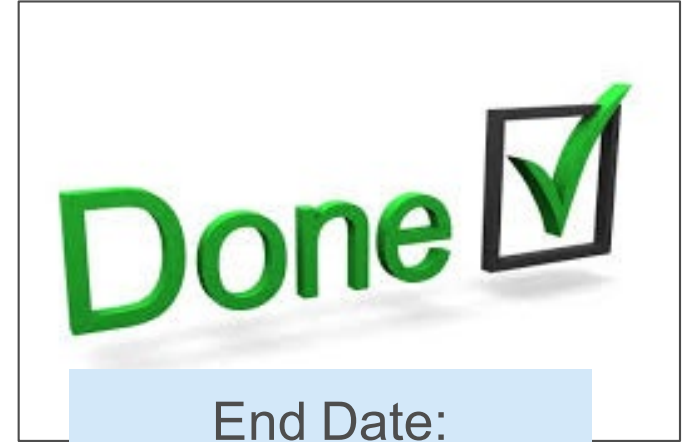
Start Date:

01/07/2017



EU Grant

€ 1,678,137



End Date:

30/06/2020

[METHENERGY+ \(rfcs-2016\) – Universidad de Oviedo / Universidá d'Uvieu / University of Oviedo \(unioviedo.es\)](#)

[Funding & tenders \(europa.eu\)](#)



SUMAD - Sustainable Use of Mining Waste Dumps - 847227

The project develops an operational **computer-based risk management tool** for the **reuse of mining waste tips** for better, safer, economical solutions for post-mining spoil waste dumps.



SUMAD history

Europe has exploited coal and lignite for decades for the production of energy. Inferior quality by-products have formed visible mountains, called slag heaps. These mounds, which are strewn over mining regions, are sometimes reused in some way, but most often remain abandoned.

The SUMAD project is the first European project supported by RFCS (Research Funding for Coal and Steel), which looks into ways of reusing slag heaps resulting from the exploitation of coal and lignite in Europe. The main objective is to determine and assess reuse methods for these waste dumps, thus contributing to the energy transition of mining regions.

The project will depend largely on feedback in Europe and worldwide and will address the technical, social and economic challenges. The project will study, in particular, the possible use of these waste dumps for the installation of photovoltaic panels and wind turbines. Ineris is principally going to contribute to the stability study of waste dumps with the help of physical and digital modelling. The project ought to result in the development of an operational risk management tool for the reuse of mining waste dumps.

This project, which was started in July 2019 and will end in July 2022, groups ten European partners from five countries (Poland, Greece, Czech Republic, France and the United Kingdom).

Main objective of SUMAD project

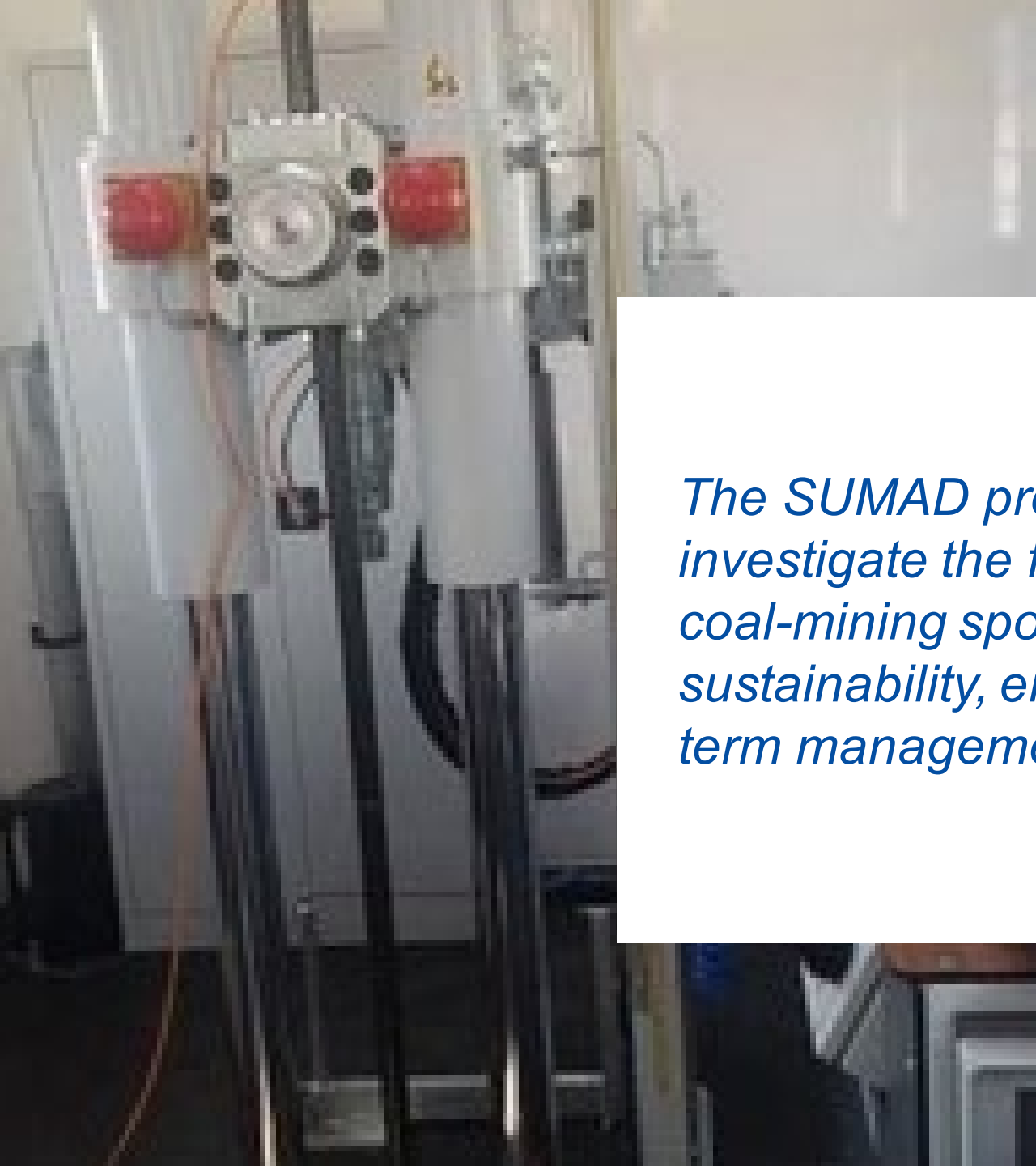
The aim of the SUMAD project is to determine ways to optimise the use and long-term management of mining spoil dumps.

Spoil dumps are the massive heaps of overburden materials that are excavated during the coal extraction process.

The spoils can contain a wide range of rock fragments and fines. Randomness in the dumping process, various methods for the excavation and transportation and local site effects can influence the spoil behaviour in a dump site.

Hence, the dump spoil materials are usually considered as heterogeneous and exhibit a time-dependent mechanical behaviour.

This project unites European experts to investigate the future use of made-ground consisting of coal-mining spoil with a focus on geotechnical, sustainability, environmental and socio-economic challenges.



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Data sheet - SUMAD



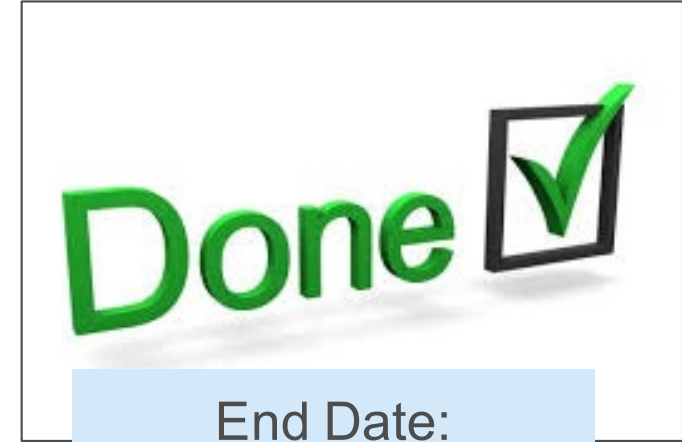
Start Date:

01/07/2019



EU Grant

€ 2,022,399



End Date:

30/06/2022

[SUMAD Funding and Tender Portal](#)



RECOVERY - Recovery of degraded and transformed ecosystems in coal mining-affected areas - 847205

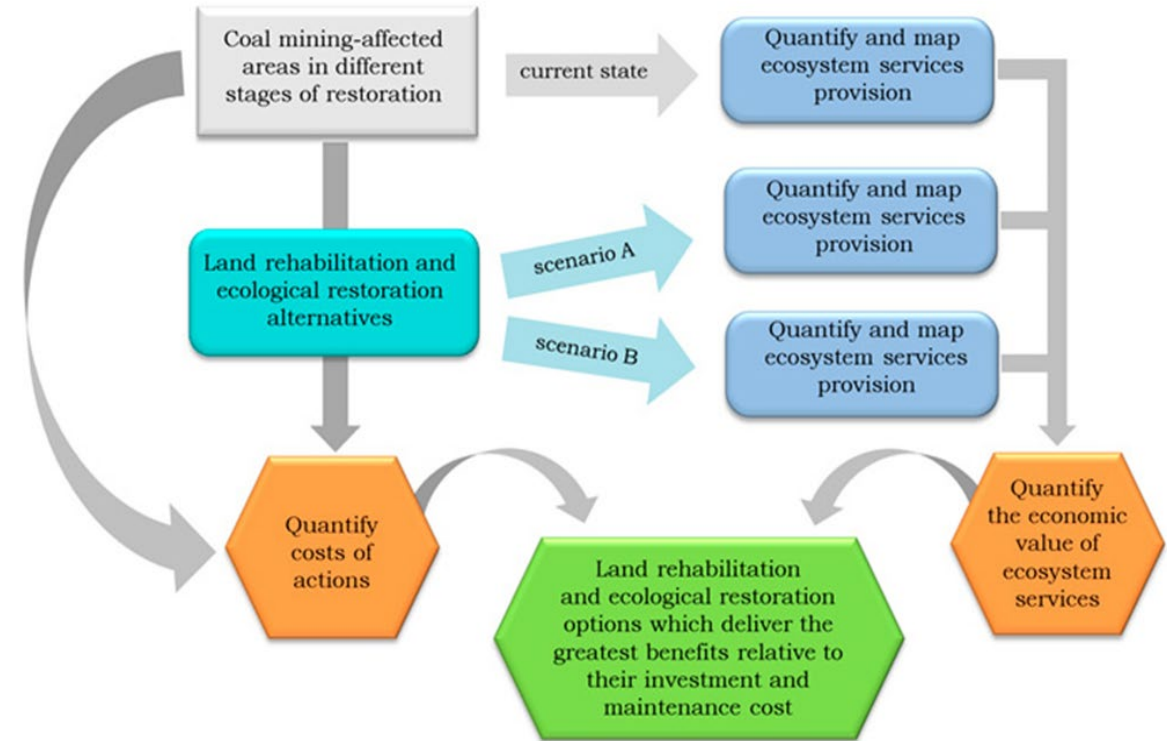
Land rehabilitation and ecological restoration of coal mining-affected areas, aiming to accelerate the recovery of degraded and transformed ecosystems to a good ecosystem status. It will assess the contribution of these ecosystems to human wellbeing by means of the “ecosystem-services” concept, evaluating the consequences of alternative courses of action to ensure their capacity to provide benefits to society is not diminished but, if possible, improved.

To achieve these goals, the major aim of the project is to increase the impact of rehabilitation and ecological restoration actions on society and environment, demonstrating the opportunities to improve overall public welfare.

RECOVERY methodology

By quantifying the costs of the alternative land rehabilitation and ecological restoration actions as well as the economic value of the ecosystem services provision, it will be possible to determine which options will deliver the greatest benefits relative to their investment and maintenance cost.

The methodology to be employed in RECOVERY is shown hereafter:



main objective

- RECOVERY Project will develop a framework for land rehabilitation and ecological restoration of coal mining-affected areas, aiming to accelerate the recovery of degraded and transformed ecosystems to a good ecosystem status.
- It will also develop artificial substitutes for soils suitable to several types of plant communities, addressing 'difficult terrains' in coal mining waste heaps.





Expected benefits for the European coal sector

1. Delivering a blueprint instrument/indicator for both coal mining impact assessment and post-mining landscape (e)valuation, to make recommendations for future planning and development of post-mining landscapes.
2. Delivering detailed costs of alternative land rehabilitation and ecological restoration actions, as well as the benefits in the provision of ecosystem services, addressing specifically coal mining-affected areas.
3. Delivering a first set of suitable indicators that will allow a proper quantification of ecosystem services involved in coal mining-affected areas.
4. Delivering feasible valuation techniques as well as optimal discount rates for ecosystem services in coal mining-affected areas.
5. Delivering an innovative framework for land rehabilitation and ecological restoration of coal mining-affected areas, conceived as “Best practice guidelines” aiming to accelerate the recovery of these degraded and transformed ecosystems to a good ecosystem status.
6. Developing artificial substitutes for soils suitable to several types of plant communities that provide a wide range of ecosystem services, addressing ‘difficult terrains’ in coal mining waste heaps.
7. Proposing suitable land rehabilitation techniques that allow successful environmental and vegetal developments in coal mining waste heaps.

Data sheet - RECOVERY



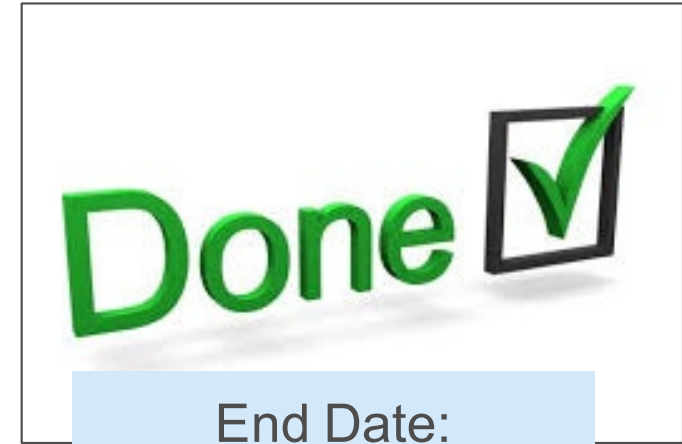
Start Date:

01/07/2019



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€ 1,188,196



End Date:

30/06/2023

[Recovery Project – EU RFCS Project \(uniovi.es\)](https://uniovi.es)



RAFF - Risk Assessment of Final Pits During Flooding- 847299

The project develops model-based methodologies and guidelines for a safer exploitation of pit lakes dedicated to recreational purposes, the common reclamation method of open-pit mines.



RAFF history

For many post-mining areas, flooding of final pits, besides being the most rational method of reclamation, also gives a possibility of enhancing socio-economic conditions of the neighbouring areas and improving the water balance. However, **stability of pit lake slopes during and after flooding process** remains an area of uncertainty. There are many examples of geotechnical failures of pit lakes' slopes and banks which were quite well documented.

These events gave rise to the idea of the RAFF project (Risk Assessment of Final Project During Flooding).

Another issue is the **quality of water in pit lakes**, which must meet certain requirements. A properly carried out process of final pit flooding has an impact on the water quality, and the water quality determines potential uses of the created water reservoir. The complexity of issues connected with the abandoned pits flooding requires preparation of comprehensive models.

The project's activities include identifying all the crucial factors for pit lakes formation, developing a methodology of assessing geotechnical conditions and their changes during and after flooding process; and developing a methodology and tools for assessment of water conditions changes in the pit lakes and their surroundings. The relevance of the project is very high as many open-pit mines are intended to be partially backfilled with leftover rocks and then flooded in the future.

Another reason is that **environmental protection and safety regulations** have become more restrictive. Gaining better knowledge about flooding processes allows the risks connected with open-pit mine closure to be minimized and enables better management of post-mining areas reclamation.

RAFF main objectives

The RAFF project aims to research issues related to pit lakes, which is one of the most common uses of post exploitation voids.

The main achievements in the project are connected with the creation of comprehensive models that can be used for risk assessment purposes.

Innovative outcomes of the project will contribute to methodologies and guidelines to improve the safety, security, and environment aspects of flooded open pit mines.

The project will carry out in-situ investigation, laboratory tests, and numerical and physical modelling to achieve the objectives.

Planned activities

- Identification of hazards in pit lakes
- Assessment of geotechnical conditions and their changes during and after flooding process
- Assessment of hydrodynamic and hydrochemical conditions in open pit mine lakes
- Risk assessment guidelines for pit lake flooding

Data sheet - RAFF



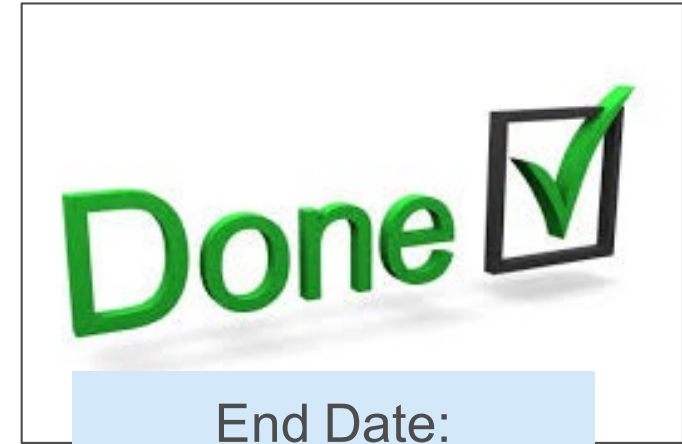
Start Date:

01/06/2019



EU Grant

€ 2,050,532



End Date:

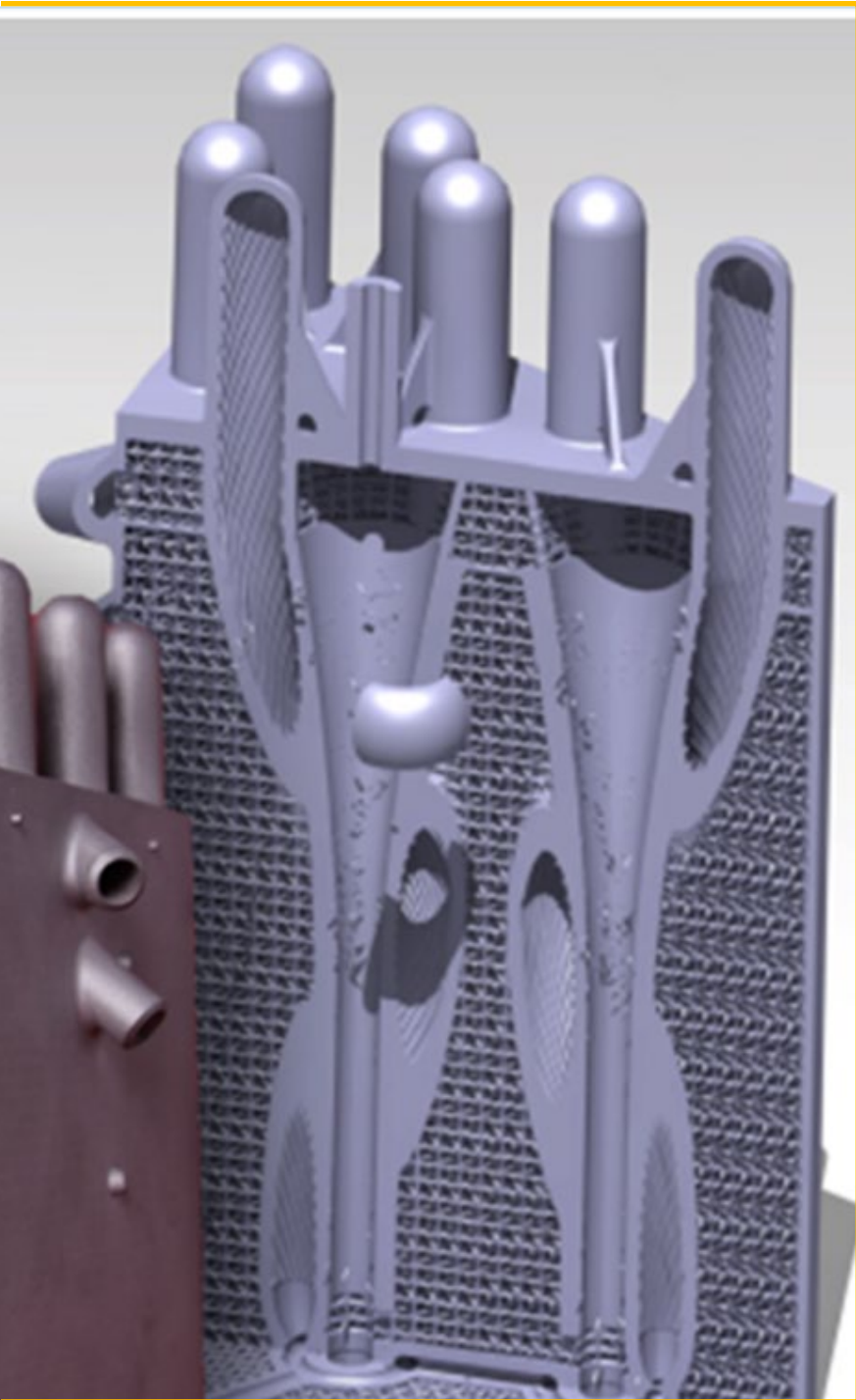
31/05/2022

[Poltegor Risk assessment of final pits during flooding \(RAFF\) - Poltegor \(igo.wroc.pl\)](http://igo.wroc.pl)



i3upgrade - Integrated and intelligent upgrade of carbon sources through hydrogen addition for the steel industry - **800659**

The project investigated new reactor concepts for direct methanation and methanol synthesis of coal-based by-product gases in order to reduce the overall coal-based CO₂ emissions of steel works.



i3upgrade history

The valorization of integrated steelworks process off-gases as feedstock for synthesizing methane and methanol is in line with European Green Deal challenges. However, this target can be generally achieved only through process off-gases enrichment with hydrogen and use of cutting-edge syntheses reactors coupled to advanced control systems. These aspects are addressed in the RFCS project i3upgrade and the central role of hydrogen was evident from the first stages of the project.

First stationary scenario analyses showed that the required hydrogen amount is significant and existing renewable hydrogen production technologies are not ready to satisfy the demand in an economic perspective.

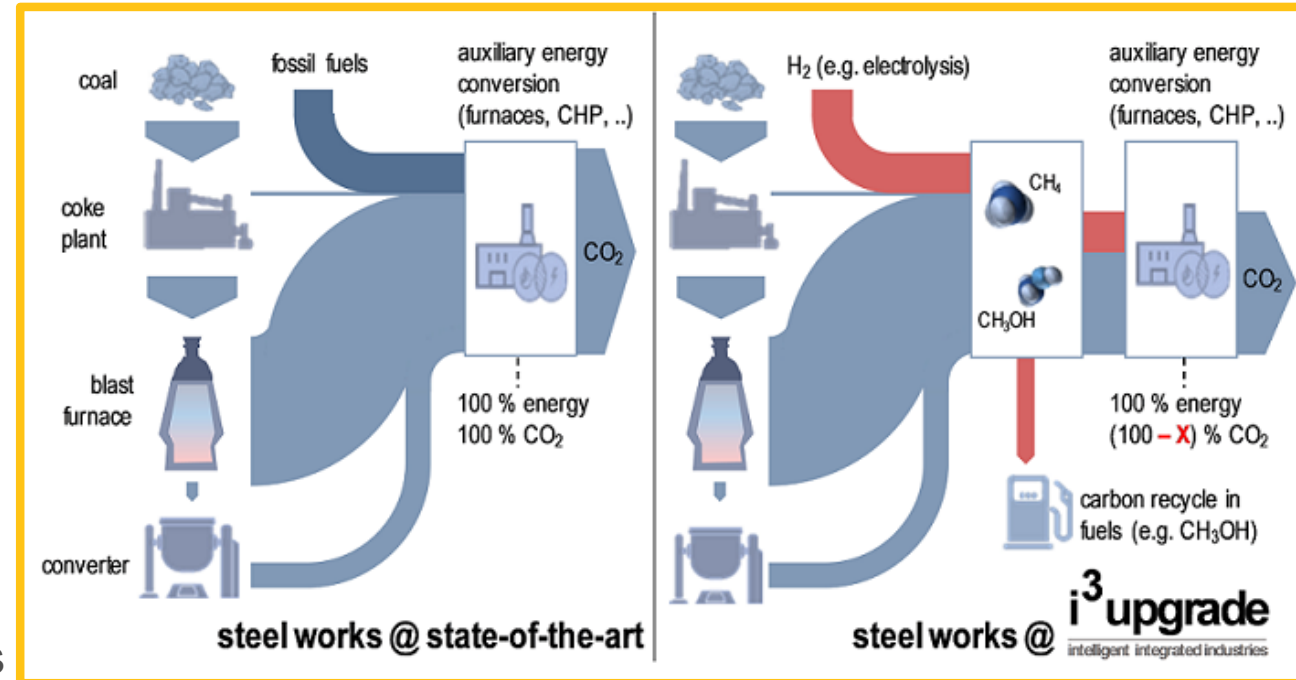
The poor availability of low-cost green hydrogen as one of the main barriers for producing methane and methanol from process off-gases is further highlighted in the application of an ad-hoc developed dispatch controller for managing hydrogen intensified syntheses in integrated steelworks.

The dispatch controller considers both economic and environmental impacts in the cost function and, although significant environmental benefits are obtainable by exploiting process off-gases in the syntheses, the current hydrogen costs highly affect the dispatch controller decisions.

This underlines the need for big scale green hydrogen production processes and dedicated green markets for hydrogen-intensive industries, which would ensure easy access to this fundamental gas paving the way for a C-lean and more sustainable steel production.

i3upgrade main objective

- i3upgrade aims at the intelligent and integrated upgrade of carbon sources in steel industries through hydrogen intensified synthesis processes.
- In contrast to established synthesis processes, the project targets direct methanation and methanol synthesis of by-products in steel works under dynamic and transient conditions being operated by advanced control strategies.
- Agent-based modelling demonstrates the opportunities for reduction of CO₂ emissions in steel works in the framework of emerging volatile markets.
- The final proof-of-concept of the new control strategies will be performed with real bottled steel mill gases as well as with a complex gas matrix from an existing gasifier.



Data sheet – i3upgrade



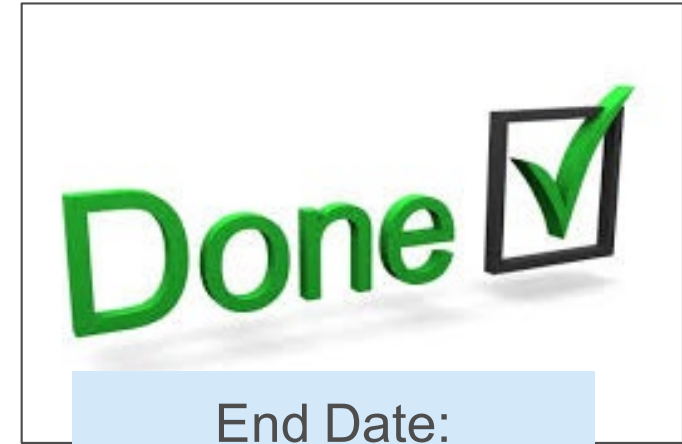
Start Date:

01/06/2018



EU Grant

€ 1,991,844



End Date:

31/05/2022

[Integrated and intelligent upgrade of carbon sources through hydrogen addition for the steel industry > i³upgrade \(i3upgrade.eu\)](https://i3upgrade.eu)



Thank you



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