Project No:
764697

Project acronym:
CHEERS

Project full title:
Chinese-European Emission-Reducing Solutions

Type of Action: **RIA**

Call/Topic:
European Horizon 2020 Work Programme 2016 – 2017, 10. 'Secure, Clean and Efficient Energy', under the low-carbon energy initiative LCE-29-2017: *CCS in Industry, including BioCCS*

Start-up: 2017-10-01
Duration: 60 months

Deliverable D4.2:
Front End Engineering Design (FEED)

Due submission date: 2021-06-30

Actual delivery date: 2021-06-30

Organisation name of lead beneficiary for this deliverable:
CHEERS Consortium and WP6

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Dissemination Level		
PU	Public	
CO	Confidential, only for members of the consortium (including the Commission Services and MOST)	X
INT	Confidential, only for members of the consortium	

Abstract for publication on the website of CHEERS

CHEERS conforms to the European Horizon 2020 Work Programme 2016 – 2017, 10. 'Secure, Clean and Efficient Energy', under the low-carbon energy initiative (LCE-29-2017: CCS in Industry, including BioCCS). The ambition is to improve the efficacy of CO2 capture in industry, and help ensuring sustainable, secure, and affordable energy.

The project focuses on a 2nd generation chemical-looping technology development that has been tested and verified at laboratory scale (150 kWth). Within the framework of CHEERS, the core technology scope covers the execution of a 3 MWth plant prototype for demonstration in an semi-industrial operational environment. This constitutes a major step towards large-scale decarbonisation of industry, offering a considerable potential for retrofitting industrial combustion processes.

The demonstration system prototype is based on a fundamentally new fuel-conversion process synthesised from prior research and development actions over more than a decade. The system will include heat recovery steam generation with CO_2 separation and purification, and it will comply with industrial standards, specifications and safety regulations. Except for CO_2 compression work, the innovative concept is capable of removing 96% of the CO_2 while eliminating capture losses to almost zero.

This report summarized the activities carried in the framework of task 2 of Work Package WP4 of CHEERS. This task consists in Front End Engineering Design (FEED) of CHEERS demonstration plant. FEED is a critical step in the CHEERS project regarding the fact that it transforms the process design developed in the WP2 into and Engineering Design which will be used for manufacturing and construction of the plant. As a first of kind technology, various designs were developed for first time such as control system, mechanical design and material selection mainly refractory lining design, instrumentation, and safety system. In addition, CHEERS demonstration plant is designed to be able to operate with two configurations with a switchable design. FEED phase was managed by TOTAL and carry out by an Engineering company.

HSSE and safety are critical items which were designed with specific attention. Specific studies were carried out for this purpose mainly HAZID and HAZOP/LOPA. The outcomes of these analysis were taken into account in the process control and instrumentation system. The system Is designed in a manner to achieve inherent safety. The design is represented in the FEED dossier which is handed over to the EPCC phase for the construction of the plant. The outcomes of various disciplines are briefly presented in this report covering process, mechanical, civil, structure, instrumentation, and material selection. An independent project review (IPR) was carried out at the end of FEED phase showing that the project is ready to start the EPCC phase.

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