



Integrative Technology Assessment of Carbon Capture and Utilization: A German Perspective

Wilhelm Kuckshinrichs*, Jürgen-Friedrich Hake and Peter Markewitz

*Institute for Energy and Climate Research – Systems Analysis and Technology Evaluation,
Forschungszentrum Jülich, 52425 Jülich, Germany*

Accepted for publication on 13th January 2015

Fossil-based energy conversion and energy-intensive industries are sources of a large part of global CO₂ emissions. CCS technologies are regarded as important technical options to reduce worldwide CO₂ emissions.

While there is no lack of technical options for CCS and storage capacities are available, the question arises as to whether and under what conditions CCS could become a key element within the framework of implementing climate protection strategies. To answer this question, an integrated technology evaluation is required with the objective to determine the importance of a technology in relation to a set of criteria. The set of criteria selected here is rooted in the regulatory framework governing the concept of sustainable development, which has led to the need for the transformation of the energy sector in favor of sustainable technologies and systems. The principle involves investigating the development of energy technologies (and energy systems) in terms of their technical, economic, ecological, and social impacts, and thus evaluating what contribution technologies can make to the transformation of energy systems. When regional considerations are important for evaluation, e.g. in case of social acceptance, the focus is on the German perspective.

In order to play a decisive role in climate protection strategies, 5 key challenges are identified, that must be overcome: (1) ‘demonstration of an industrial scale and commercial availability’, (2) ‘environmental and safety requirements’, (3) ‘cost efficiency and economic viability’, (4) ‘coordination of energy and climate policy’, and (5) ‘public acceptance’. Given the different analyzes of the key challenges and the results of subsequent expert interviews, the OECD approach of a composite index for evaluation is used. The experts surveyed criterion (2) ‘environmental and safety requirements’ as being mostly fulfilled and criterion (5) ‘public acceptance’ as being least fulfilled. Criterion (1) ‘demonstration of an industrial scale and commercial availability’ was also evaluated relatively positively, while (3) ‘cost efficiency and economic viability’ fared poorly. Nevertheless, the calculated index is 2.2 which is not even coming close to achieving the maximum of 5.00.

Keywords: Integrated technology assessment, demonstration and availability, environmental and safety requirements, cost efficiency and economic viability, composite index