GIS-BASED ANALYSIS OF HYDROGEN PIPELINE INFRASTRUCTURE FOR DIFFERENT SUPPLY AND DEMAND OPTIONS

Sylvestre BAUFUMÉ[1], Thomas GRUBE[2], Fabian GRÜGER[3], Jürgen-Friedrich HAKE[1], Dennis KRIEG[2], Jochen LINSSEN[1], Detlef STOLTEN[2], Michael WEBER[2]

Abstract

This study assumes a high penetration of hydrogen-fuelled vehicles (Fuel Cell Electric and Internal Combustion Engine) for Germany in 2050 and investigates how a pipeline network for hydrogen transmission and distribution could look like and what it could cost – under different scenarios for H2 production and demand. All data are geo-referenced for their computation and displayed within a Geographical Information System (GIS) environment.

Statistical data describing the current vehicle repartition per type and district are computed to evaluate the expectable geographical distribution of hydrogen demand under several "demand scenarios" (for example big agglomerations first or equally distributed introduction). We identified most of the approximately 14.000 existing refuelling stations for conventional fuels and expect hydrogen to be delivered at some of them according to their localisation (along or near highways, within urban areas, etc…). Selected stations form the sinks of the modelled distribution network.

Then, we envisage highly differentiated hydrogen production scenarios (electrolysis using offshore wind generated electricity only or associated with onshore wind generated electricity or lignite gasification) and calculate the preliminary layouts and costs of pipeline networks able to balance the proposed demand and supply options. Finally, we compare the different options from an infrastructure planning and support perspective.

[1] Institute of Energy and Climate Research – Systems Analysis and Technology Evaluation (IEK-STE), Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany, +49 2461 61-4540, +49 2461 61-2540 (Fax), s.baufume@fz-juelich.de, http://www.fz-juelich.de/iek/iek-ste

[2] Institute of Energy and Climate Research – Fuel Cells (IEK-3), Forschungszentrum Jülich GmbH, D-52425 Jülich, Germany, +49 2461 61-5398, +49 2461 61-6695 (Fax), th.grube@fz-juelich.de, http://www.fz-juelich.de/iek/iek-3

[3] Ingmen GmbH, Neuhöfferstr. 25, D-50679 Köln, Germany, +49 221 204-25680, grueger@ingmen.de, http://www.ingmen.de