

Governing safety hazards in future urban gas distribution systems: How to organize governance in hydrogen and bio-methane systems

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This workshop focuses on safety in future urban gas distribution systems. Current gas infrastructure and appliances may be used to transport and combust gasses that are considered renewable, such as bio-methane and hydrogen. This is especially promising in densely populated urban areas, where energy demand is high and the ability to provide heating with heat networks or electric solutions is limited. However, substituting natural gas with renewable gasses comes with institutional as well as technical challenges.

Safety has long been provided for by national governments. Rules and regulations were set at a national level, and governmental agencies were put in place to monitor them. Liberalization has caused new actors to emerge, such as private energy companies and certification bodies. This has resulted in the decentralization of some key services related to energy provision. After liberalizing allowed renewable gas producers market entry, many European countries see the share of biomethane in their distribution grids rise and some investigate the possibility to employ their infrastructure to distribute hydrogen.

This new constellation of actors faces the challenges that come with adjusting the current infrastructure. Both renewable gasses are characterized by different burning properties and chemical composition, influencing dangers ranging from pipeline leakage to incomplete combustion. Renewable gas production may fluctuate per season or depend on weather conditions. To balance supply, then, new ways of storing and transporting gas may be needed. This workshop aims to bring together academics and practitioners to discuss the organizational challenges of providing for safety in future urban gas distribution systems. It focuses on technical as well as institutional features, and includes contributions from the Dutch safety regions, KIWA Institute for Testing, Inspection and Certification as well as academia.

Presentation 1

Responsible innovation in energy systems: how about safety issues?

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The Netherlands faces its biggest energy transition since its implementation of using gas for households in the 1950s. Accelerated by earthquakes in the province of Groningen and the Paris climate agreement (2015), the Dutch national government is making serious efforts to enable the energy transition (see the Topsector Energy: affordable, robust and sustainable energy system). This will have a significant impact on our urban buildings and traffic and transport system. Refraining from fossil fuels, more sustainable fuels such as wind, solar, battery packs and hydrogen will be implemented during the upcoming years in Dutch society.

Inherent to these developments are severe safety impacts, both regarding suppression of fires and prevention. Mitigating residential fires becomes complex when there are still high voltage power supplies present, such as solar panels on the roof and power banks in the building. Hydrogen-fuelled cars being involved in car crashes may cause large torches and explosions without clear precursors. Thermal runaways of battery packs in vehicles and neighbourhood battery energy storage systems can become a major threat even after the fire brigade has mitigated the fire.

Regarding prevention, many questions arise. Do (permits for) hydrogen fuel stations guarantee sufficient safe design? What are the tunnel safety requirements in respect to electric buses containing battery packs? And what are the necessary safety requirements for neighbourhood batteries?

The Dutch safety regions, The Netherlands Fire Service and their knowledge institute IFV carry out a variety of activities to facilitate a responsible energy transition, which is accompanied by enormous innovations. In this paper, on the one hand, we will address the safety issues that are triggered by the energy transition. On the other hand, we will present the contribution safety regions and fire brigades are able to make in facilitating a safe energy transition, and address the knowledge gap on safety that is still apparent.

Key words:

Fire, suppression, Firefighting, hydrogen, battery packs, electric vehicles

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Presentation 2

Future Gas Distribution Grids

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In order to achieve the objectives set forth in the Paris Climate Agreement, the Netherlands aims to reduce its carbon dioxide emissions in urban areas to 0% by 2050. Fossil energy sources will give way to sustainable energy. This transition will have a far-reaching impact on many, including network operators. With the phasing out of natural gas, an important question emerges as to whether or not there is still a future for the existing gas network. This question is a timely one for regional network operators, as decisions already have to be made regarding long-term maintenance for the gas network. Studies such as 'Net voor de Toekomst' ('Network

for the Future') foresee that the use of sustainable gases such as hydrogen and biomethane will result in expedited availability of a sustainable energy supply. In locations where the gas network is suitable, the option of finding a sustainable gas solution for gas networks is possible, whether temporary or otherwise. This presentation focuses on the technical challenges and possibilities of future gas distribution networks, and what needs to be done to make them future-proof.

Presentation 3

Governing Safety Hazards in Future Urban Gas Distribution Systems

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This presentation focuses on the governance of safety in future urban gas distribution in the Netherlands. Safety, along with other services associated with centralized gas supply, has long been provided for by national governments. Rules and regulations were set at a national level, and governmental agencies were put in place to monitor them. Liberalization has caused new actors to emerge, such as private energy companies and certification bodies. This has resulted in the decentralization of some key services related to energy provision including supply, maintenance and certification. At the same time, it is expected that natural gas will be increasingly substituted by renewable gasses. This will inevitably cause a technical decentralization of gas distribution as well. This presentation will briefly discuss some of the technical challenges that appear with the advent of renewable gasses, and further elaborate on the associated institutional challenges.