Large-Scale Energy Storage in Salt Caverns and Depleted Gas Fields

Publieke samenvatting / Public summary

Aanleiding

Future energy systems will be characterized by a larger share of (intermittent) renewables, complemented by other (flexible) forms of power/heat production, improved grid interconnectivity, demand-response functionalities and the deployment of energy storage technologies. Energy storage will play a pivotal role in providing the needed flexibility and offering balancing options to the integrated energy system. Greater deployment of energy storage is required at different scales, i.e. from low power and fast response solutions (< 1kW;<1s) to longer-term balancing needs for the grid (>1GW;hours /days/months). Large-scale energy storage can provide flexible bulk power management services for electricity, gas and heat commodities. In addition to flexibility, large-scale energy storage offers essential services to society in the form of strategic energy reserves and balancing solutions for unavoidable seasonal variations. Action is needed on multiple levels and barriers for deployment need to be removed. There is a key window of opportunity to rebuild momentum for R&D of large-scale subsurface energy storage, while benefiting from synergy with developments in adjacent research domains.

Doelstelling

The main objectives of this study are: 1. Improve insights into the role that large-scale subsurface energy storage options can play providing flexibility to the current and future transitioning energy

Projectinformatie / Project information

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Algemene informatie / General information

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Nederlandse Organisatie voor toegepast-natuurwetenschappelijk onderzoek TNO

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system. 2. Reducing technical, economic, societal & regulatory challenges and risks for specific large-scale subsurface energy storage technologies, including: hydrogen and compressed air energy storage in salt caverns and hydrogen storage in depleted gas fields. In this study technical and non-technical barriers and drivers will be assessed. The main disciplines are: • Technical: assess feasibility of the selected technologies, energy performance and efficiency as well the requirements for creating a robust energy system. • Public perception: create understanding of stakeholder perception and provide strategies for engagement. • Economic: determine value of selected storage technologies from a system perspective towards 2050 as well as on the basis of individual techno-economic case studies. • Health, safety and environment: knowledge gaps in risk assessment of subsurface storage technologies, integrity analysis and biochemical interactions.

Korte omschrijving

To achieve the anticipated results, we have formulated 5 work packages. The main workflow of the project consists of a top down approach towards the need for large-scale energy storage in the Netherland from a system perspective (WP1) and a bottom up approach looking at the value of the selected technologies from a business (techno-economic) perspective (WP2). Furthermore, several technical questions will be addressed in WP2. The present societal perception and regulatory framework will be assessed in WP3. Regulatory barriers and drivers will provide input for policy recommendations. Risk and safety aspects will be investigated in WP4. There is a strong link amongst these 4 work packages. Project management and public dissemination of the results is provided by activities in WP5.

Resultaat

Report: A report with the results of the work packages, which include, but is not limited to the following topics: • the role and requirements for large-scale subsurface energy storage in the future energy system, • the techno-economic feasibility of

selected storage options • best practices in societal engagement when implementing selected energy storage technologies, • drivers and barriers in policy and regulatory framework • risk analysis and recommendations for a de-risking approach Models: • Advancement in existing energy system models (OPERA, Competes) to assess future role and need of flexibility in the energy system under different scenarios • Advancement in techno-economic models for the selected energy storage technologies Argument map: For communication purposes an argument map will be published highlighting the pro's and cons of large-scale subsurface energy storage technologies Synthesis paper: A public summary of the project's most relevant findings Public event: Dissemination event to consortium partners and other interested stakeholders

De data in deze applicatie is afkomstig van de Rijksdienst voor Ondernemend Nederland (RVO) en wordt in samenwerking met de Topsector Energie ontsloten.
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