Norwegian retired electric vehicle batteries for rural energy transitions: Sharbazher District in in Iraqi Kurdistan region

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Abstract The aim of this research is to explore the role of Norwegian retired electric vehicles (EV) batteries in contributing to energy transitions in developing countries. Due to the increased adoption of electric vehicles, the number of EV batteries for the end-of-life (EoL) management is projected to raise enormously, especially in Norway in which the EVs stand for 92% of all new cars sold in 2024. The literature on the EoL phase of EV batteries takes a particular focus on 'recycling' strategies to reduce the reliance on extracting new raw materials for manufacturing batteries (M. Wang et al. 2022:10). There is very limited research on 'reusing' strategies. Cusenza et al. (2019:340) state "reuse is preferable to recycling", which is consistent with circular battery economy principles.

This study takes a global market perspective on circular battery economy (Geissdoerfer et al. 2018) by exploring the opportunities and challenges to reusing the Norwegian retired EV batteries for storing solar energy in Iraqi Kurdistan region, contributing to the emergence of off-grid energy systems. The latest development in the region, e.g., the agreement of the Kurdistan Regional Government with the US companies on oil and natural gas resources and the emergence of solar power might shape the future energy system in the region. The main focus is on onsite decentralised renewable energy systems, which will demand a particular sociotechnical regime including governance and institutional arrangements, actor constellation and technological artefacts. An off-grid energy system based on renewable energies bring about many benefits. As relatively independent systems, they are less vulnerable to external threats, cyberattacks and blackouts, are more appropriate for remote areas and cause less geopolitical conflict with national grid system.

This research targets the rural district of Sharbazher in the Sulaymaniyah governorate in the region, which was targeted for the author's PhD fieldwork. The territorial factors in the Sharbazher district would provide both potential for producing renewable energies and an enabling environment for citizen participation in creating energy communities. In this way the twin objectives will be achieved: to decrease the climate change impacts and to reduce the reliance on national grid which is currently incapable to generate adequate electricity required by households and business entities in the region. The key research questions are:

• How can local governance and institutional arrangements enable stakeholder participation for creating energy communities towards regional energy transitions? What are the obstacles to coupling between EV batteries and solar PVs?

• What kind of organisational form might enable local communities in the Kurdistan region to plan and implement their own energy visions?