POSSIBILITIES, OPERATION AND OPTIMIZATION OF SECTORCOUPLED SUPPLY FOR THE FLEXQUARTIER

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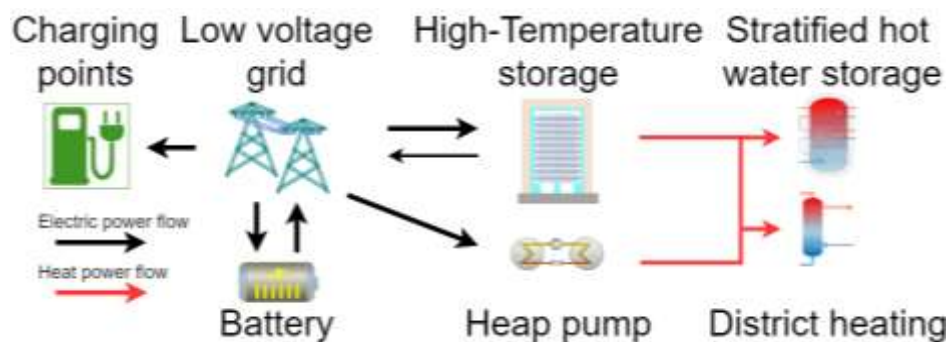**Thomas Stetz**
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Abstract

Diabetes mellitus is a chronic metabolic disease recognized as an emerging epidemic that has a negative impact on health, the workforce, and the economy. It has serious consequences in various organ systems including the heart and blood vessels. The aim of this study is to assess Risk factors for the development of Heart Failure among Patients with Diabetes Mellitus Attending Somali Sudanese Specialized Hospital, 2021. A cross-sectional study was done among 110 diabetic patients hospitalized at Somali Sudanese Specialized Hospital (SSSH) in Somalia (2021), of whom 99 (90%) were DM Type 2 and 11 (10%) were DM Type 1. A structured questionnaire was administered to collect information about demographic, medical, and social factors that might be associated with the development of heart failure. The statistical Package for the Social Sciences, version 22 (IBM Corp., Armonk, NY, USA) was used for data analysis. It was found that more than half of the participants 59 (53.64%) were female and 51 (46.46%) were male. The majority of participants 61 (55.5%) had heart failure, and about 49 (44.5%) had not yet developed. More than 60 (54.55%) of the participant's random blood glucose level was between 200-250 mg/dl and nearly one-third 37 (33.64%) was between 126200mg/dl, while 13 (11.8%) more than 250 mg/dl. Factors that showed significant association with heart failure incidence, with $p < 0.05$, were advanced age, low educational level, being married, elevated blood pressure, long duration of diabetes, irregularly taking of medicines, other comorbidities particularly hypertension and ischemic heart disease, and abnormal blood levels lipid profile. To achieve tight control of

blood pressure and blood glucose levels, patients should be counseled to take their medications on a regular basis and have frequent hospital follow-ups.

The project name "FlexQuartier" derives from the words flexible and the German word for neighbourhood. The idea of the project is to investigate the possibilities of futuristic, sustainable neighbourhood theoretically, as well as during planning, construction and operation. The construction of the neighbourhood is currently in progress. The area is about 7.5 ha and consists of a residential part with around 340 accommodation units, a kindergarten, a parking garage and a small amount of commercial space for offices. Additionally, are there three commercial sites and the main distinctive feature the "energy centre". This project is funded by the German Federal Ministry of Economic Affairs and Energy.

The neighbourhood generates power with PV systems, that covers more than half the rooftop area. To locally store produced energy is the "energy centre" equipped with a battery storage (700 kW, 700 kWh) and a high-temperature-storage (HTS). The HTS is built of fireclay bricks, which can be heated up to 1200°C. The thermal energy is converted back with a turbine to electrical energy, whereas the remaining lower temperature heat can be stored in the stratified hot water storage system or feed to the district heating. Furthermore, the system contains two different heat pumps to be able to efficiently feed in the district heating from different temperature levels.

The neighbourhood can be aggregated as one prosumer regarding the power utility. The installed devices can therefore be used in several ways, depending on the prioritised goal. To face this ambiguity a management system has been developed, which optimizes the neighbourhood`s electrical supply system using an optimal power flow. Depending on the set constraints for devices and the supply system, as well as the used cost functions different use cases can be performed. The main use cases are peak shaving, increased self consumption, as well as ancillary services like providing operating reserve, voltage control or congestion management. Furthermore, checks the manager with each optimization, that the supply system constraints are kept, which avoids overload, overvoltage or undervoltage events.