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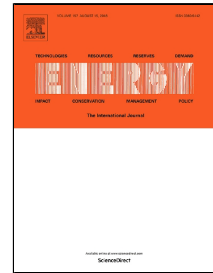
Integration of renewable energy and demand response technologies in interconnected energy systems

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## Integration of renewable energy and demand response technologies in interconnected energy systems

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### ABSTRACT

Sustainable island energy systems have been a subject of academic research for some time. Real-life examples of highly renewable and sustainable island energy systems can be found all over the World. Islands on small geographic proximity provide the potential for the development of 100% renewable island energy systems by exploiting their grid interconnections. This paper proposes that interconnections of a group of islands can be used to integrate the production from locally available renewable energy sources. Besides interconnection, electric vehicles were used as a demand response technology to provide storage for electrical energy from variable sources. Electric vehicles were connected to the grid using smart charging systems (vehicle-to-grid). In addition, stationary batteries were explored in sub-scenarios for the year 2035. This enabled to analyse the influence of the battery location through two main different scenarios, i.e. one big central battery and several smaller distributed batteries. Scenarios with different integration dynamic of variable renewable energy sources and electrical vehicles were modelled with EnergyPLAN model, while the interconnection analysis was carried out with the MultiNode tool expansion. The results showed that the interconnections increased the share of energy from renewable energy sources in the final energy consumption and declined the total critical excess electricity production, while vehicle to grid technology enabled exploitation of synergies between sectors.

Keywords: Sustainable island systems, Renewable energy sources, EnergyPLAN, MultiNode, Interconnection

### Table of acronyms

|      |  |
|------|--|
| CEEP | Critical Excess Electricity Production |
| DR   | Demand-response                        |
| DSM  | Demand-side management                 |
| EV   | Electric vehicle                       |
| GIS  | Geographic information system          |
| PES  | Primary energy supply                  |
| PP1  | Power plant                            |
| PV   | Photovoltaic                           |
| RES  | Renewable energy sources               |
| SE   | Solar energy                           |

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