

# Integration of transport and energy sectors in 100% renewable island communities

Hrvoje Dorotić, Borna Doračić, Antun Pfeifer, Nikola Matak, Tomislav Pukšec, Goran Krajačić

Department of Power Engineering, Energy and Environment, Faculty of Mechanical Engineering and Naval Architecture, University of Zagreb

## ABSTRACT

In order to design a self-sufficient and sustainable island, integration of renewable energy sources alongside with energy efficiency measures is needed, with attention to be given to energy storage. In energy planning of small island energy system integration of other systems, like transportation, requires particular care and precision due to lack of resources and space restrictions. In this paper, integration of electric vehicles as energy storage for the production of electricity from renewable energy sources in island system is examined. In order to demonstrate the method, case study of The Island of Korčula is presented. Through scenario approach, using energy planning software, it has been shown that by using smart charging integration in a combination with the installed supply capacities equal to 30 MW of solar panels and 22 MW of wind turbines, total electricity export could be reduced by 25% and total import by 36%.

## METHOD

- Bottom-up energy demand for household, tourism and transport sector for 2011
- Development of 2050 100% RES scenario + 100% EV share
- EnergyPLAN was used for the energy system simulation, new model has been developed in order to simulate 100% RES with EV smart charge
- Quasi-optimization of solar and wind share in order to create zero net import/export of electrical energy condition
- Comparison of EV dump and smart charge integration

## RESULTS

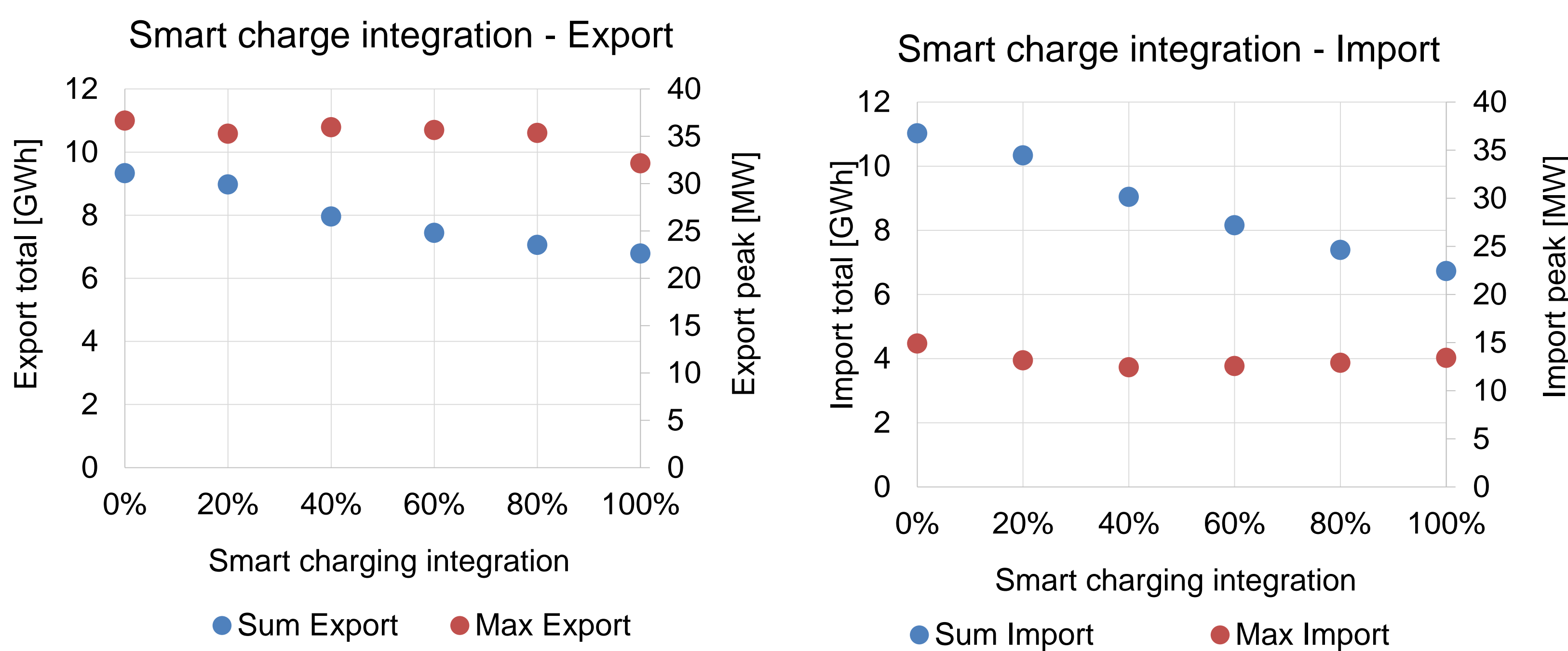


Figure 2 Export and import characteristics for 30 MW of solar and 22 MW of wind capacities installed

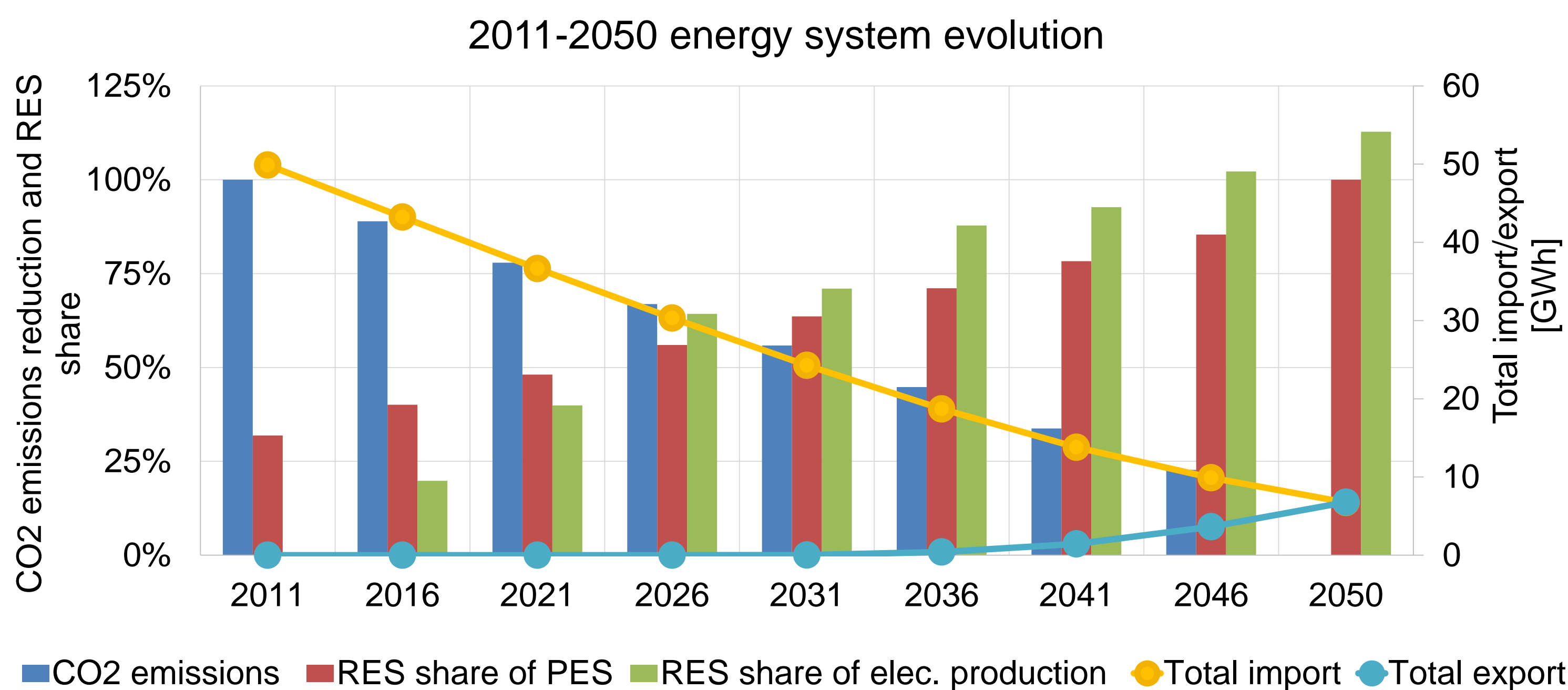


Figure 4 2011-2050 energy system evolution

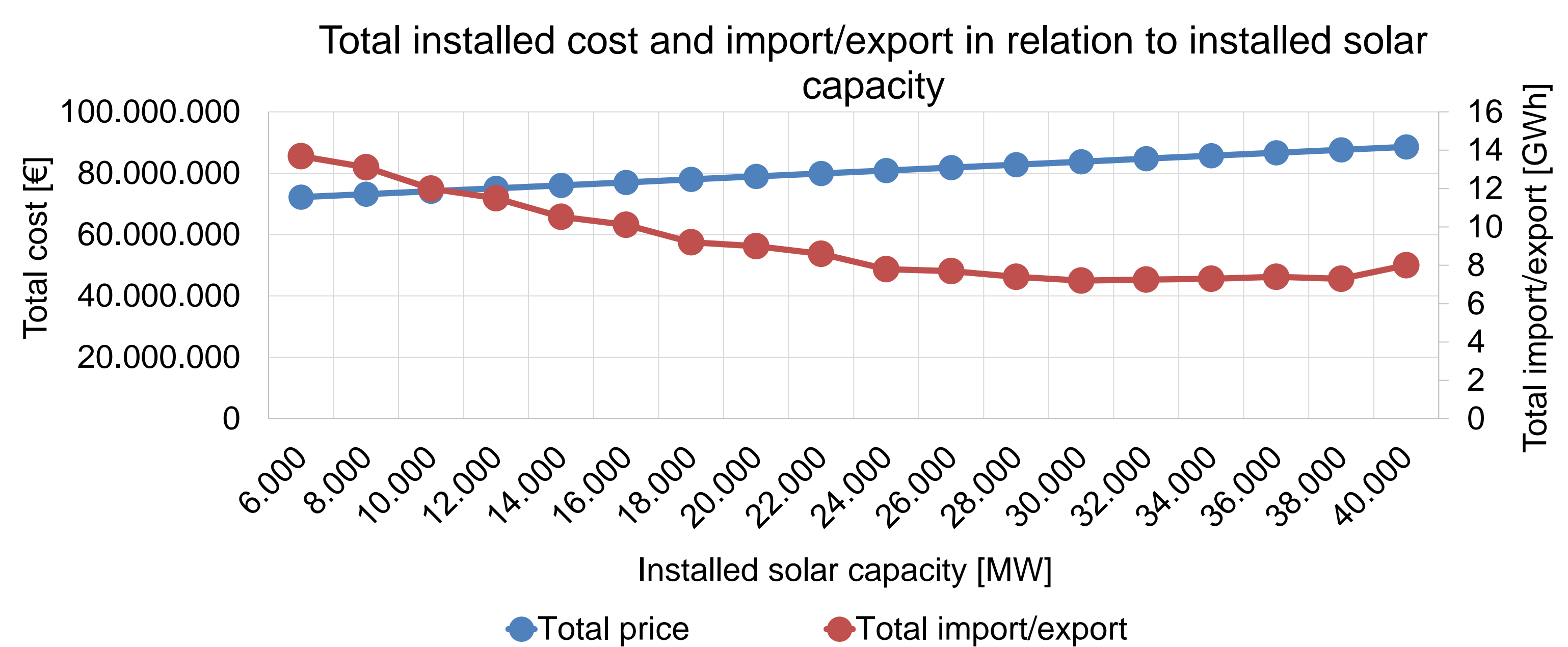


Figure 1 Export and import characteristics for 30 MW of wind and 22 MW of solar capacities installed

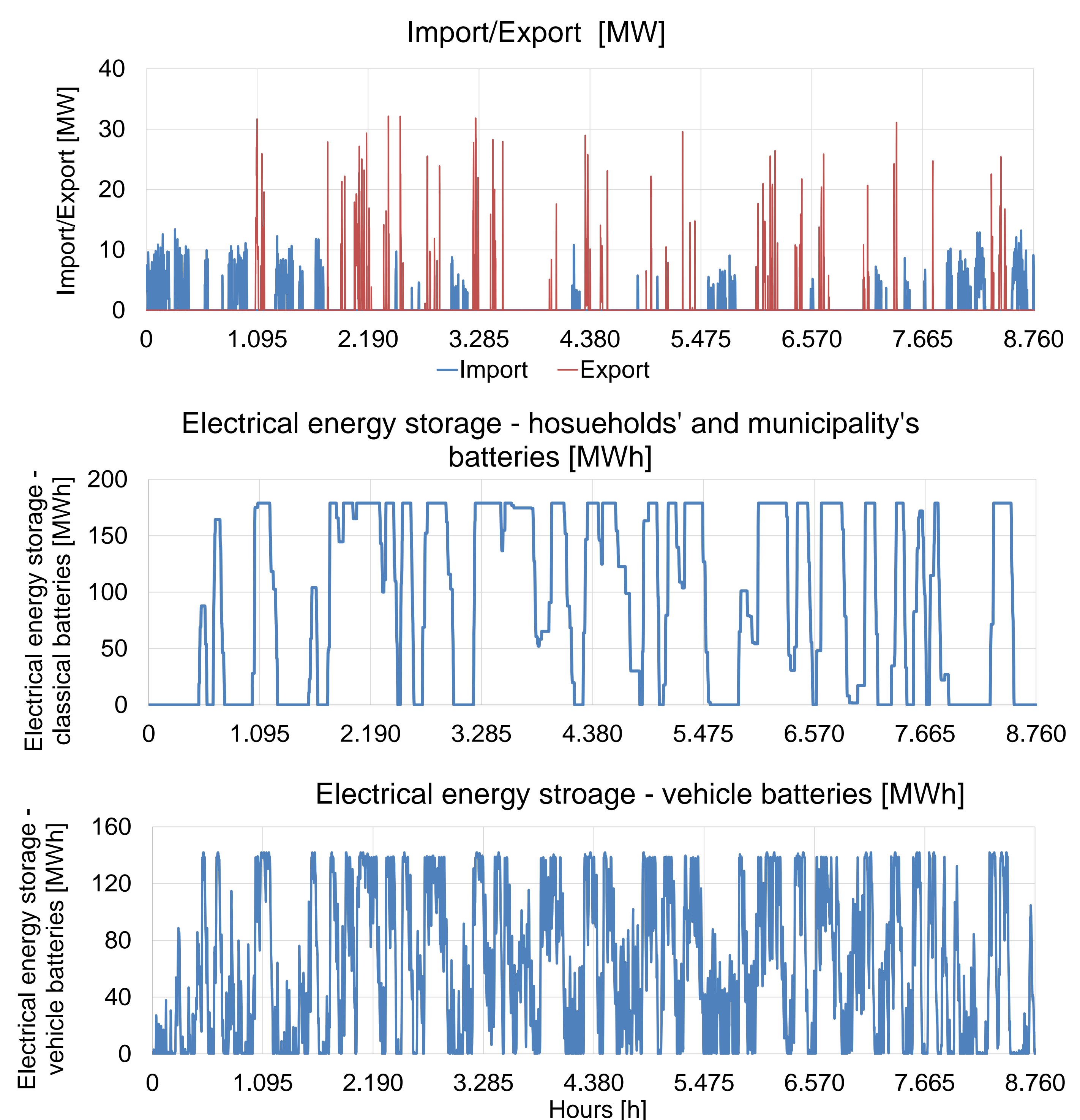


Figure 3 Import/export load and electrical energy storage state of charge – 30 MW of solar and 22 MW of wind

## CONCLUSION/ FUTURE WORK

In this work, planning of 100% RES system has been presented, including the integration of smart charging vehicles. It has been shown that electrification of the transport sector in combination with smart charging can decrease electrical energy import by 36% and export by 25%. This work presents novel approach due to the new EnergyPLAN model which has been developed for this research.