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Participation of Distributed Residential Batteries in Energy Markets

Context:

- Climate change requires to pursue the deployment of renewable energy production.
- The removal of Feed-In-Tariffs reduces the economic viability of renewable energy sources.

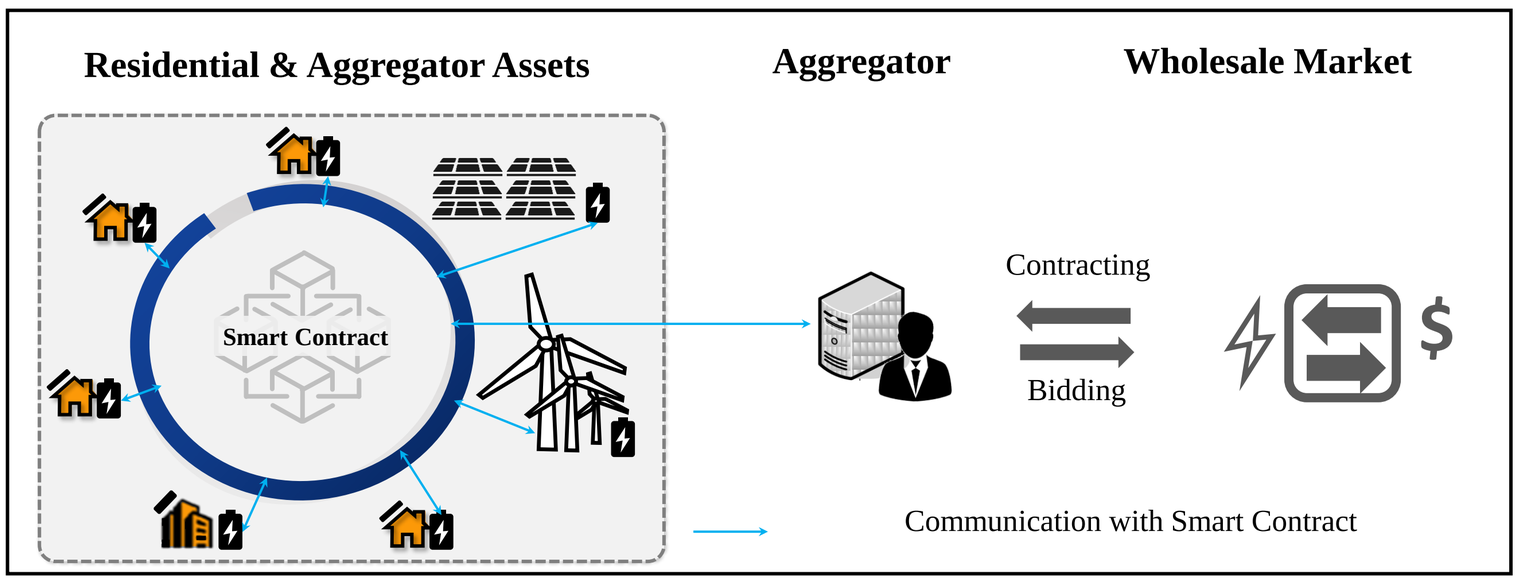
Key Proposition:

- To increase economic viability of residential renewable energy sources (RES) and batteries, we propose to use these assets for a multi-purpose: self-consumption and participation in wholesale energy markets.
- We provide a framework and a control algorithm to allow residential batteries and RES to participate in wholesale energy markets and to increase end-users self-consumption.

Key Challenges Addressed:

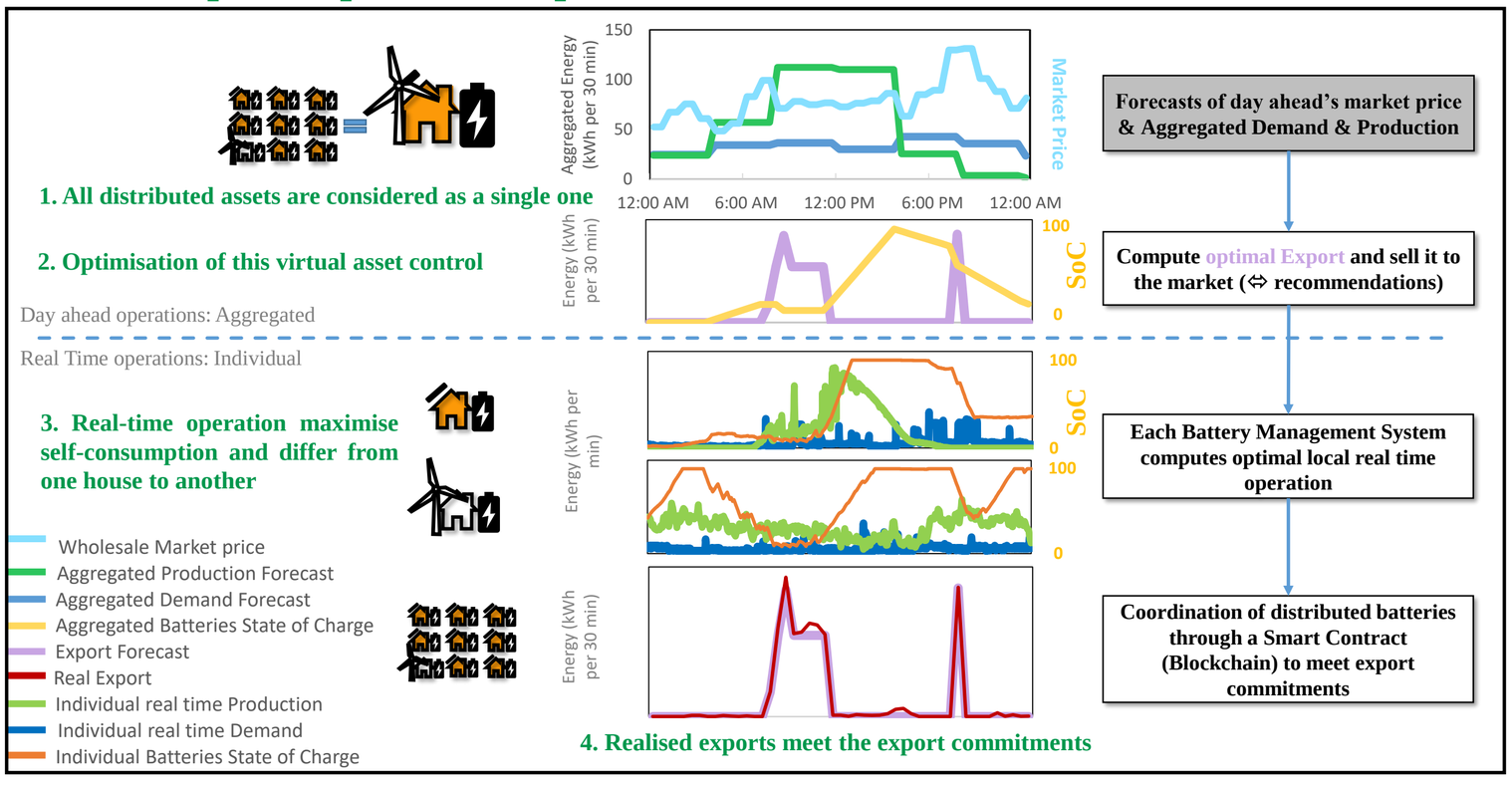
- Optimal algorithm to control residential batteries.
- Business model for residential batteries.

Use case architecture

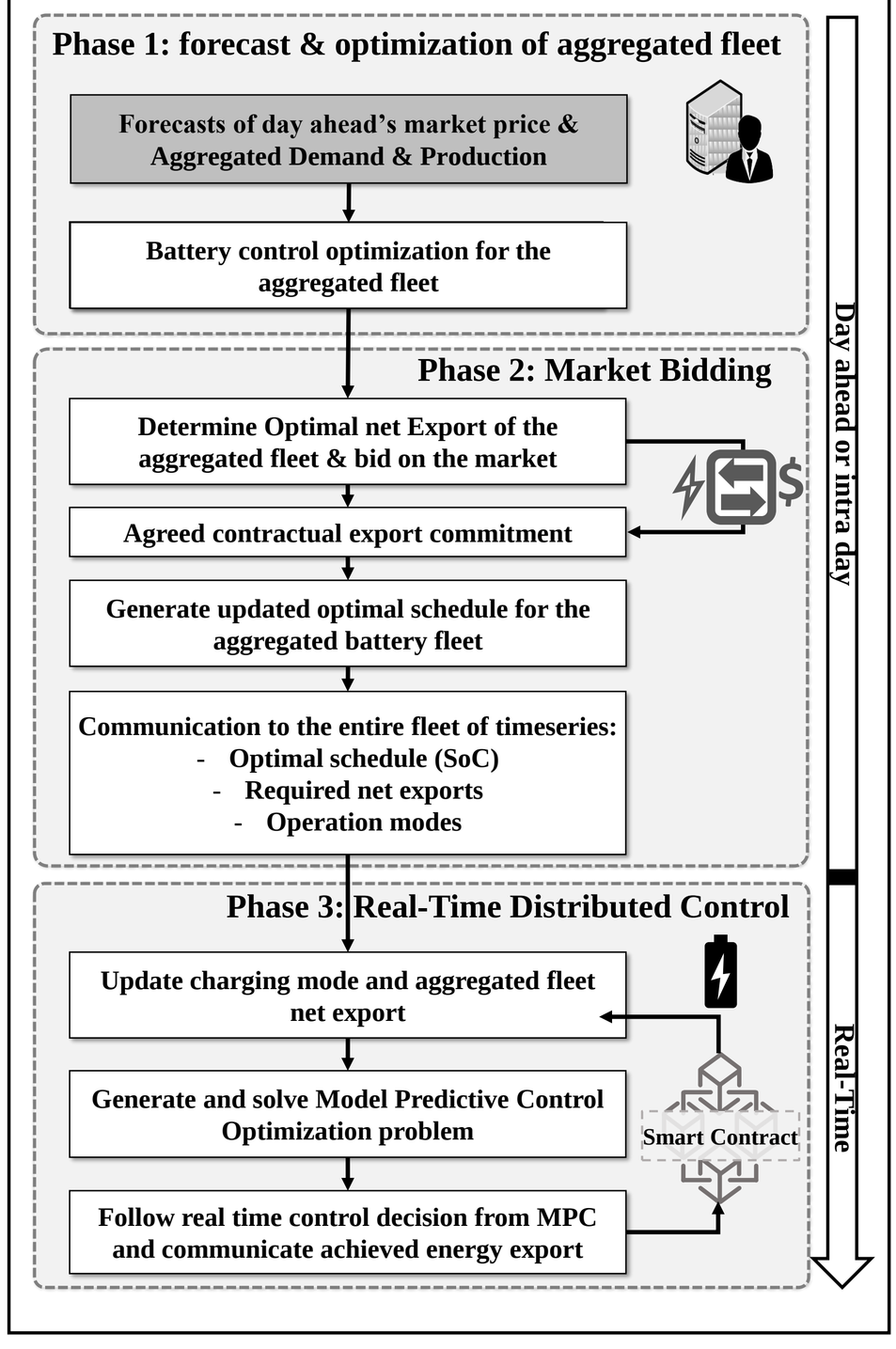


Use case representation: an aggregator manages distributed assets such as residential PV or batteries, but also wind farms and a solar PV farms. The aggregator can sell extra energy to the wholesale markets

Example of operation steps and results

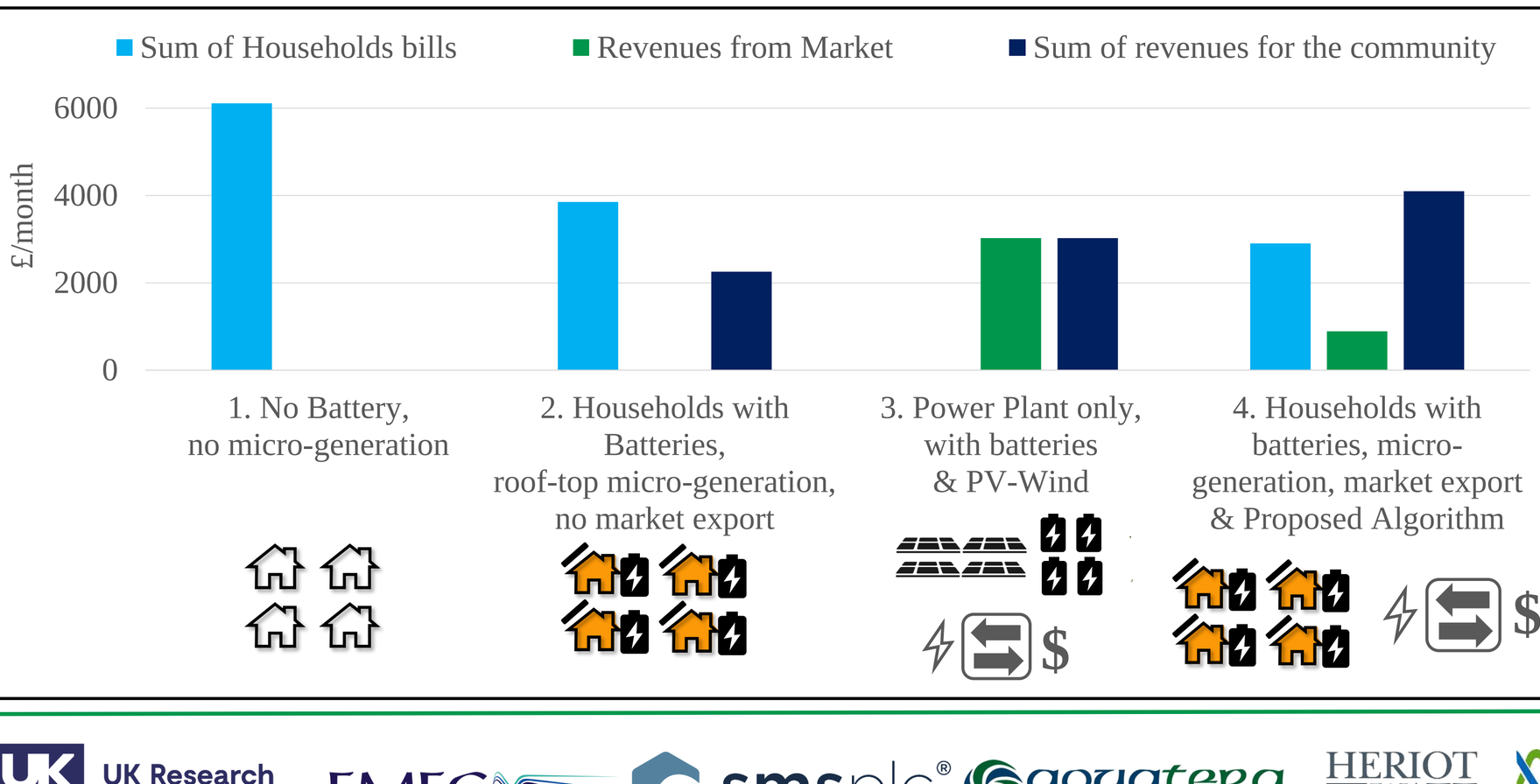


Framework proposed



Framework for the control of distributed residential batteries contributing to the wholesale market.

Experimental results: validation of business model and control algorithm



An experiment was conducted on real consumption and production data to assess the benefits from the proposed framework and algorithm. 4 scenarios were compared:

1. A community without any generation assets: the community pays an expensive electricity bill
2. A community with households having their own generation assets, but without any export to the energy market
3. No community, but a virtual power plant with generation assets, with revenues from the energy market only
4. Our proposed framework: a community with distributed assets for self-consumption and export to the energy market. It provides the greatest value to the community.