

# **Extending PowerMatcher to Reduce Peak Demand Created by Electric Vehicles**

Iain Meeke, Master in Computer Science  
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Supervisor: Dr. Donal O'Mahony

The current electricity grid has remained the same since it was first developed. It provides reliable electricity by burning fossil fuels at large central power stations. Renewable energy sources are becoming more popular and tend to be distributed, with small generation spread throughout the electricity grid. These distributed renewable sources add complexity to the grid as they are intermittent and difficult to coordinate. PowerMatcher is a tool that provides real-time distributed coordination of the electricity grid. PowerMatcher is a multi-agent system in which agents communicate using bid and price messages based on transactive energy techniques. This research investigates PowerMatcher's behaviour in a modern neighbourhood scenario. In particular, the ability to balance supply and demand of neighbourhood and the peak to average demand is assessed. Simulation of electric vehicles, solar panels, batteries, and wind turbines were created to test PowerMatcher's ability. A potential improvement for PowerMatcher is identified during these simulations that would allow PowerMatcher to balance future loads as well as acting in real-time. The design of the extension for this improvement is described in this research.