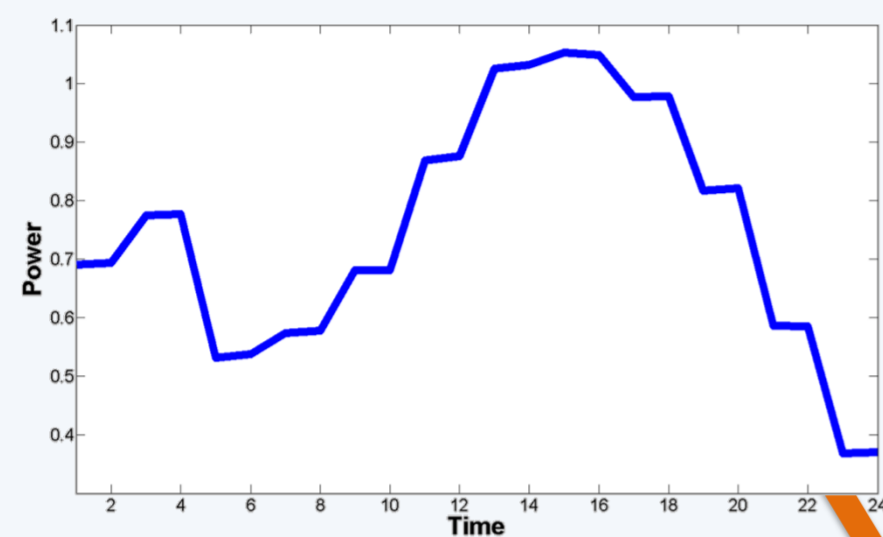


Rapid Prototyping and Network Reconfiguration

Possibilities for our private network...

Through the main connection panel, many devices may be interconnected, allowing researchers at Imperial to obtain proof of concept data for novel power electronic control strategies and devices previously only possible in simulation.



Time Varying Loads
Inverter units can be programmed to mimic the variation of loads with time, such as the normal variation that occurs throughout the day

Rectified, Constant Power and Non-Linear Loads

The presence of a large amount of converter interfaced loads, such as computers and other DC electronics can be represented



Active Loads

Devices are connected as desired through a reconfigurable set of contactors

Solar Array

Power from multiple arrays of photovoltaic panels on the roof of the electrical engineering building can be routed into the private network to study the effect of their presence



Passive Load Banks

Passive RLC load banks can be connected within the lab as a representation of various combinations of load types



Connection Panels

The main connection panel and all local connection panels are configurable through an intuitive software interface



High Power Inverters

The inverter units are controlled by computers that can easily be programmed by researchers. It is possible to quickly switch between simulated plant models and the inverter units themselves to obtain real world data. The lab also contains multiple inverters with higher power capabilities that allow researchers in the SEL to operate a private "grid", making investigations into interactions with machines and other devices possible. Experimentation can be performed without adversely affecting the public utility grid. This also allows students to research device operation when exposed to unfavourable network conditions

Electric Cars



The growing presence of electric cars offers a possible energy storage solution that can be studied in the SEL

Pumped Storage



Energy storage offers a solution to some problems associated with the intermittence of renewable sources

Battery Bank

A battery bank can be connected to an experiment for testing systems and control strategies in the presence of energy storage



CHP Plant



Gas Generator



Inverter interaction with induction machines is another important topic that can be studied in the SEL



Multiple Machines

Machines connected to the private network can behave as motors or generators and imitate characteristics of other machines

Internal topologies of electric cars can also be realized with appropriate reconfiguration of the lab using inverters and motors contained within



Distributed Energy Sources

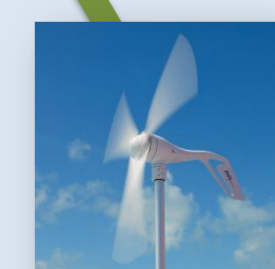
Inverters can be programmed to interface distributed energy resources or even emulate their presence



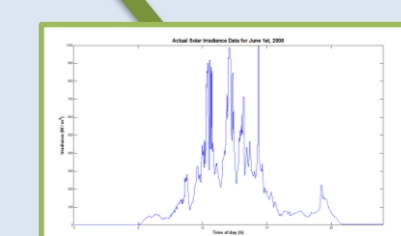
Micro-turbines



Solar Panels



Wind Turbines



As an example: the inverter can be told to output power corresponding to daily solar irradiance profile