



Renewable Energy  
for Self-Sustainable  
Island Communities

# REACT control loop for automated prosumer energy management in geographical islands

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on behalf of REACT WP5 partners

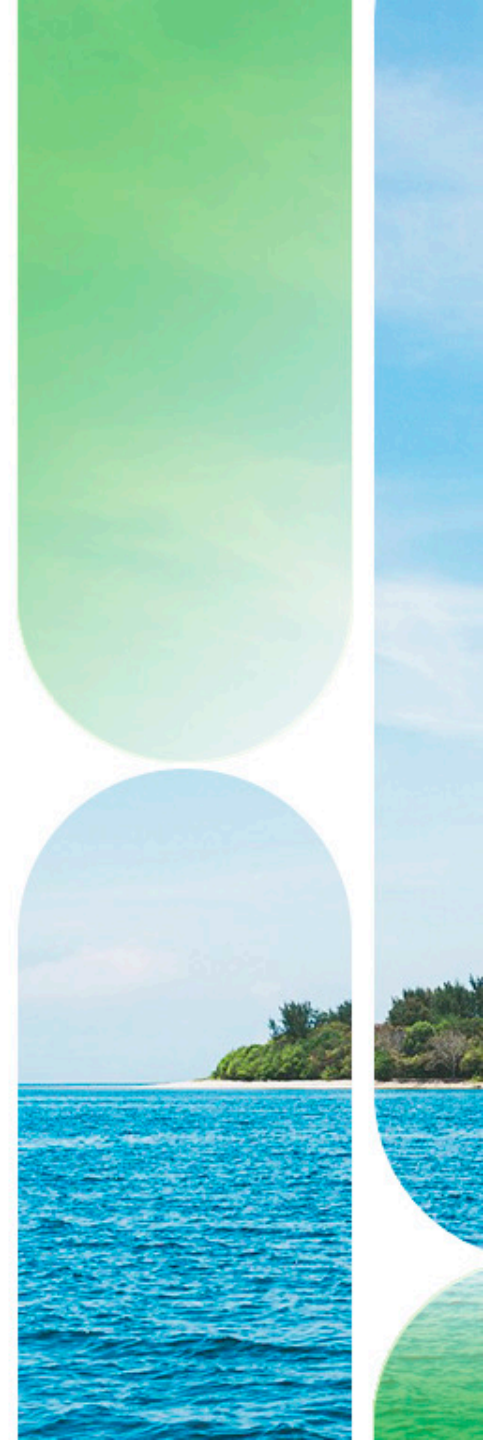
*Austrian Institute of Technology, Fraunhofer ISE, Tekniker, NUI Galway*

Sustainable Places – September 6-9<sup>th</sup>, 2022

*European Actions towards Geographical Islands*

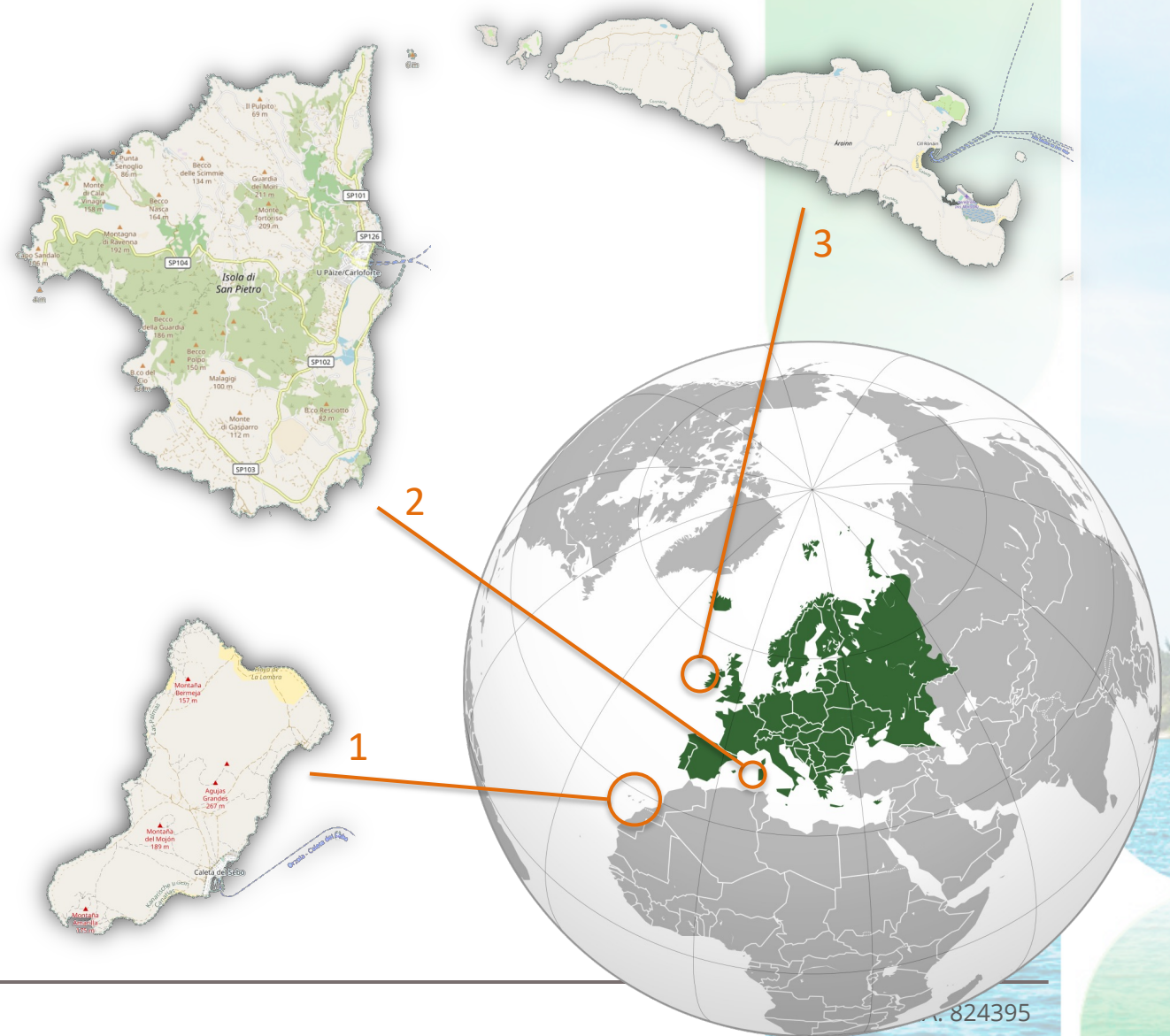


This project has received funding from the H2020  
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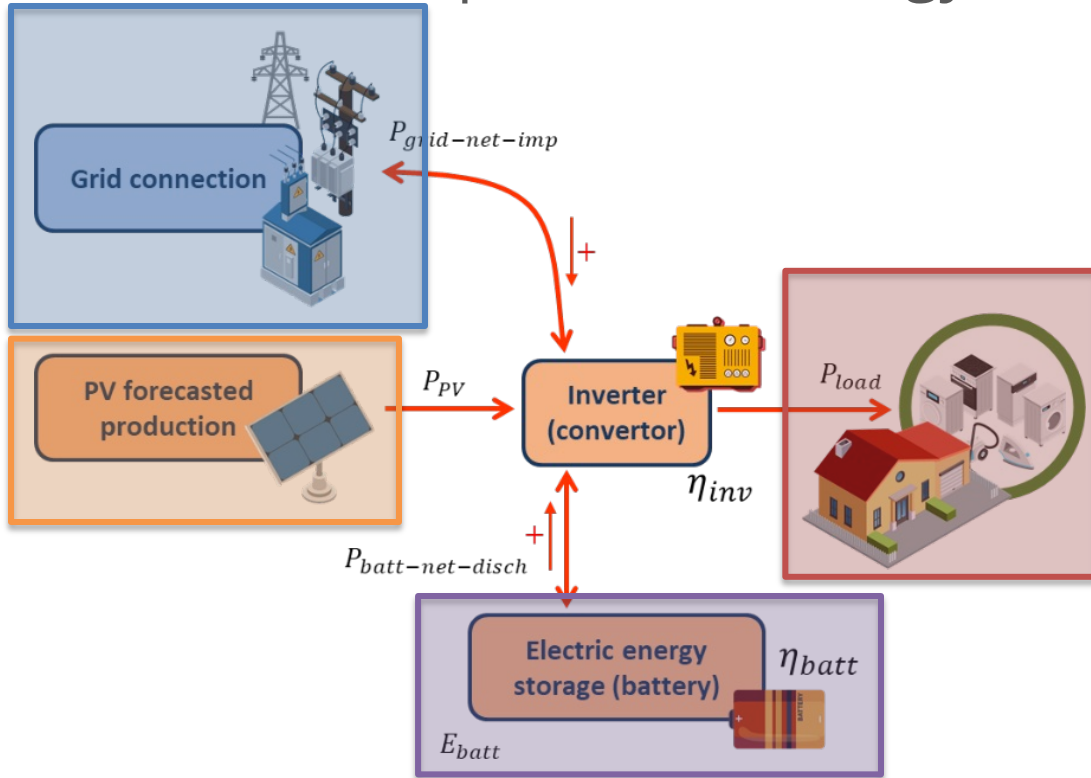
# Islands of REACT

1. La Graciosa (Canary archipelago)  
13 residential + 6 commercial + 3 public
  2. San Pietro (Italy/Sardinia)  
16 residential + 1 commercial + 9 public
  3. Inis Mór (Aran Islands)  
16 residential + 2 commercial + 4 public
- Follower (replication) islands
    - Gotland
    - Lesbos
    - Isle of Wight
    - Majorca
    - Réunion

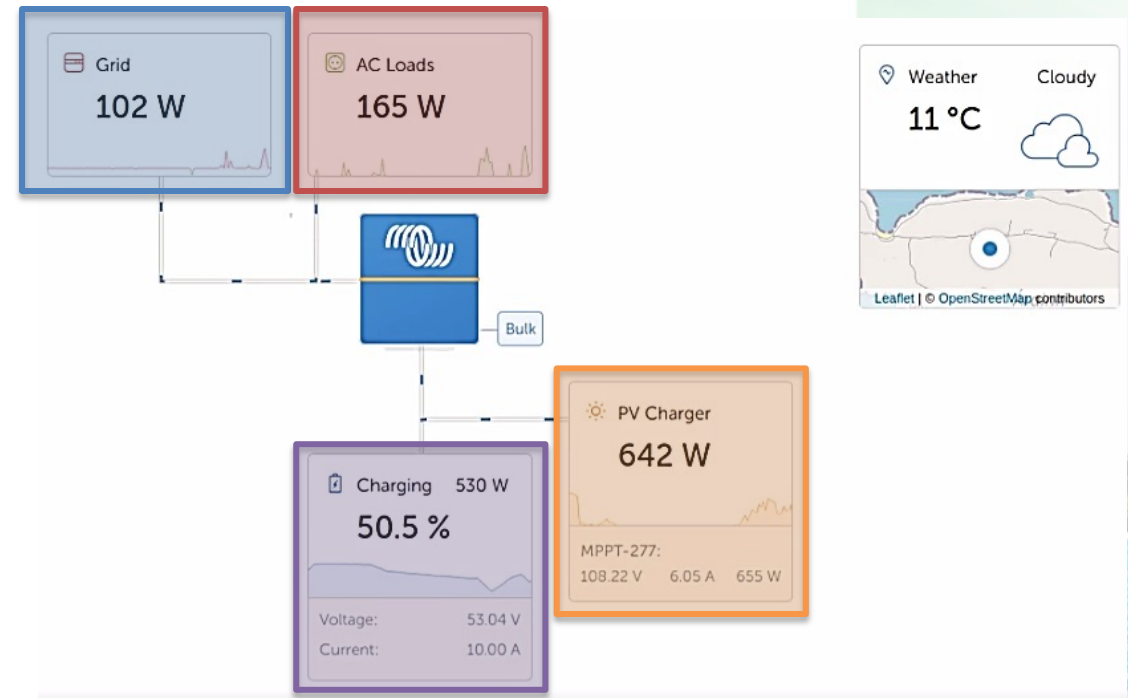


# Prosumer energy management

- Individual prosumer energy models

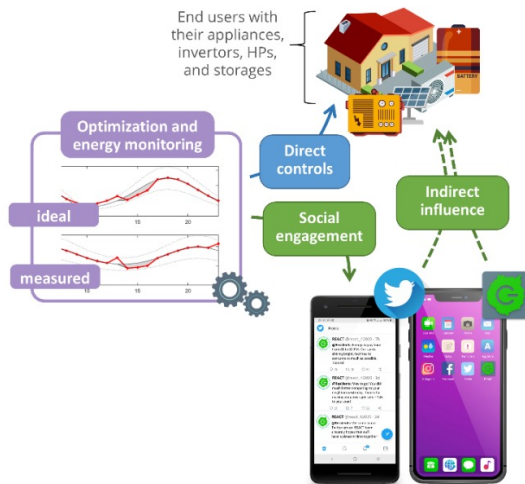
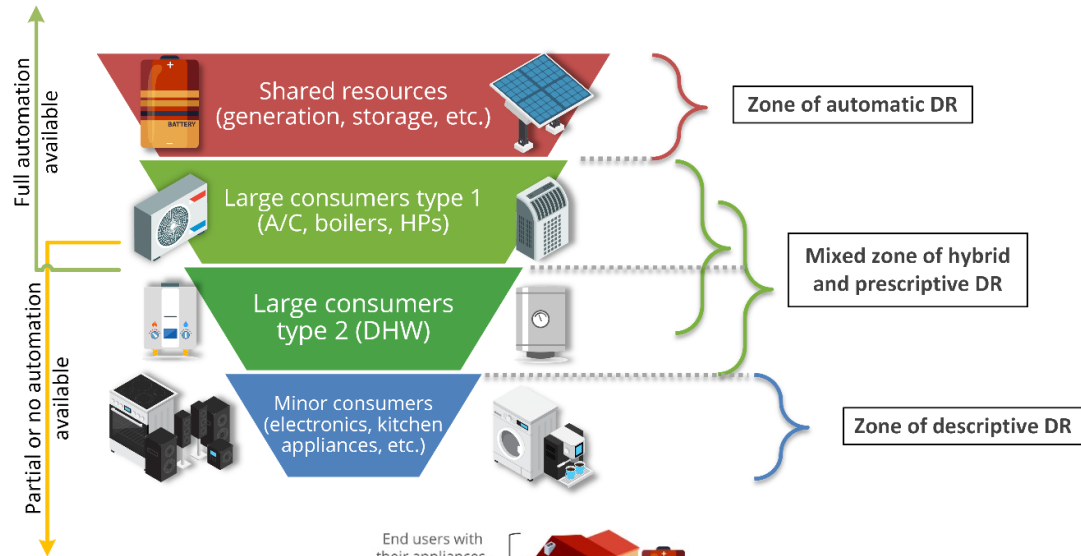


- Energy dashboard overview (Victron)

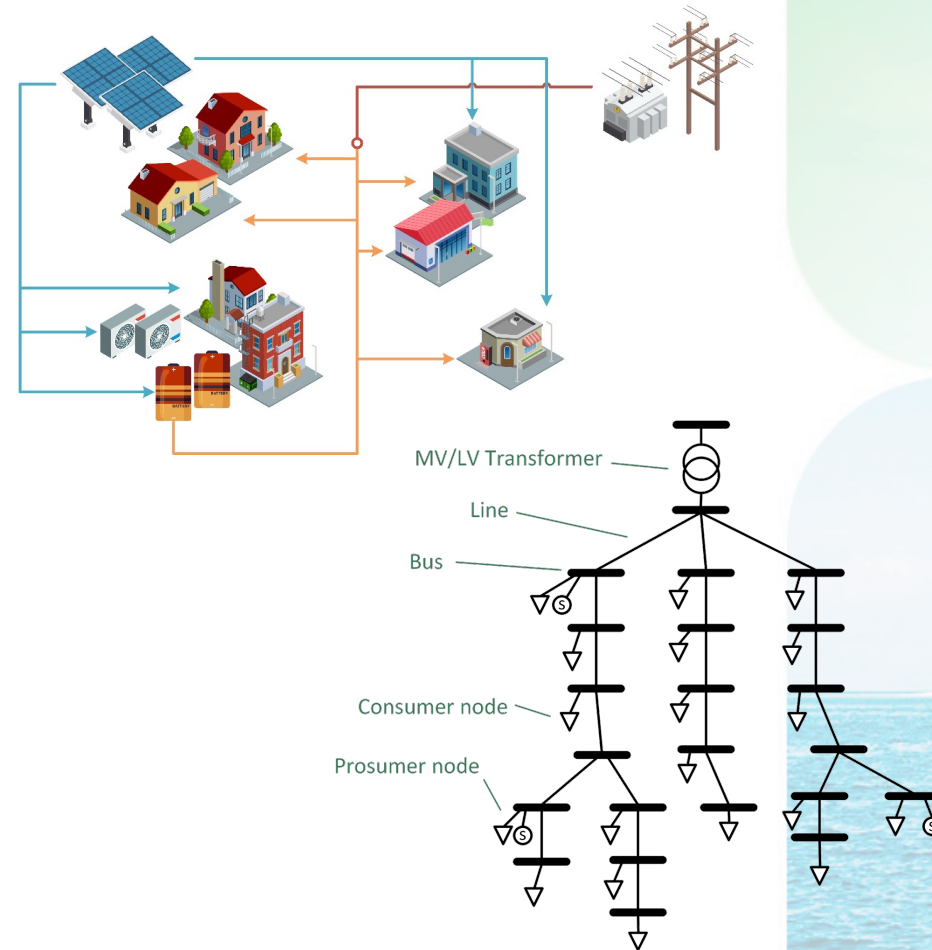


# Prosumer energy management

- Multi-level DR approach

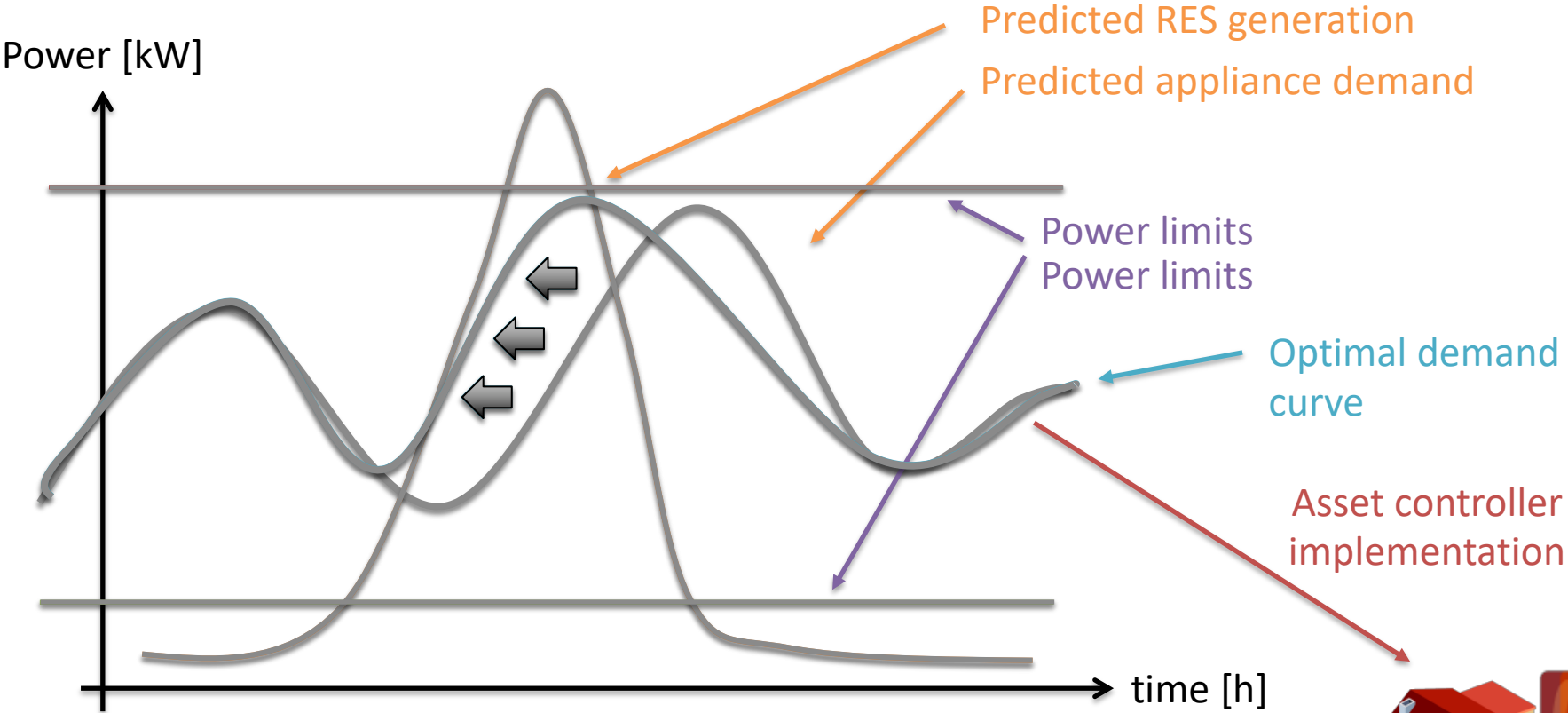


- Energy community perspective



# REACT control loop

- Illustrated workflow



Production and demand forecasting

Grid capacity management

Energy dispatch optimization

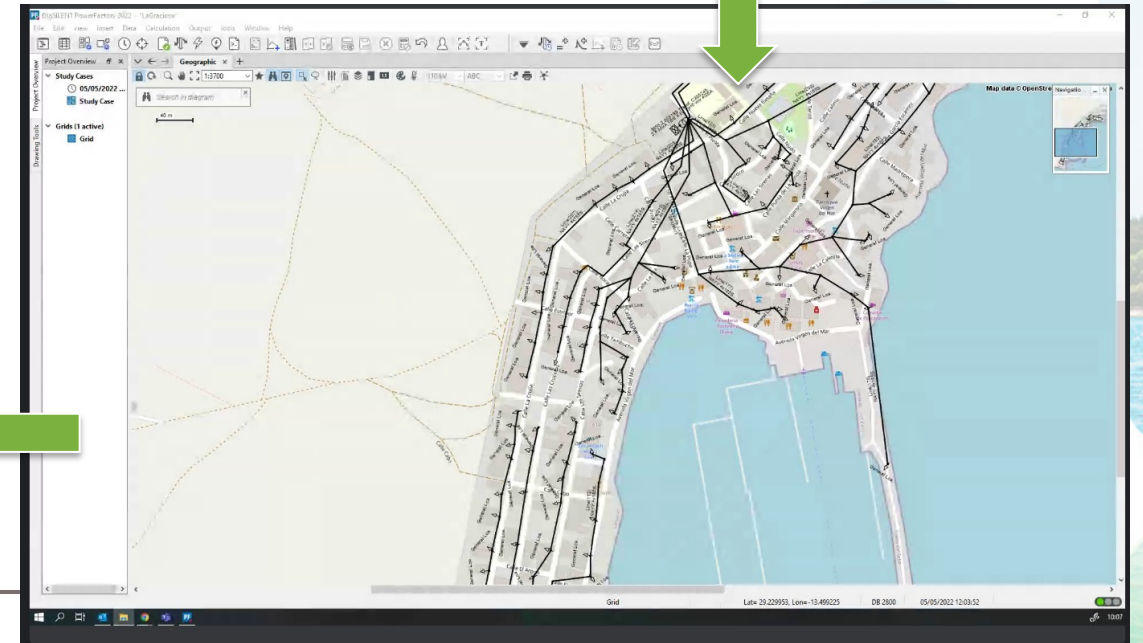
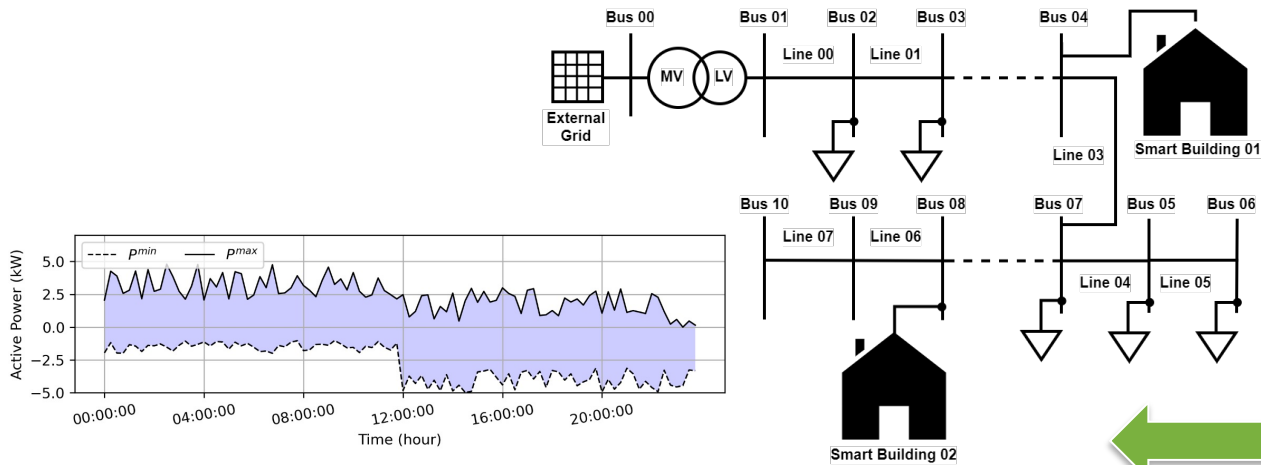
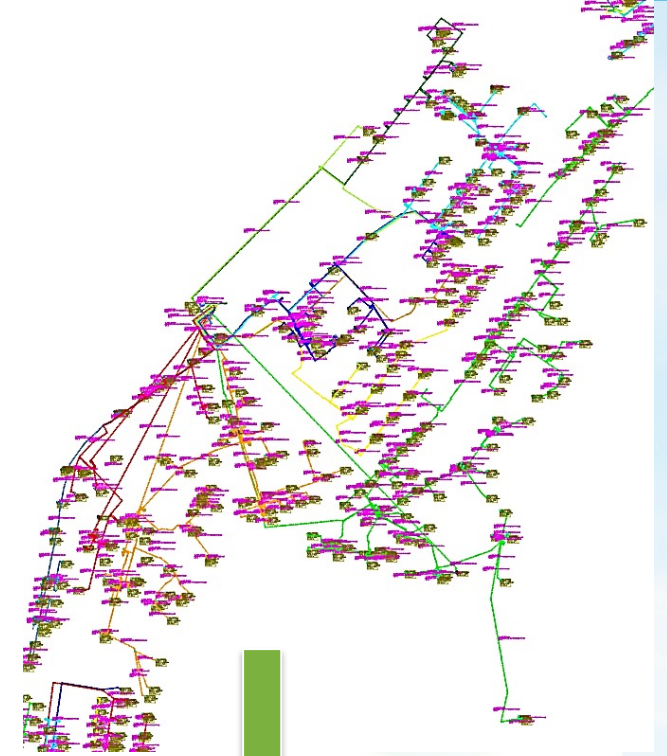
Orchestration and control

End user assets and appliances



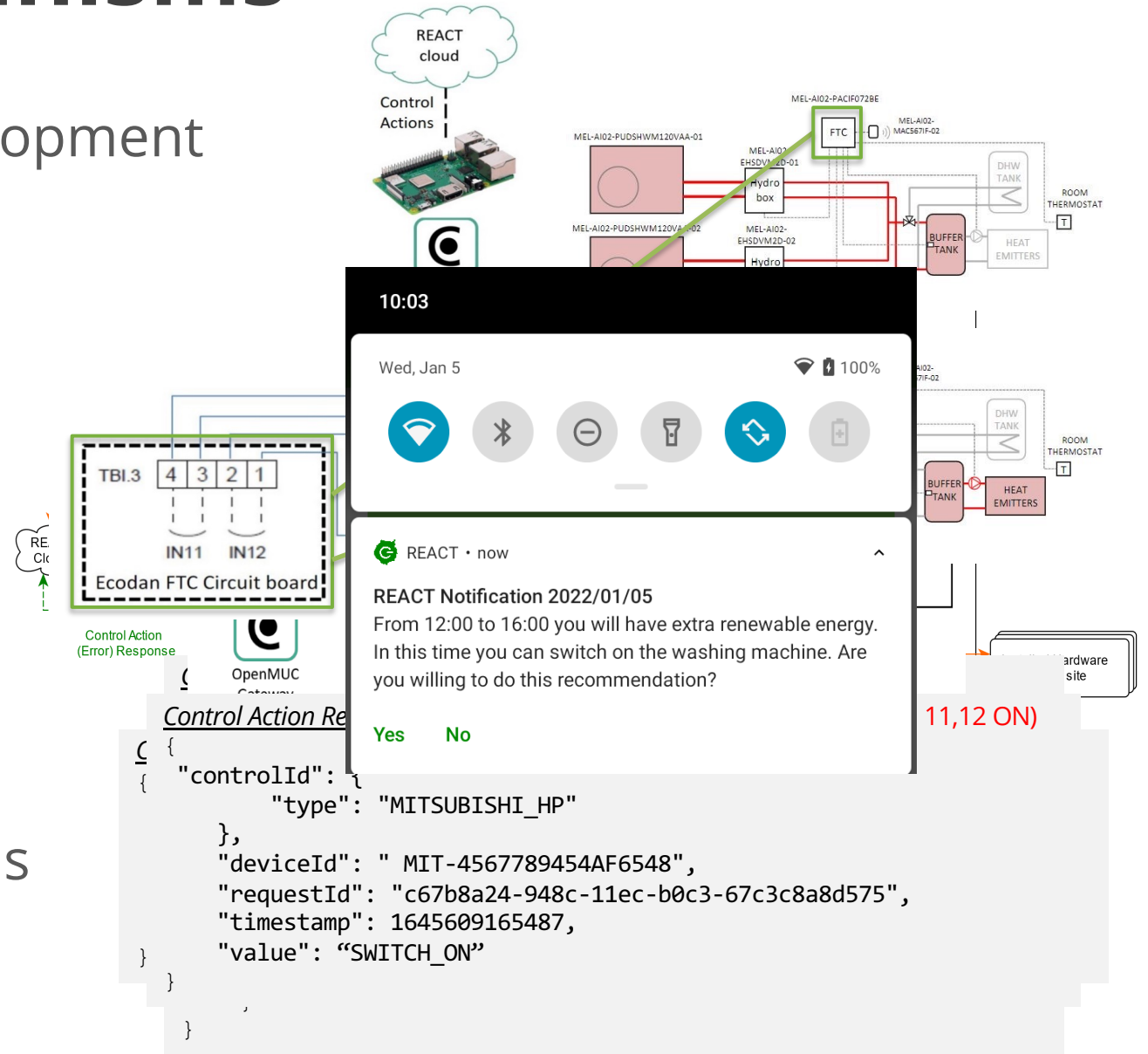
# Grid capacity management

- Fully integrated LV grid model (La Graciosa) vs Energy community approach (San Pietro)
- Consumer arrangement based on grid diagrams
- DSO cooperation is key
- Scale of REACT solution distribution



# Asset control mechanisms

- Energy gateway (openMUC) development
- Control orchestration
- Direct device management
  - Batteries & inverters
  - Power-to-hydrogen
  - EV chargers
  - (Large-scale) heat pumps
- Indirect controls
  - Load adjustment suggestions



# Demo case: Controlling grid power

The image shows a dashboard for a Victron Energy installation (AI15) and a terminal window. The dashboard displays power consumption for Grid (101 W), AC Loads (165 W), and PV Charger (647 W). A red arrow points to a 'Bulk' button with '200 W' written below it. The terminal window shows the command `/set_grid_connection_point_power 200` being executed, which increases the power at the grid connection point to draw 200 W.

**Dashboard Data:**

- Grid: 101 W
- AC Loads: 165 W
- PV Charger: 647 W
- Charging: 525 W
- Battery Charge: 50.5%
- Voltage: 53.04 V
- Current: 9.90 A
- MPPT-277: 109.09 V, 6.08 A, 663 W

**Channels Access Tool Table:**

Channel ID	Value	Time	Write
pacGridSetPoint	100	22/03/2022, 14:47:28	<input type="text"/> Write value Set record
victronEssMode	2	22/03/2022, 14:47:28	<input type="text"/> Write value Set record
pBat	525	22/03/2022, 14:47:28	<input type="text"/> Write value Set record
pAcGridL1	102 W	22/03/2022, 14:47:20	<input type="text"/> Write value Set record

```
dwerner@de17199: ~/git/react-edge/testing/demo
openMUC
220322 144623.712 [CM Configuration Updater (Update: pid=org.openmuc.framework.dataloader.mqtt.MqttLogger)] INFO o.o.f.l.m.MqttWriter - [mqttlogger] Saving buffers.
220322 144623.713 [CM Configuration Updater (Update: pid=org.openmuc.framework.dataloader.mqtt.MqttLogger)] INFO o.o.f.d.m.MqttLogger - Connecting to MQTT Broker
220322 144623.716 [CM Configuration Updater (Update: pid=org.openmuc.framework.dataloader.mqtt.MqttLogger)] INFO o.o.f.d.m.MqttLogger - ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.723 [com.hivemq.mqtt.handler] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.723 [MqttRecorder] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.723 [MqttRecorder] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.723 [MqttRecorder] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.723 [MqttRecorder] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.723 [MqttRecorder] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.724 [MqttRecorder] INFO ChannelHelper- Updating maxValueAgeMilliseconds from 1500ms to 1500 ms
220322 144623.844 [CM Configuration Updater (Update: pid=org.openmuc.framework.lib.ssl.SslManager)] INFO o.o.f.l.s.SslManager - Successfully loaded

Control
dwerner@de17199:~/git/react-edge/testing/demo$ ./set_grid_connection_point_power 200
dwerner@de17199:~/git/react-edge/testing/demo$ /set_grid_connection_point_power 200
```





# THANK YOU FOR YOUR ATTENTION

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