



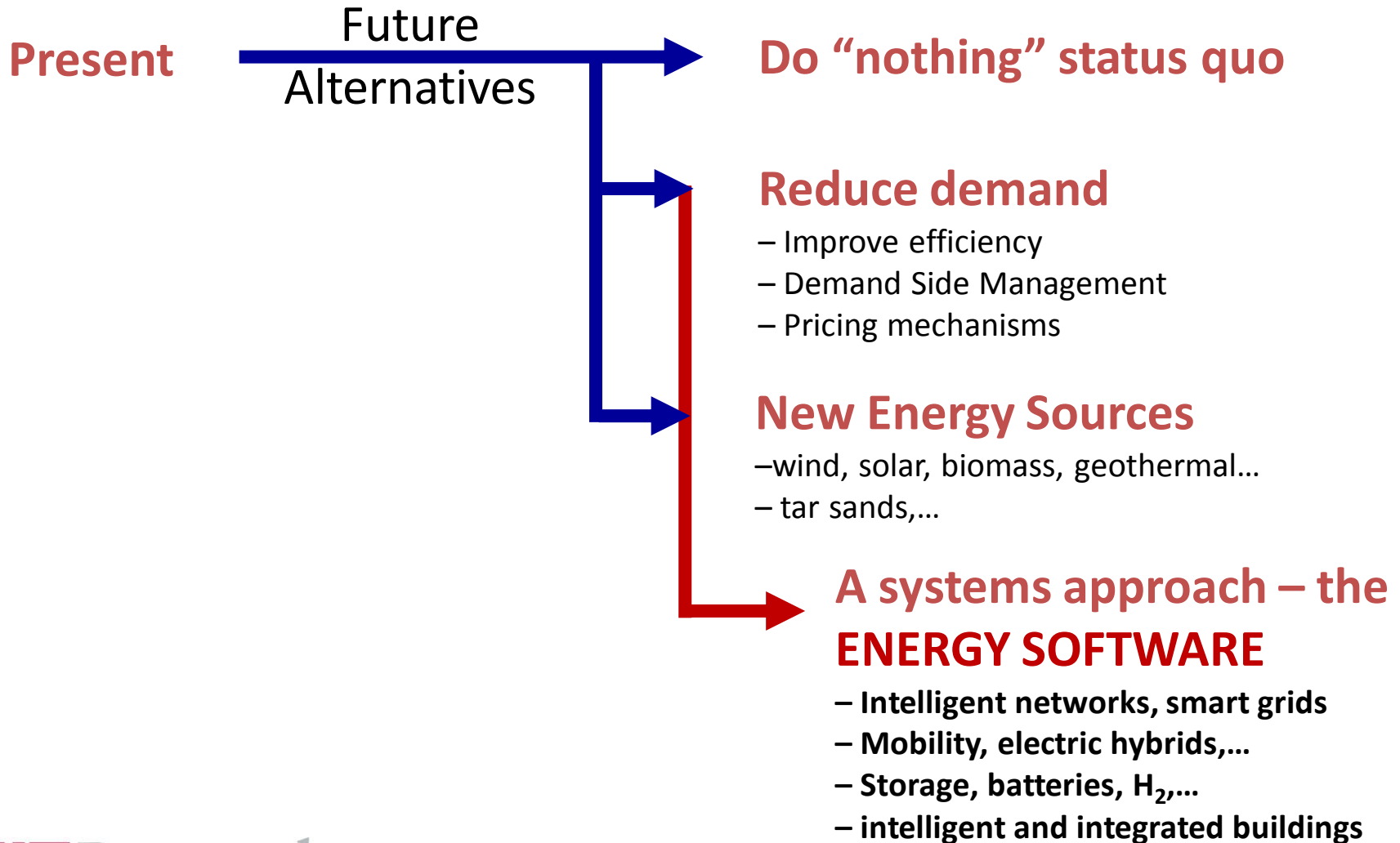
Sistemas Energéticos do Futuro: Os desafios para a ilha do Corvo

Paulo Ferrão

São Miguel, Açores, 12/12/2011

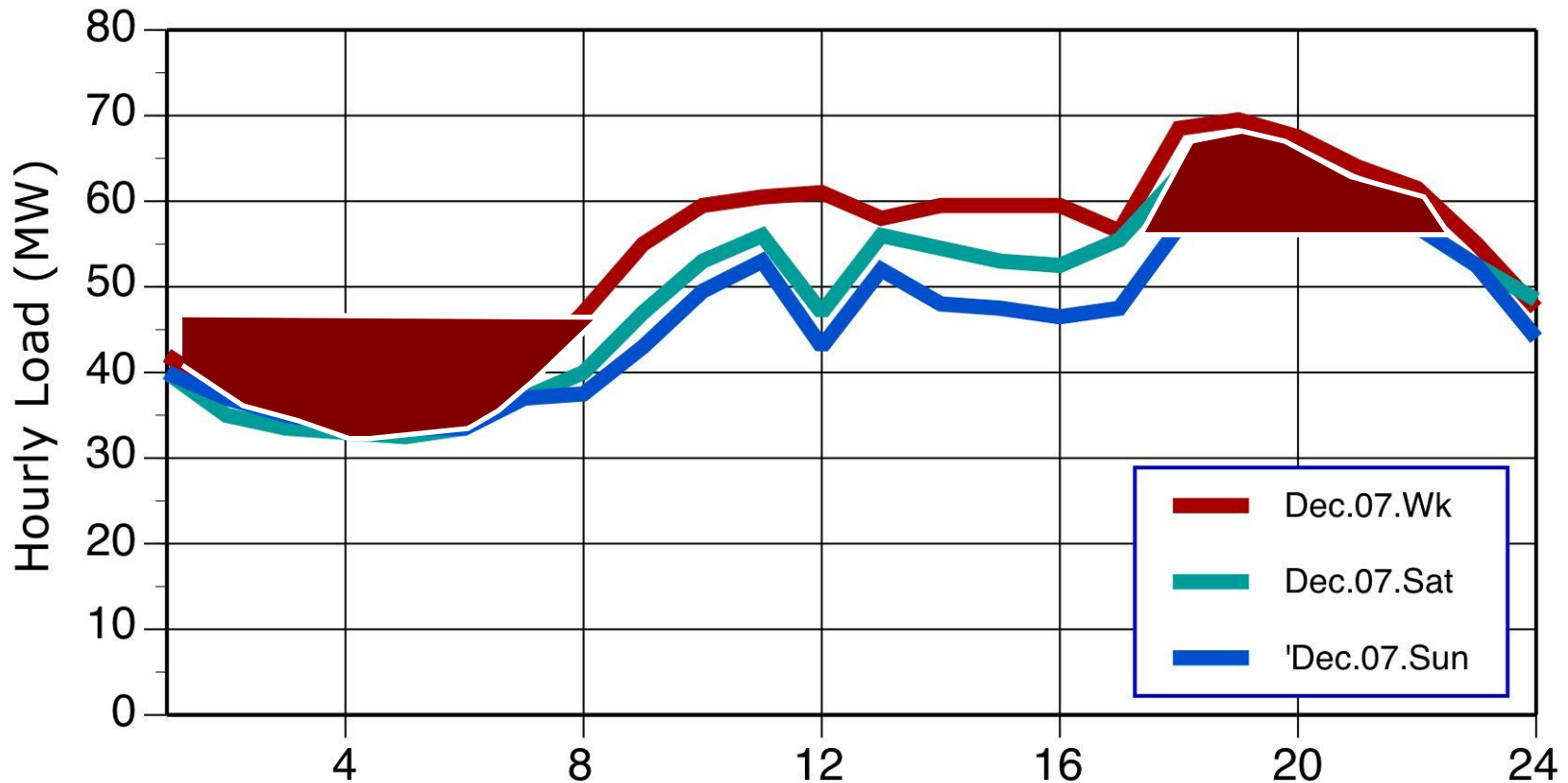


Energy systems of the future, finding a pathway



The main challenges

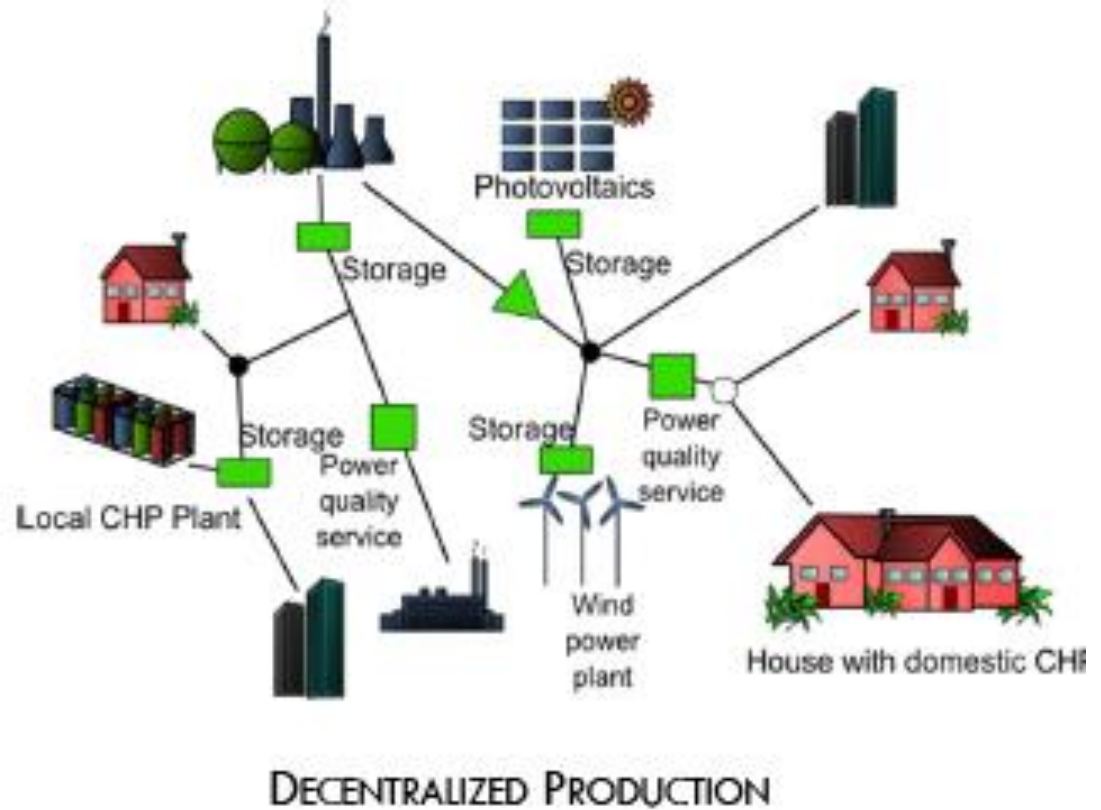
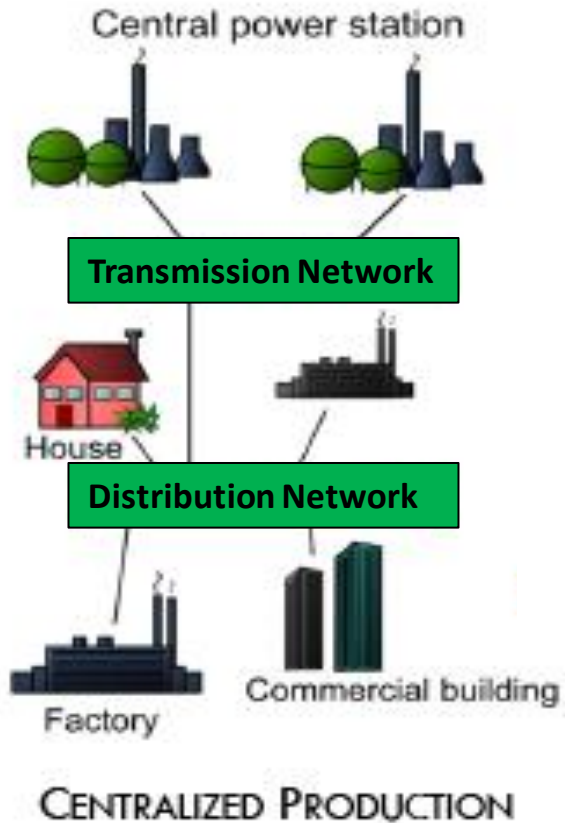
- 2007 Electricity Demand



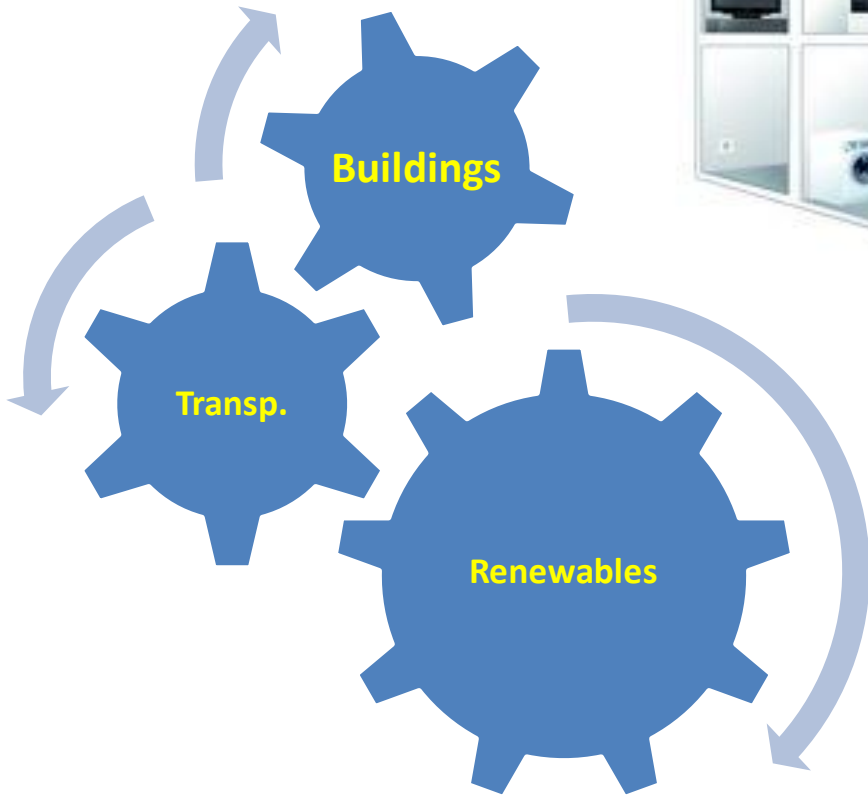
Electricity Demand - São Miguel
(EDA, December 2007)

THE ENERGY INTERNET

THE NEXT REVOLUTION



The challenge



The “secret” is that they need to cooperate, they are not working alone



The future – Intelligent Energy Networks, the energy software revolution

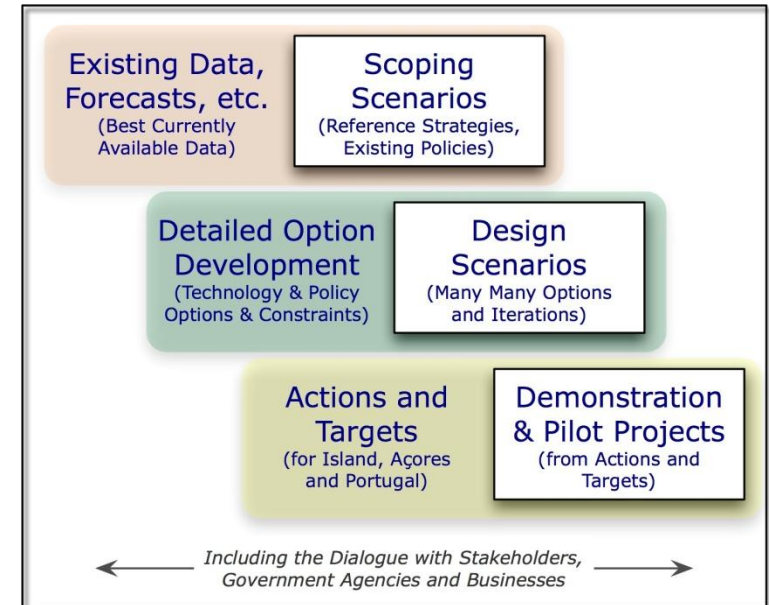


Why a Green Island?

“Islands” represent excellent case studies with which to organize and demonstrate **new methodologies for the sustainable and economic transformation of infrastructures**, including new challenges such as climate change adaptation and energy security.

Green Islands Research Strategy

- **Scoping Scenarios**
 - Use of Existing Data, Forecasts, etc.
 - Reference Strategy and Permutations
- **Design Scenarios / Vision Scenarios**
 - Development of Detailed, Island Specific Technology & Policy Options
 - Broad Set of “Design Scenarios”
 - Leading to a set of well vetted “Vision Strategies”
- **Demonstration and Pilot Projects**
 - Actions and Targets from “Vision Strategies”
 - Specific Implementations of Vision “Options”



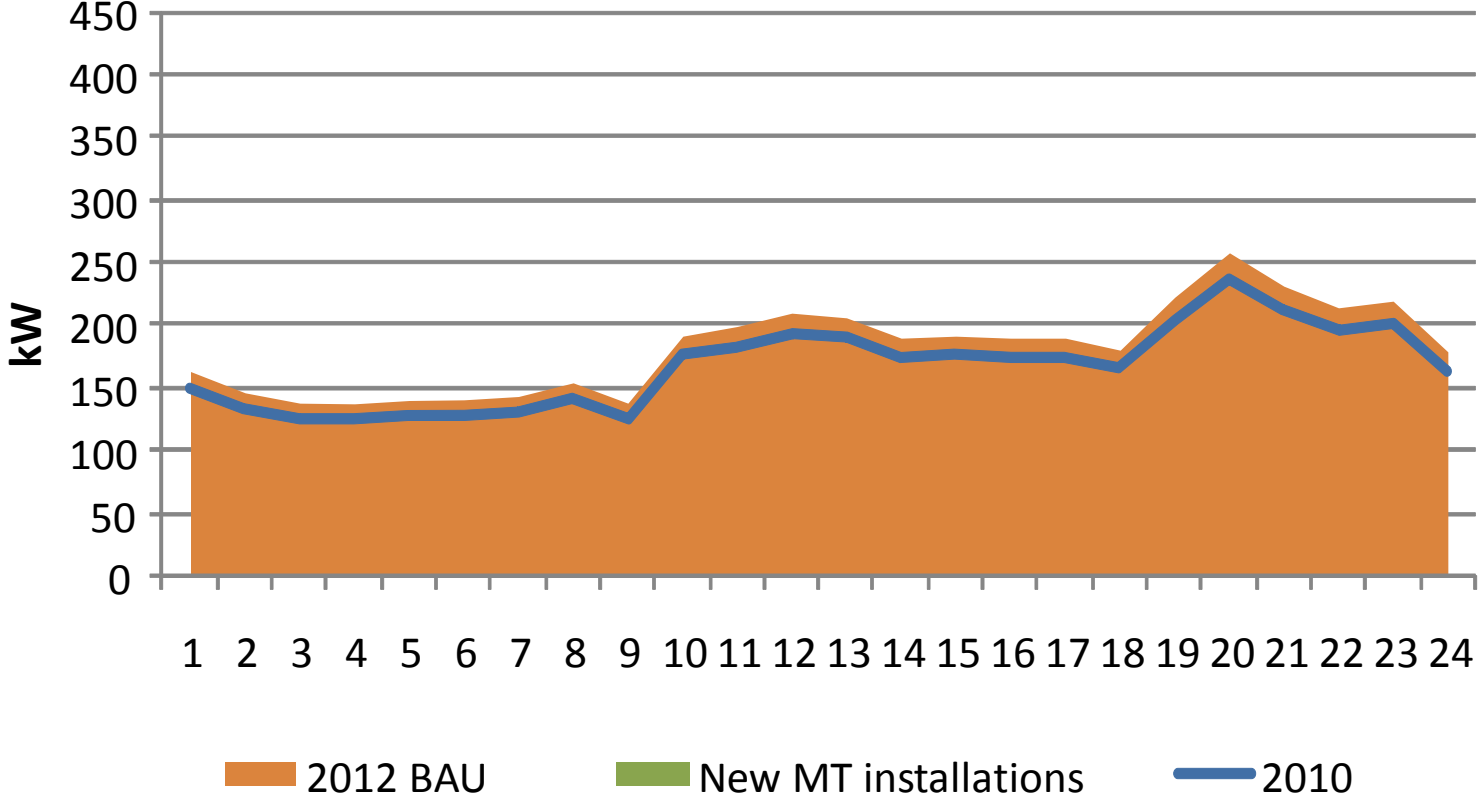
Sustainable Corvo

The new paradigm of a sustainable energy system

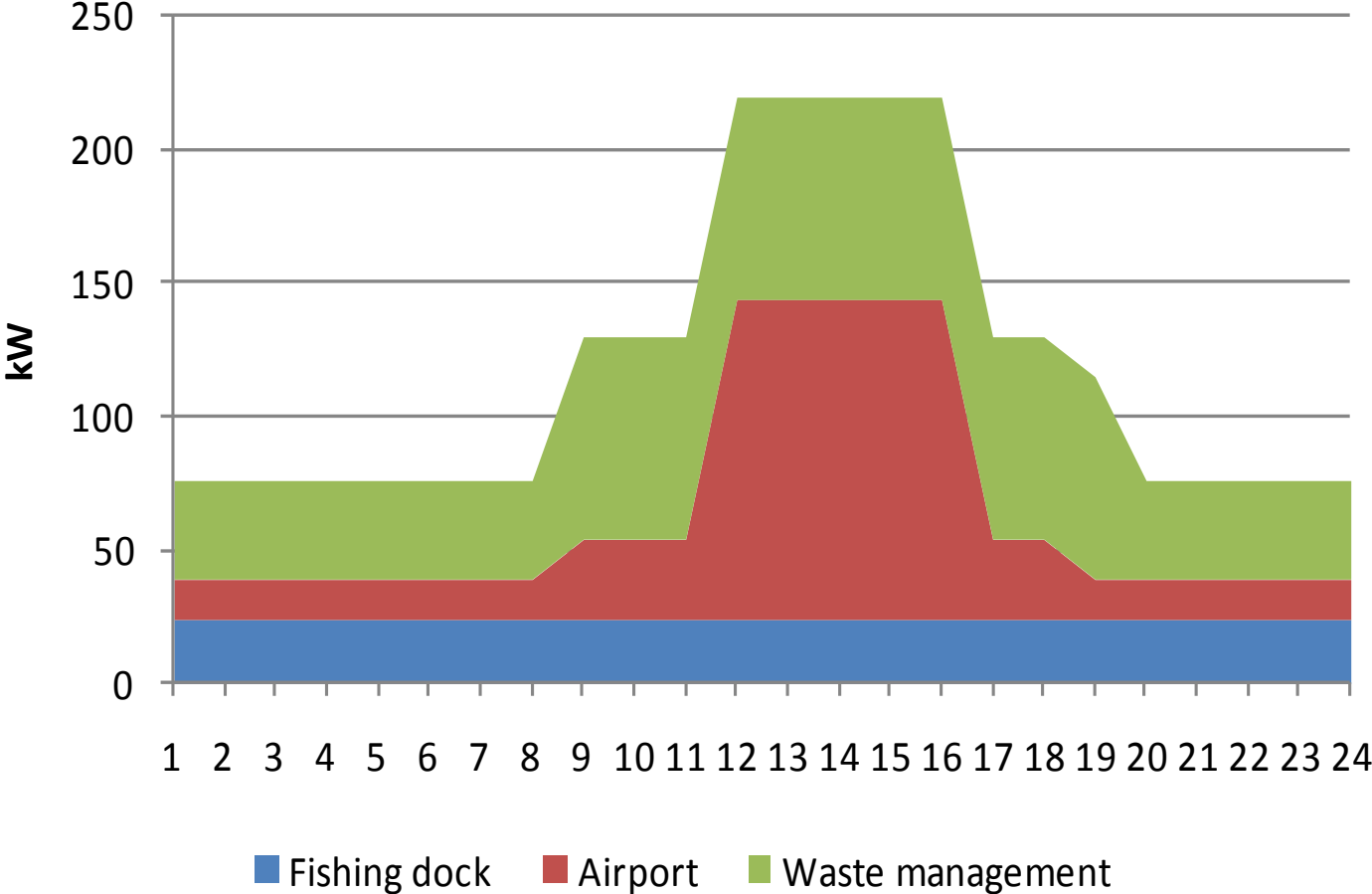
Land area	17 km ²
Population (2008)	488
Primary energy consumption	21 TJ
Electricity Consumption (2010)	1,4 GWh
Renewables penetration in electricity	0 %
Electricity Production (4 diesel units)	536 kW
Number of vehicles	93
Number of households	145
Electricity customers	248



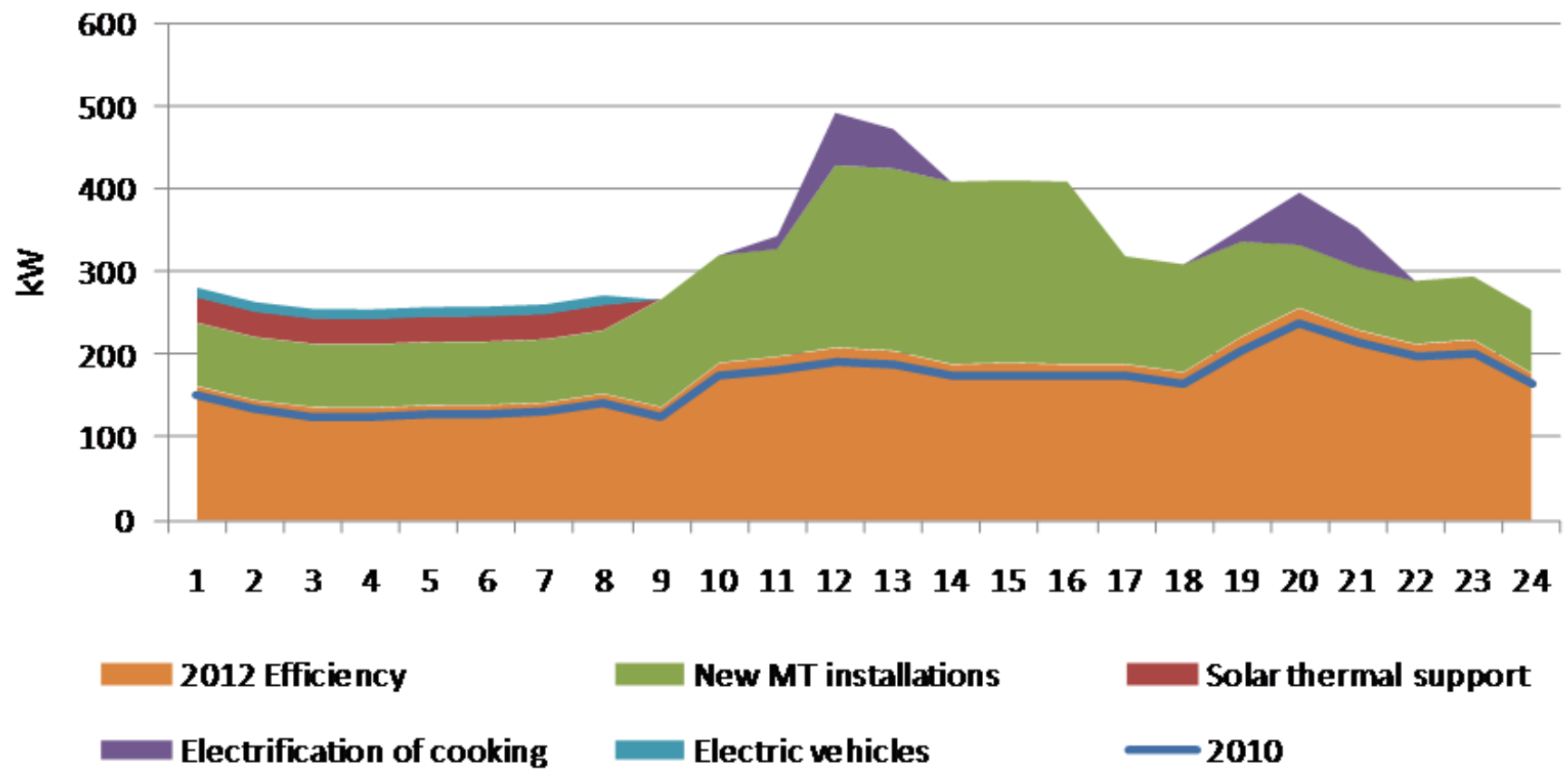
Expected load diagram in 2012



New electric loads (already planned)



Total Load Diagram (after electrification)



Objectives of the Project

- 70% of renewable energy sources in electricity production
- 25% reduction of the consumption of primary energy
- Develop in the island of Corvo a living laboratory of international recognition in the area of sustainable energy systems, with the implementation of a real smart grid
- **Enable the creation of knowledge in the research institutions and industrial partners for the development of solutions towards sustainable energy systems that can be adopted in other remote regions**



Modeling of the energy system

- Modeling of the system (IST)
- Modeling of the electricity grid (INESC Porto)

Substitution of the consumption of gas

- Solart thermal systems with electric backup for water heating (CMCorvo, Gov. Regional)
- Electrification of stoves and ovens (CMCorvo, Gov. Regional)

System for active demand management

- Development of Energy Boxes and DSM equipments (EFACEC)
- Development of algorithms for the control of the electric backup systems (IST)
- Development of algorithms for the integration of the Energy Boxes with the DSM controller (IST/MIT)
- Forecasting systems for renewable resources and integration with DSM (INESC Porto)

Wind energy (4 X 275 kWel, EDA)

Solar PV (aprox. 250 kW, EDA)

Smart Grid

- Development of Platform for communication with final user (PT)
- Infrastructure for communication and data processing (PT)
- Development of concentrator for the Energy Boxes (EFACEC, PT)

Grid regulation and energy storage systems

- Integrated system for automatic management and control (EDA, INESC Porto, EFACEC)
- Flyweel (EDA)

Electric mobility (V2G – Vehicle 2 Grid)

- Development of algorithms for V2G (INESC Porto)

Green Islands contribution to a Research Agenda

To increase sustainability and security of supply and allow for multiple interactions within the energy system, the research agenda should consider:

- Renewable resources characterization
- Energy storage technology and integration
- Energy efficiency
- Alternative transportation fuels (biofuels, electricity, others)
- Smart energy networks
- Dynamic energy demand
- Modes and practices for electric vehicles charging
- Evolution of energy consumption
- Consumer behavior
- Demand side management
- Impact of energy efficiency policies

