Smart Energy Systems for using RES up to 100% – The combination of RES and Tourism

Examples from Juist and La Gomera

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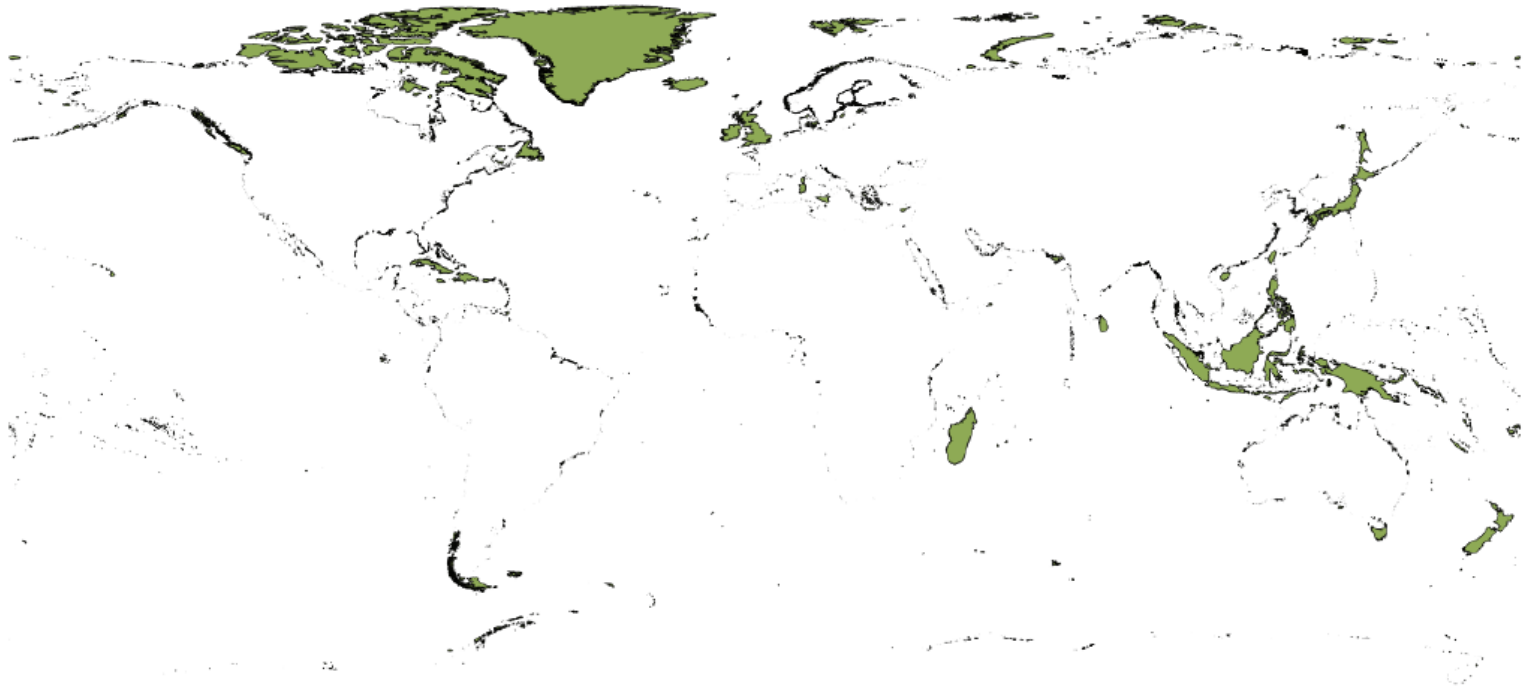
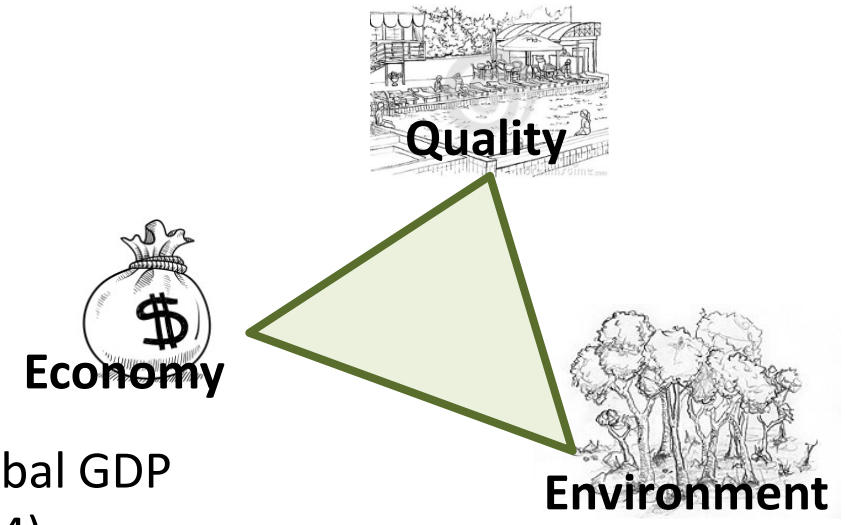
Islands, Tourism and Climate Change
Case of Juist

Overview global islands



Many islands show similar economic activities based on tourism!
Many islands have similar energy supply structures!

Tourism and climate change



- 10 % of global GDP (WTTC 2014)
- important part of the regional value chain

- exceeding consumption of resources (energy and water)
- approx. 4% of the global CO_2-emission rate (UNWTO-UNEP-WMO 2008)

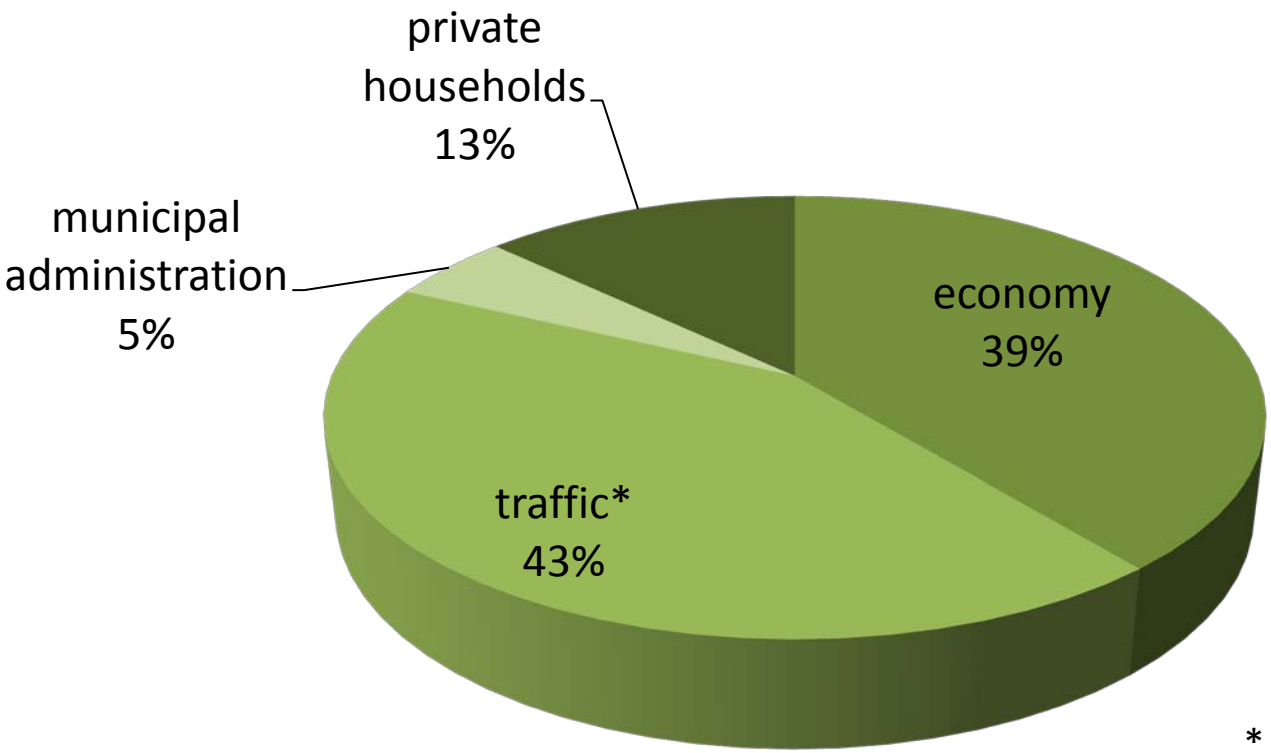
Especially intensified for underdeveloped and isolated regions

Example Juist

Juist

- 16 km²
- 1,700 inhabitants
- submarine cable to coast
- More than 6,000 clients per day (970,000 overnight stays per year)
- 70 % regular guests
- 20,000 tons CO_2 per year
- project ClimateIsland started in 2010 (2030: carbon neutral)

CO_2 emissions in 2012



* including arrival (ferry and flights) and car use on mainland

Project: ClimateIsland Juist

- Cooperation between local government and utility company; promoted and disseminated by C.I.S.T
- Involving tourist industry as well as population and guests
  - 69 % of population knows efforts and 73 % are willing to participate
  - One third of guests is willing to pay more to reach objectives
- 3 working fields: information, realisation, dissemination
- Majority of GHG emissions belong to energy use

Project: ClimateIsland Juist – energy actions done (in extracts)

- Carbon footprint for guesthouses (free of charge)
- Highlighting environmental friendly providers
  (→ competitive advantage)
- Solar thermal system for indoor pool
- Street lighting (replacing mercury-vapour lamp with LED)

Project: ClimateIsland Juist – energy reaching flexibility (to do)

- Assessment of RES and storage potential, analysis of public buildings regarding the efficiency potential
  - → Focus is set on heat sector (due to submarine cable)
  - → High refurbishment requirements (e.g. insulation)
  - → Set up wind turbine on mainland
  - → Solar thermal systems, PV and CHP for implementing prosumers

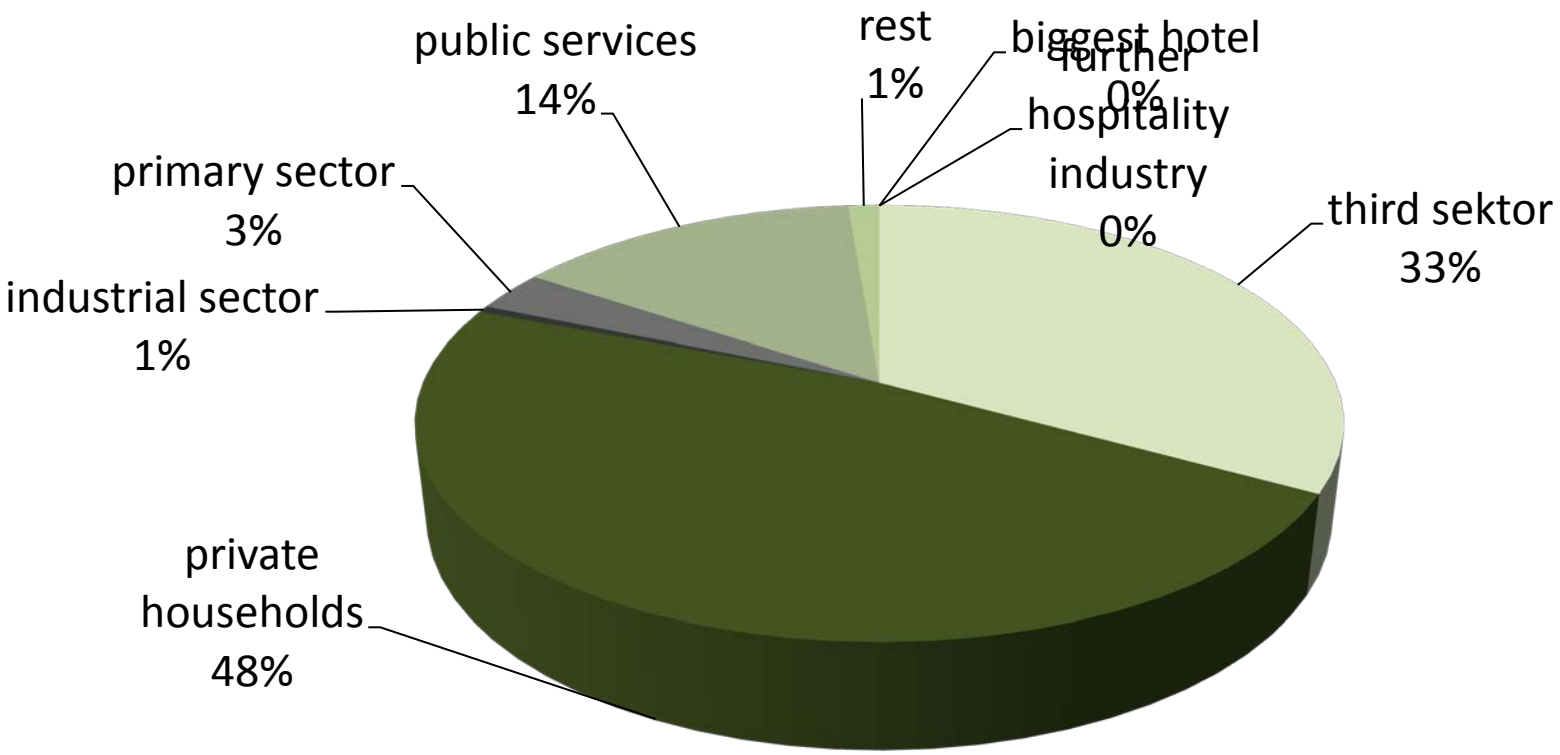
Energy and Islands
Case of La Gomera

Example La Gomera

La Gomera

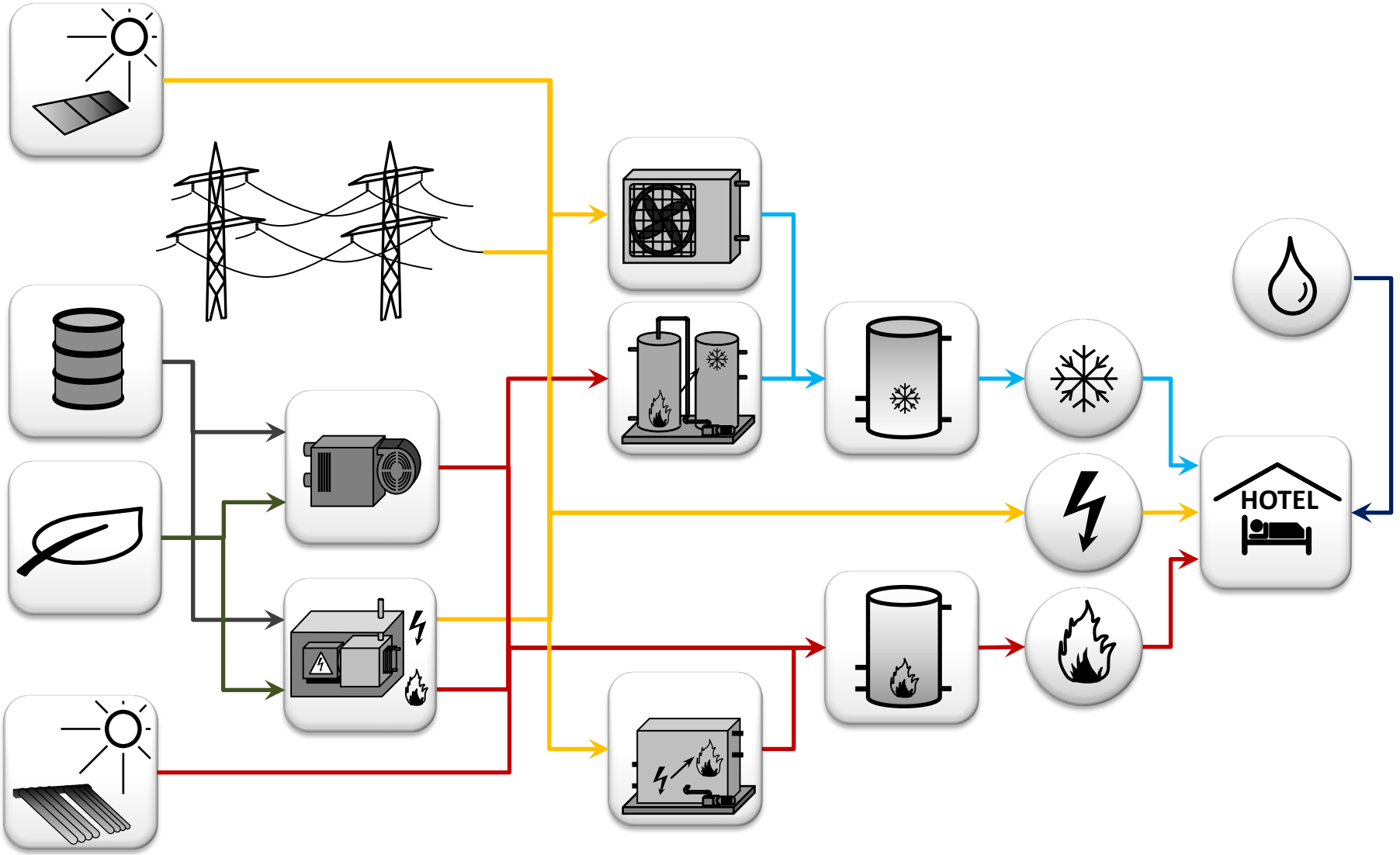
- 370 km²
- 21,000 inhabitants
- Central diesel power plant
- 65 – 70 GWh electric per year
- high LCOE
- natural water ressources
- rising costs

Distribution electricity demand La Gomera



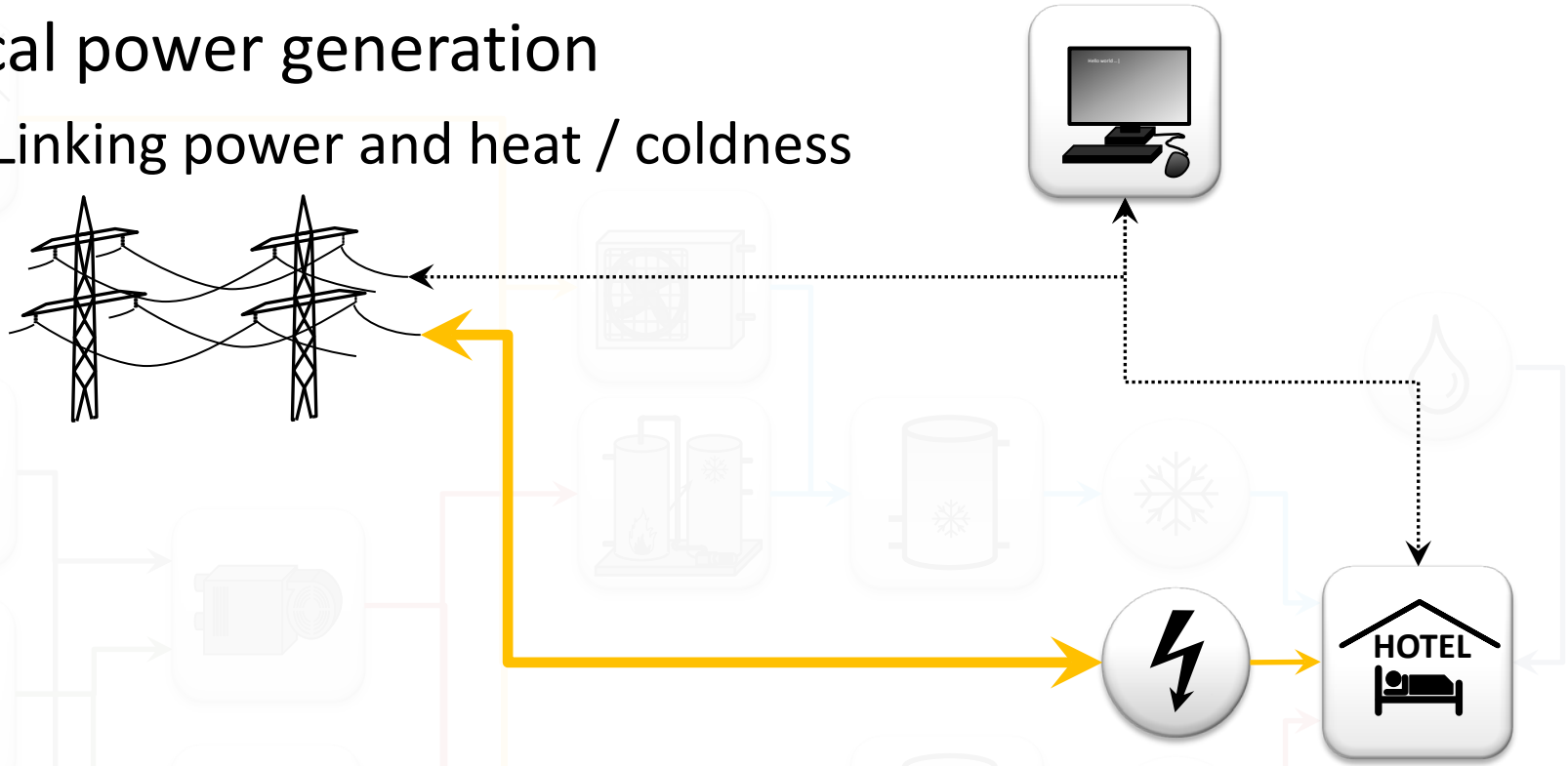
Based on figures of 2006

Focus on main consumer of tourism sector



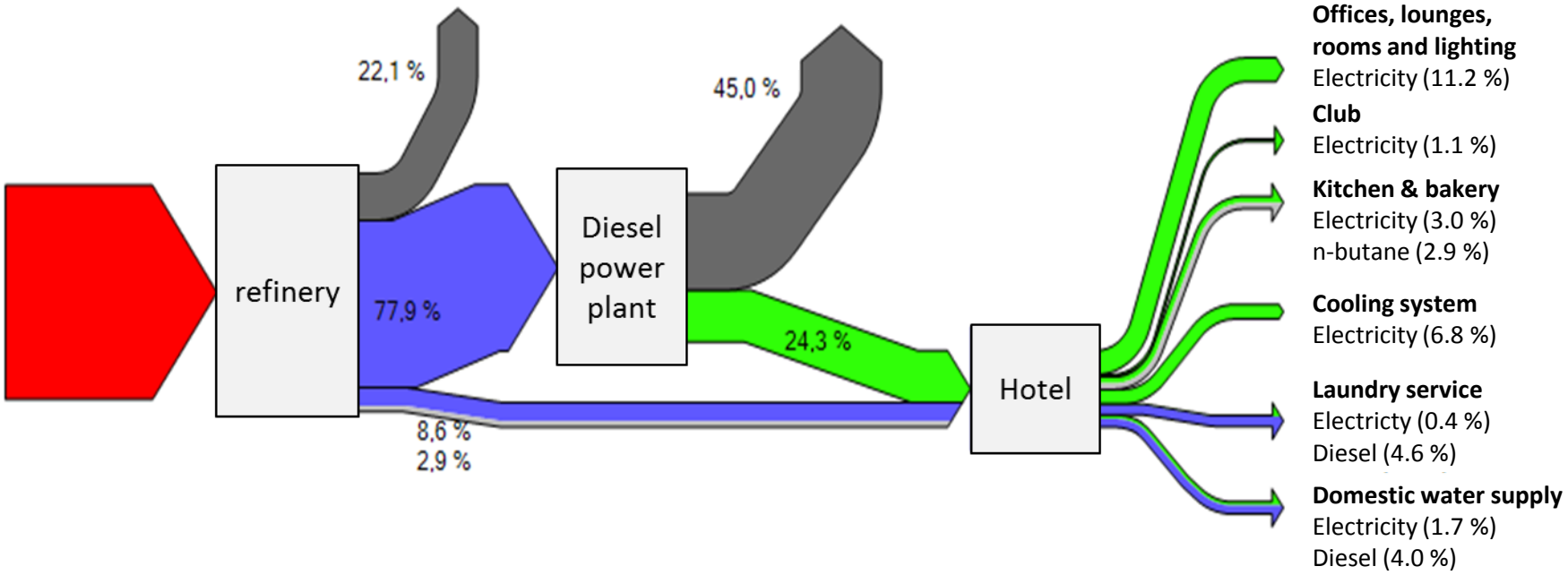
Bidirectional linking of grid and prosumer

- Local power generation
  - Linking power and heat / coldness



- Linking decentralized solution and island grid
  - Island‘s energy supply based on RES
  - Demand side management for adaptability of need, demand and supply

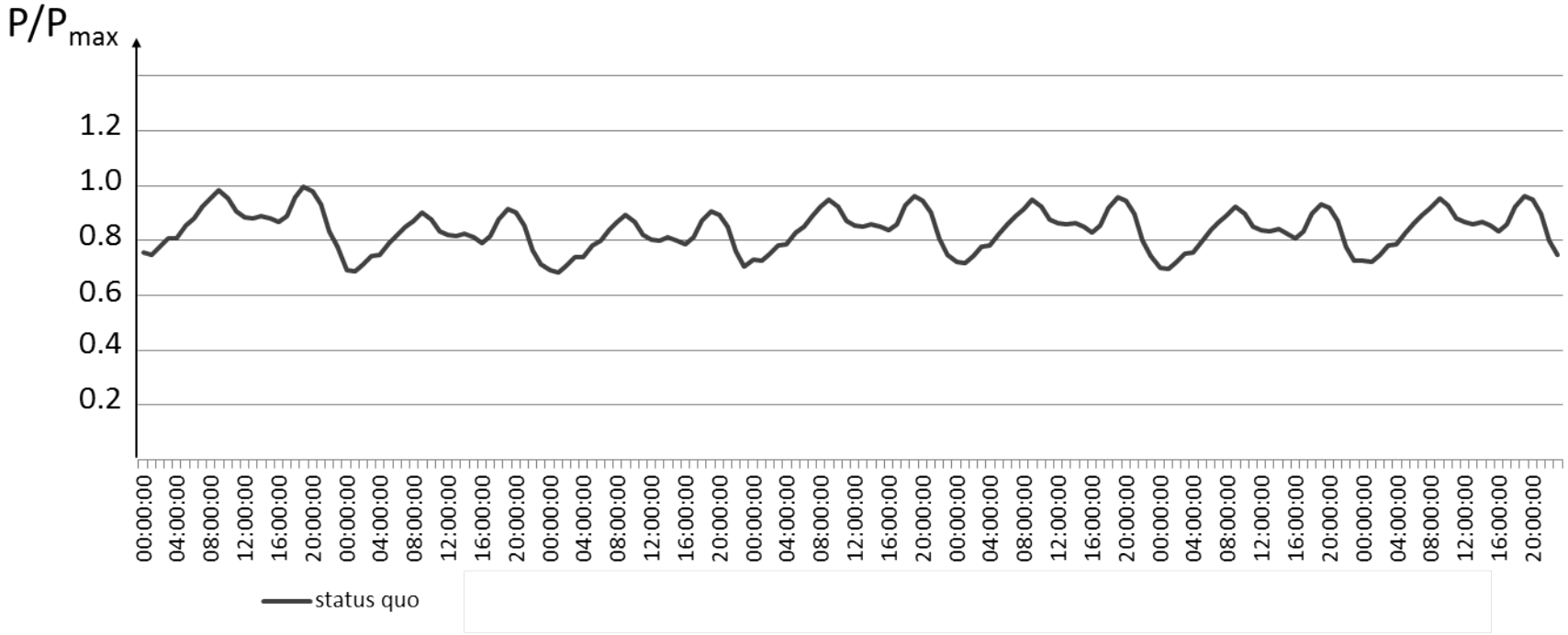
Energy flows of hotel



- crude oil
- diesel
- n-butane
- electricity
- losses

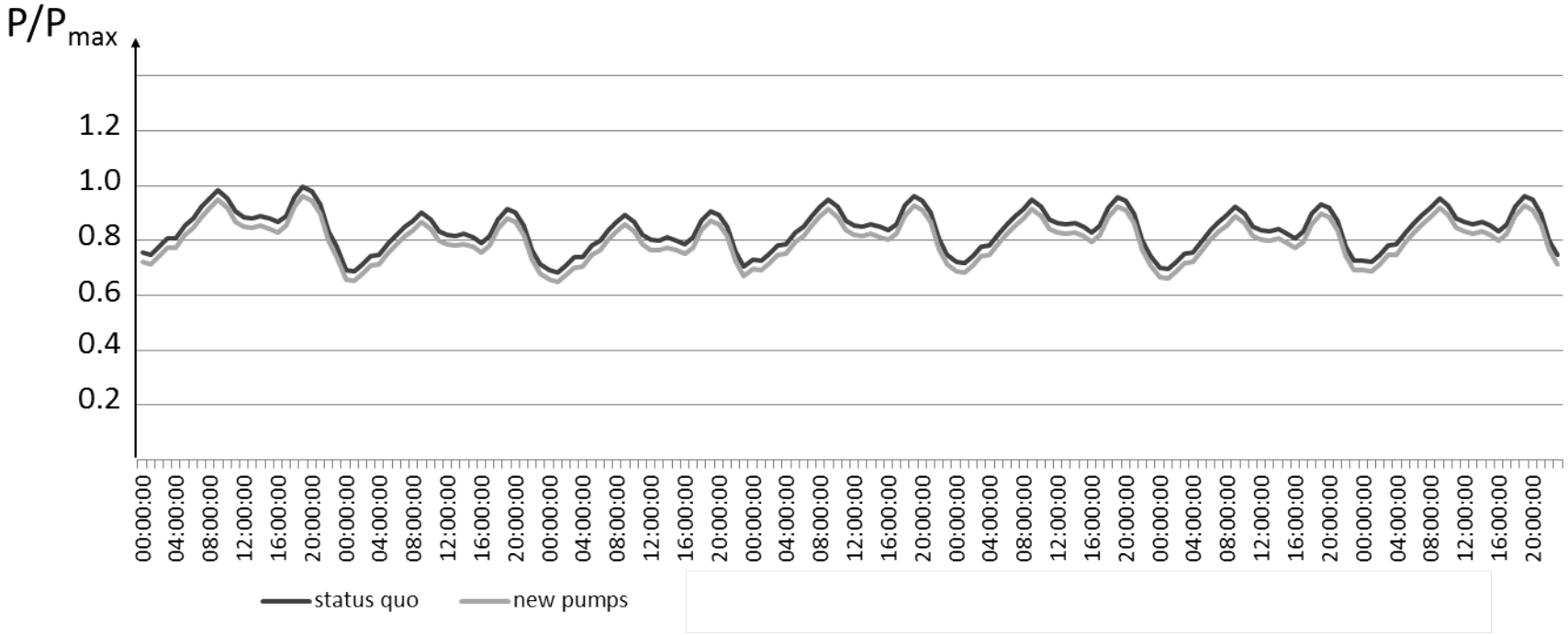
in % of primary energy input

Load curve of Hotel (typical week in off season)



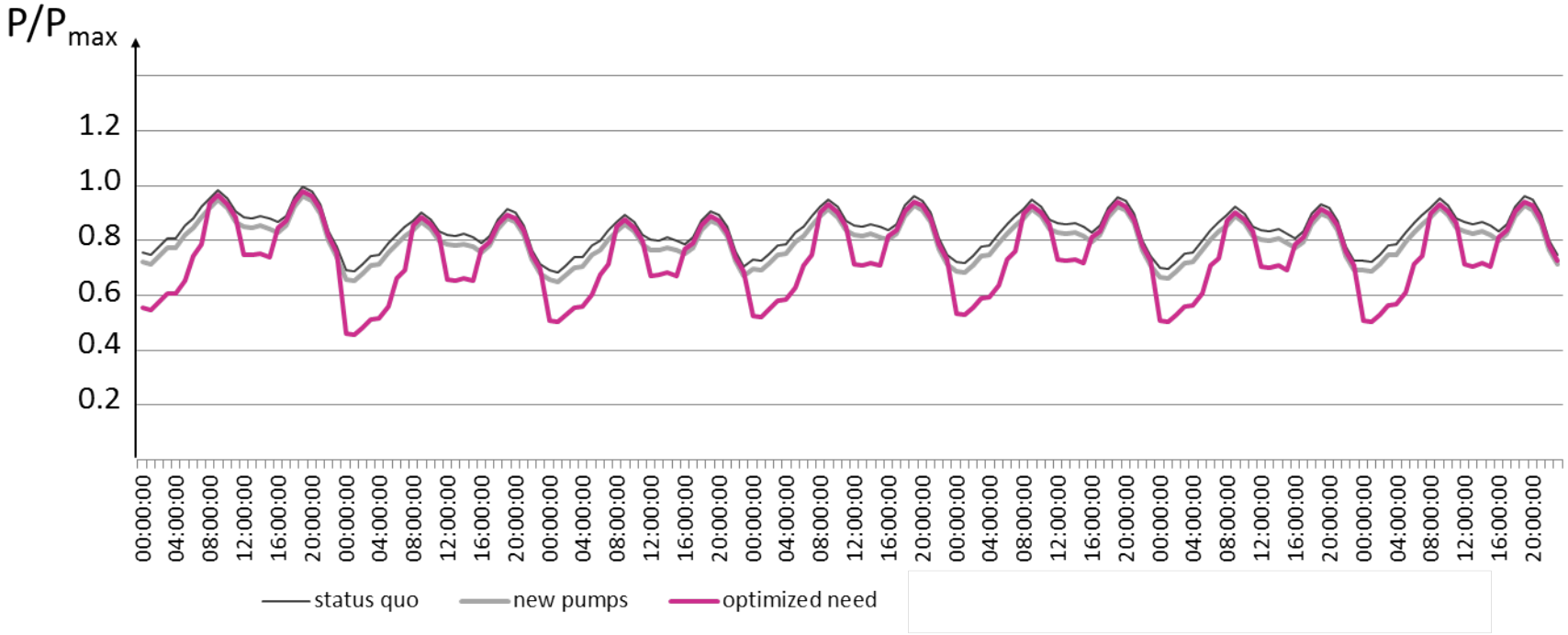
- For further approach focus is on cold system (pumps and chilling machines)

1st step: reduction of end energy use (new pumps)



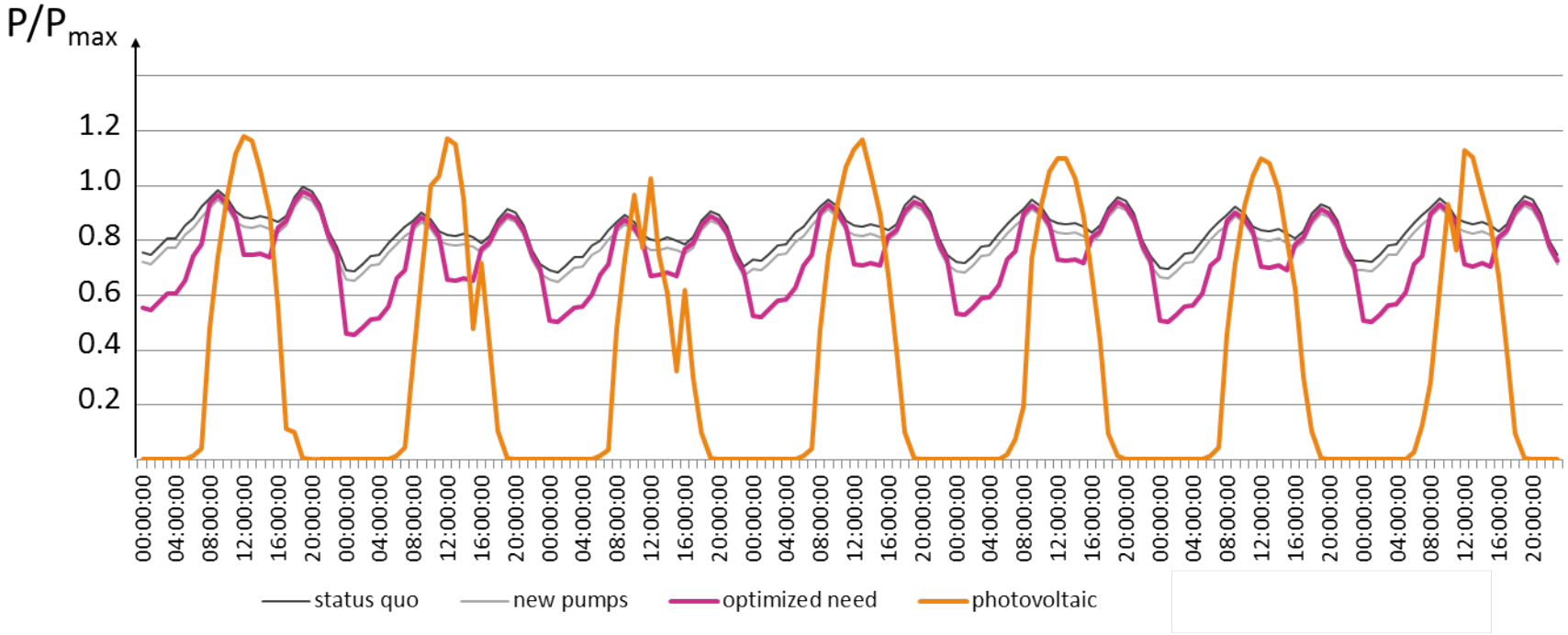
- Reduction of electricity and GHG emissions of 5 %

2nd step: optimization of energy need (coldness)



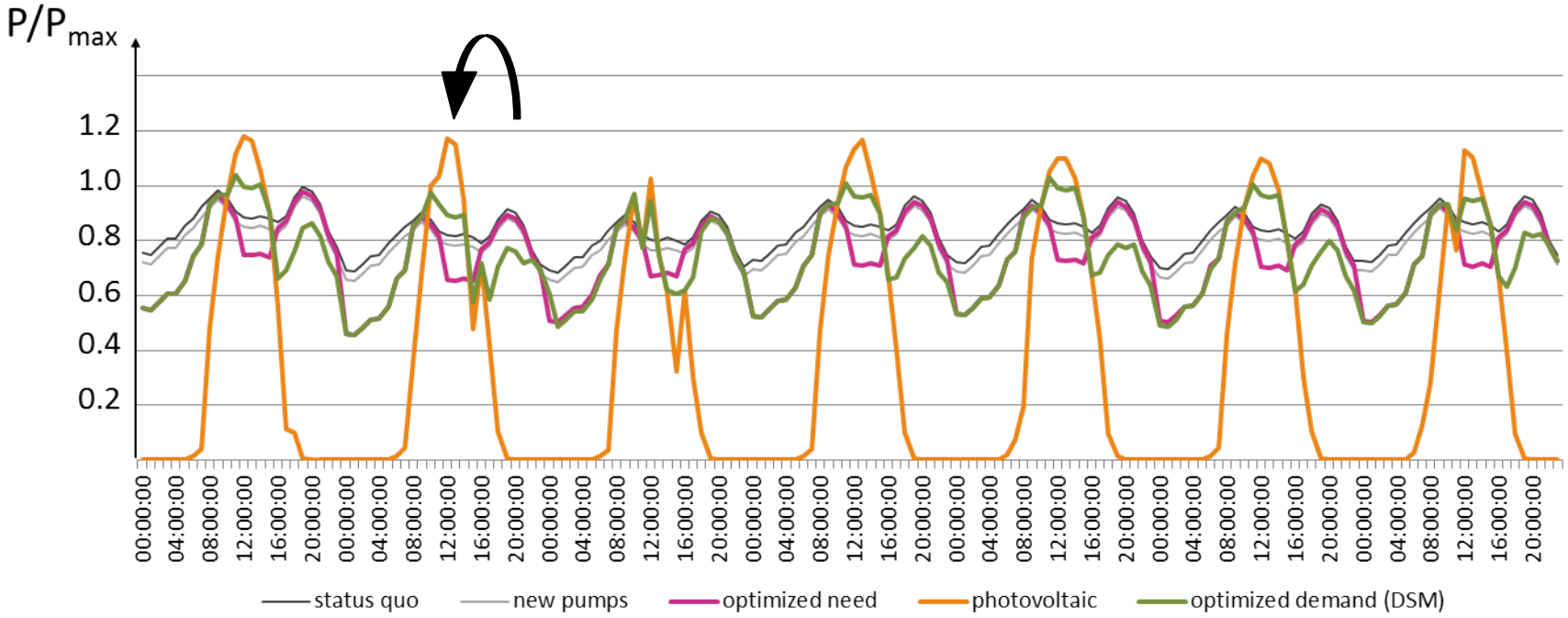
- Constraint: high flexible equipment
- Reduction of electricity and GHG emission savings of 11 %

3rd step: reduction of primary energy (PV)



- PV self-consumption of 83 % (self sufficiency of 38 %)
- No reduction of electricity but GHG emission savings of 41 %

4th step: optimization of energy demand (DSM)



- Constraints: free capacity and need for thermal energy storage
- PV self-consumption of 95 % (self sufficiency of 43 %)
- GHG emission savings of 45 %

LESSONS LEARNT JUIST AND LA GOMERA

Summary and conclusion

- Tourist industry and clients should be involved in projects regarding 100 % renewable islands
- Touristic facilities offer high potential for energy saving and for DSM to increase RES penetration

➢ Knowledge of equipment and permanent energy monitoring is indispensable

➢ Closer networking of tourist industry, researchers, political decision makers and utility companies is needed

THANK YOU FOR YOUR ATTENTION!

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