Beyond the Energy Transition;
Learning from Island systems

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Team: International Innovation
Motivation and Purpose

• UNCERTAINTY ABOUT THE ENERGY TRANSITION
• FEW SCIENTIFIC METHODS AVAILABLE
• A COMPARATIVE APPROACH IS ONE

• SMALL ISLANDS OFFER A WINDOW INTO THE FUTURE
  • High percentage of renewables (above 20%)
  • Expensive diesel power generation
  • Do not export their problems to a transmission grid

• THIS PRESENTATION USES EXISTING DATA AND EXPERIENCES AND ADDS A DIMENSION OF THE SOCIAL ORGANISATION (of the energy transition). BEHAVIOR FALLS OUTSIDE ITS SCOPE.

(Why not Germany as an example?)
A Comparative Method

IS ABOUT COMPARING APPLES AND ORANGES BUT IN A STRUCTURED WAY;

1. DETERMINE THE VARIETY
2. ISOLATING SOME FACTORS
3. ESTABLISH CAUSAL FACTORS AT DIFFERENT LEVELS OF SOCIAL ORGANISATION
4. BE AWARE OF COMPLEXITY IN THE SENSE OF THE UNPREDICTABLE OUTCOME FROM THE INTERPLAY OF MULTIPLE FACTORS
5. BE AWARE OF CIRCULAR REASONING

BY THE WAY, REMOTE AREAS FOLLOW THE SAME LOGIC AS ISLANDS.
Geographical Spread and Parameters

• SIMULATION MODELS OF AN HYBRID MINI-GRID (BREYER 2013):
  • Diesel price
  • Irradiation
  • Wind

• DISTANCE TO SHORE DETERMINES TRANSPORT COSTS. PACIFIC HIGHEST, LOWEST MEDITERRANEAN SEA
• WIND DOMINATES IN THE ARCTIC
• TROPICS AND AIRCONDITIONING COINCIDE WITH PV AND RESULT IN LOWER STORAGE
• DIESEL GENERATOR BECOMES BACK UP

• OBSERVATION: STORAGE SYSTEMS ARE DIVERSE AND RANGE FROM LNG, BIOGAS, HYDRO, H2, FLYWHEELS, GEO-THermal, TO VARIOUS TYPES AND SIZES OF BATTERIES.

(Storage seems not to be the bottleneck!)
GLOBAL PV AND WIND POWER POTENTIAL OF SMALL ISLAND HYBRID MINI-GRIDS.
Some Experiences Taken From IEA PVPS Task 11

• Design of the system should be adequate to local conditions and needs of the community.

• Unfamiliarity and top down approach are negative factors.

• A condescending approach has harmful effects.

• Users will always find new ways to consume energy, efficient use has to be planned and promoted.

• The goal of the project should be subject to the capacity of the community to develop. As much local knowledge should be used and external dependencies limited.

• Nothing is maintained free, the tariff paid should be able to sustain operation and replacement of components.

• Most failures are not due to technical problems but to the lack of a clear organisational scheme.
Organisational Diversity & Technical Dependence

- CASES ON A SCALE OF TECHNICAL DEPENDENCE OF THE POPULATION RESULTING IN VARIOUS DEGREES OF OUTSOURCING.

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<tr>
<th>Tonga</th>
<th>Crete</th>
<th>Magnetic Island</th>
<th>Aruba</th>
<th>Lanai - Hawai</th>
<th>Cape verde</th>
<th>Gotland</th>
<th>Texel</th>
<th>Fair Isle Shetlands</th>
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https://www.nlb.org.uk/LighthouseLibrary/Lighthouse/Foula/
Organisational Diversity & Technical Dependence

• ALL IS NOT WELL IN PARADISE!
• TENSIONS DO EXISTS BETWEEN UTILITIES AND THE POPULATION:
  • Where centralised power plants are planned at historical sites or near tourist centres.
  • When the population goes off grid, the utilities might become antagonistic.
  • When the population is not involved and utilities are part of an exclusive elite.

Image: By Michael via Wikimedia Commons
Organisational Diversity & Technical Dependence

- A wide range exists from little relevant technical skills (everything outsourced) to virtual independence (almost nothing outsourced).

Results:
- Energy transition has different faces and possible in all scenario’s.
- Main success factor seems to be the ability to supply a flexible energy service and service levels that take into account local circumstances.
- Service suppliers encountered so far; engineering companies, utilities, local government, research institute, IT integrator, crofting community.

- That is the lesson to whom it may concern.
SOURCES

• Special thanks to Muriel Watt (Australian PV Platform and IEA PVPS exco), Christian Breyer at Lappeenranta University of Technology (LUT) and Arie Hobbel (CapGemini and Cloud Power Texel) who provided me with a wealth of information.

• Also various projects supplied information that is not represented here and of course all members of IEA PVPS task 11.

• References:

  Blechinger, Cadet, Bertheau, Huyskens, Breyer, Seguin 2013
  “Global PV and Wind Power Potential of Small Island Hybrid Mini-Grids”

  Jacquin (PHK Consultants) e.a. IEA PVPS Task 11
  “Social, Economic and Organizational Framework for Sustainable Operation of PV Hybrid Systems within Mini-Grids.”