# Pathways towards 100% renewable energy on the Faroe Islands

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# Introducing the Faroe Islands

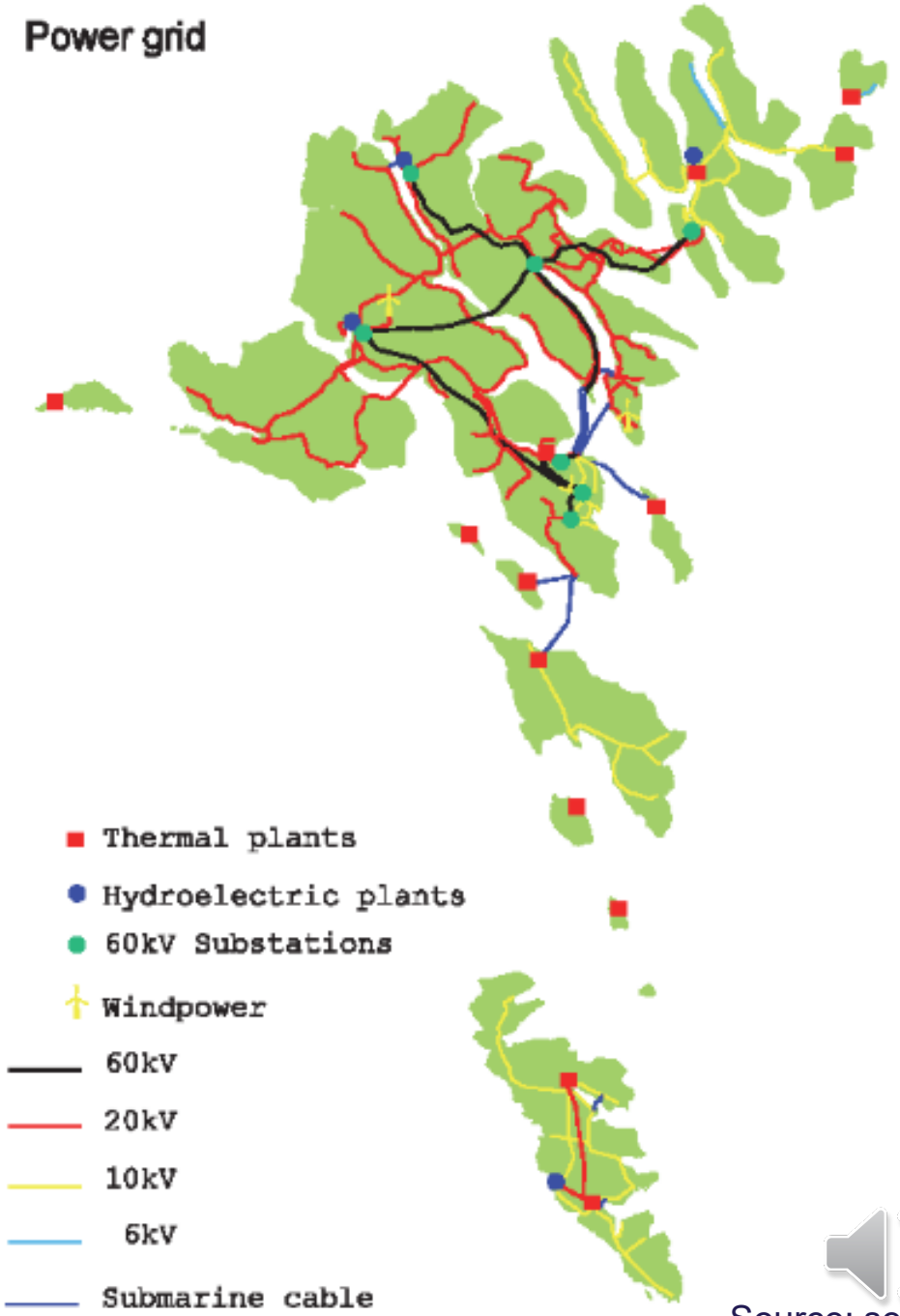
- 18 small islands
- Population of 52,000

**Climate**

- Average wind velocity: >10m/s
- Annual rainfalls: >3000mm
- Low temperature variations
  - Warmest montly average: 11°C
  - Lowest montly average: 3.5°C
  - Variation in temperature: 7.5°C

# Introducing the Faroe Islands

- 7 isolated electricity grids
- Main grid: ~90% of demand
- Southern grid: ~9% of demand
- Smallest 5 grids: <1% of demand




Source: sev.fo

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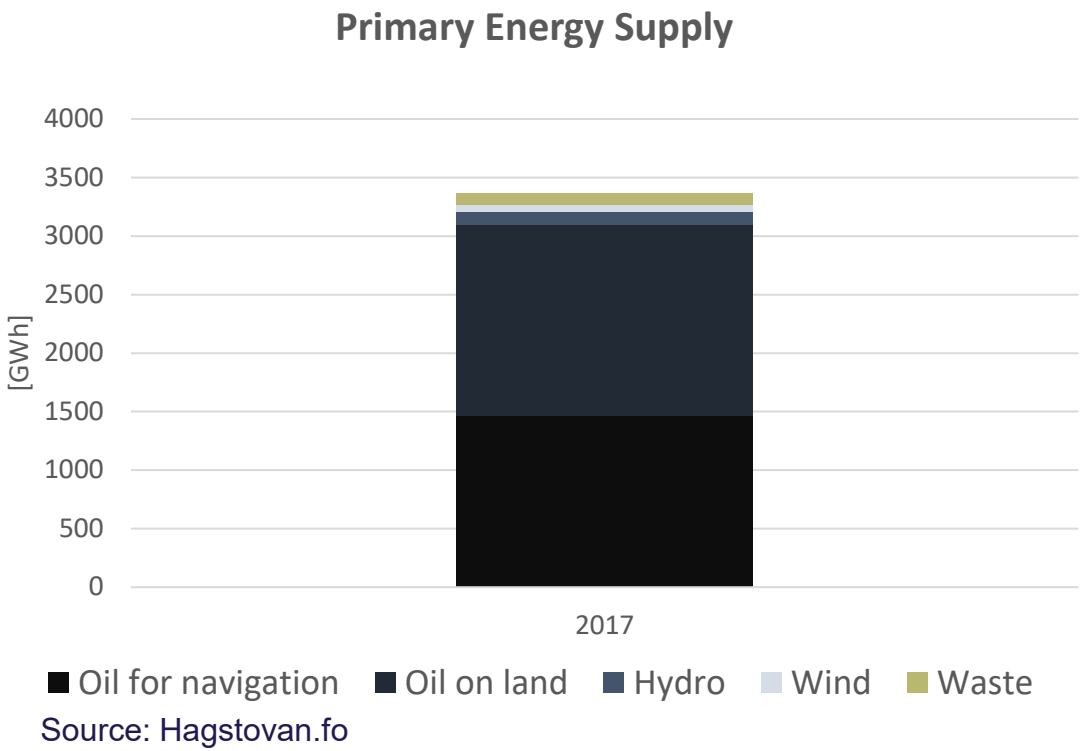
# Introducing the Faroe Islands

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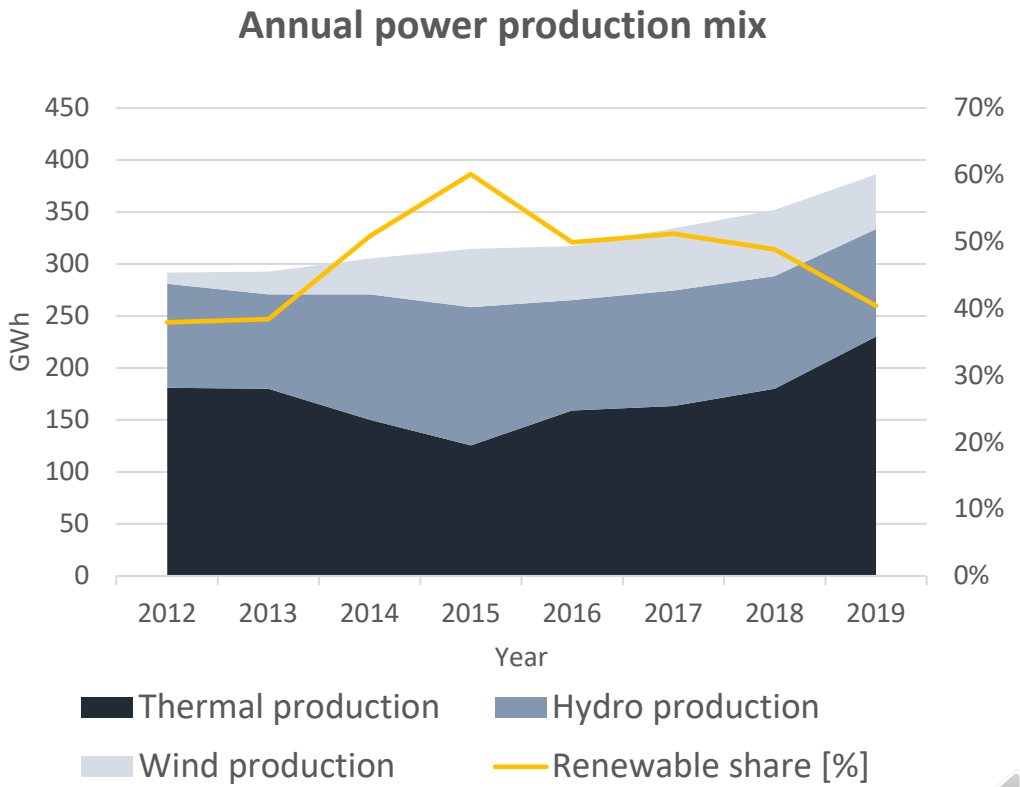


Source: Sev.fo

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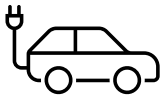
# Introducing the Faroe Islands

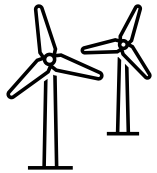
**Shared goal of the government and the power company, announced in 2015:**

- **By 2030**

All heating based on renewable energy



All onshore transportation electrified



100% renewable electricity

# Previous work



- Papers and reports
  - Dansk Energi (2016)
  - EA Energy Analysis (2018)
  - Norconsult (2018)
  - Dansk Energi (2018)
  - Heilsu og Innilendismálaráðið (2018)
  - Katsaprakakis *et al.* (2019)
  - Tróndheim *et al.* (2019)
  - Simonsen & Niclasen (2020)

Result
- Significant mapping of available resources
- Signinficant documentation of the current system

Consensus:
- Much more wind (between 100-150 MW)
- A lot of solar (between 70 to 125 MW)
- Increasing hydro reservoirs and turbines
- Pumped hydro
- Tidal has great potential
- Strengthening of the grids
- Up to 85% RES is feasible. The last 15% are tricky and expensive.

# Missing knowledge/ Novelty of this study



What is the role of the heating sector?

# Research questions

- How can the following initiatives support the transition towards 100% RES on the Faroe Islands by 2030:
  - Heat savings in buildings
  - More district heating to substitute individual heat pumps
  - Large thermal storages connected to heat pumps in district heating systems

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# Methodology



- Modelling the Faroese system in EnergyPLAN
  - 2017 scenario for validating the model against historical data
  - Projected 2020 reference scenario, based on known changes in the system since 2017
  - Creating 2030 scenario, based on state-of-the-art
    - Wind, PV, Pumped Storage
    - Individual ground source heat pumps
  - Analysing what happens in the system when implementing:
    - Heat savings
    - More district heating
    - Thermal storages
  - Based on these results, discussing how the 2030 system should look like and what implications this has on
    - Peak electricity and required power production capacities
    - Needed policy change for realizing potentials in the heating sector

# (Very)Preliminary results

- Heat savings in the range of 30% should be feasible and reduce the demand for electricity by between 5-10%
- There is a potential for more district heating, which will lower the demand even further

Work in progess…

# Thank you

- References:


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- Simonsen, K. and Niclasen, B. A. (2020) 'Analysis of the energy potential of tidal streams on the Faroe Shelf', *Renewable Energy*. Pergamon. doi: 10.1016/j.renene.2020.08.123.
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