The Least-Cost Path to a 100% Renewable Electricity Sector in the Faroe Islands

4th International Hybrid Power Systems Workshop

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- Background
- The Faroese Power System
- Energy demand
- Renewable resource potential
- Energy mixture optimisation
- The optimal energy mixture
- Conclusion and future work

Outline

SEV’s vision
- 2014
- 100% renewable electricity sector by 2030

Government
- 2015
- 100% renewable electricity sector by 2030
- Electrification of heating (50% by 2025)
- Electrification of transport

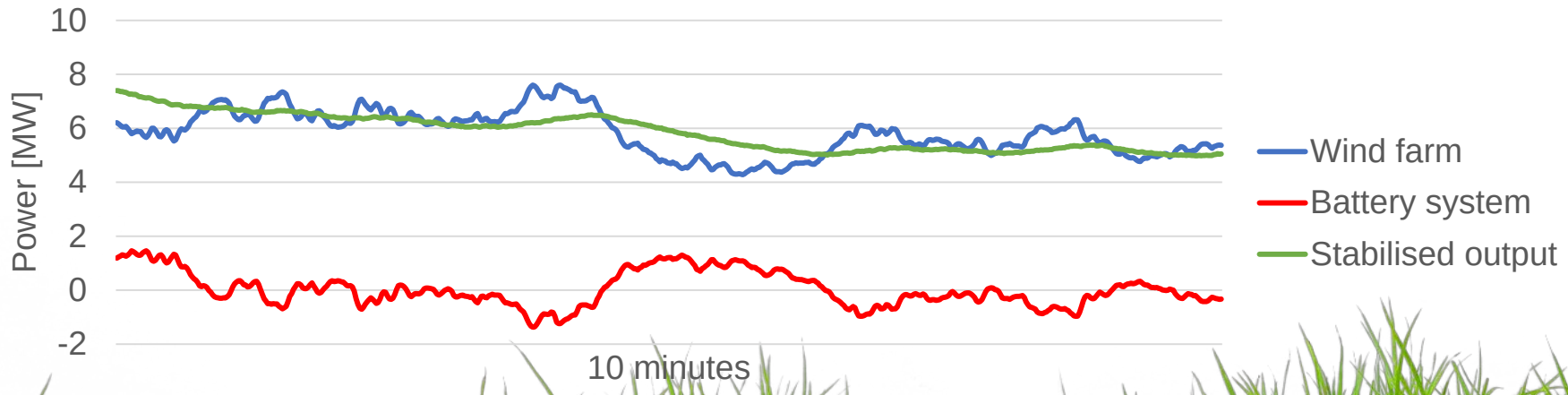
The path to a 100% renewable electricity sector

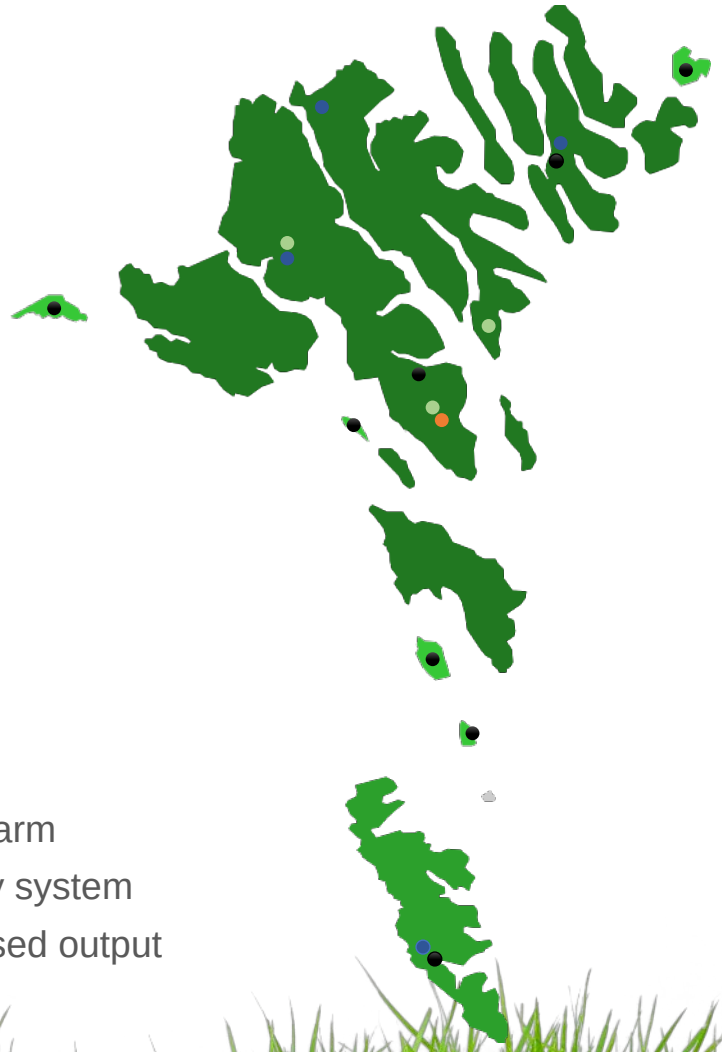
Background

The grids
- Main grid (~90%)
- Suðuroy (~10%)
- Other grids (<0.2%)

Production in 2018 (350 GWh)
- Diesel: 51%
- Hydro: 31%
- Wind: 18%

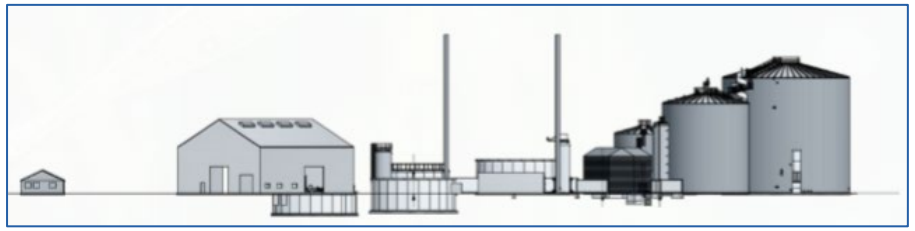
Existing power plants
- Diesel (66 MW)
- Hydro (41 MW)
- Wind (18 MW)
- Battery System (2.3 MW/0.7 MWh)



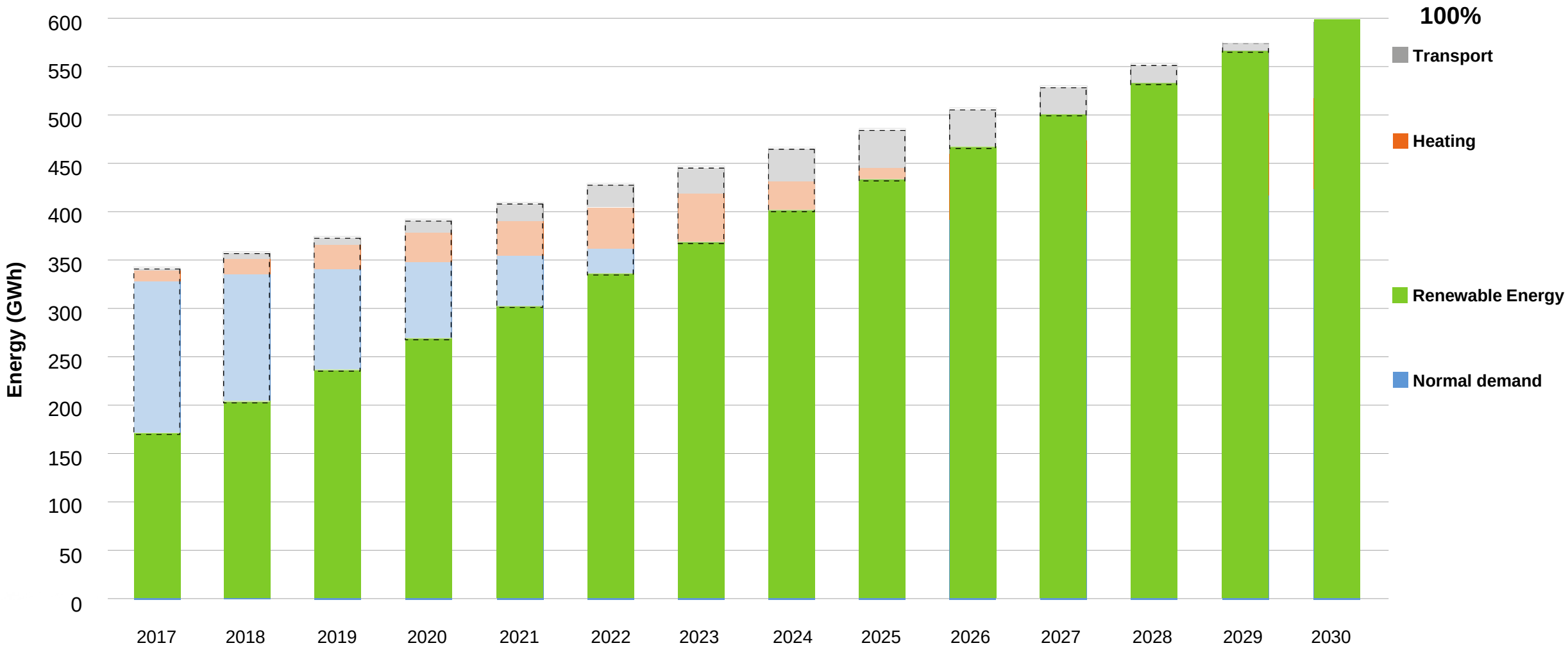


The Faroese power system

- Biogas plant (1.5 MW)
- Solar plant (0.25 MW)
- Tidal demonstration project (0.2 MW)



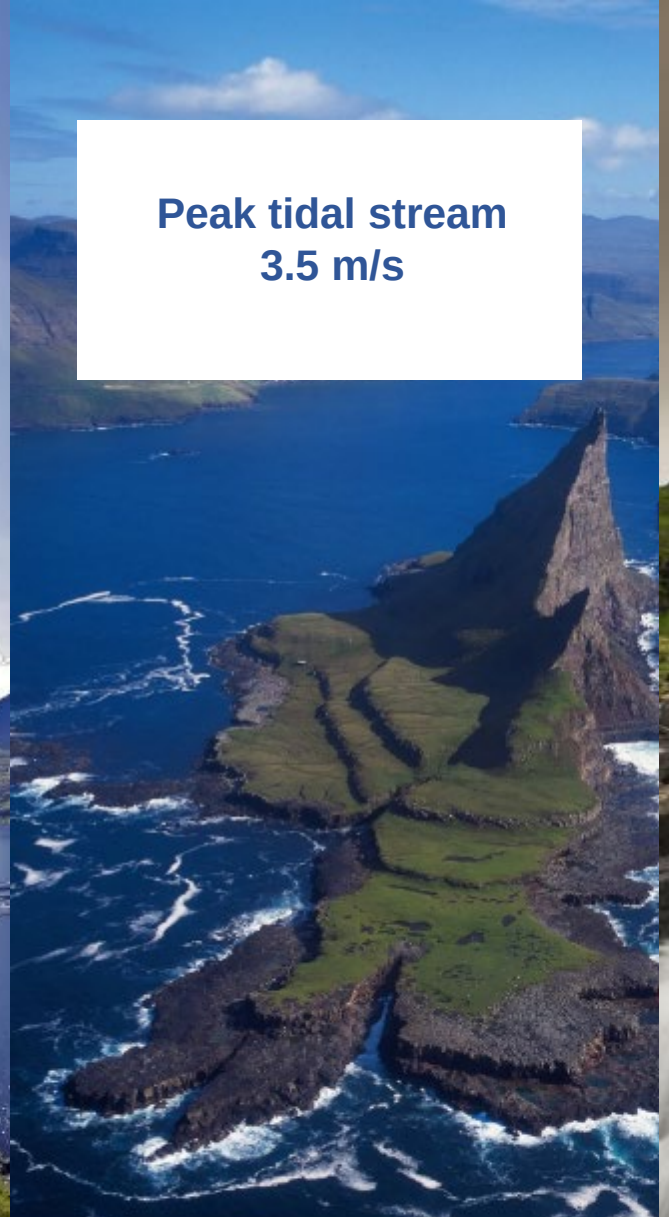
‘New’ technologies (2019-2020)



Energy demand 2017-2030

Average wind speed
10 m/s

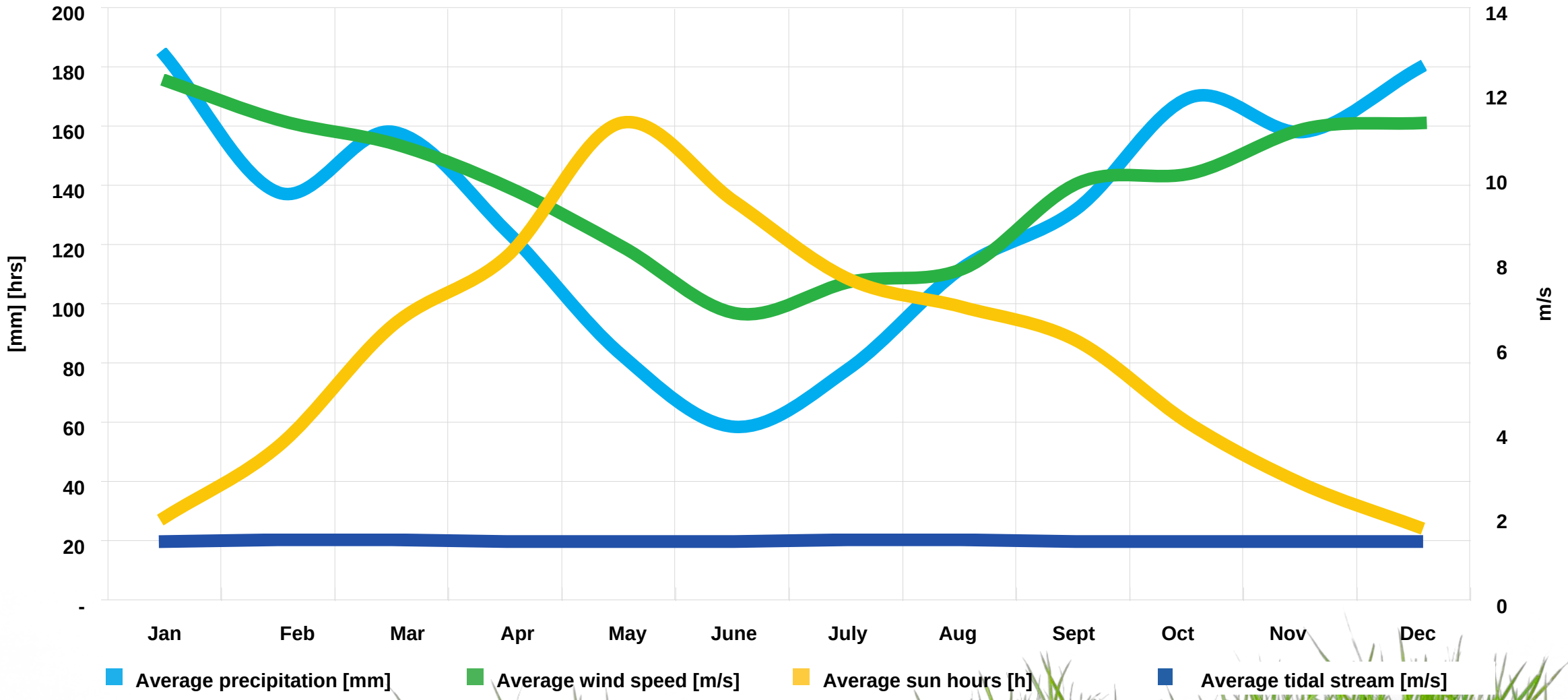
Average sun hours
1000 h/year



Peak tidal stream
3.5 m/s

Average precipitation
1300 mm/year

Renewable resource potential



Renewable resource potential – Monthly

Optimisiation model, Balmorel

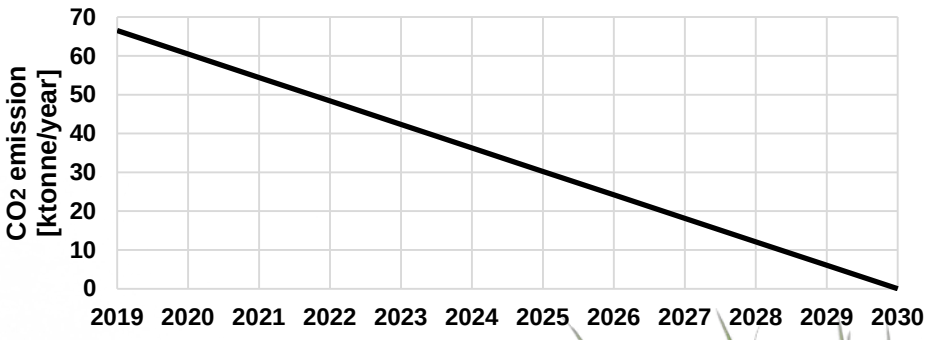
- Investments (annually)
- Dispatch (hourly)
- 2019-2030

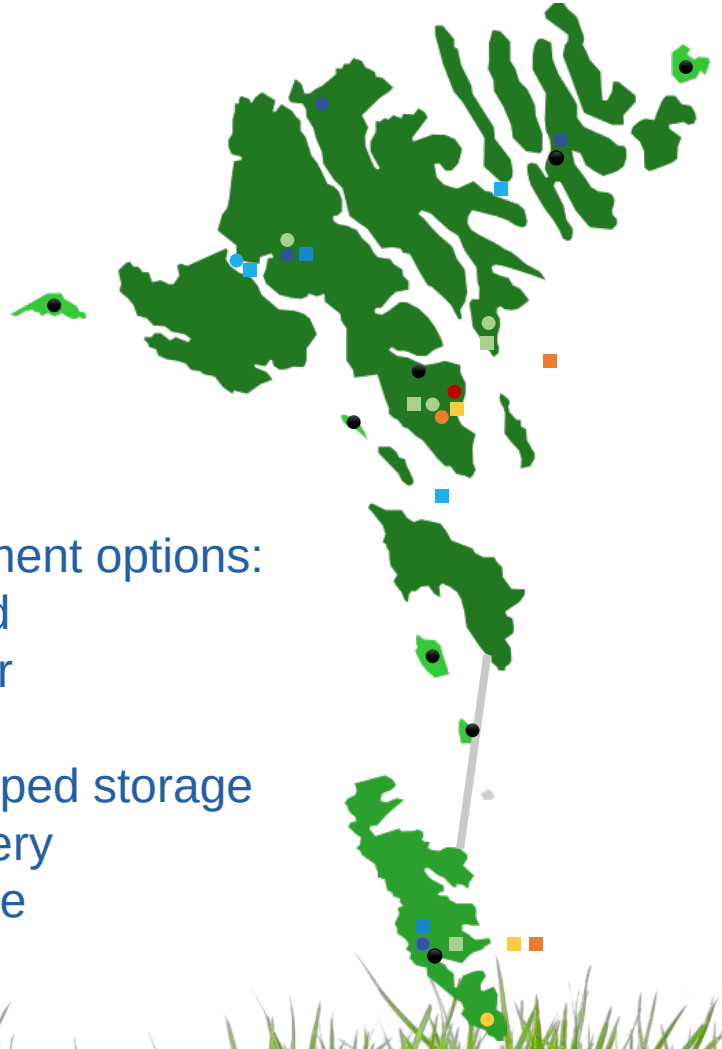
Minimise

- Investment costs
- Fixed O&M costs
- Variable O&M costs

Constraints

- Demand
- Resources
- CO_2 emission

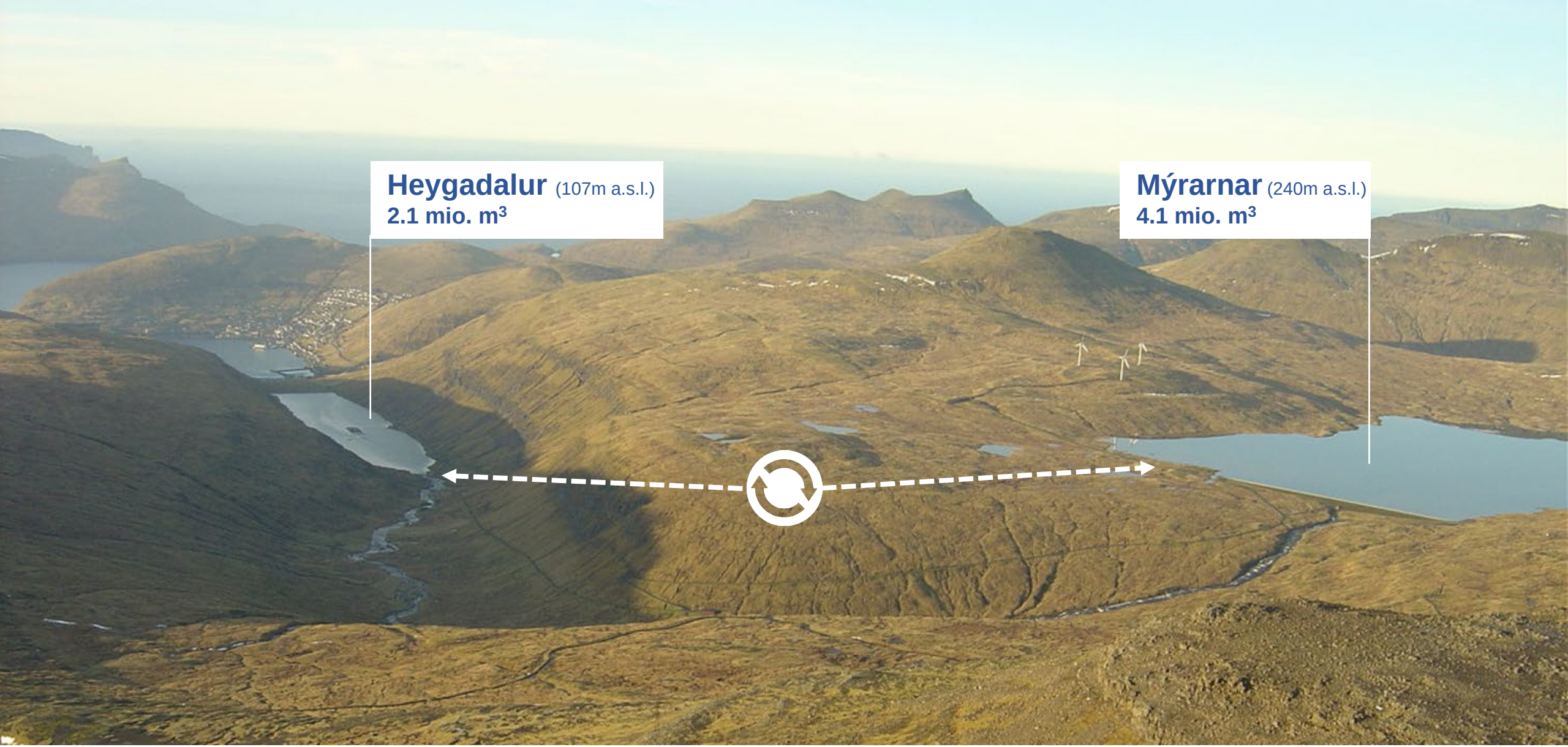




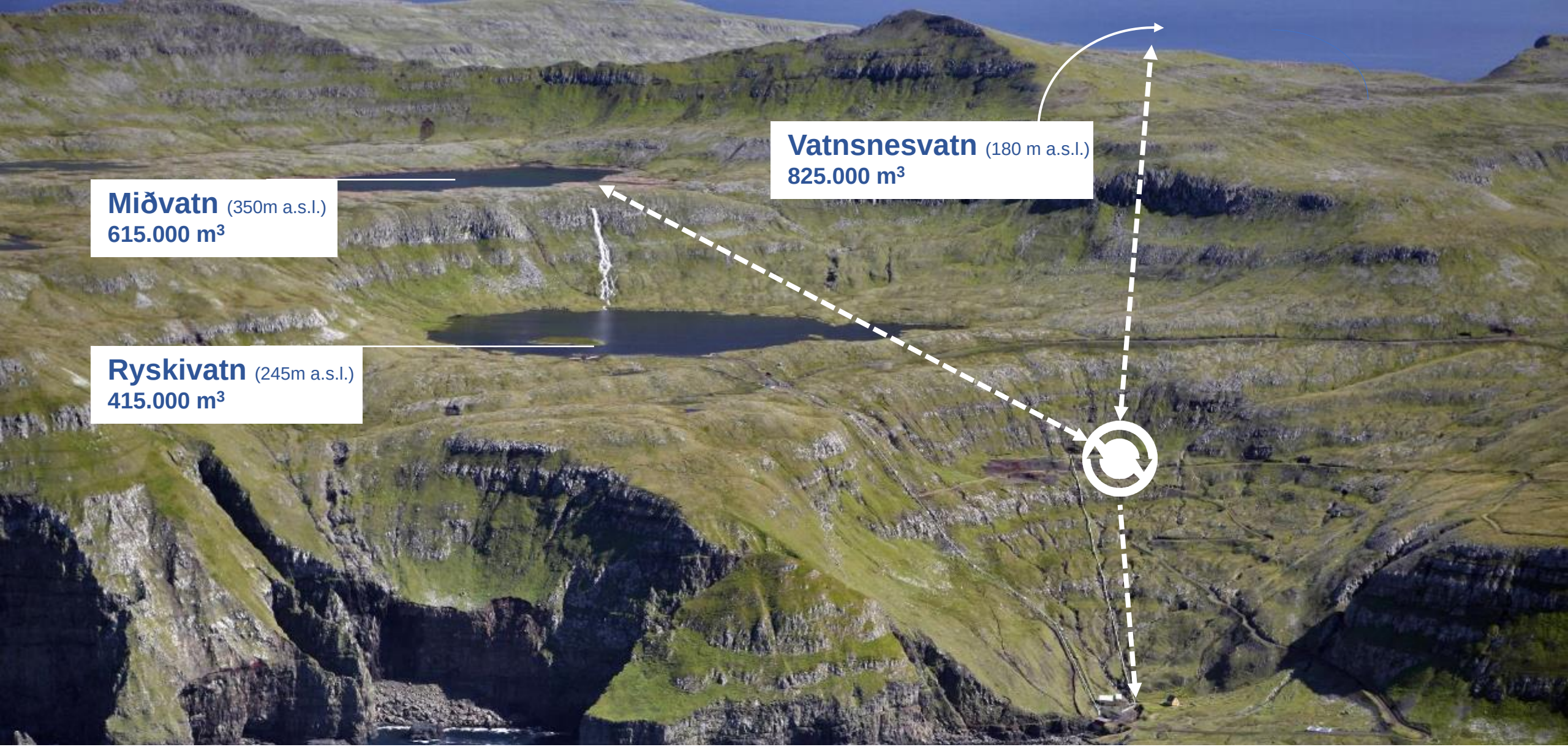
Investment options:

- Wind
- Solar
- Tidal
- Pumped storage
- Battery
- Cable

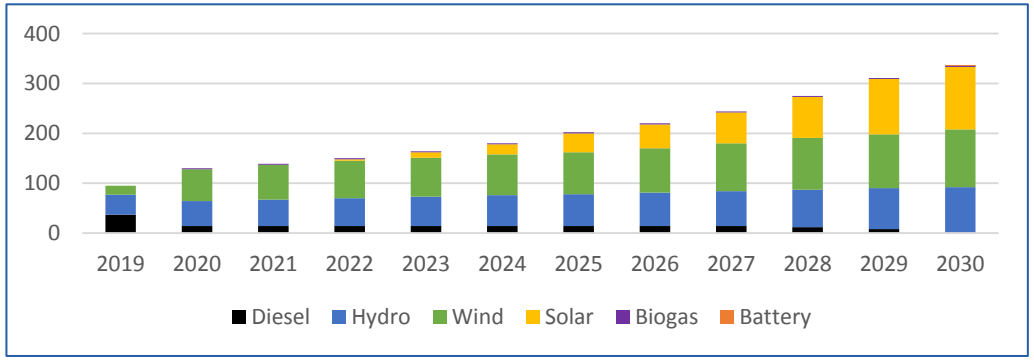
Optimising the energy mixture

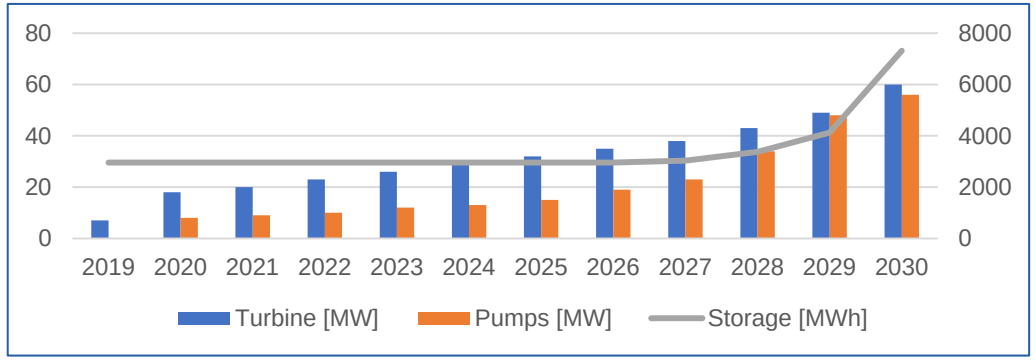


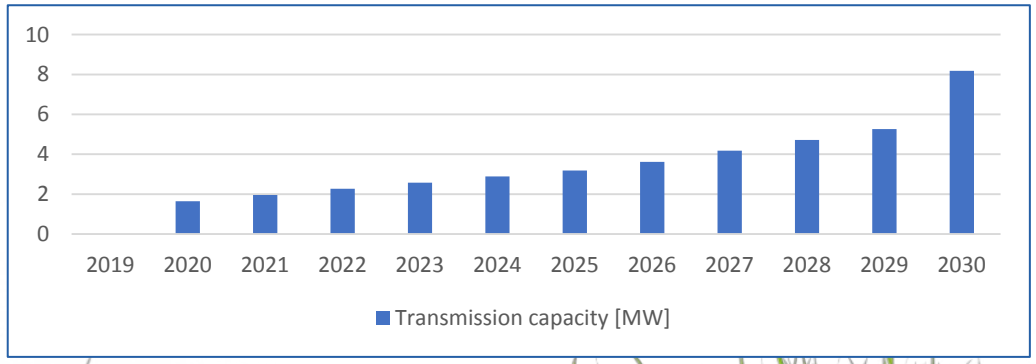
Pumped storage option 1 – Main grid



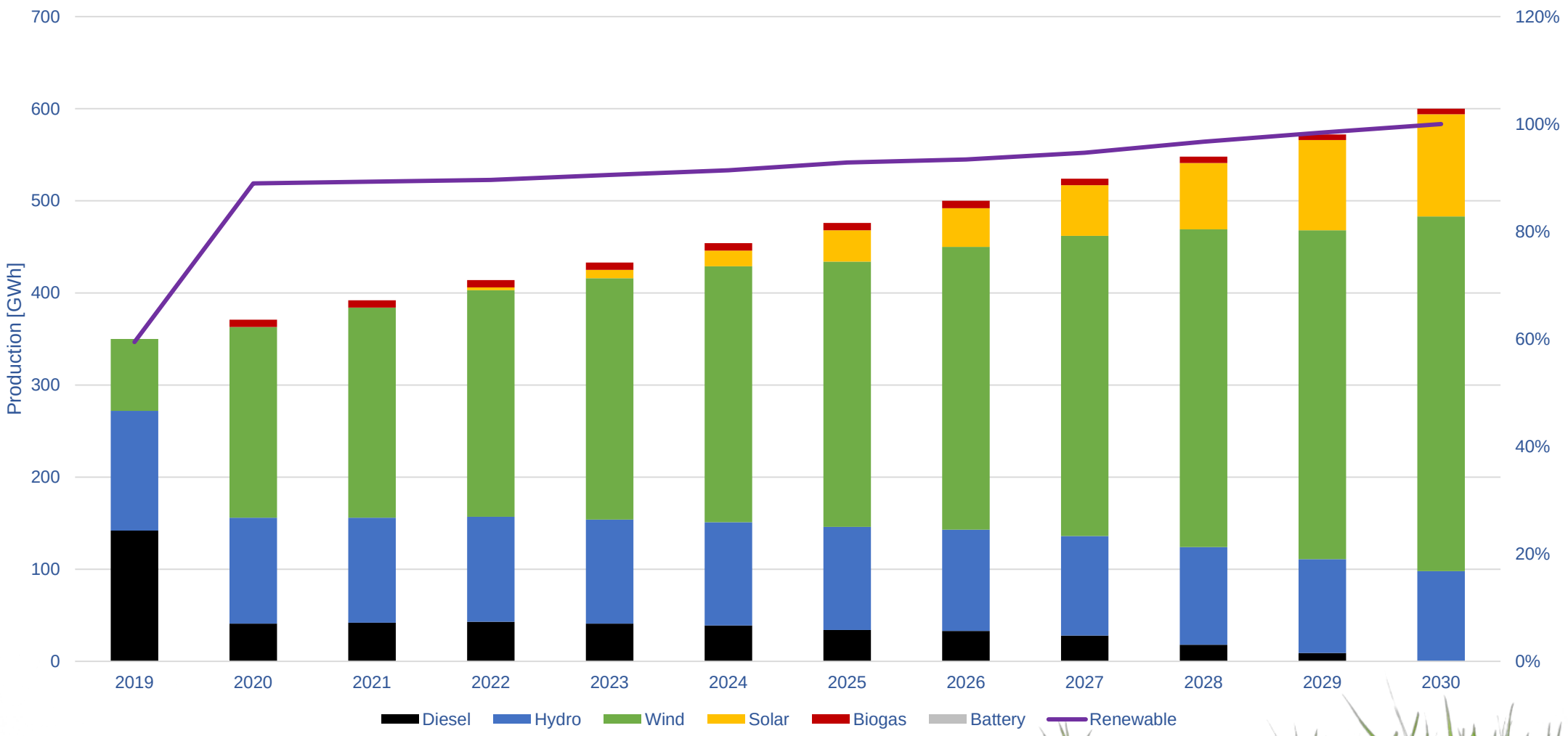
Pumped storage option 2 – Suðuroy







The optimal capacities



The optimal annual generation

- Optimal energy mixture has been defined

- Obtaining more realistic results
  - Continuing developing the model
  - Additional technical constraints
  - More data input (more investment options)

- Analysing the stability of the proposed energy mixture

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Conclusion and future work

Thank you

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