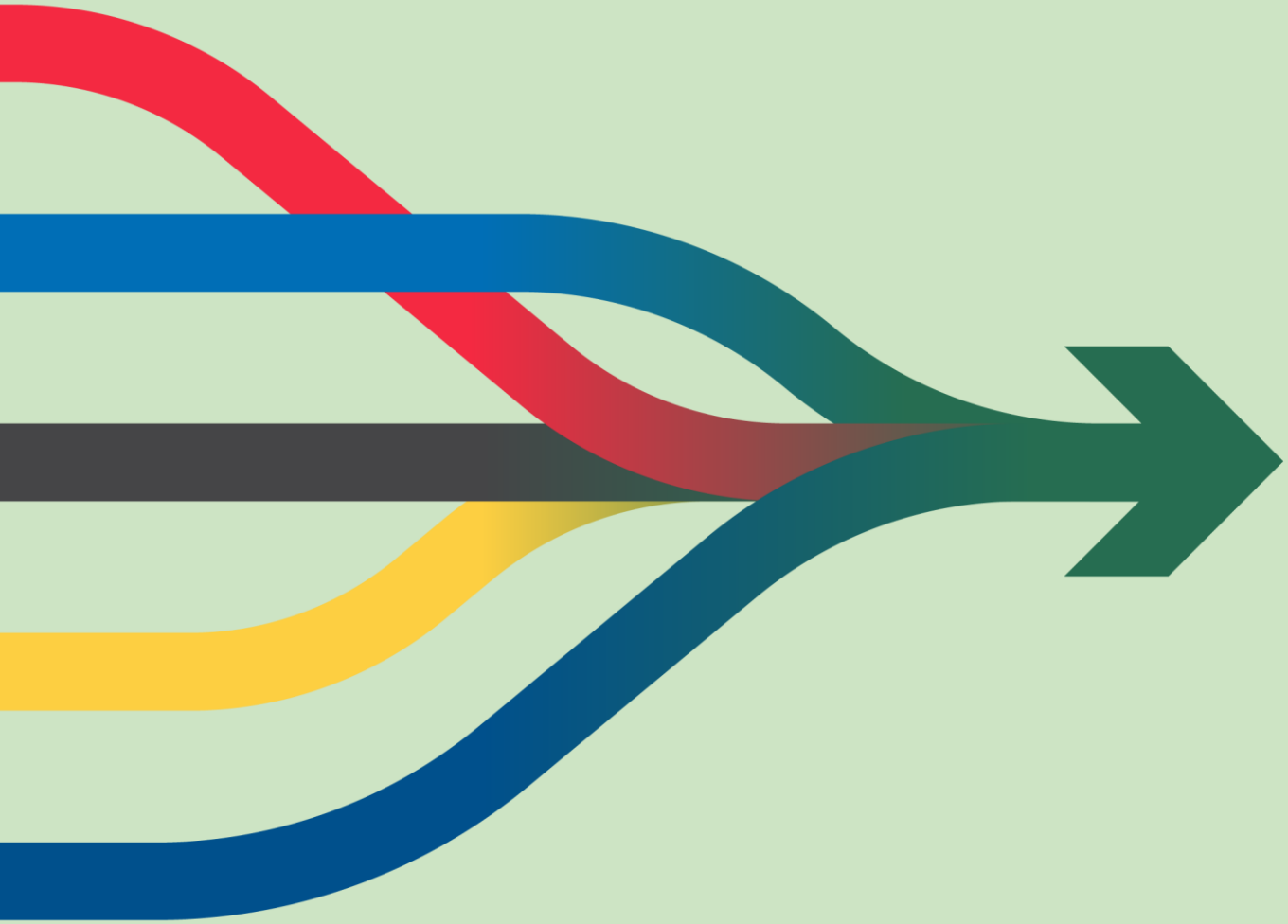

Heavy-duty Land-based Transport on Biomethane from Local Biogas and Green Hydrogen

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Heavy-duty Land-based Transport on Biomethane from Local Biogas and Green Hydrogen

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Aim of the project

- Analyse potential of producing green fuels for heavy-duty transportation in the Faroe Islands
  - Island communities and isolated areas
- Description of optimal utilization of available local resources
  - Biogas
    - Upgrading
    - Bio-CNG, Bio-LNG, Bio-methanol
  - Curtailed energy from green energy production
    - Energy storage
    - Power to X
- Feasibility study on production of fuel from biogas and H_2

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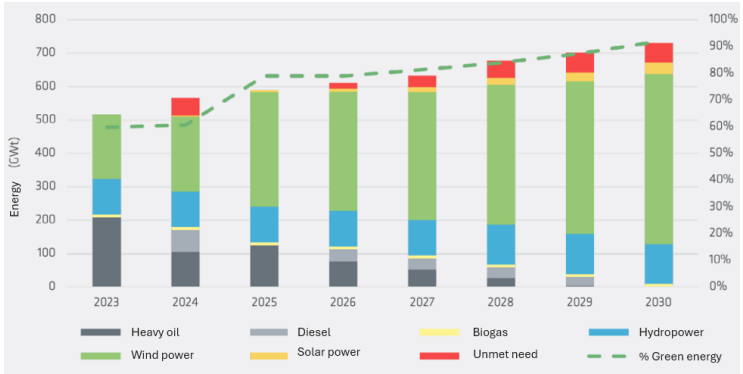
Background

100% renewable energy on land in 2030

- International commitments
- National goals and plans
- Approx. 50% renewable electricity in 2023
- Striving for a more sustainable future



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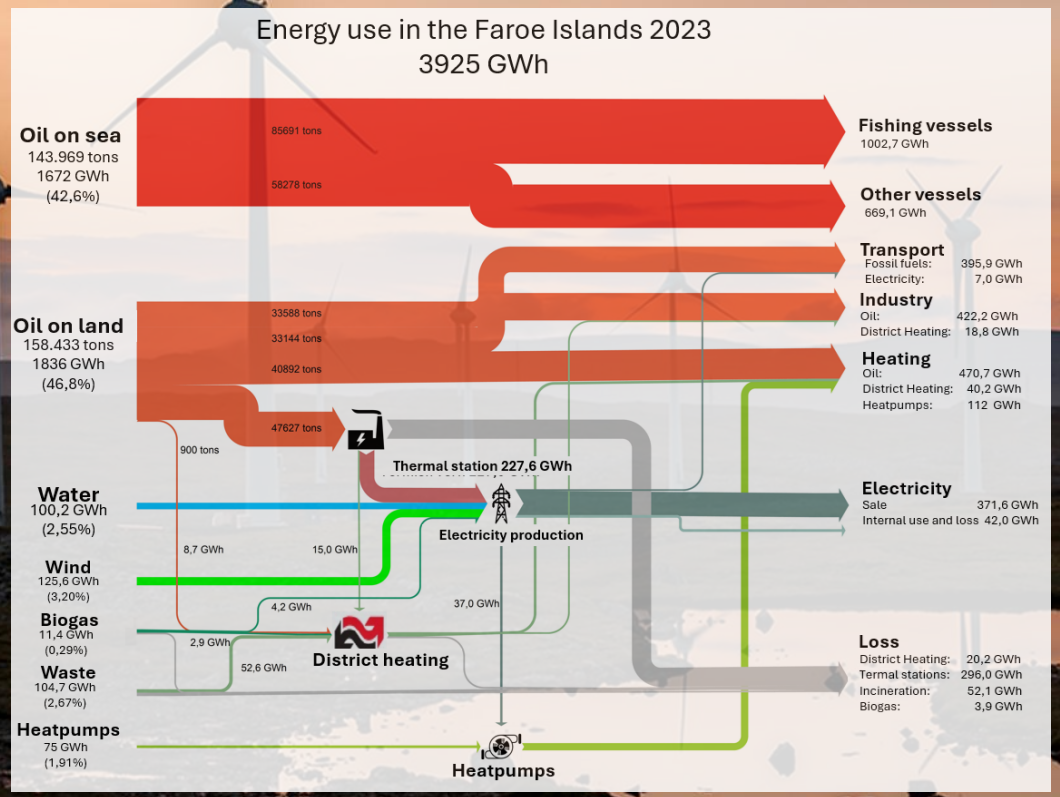
Background

Total energy consumption

- Electricity accounts for just over 10% of total energy consumption
- 53% of the energy consumption comes from maritime and land transport
  - 43% maritime transport
    - Near shore vessels for aquaculture ~ 3200 tons diesel
  - 10% land-based transport
    - Heavy-duty land-based transport ~ 2000 tons diesel
- Electrification alone cannot achieve the desired reduction in GHG



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Future-proof Biogas Production

- Advantages of biogas production
  - Waste handling
  - Fertilizer
  - Nutrient circulation
  - Reduced import, increased circularity
- Conventional use of biogas releases CO_2
  - ~60-65% CH_4 and ~35-40% CO_2
- Increased production of green energy will surpass electricity from biogas
- Alternative utilization of produced biogas
  - Fuel for heavy transport

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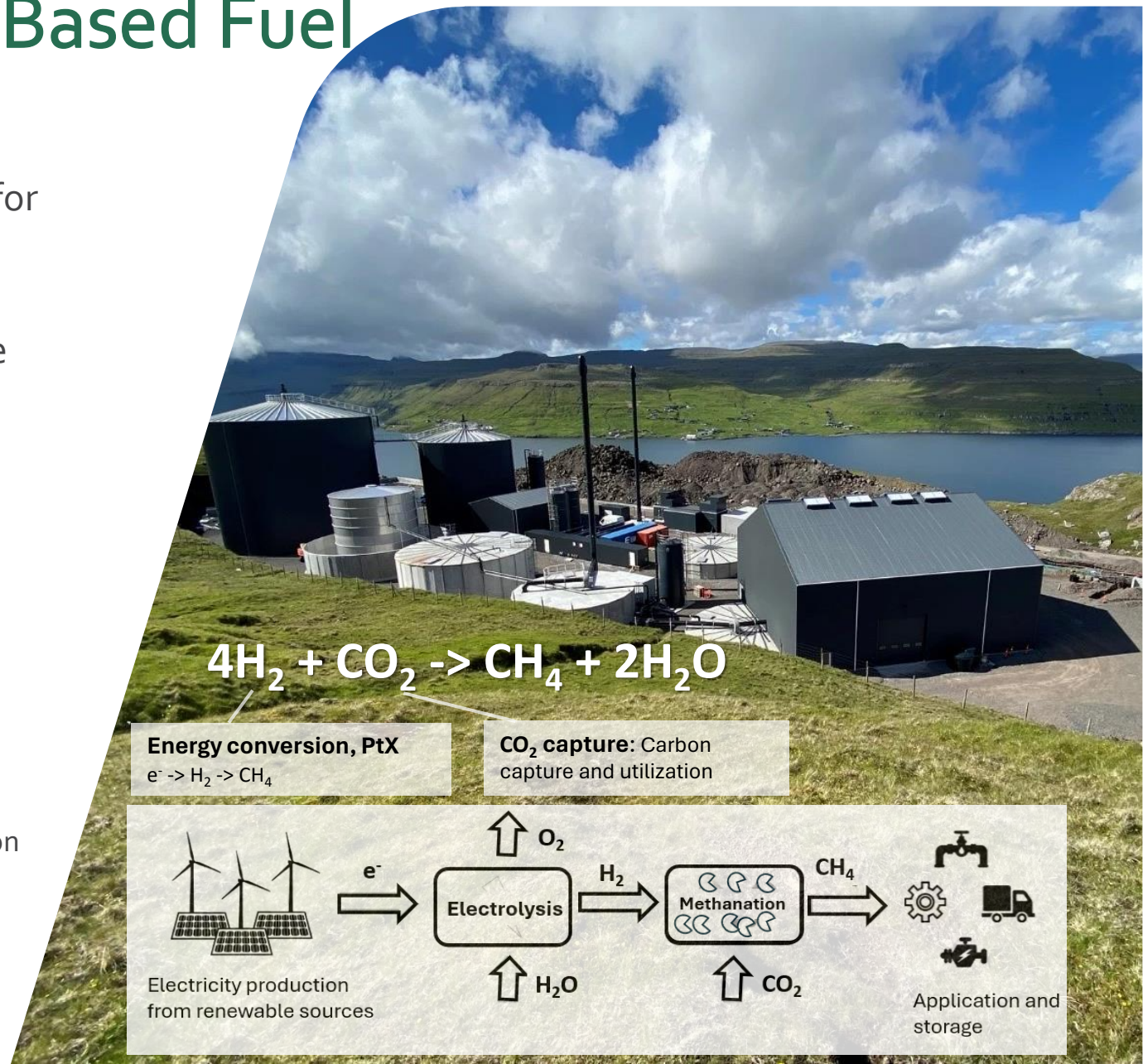
From Biogas to a Carbon-Based Fuel

- Several types of sustainable carbon-based fuels for heavy transport
  - Bio-CNG, Bio-LNG, Bio-methanol
- Biological conversion of CO2 and H2 to methane
  - Upgrading biogas to ~100% methane
  - Capture and utilizing the CO2
  - Ambient pressure, meso-/thermophilic temperatures
- Biogas to methanol
  - Intensive research in different pathways
  - Steam reforming, catalytic reaction
- Fuel compatibility to Faroese society
  - Energy density
  - Infrastructure
  - Technological complexity and effectiveness of production
  - Cost effectiveness



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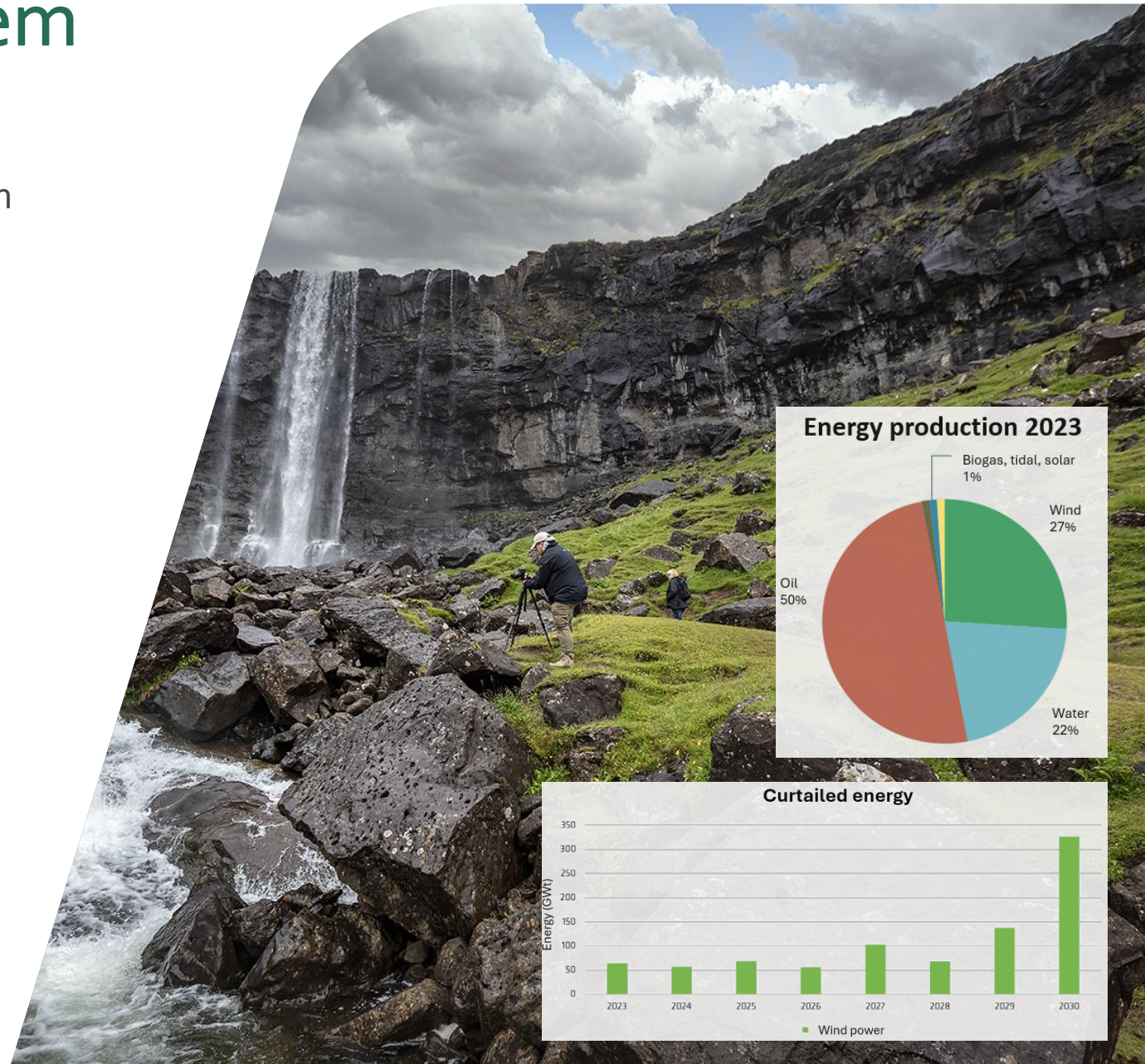
The Faroese Energy System

- Increase in share of renewable energy production
- Strategy for future energy production
  - 100% green electricity for on land purposes in 2030
  - Expected curtailed energy
    - No export of surplus energy
    - Insufficient storage opportunities
  - Utilization of curtailed energy
    - Balancing out fluctuations and increasing grid stability
    - Hydropower pump-storage system
    - Production of hydrogen from electrolysis
- Distribution system
  - Two national electricity grids
  - No national nor international gas grid



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Heavy-duty Transport in the Faroes

- A total of 53% of energy consumption in the Faroes comes from sea and land transport
  - 10% land based
  - 43% maritime based
- Bio-CNG from today's biogas production
  - 3500 tons of diesel can be replaced by bio-CNG from upgrading todays biogas production
  - Potential of increasing the biogas production
  - New biomass; fish sludge, food waste, household sludge etc.
- Reduced import, increased energy independency and increased circularity

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Heavy-duty Land-based Transport on Biomethane from Local Biogas and Green Hydrogen

- Production of carbon-based fuel for heavy transport
  - Find the optimal process for island communities like the Faroe Islands
  - Best suitable fuel for local conditions
- Feasibility
  - Economy of producing fuels for heavy transport
  - Crucial parameters for economic succes
    - Availability of resources and energy sources
    - Local prices of fuel and electricity
    - Infrastructure and storage
- Optimal utilization of all outputs
  - O_2
  - Heat
  - CO_2
  - CH_4

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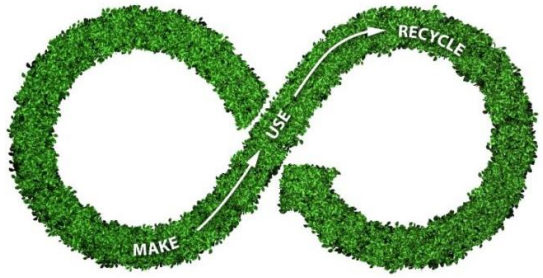
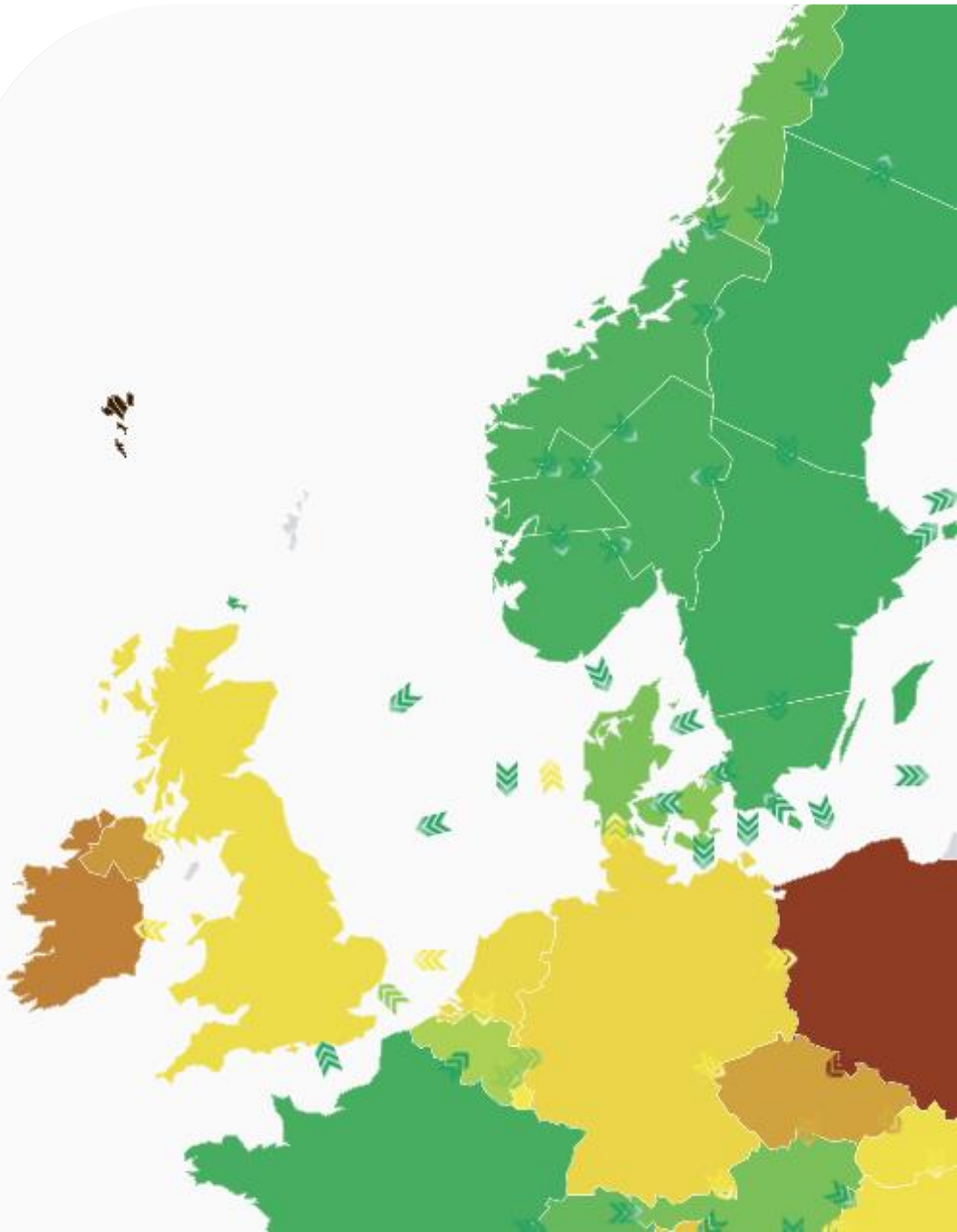
From Faroe Island to Island Communities and Isolated Areas

- No common international grids
  - Local prodution and utilisation
- Increased circularity and independency of remote areas
  - Local circularity
  - Resource utilization
    - Organic waste and biogas
    - Curtailed energy
  - Reduced import of oil and fertilizer





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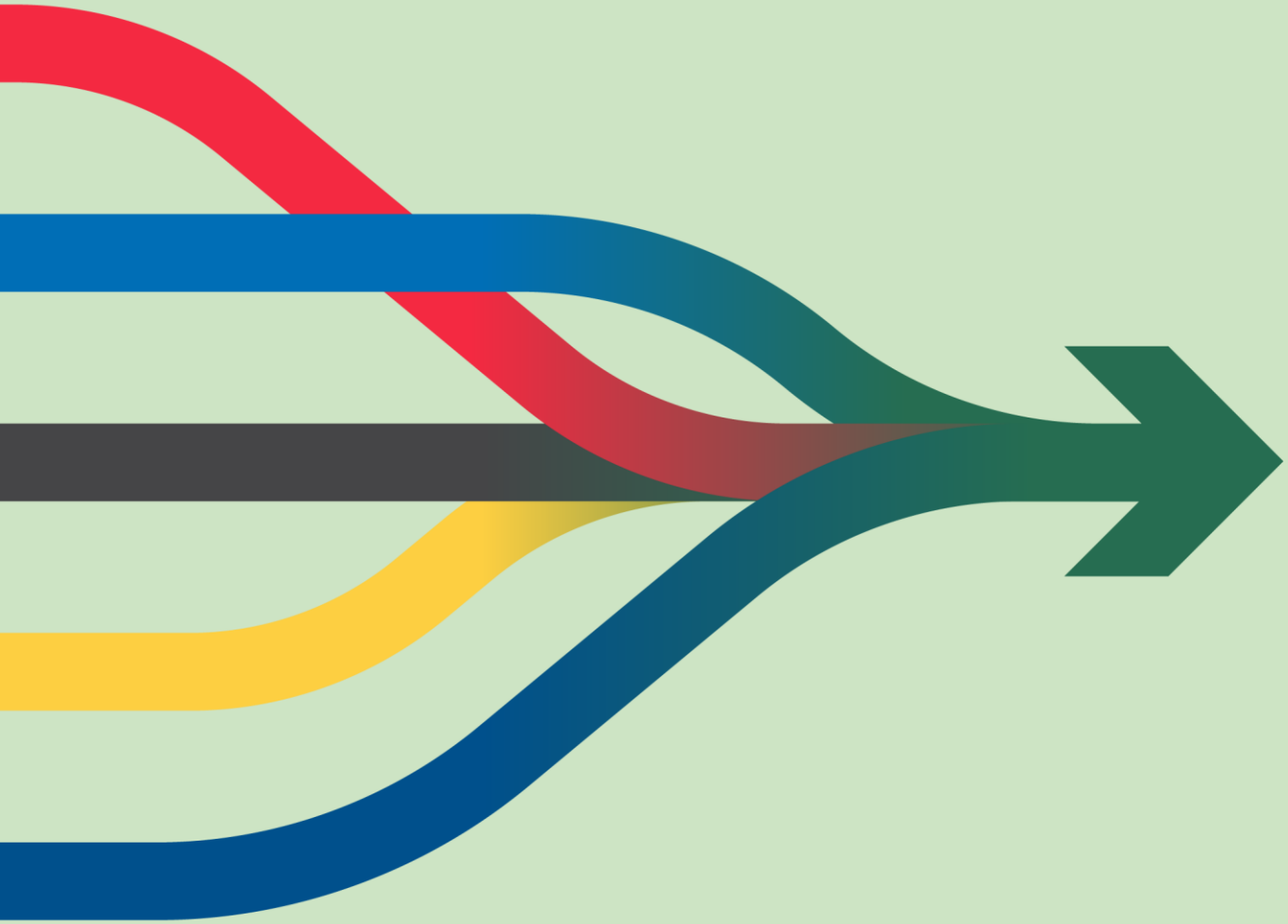

Thank you

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