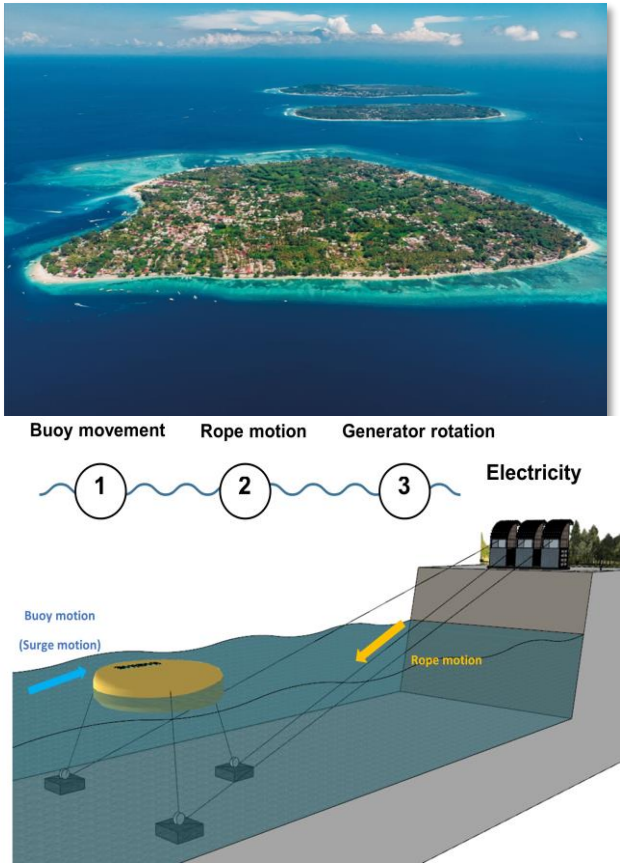
INWave: A Breakthrough Technology in Wave Energy Harvesting

→"Microgrid Integration of Wave Energy in SE Asian Countries"

1. Why Wave Energy?
- →Challenges for grid integration
- →Current state of development

2. Why 'INWave'? Onshore/Nearshore wave energy converter
- →Device USPs
- →Tailored for islands and coastal communities microgrids

3. Case study: INWave integration with Solar pv project
- →Grid impact study
- →Wider impacts
- →Lessons learned



Problem Solving

730Mil
people in islands

400Mil
rely on Diesel Gen

Limited Access
of Clean/Affordable Energy

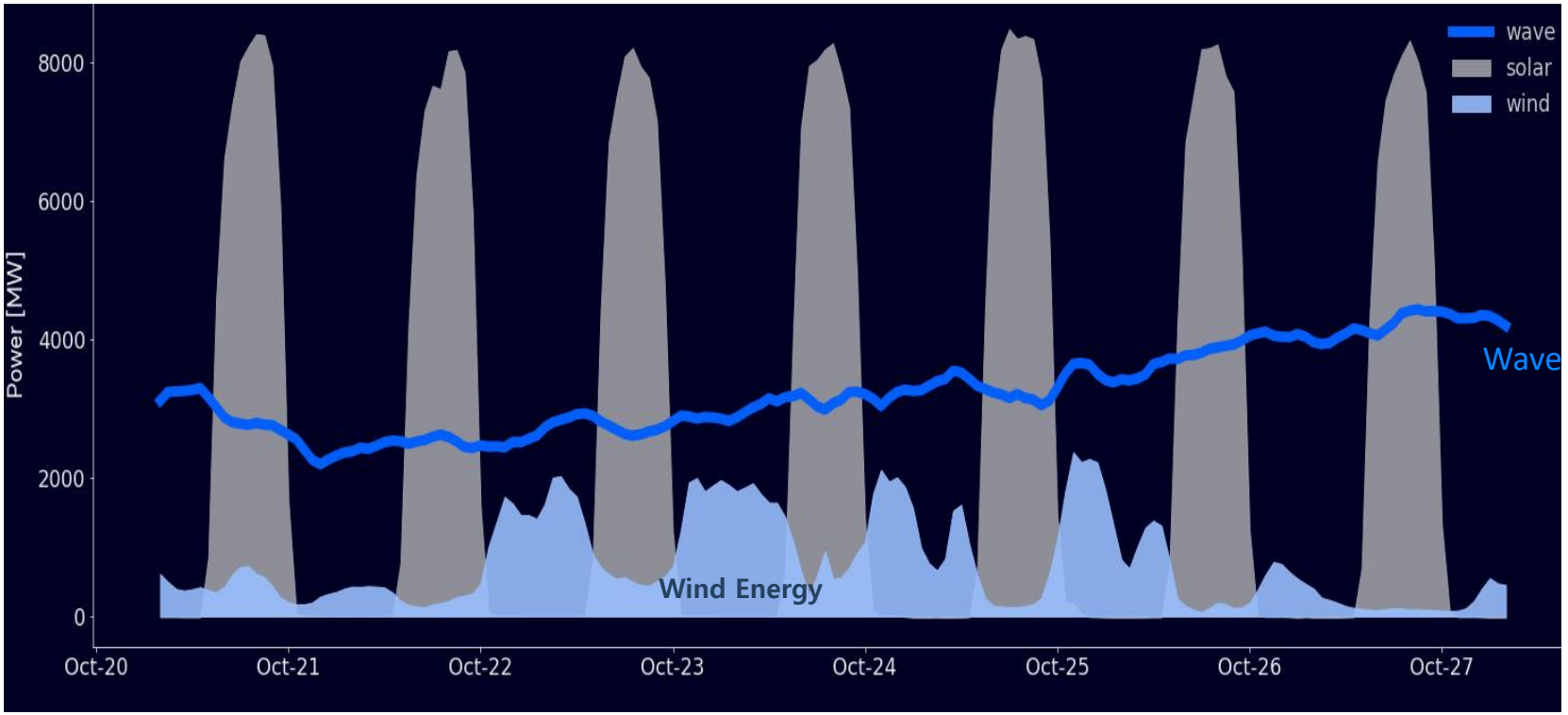
Q1 Are Remote islands and coastal villages “isolated” from reliable energy access?

- ***No! Surrounded by rich wave resources, “Dense, Consistent & Predictable”***

Q2 Then, why no commercial wave to power technologies yet?

“INGINE Wave Energy Systems” ensure “more efficient and near to market”

1. Why Wave Energy? Complementary



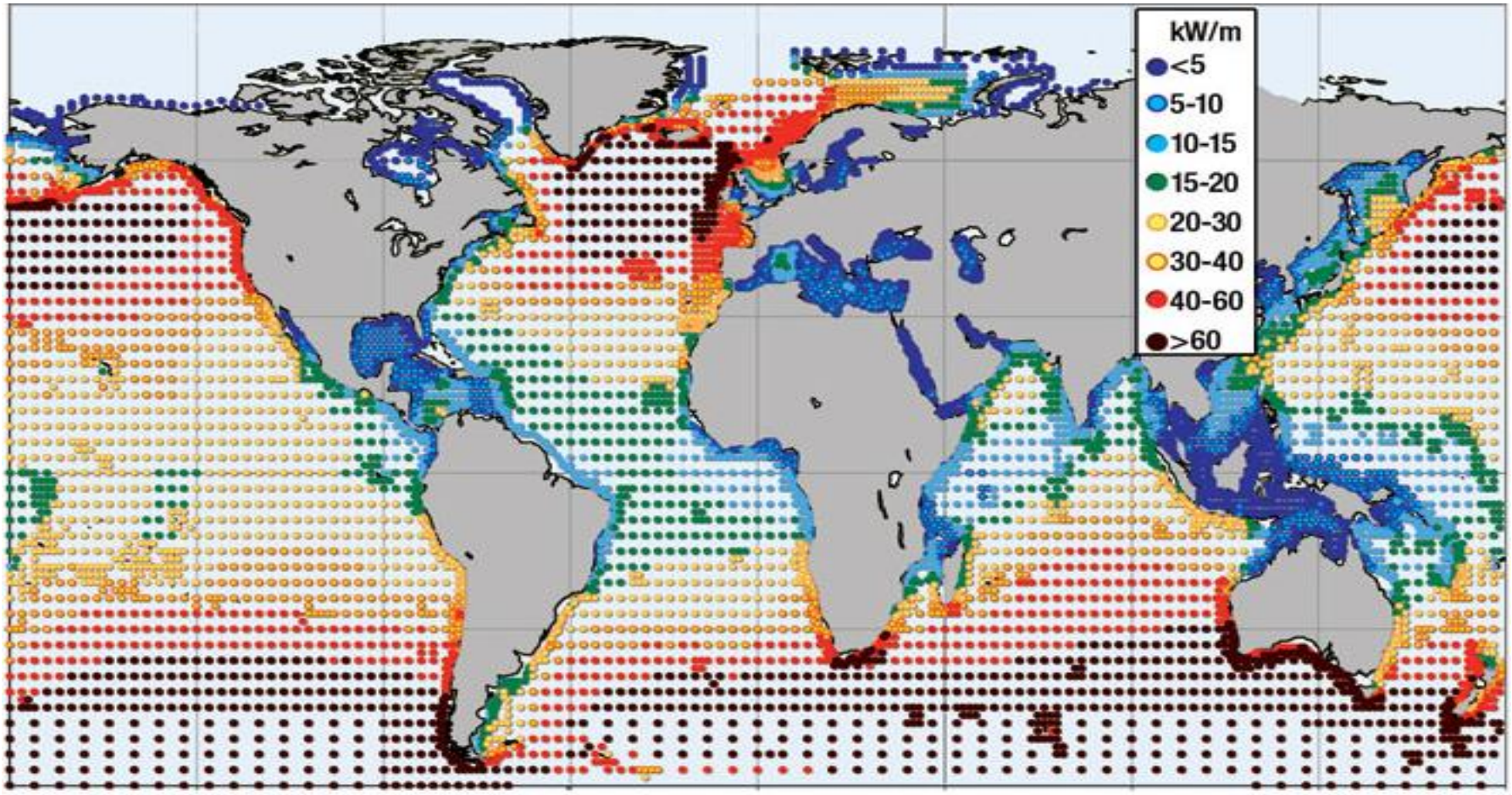
Berkeley labs Solar-to-Grid

→ Makes up for **Wind power shortage** when wind is not blowing

→ Smoother variability **than Solar**, and complementary high seasons, i.e. during Monsoon

Wave energy potential market size

- **Global market potential(TAM): $576Billion EPC market, 300 GW capacity by 2050 (OES 2023)**
- **Indian Ocean wave power estimates as 22.3% of the 300GW. SOM in Indonesia at 15GW in 10 years.**



*** Average Annual Wave (kW/m):** annual available wave power in kW per metre width of wave crest

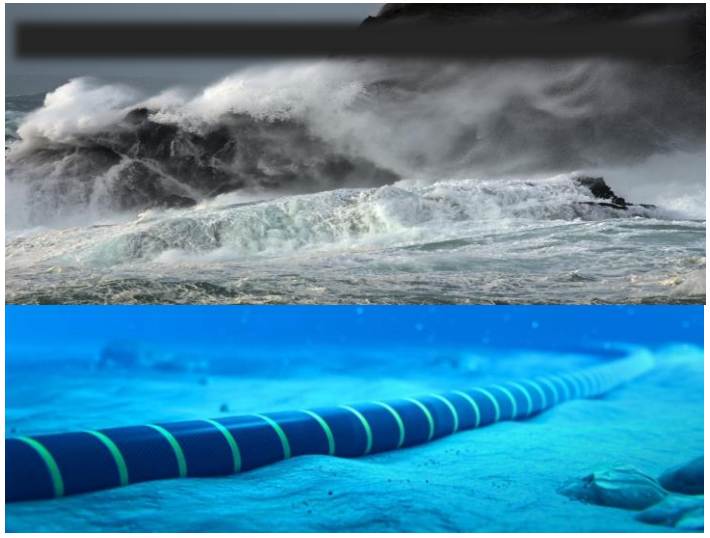
2. Why INWave, compared with Offshore WECs?

① Avoiding harsh/extreme condition, efficient in shallow water on Onshore

② Faster to enter the market, with lower LCoE, and strong 63 Patents protected

③ Scalable small-scale modules, suitable for Off/ Microgrid projects

[Other Offshore Wave Energy Converters]



Expensive subsea cables (approx $3million / km),
for large-scale deep-sea installations/ repairing

VS

[INGINE's Onshore Wave Energy Power Plant]

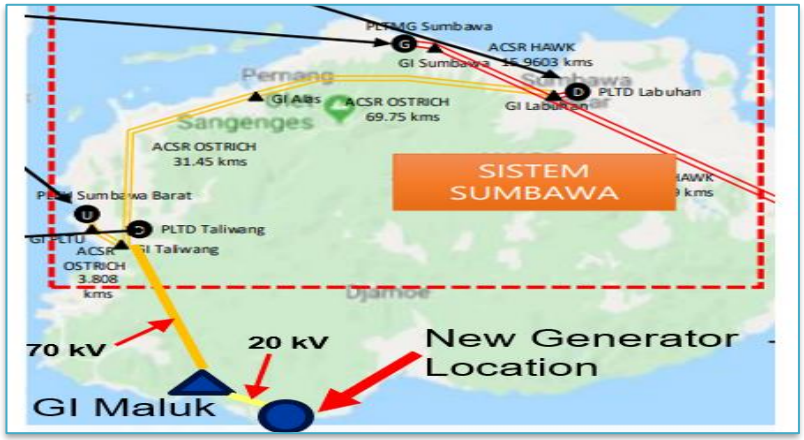
No subsea electric cables needed,
easy installation/maintenance in remote islands

Progress in SE-Asia in 3 years

Innovate UK ENERGY CATALYST

- **Innovate UK EC Round 9 grant winner in 2023**
- **Innovate UK EC Round 10 grant winner in 2024-2026**
- **Further investment to scale-up 1MW+ by 2027, SE Asian focus**

Seeking Seed Fund: £2Mil to match Indonesia projects, in 2025



Selected Site Sumbawa Barat Tatar coast Indonesia

Dec 2025
Pilot Plant

- 125kW demonstration with PT PLN Indonesia Power

Dec 2026
Indonesia

- Scale-up project

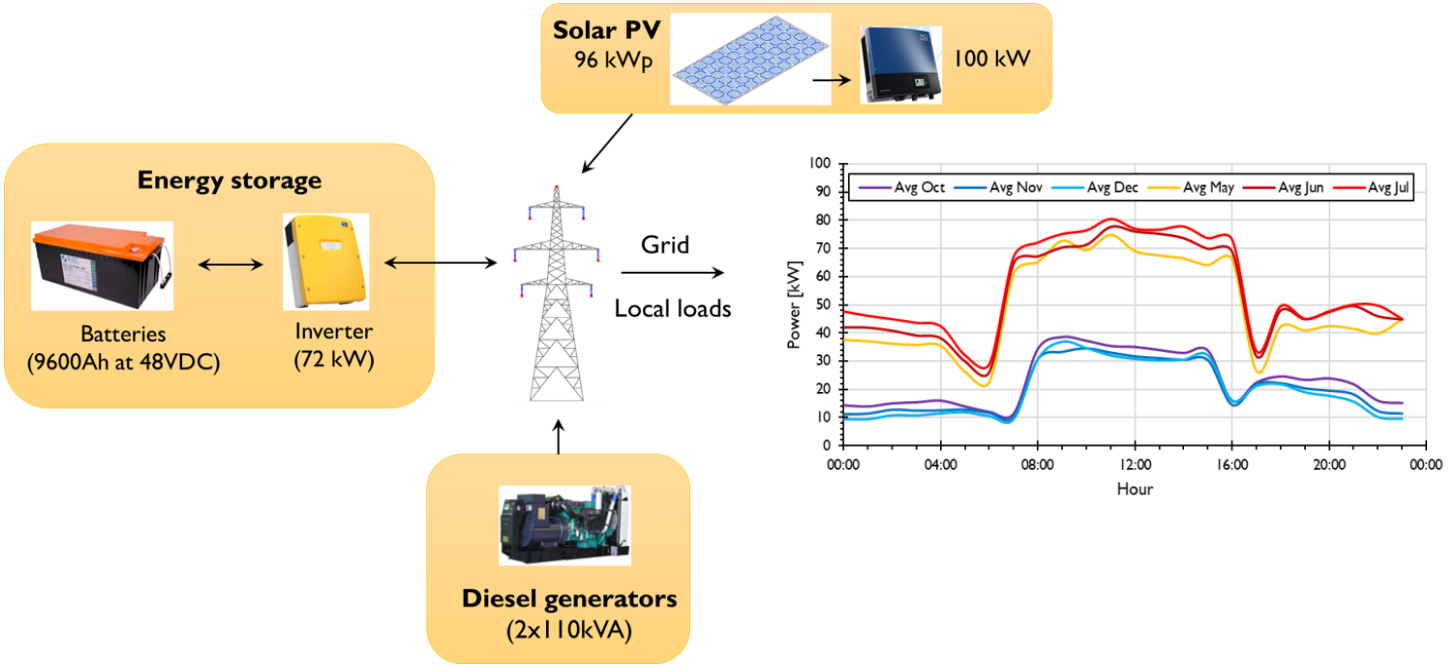
Commercial Project starts from 2027

- **1.5MW commercial capacity to operate, replacing diesel generators in 2-3 years**

23MW, 6.9M gbp revenue in 5 years

3. Case study: Grid Impact study

→ **An example of a remote island existing power system is as follows:**

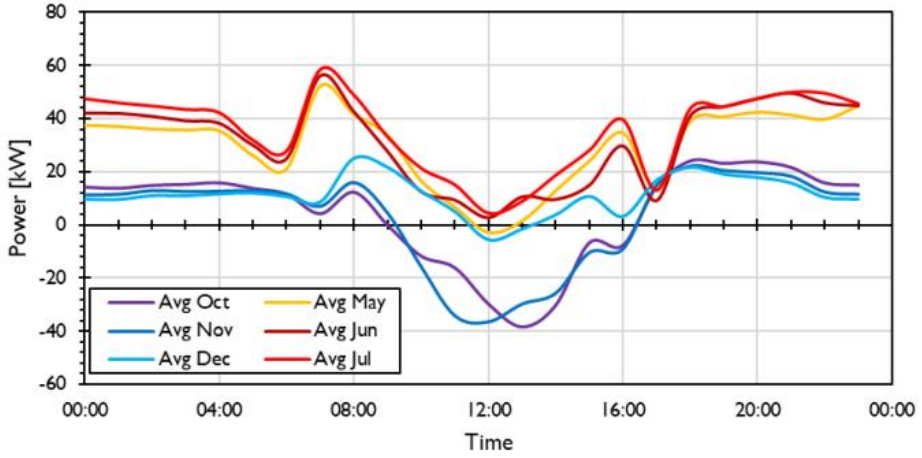


→ **Among its loads, this island is equipped with a desalination plant (30kW), causing the square shape of the electricity demand. Due to lack of electricity, it only operates intermittently.**

Case study: Grid Impact study

- **The study was conducted to estimate the state of the grid from "only Solar" to "Solar + Wave"**

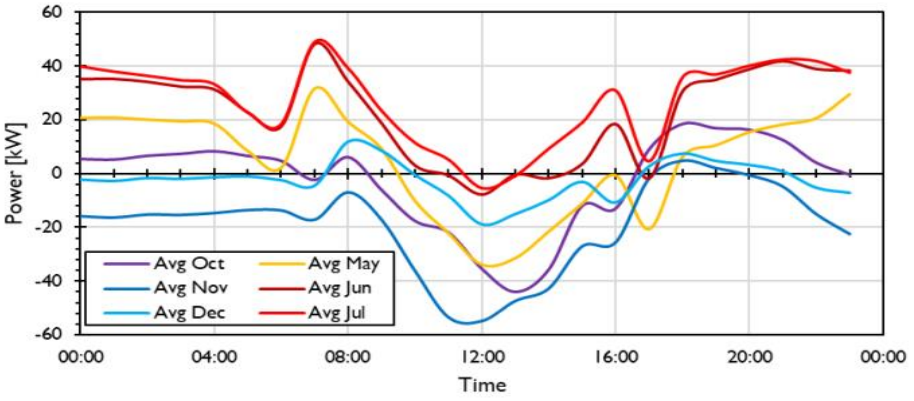
→ Power supply/demand imbalance considering solar production only



→ Before the introduction of the INWave, diesel generators are required almost constantly, especially at night

→ Full RE hours are only possible during the sunniest hours, especially in winter when demand is lower

→ Power supply/demand imbalance considering solar + wave combined

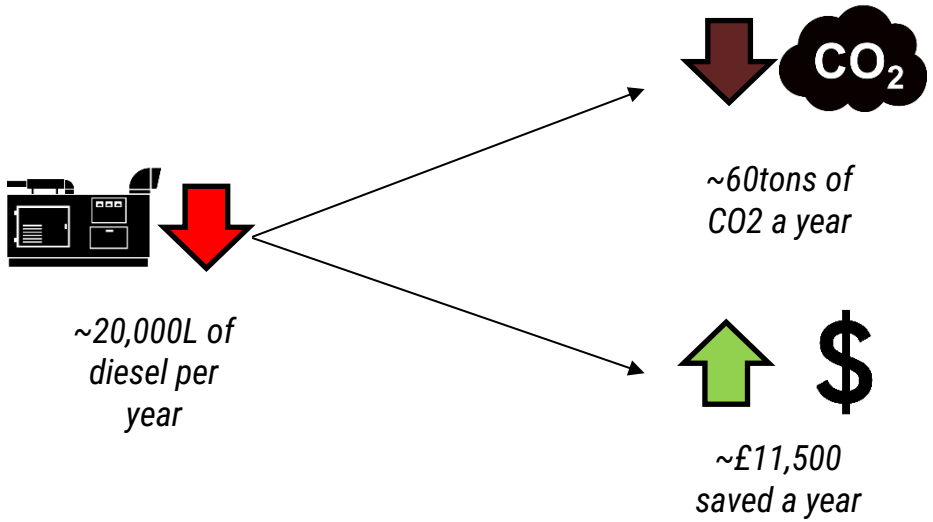


→ With the INWave, diesel generation can be fully phased out **during winter months, with significant oversupply**

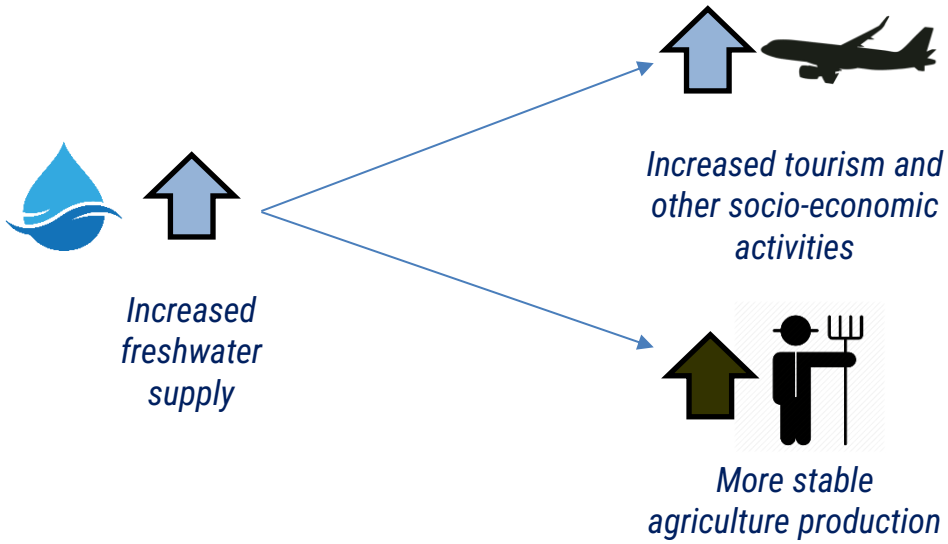
→ Dependance on diesel generator is significantly reduced in summer as well, with a peak imbalance of **about 50 kW which can be bridged by the storage**

Case study: Wider Impacts

→ **Almost total phase-out of the diesel generators significantly reduces GHG emissions and fuel costs:**



→ **Increased electricity supply allows for increased use of the desalination plant:**



- **System Composition example:**
  - 125kW INWave (33% capacity factor)
  - 200kW Solar PV (20% average capacity factor)
  - 50kW battery smoothing

⇨

- **Annual Renewable Energy Supply**:
  - Wave: ~655,000 kWh
  - Solar: ~350,400 kWh
  - Battery Buffer: ~43,800 kWh
  - Total: ~1.05 million kWh/year
  - CO_2 savings: ~350 tons/year

Case study: Lessons learned

- **Clear high potential for INWave and wave energy integration in remote islands microgrids**
  - → **Grid impact is positive** with improved supply and flexibility
  - → Interaction with other RE sources must be understood better **to reach 100% diesel generator phase-out**, as well as with deeper integration of microgrid/smart grid technologies

- **Significant barriers to be lifted**
  - → **Continuous dissemination of information about Wave Energy** is primordial, through workshops and targeted communications
  - → Financing projects integrating WECs with other energy sources, analyzing climate change impacts, and assessing the viability of WECs for small island communities can help inform **policy decisions**

INGINE
Wave Energy Systems

Conclusion:

INWave-driven, Hybrid microgrid of “Solar+Wave+Storage” solution to provide a resilient, cost-effective, and sustainable energy for in remote islands/ coastal communities

We invite solar projects to participate in this pioneering initiative, aligning with SE Asia’s ambitious RE goals and offers significant financial/environmental returns.

Jeff Lee, Managing Director, INGINE Wave Energy Systems Ltd. (IWES)
E: **jeff@inginewave.co.uk** T: +44 (0)77 6965 2237, **www.inginewave.co.uk** **linkedin.com/in/jeffswlee**