

Towards a Just Energy Transition

Empowering Island Fishery Community through Smart Solar–Powered Ice Production Indonesia

Asia Clean Energy Forum 2025

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Solar Cold Chain for Green Economy – GIZ Indonesia



In energy sector,

675 million

People remains have no access to electricity,
and many face unreliable supply

[IEA WEO, 2023]

In some regions,

40%

of fish is lost
post-harvest

Conventional cooling = high emissions + grid dependence



How to extend the cold
chain to remote areas?

1st

Indonesia, the largest
archipelagic country
17,000 islands

2nd

Indonesia, the 2nd
largest fish producer
worldwide

5,000 km



**90% (approx. 2 mio) of fishers are
small-scale coastal fishers**

Many areas in Eastern
Indonesia face
**unreliable electricity
access**

Challenges Facing Indonesia's Islands

Annual **fish losses** around 75 to 125 thousand metric tons (MT) due to poor handling, and the **availability and quality of ice**

Fishermen in North Maluku forced to bury 2 tons of tuna due to limited storage and market access

Source: Kompas.com – 06/04/2020



Inappropriate cold chain significantly influences both the quality and price of products, Kupang 2022



Limited access to cold chain facilities in remote or island areas due to **Unreliable electricity**

Challenges Facing Indonesia's Islands

The **first few minutes** after a tuna is caught are **critical**, they determine whether the catch becomes **premium-grade** or a **lost opportunity**

Ice is essential in the
upstream fisheries
supply chain

100% renewable energy
off-grid & hybrid capable
natural refrigerant R290

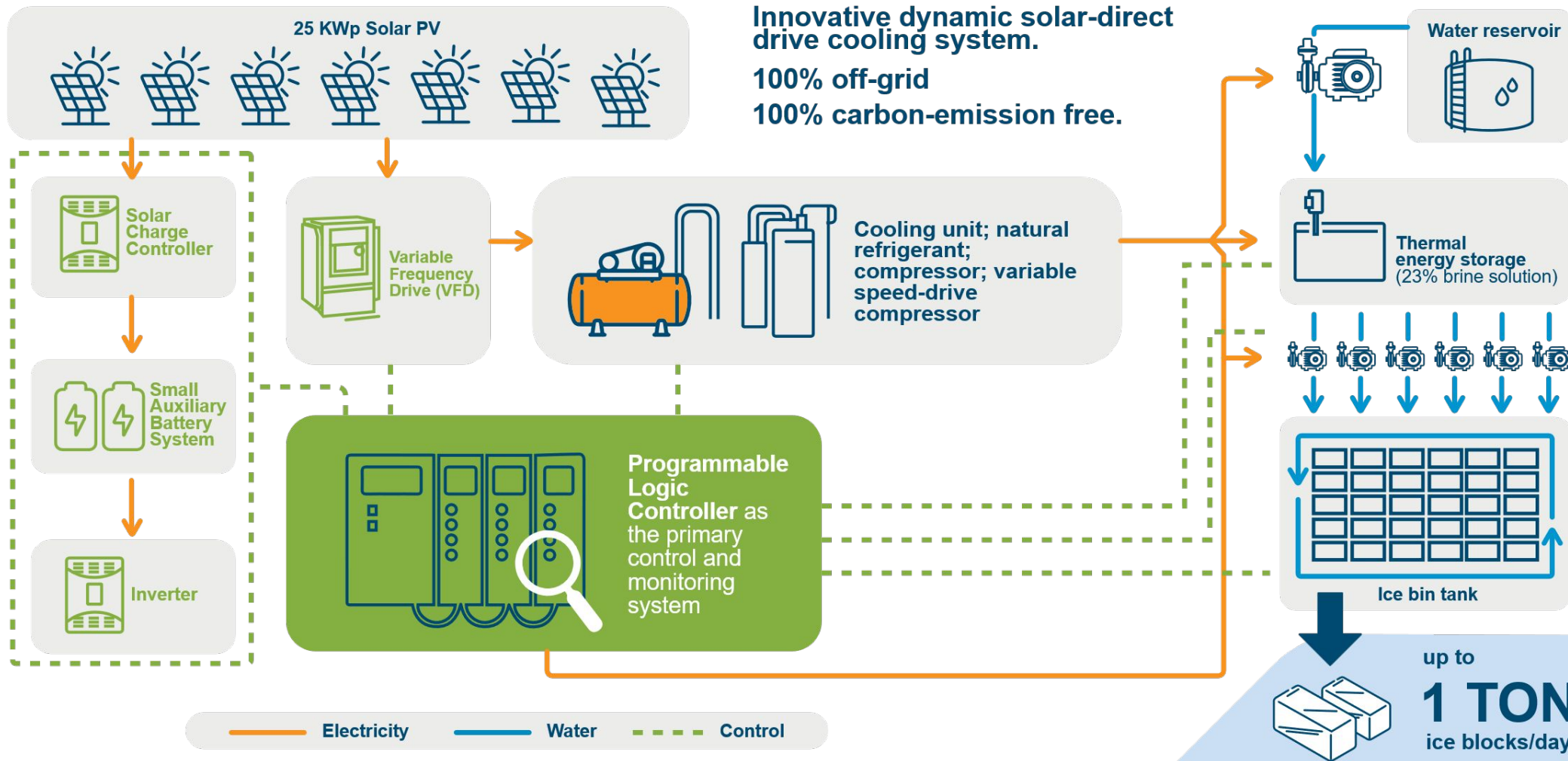
lean and less costly
combination electrical and thermal
energy storage, no fuel

smart and dynamic
energy demand following sunshine 50%
of the year 1 ton/day



Solar Ice Maker
up to 1.2 tons of ice per day
100% emission-free

Smart Technology Innovation in Solar Ice Maker



Smart Technology Innovation in Solar Ice Maker

Key Highlights

100%

full off-grid

and dynamic operation

Efficient

by utilizing thermal energy
from 23% brine solution

Smart

Energy Management

by adjusting the compressor
speed at 25-60Hz



Smart

Solar Ice Maker

How?

Dual Operation Modes: The system can run **automatically** based on pre-set logic or be **operated manually** when needed (troubleshooting)

Sensor-Driven Intelligence:

Key parameters like solar irradiance, water flow, and temperature are monitored in real-time through digital sensors, enabling responsive and optimized operation.

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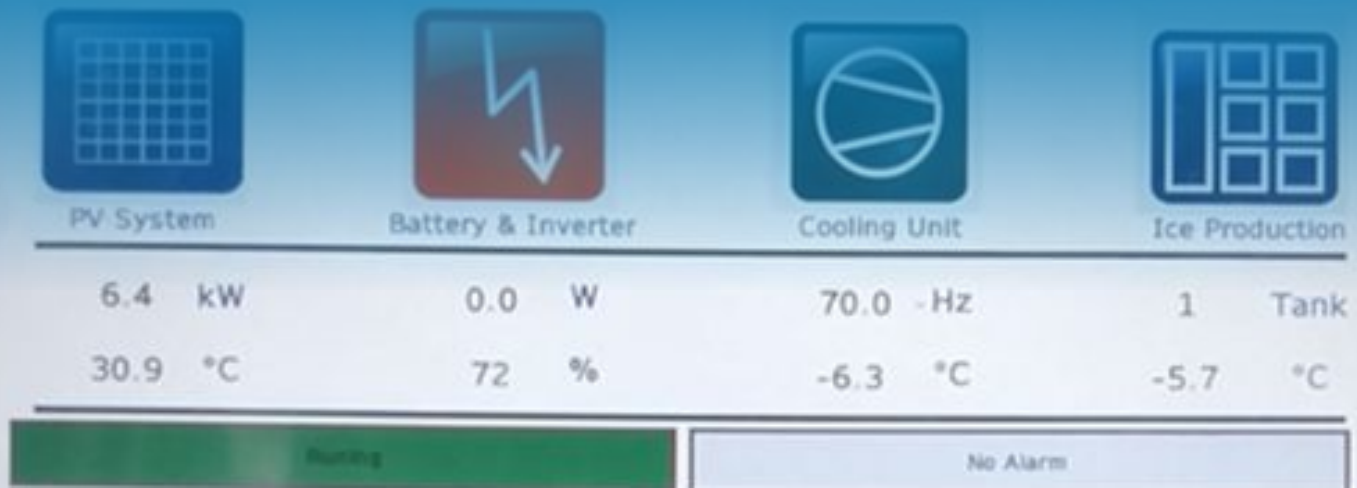
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Smart

Solar Ice Maker

How?

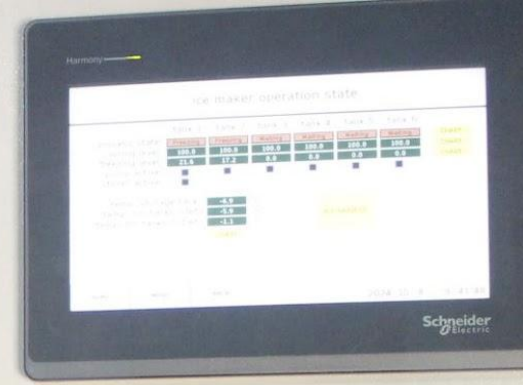
Real-Time Monitoring: Operators can track ice production status live and receive alerts when the ice is ready to be harvested



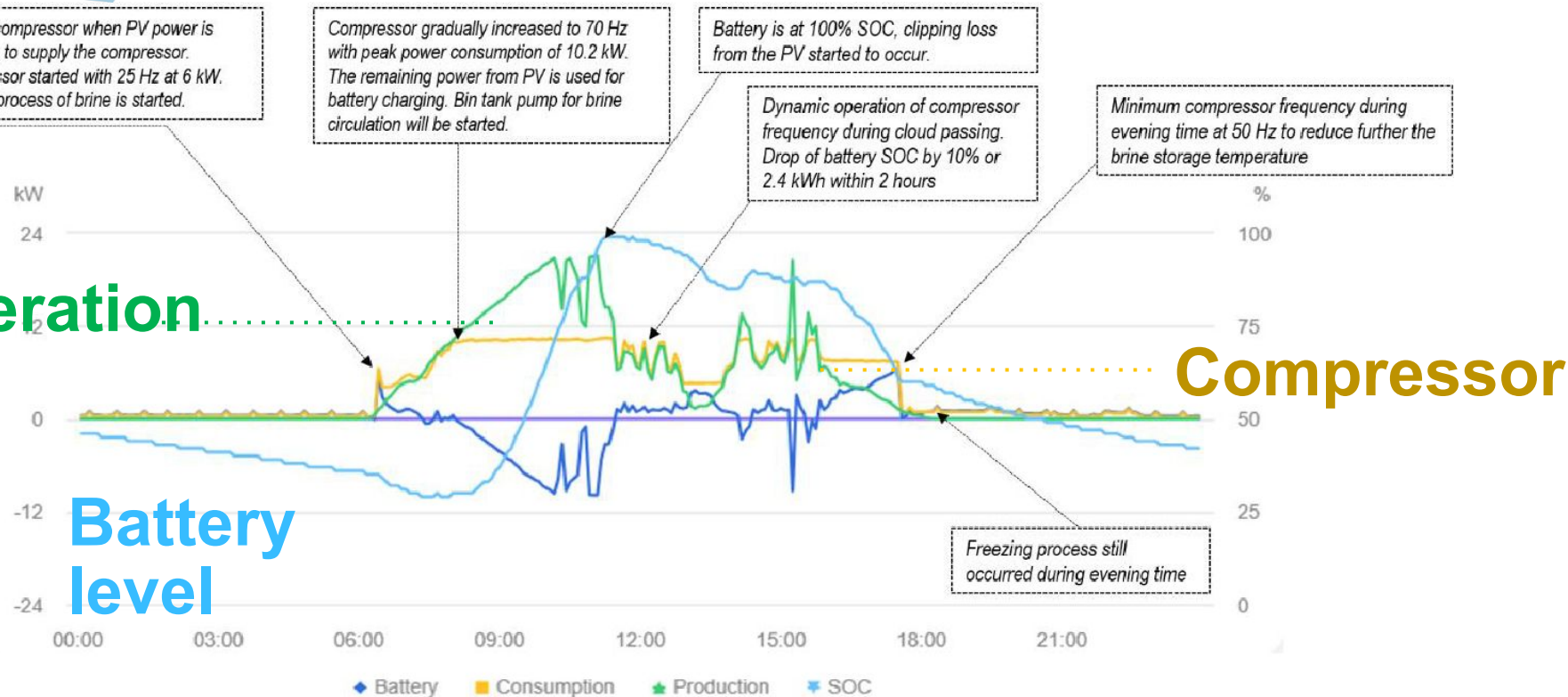
Smart

Solar Ice Maker

How?



PV Generation



3 contain

power, control &
ice ge
ice s

Technical Specification of Solar Ice Maker

**Combined
Energy Storage**

**Battery
LFP**

24 kWh

**Brine
Storage
Tank**

3,000 L

**Variable
frequency
design**

**Brine
Storage
Tank
3,000 L**

**Dynamic Load and
Speed Regulation**

**Block Ice
Generator**

**Ice blocks
compared
to mine
1.2 tons
per day
(6 tanks)**

**Ice
storage
5 tons**

**Solar PV
27 kWp**

Knowledge Transfer = Sustainability

**providing hands-on
technical training for local
operators on the O&M of
Solar Ice Maker**



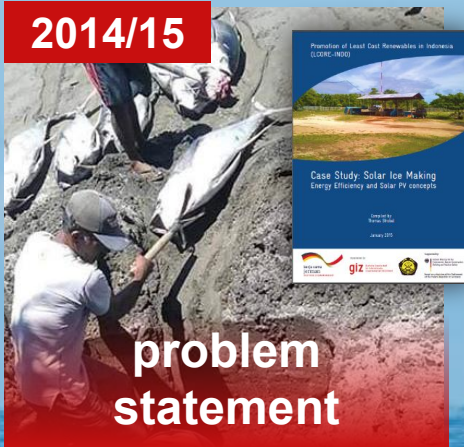
Photo: © IPNLF, 2024.



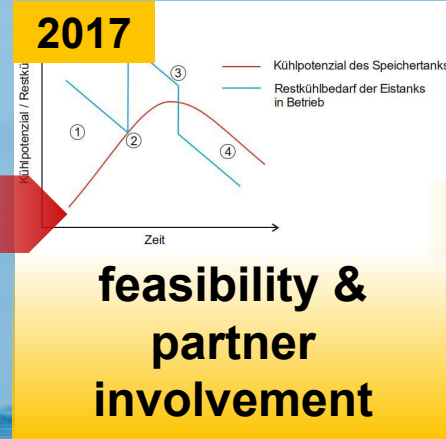
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From Concept to Scale

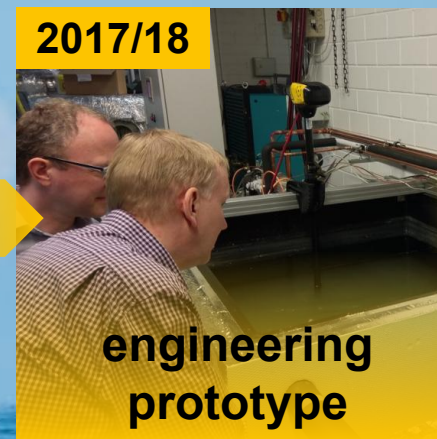
2014/15



2017



2017/18



2018/19



2020/21



2022



2024



2025



Intersolar 2025 – Germany

Dynamic Solar-Powered Off-grid Cooling for Island Fishery Communities



Achievement

Manufacturing and production established in Indonesia

SIM 2.0 Kawa



Adaptable technology for island context



SIM 1.0 Sulamu

**USD >1,200,000 annually
by private sector and partners**

Achievement

mitigates

**80 tons
CO₂e**

creates local value of minimum

USD 80,000

avoid

300,000

pcs of marine
plastic litters

The Power of Partnership

Funding & Core Implementing Partners 2017-2024

Key Highlights

Refrigeration Technology



Solar & Energy Storage Technology



Applied Research



Sustainable Fisheries



International Cooperation



The Way Forward

Global Impact

90% of the world's 120 million fishers are small-scale—often without access to ice or cooling

[FAO, 2022]

No cold chain = no fair market access for small-scale fishers

The Way Forward

Global Impact

Let's make
sustainable
cooling
accessible

Adopt the solar ice
maker as a
sustainable cooling
solution for island
communities!



Photo: © IPNLF, 2024.



Shaping
Transformation
Together

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