Harnessing the Power of Tides

The Sihwa Lake Tidal Power Plant is a circular water–energy project operated by Korea Water Resources Corporation (K-water). Located on the Sihwa tidal embankment, the facility integrates renewable electricity generation with controlled seawater circulation. With an installed capacity of 254 MW, the plant operates as a tidal barrage power station using 10 turbine-generator units and 8 sluice gates. It generates approximately 552.7 GWh of electricity annually, contributing to an estimated 315,000 tons of CO_2 emissions reductions each year by displacing fossil-fuel-based power generation. K-water also reports an energy security benefit equivalent to replacing roughly 862,000 barrels of imported oil annually. In addition to energy production, the project supports seawater exchange through its gates, helping improve water circulation in Sihwa Lake.

This case study presents how water-related infrastructure can deliver integrated outcomes by recovering renewable energy from tidal flows while supporting seawater circulation functions within the same asset.

REDUCE

RECOVER

ANSAN-SI, SOUTH KOREA

SEAWATER

INDUSTRIAL

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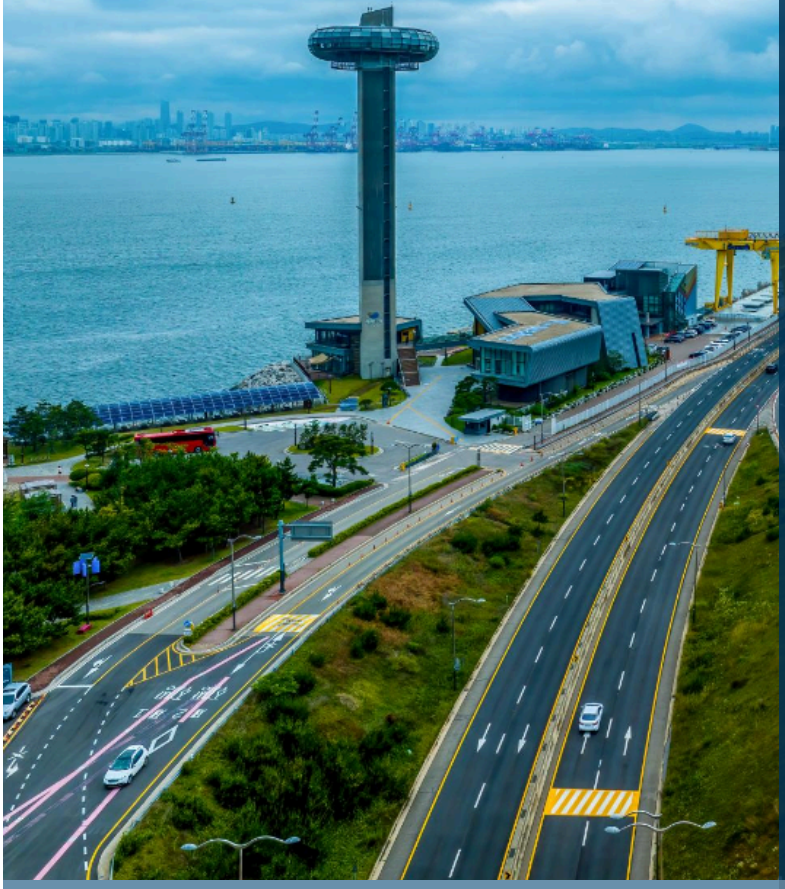

CHALLENGES FACED

Operating a tidal power plant in a marine environment requires careful planning across technical, operational, and stakeholder dimensions. Equipment must withstand corrosion, biofouling, and harsh coastal conditions, making regular inspections and strong maintenance practices essential. The facility must maintain stable performance while adapting to natural tidal and seasonal variability. Clear communication is important, as stakeholders may focus on different aspects such as energy generation, water circulation, or environmental outcomes.

TECHNOLOGIES & SOLUTIONS USED

The project uses a tidal barrage power system integrated with a coastal embankment. Key components include 10 turbine-generator units (25.4 MW each) and 8 sluice gates, with coordinated control of gates and turbines to manage tidal flows. Designed for marine conditions and long-term operation, the facility serves two primary functions: generating renewable energy from tidal flows and facilitating seawater circulation through controlled gate operation.

IMPACT & INSIGHTS

- The facility has an installed capacity of 254 MW, consisting of 10 turbine-generator units and 8 sluice gates.
- Annual electricity generation is reported at approximately 552.7 GWh.
- K-water reports an annual CO_2 reduction of approximately 315,000 tons, and an energy security effect equivalent to substituting approximately 862,000 barrels of imported oil each year.
- Chemical oxygen demand levels in Sihwa Lake reported at approximately 2.0 ppm, comparable to offshore conditions.

LESSONS LEARNED

- Large, multipurpose infrastructure projects require early coordination among public agencies and stakeholders.
- Responsibilities for development, permitting, operations, monitoring, and communications should be established from the outset.
- Funding and management strategies must cover not only construction but also ongoing operation and maintenance.
- Consistent performance metrics and clearly sourced data help ensure credibility and effective public communication.

> **The project is often referenced as an example of using water-related infrastructure to deliver renewable electricity while also providing seawater exchange functions through gate operation.**

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