OCEANBLOCKS / METHOD DEMONSTRATION

Industrial heat recovery assessment example

A fictional case showing how an infrastructure opportunity moves from an initial idea to a documented decision. All site details, prices, costs and results are invented for this example. It is not a live OceanBlocks project or a client outcome.

Decision

Conditionally advance to a scoped feasibility study. The illustrative heat-recovery option has enough potential to justify checking the missing evidence. It does not justify equipment purchase, a financing commitment or a performance claim.

$136,024
Illustrative annual net saving

3.09 years
Illustrative simple payback

2,700 MWh
Useful heat recovered each year

What determines the decision

The critical issue is whether a usable heat source and a compatible heat demand coincide for enough hours. Equipment capacity alone does not establish a business case. The base case assumes 4,500 paired operating hours, which have not been measured.

Under a combined downside case, payback rises to 9.18 years. A small efficiency and controls project also remains a credible alternative. It must be tested first or alongside recovery because it could change the demand that recovery is expected to serve.

Evidence required before spending on equipment

Measure source and demand profiles; establish usable temperatures and fluid conditions; validate the marginal fuel price; obtain a bounded installed-cost estimate; and confirm a safe integration plan that preserves the existing heat supply.

23 October 2026 | Public illustrative edition | Currency USD

Source note: all case inputs and scenario ranges were created for this illustration. No external market prices, operational datasets or supplier claims are used. Calculations on pages 3 to 5 allow the reader to reproduce the result.

ILLUSTRATIVE ASSESSMENT / 02

The fictional site and its assumptions

Facility A is an invented industrial site with a process heat demand and a possible source of surplus process heat. Its sector, location and equipment are intentionally unspecified. This avoids implying a particular project, counterparty or proprietary process.

Input	Illustrative assumption	Treatment
Useful heat demand	2.00 MW for 6,000 h/year	12,000 MWh/year; flat simplified demand
Existing boiler efficiency	85%	Same fuel energy basis throughout; constant at part load
Marginal delivered fuel price	$50/MWh of fuel energy	Fuel actually avoided; no fixed bill reduction
Incremental electricity price	$120/MWh of electricity	Applies only to recovery parasitic load
Recovery output at the demand interface	0.60 MW of useful heat	Already net of heat-transfer and distribution losses
Paired source and demand hours	4,500 h/year	Includes availability and coincident demand; do not derate twice
Incremental pumping and controls load	0.020 MW when recovery operates	20 kW; no load outside paired hours
Recovery installed capital cost	$420,000	Includes a $70,000 planning contingency; breakdown on page 4
Recovery incremental maintenance	$12,000/year	Fixed in this model; no additional staffing cost assumed
Controls alternative	5% reduction in baseline fuel use	Separate option; savings are not added to recovery
Controls capital and maintenance	$65,000 and $5,000/year	Installed cost and incremental annual maintenance
Illustrative screening threshold	Simple payback of 4.00 years or less	Example decision rule only; not an OceanBlocks investment policy

Evidence status: every input above is an assumption. No meter records, supplier quotations, engineering drawings or operating records have been provided. No input is described as verified.

ILLUSTRATIVE ASSESSMENT / 03

Compare three options

Each option is compared with the same assumed baseline. Baseline fuel demand is 12,000 / 0.85 = 14,117.65 MWh/year, costing $705,882/year. The model compares incremental cash operating effects, not the full cost of operating the facility.

Option	Incremental capital	Annual net saving	Simple payback
A Maintain the current heat supply	$0	$0	Not applicable
B Improve controls and operating efficiency	$65,000	$30,294	2.15 years
C Recover surplus process heat	$420,000	$136,024	3.09 years

A Maintain the current heat supply

Retain the existing boiler and operating practice. This is the reference case and the operational fallback. It avoids new project capital but leaves the assumed energy spend unchanged. Routine baseline maintenance is common to all cases and excluded from incremental comparisons.

B Improve controls and operating efficiency

A bounded review of setpoints, scheduling, losses and operating discipline could identify a lower-cost intervention. The assumed 5% fuel reduction is a modelling input, not a promised result. Fuel saving is 705.88 MWh/year, worth $35,294 before $5,000 of incremental maintenance.

C Recover surplus process heat

Assess a heat exchanger, recovery loop and controls to supply an existing useful heat demand. The model assumes direct thermal integration; it does not assume electricity generation, fuel manufacture or a proprietary conversion process. The boiler remains available to supply the duty when recovery is unavailable.

Why advance C while retaining B

C offers a larger illustrative operating saving and passes the example screening rule, but requires much more capital and stronger engineering evidence. B should be investigated at the same time. If B changes the load profile, recalculate C using the improved baseline before comparing or combining them.

Scope boundary: no baseline asset replacement, production increase, heat sales, carbon credits, grants or avoided standby capacity are included. No combined B+C outcome is modelled.

ILLUSTRATIVE ASSESSMENT / 04

The model is simple enough to check

The following equations use only the assumptions on page 2. All savings are annual and incremental. Displayed values are rounded; the calculation file retains precision.

Calculation	Formula	Base case
Useful heat recovered	0.60 MW x 4,500 h	2,700 MWh
Fuel energy displaced	2,700 / 0.85	3,176.47 MWh
Avoided fuel expenditure	3,176.47 MWh x $50/MWh	$158,824
Incremental electricity	0.020 MW x 4,500 h x $120/MWh	$10,800
Annual net operating saving	$158,823.53 - $10,800 - $12,000	$136,024
Simple payback	$420,000 / $136,023.53	3.09 years

Illustrative installed capital allowance

Cost category	Assumed USD
Recovery equipment	210,000
Installation and piping	60,000
Civil and structural works	25,000
Controls and electrical works	20,000
Engineering and commissioning	35,000
Subtotal	350,000
Planning contingency 20% of subtotal	70,000
Total used in the model	420,000

The total is an invented planning allowance, not a supplier quote. It assumes no material land, major outage, capacity expansion or unusual remediation cost. Those items must be assessed explicitly during feasibility; the contingency is not evidence that their costs are covered.

Simple payback omits financing, tax, depreciation, time value of money, asset life and residual value. It is a first screening measure. A real capital decision requires a project cash-flow model and an appropriate appraisal method.

ILLUSTRATIVE ASSESSMENT / 05

What changes the outcome

The single-variable cases below change one base assumption at a time. They are illustrative stresses, not probability forecasts. Incremental maintenance remains $12,000/year and electricity remains $120/MWh in every case.

Scenario	Net saving per year	Payback	Example 4 year rule
Paired hours 3,000/year	$86,682	4.85 years	Does not pass
Base case	$136,024	3.09 years	Pass
Paired hours 6,000/year	$185,365	2.27 years	Pass
Fuel price $35/MWh	$88,376	4.75 years	Does not pass
Fuel price $65/MWh	$183,671	2.29 years	Pass
Installed capital $336,000	$136,024	2.47 years	Pass
Installed capital $504,000	$136,024	3.71 years	Pass
Combined downside	$54,918	9.18 years	Does not pass

Combined downside = 3,000 paired hours, $35/MWh fuel and $504,000 installed capital. The capital stresses are 20% below and above the base total. None of these ranges has been validated for a real site.

Thresholds that guide the evidence request

Holding all other base assumptions constant, the four-year screening rule requires approximately 3,557 paired hours/year, or a marginal fuel price of at least $40.23/MWh, or useful recovery output of at least 0.483 MW. The corresponding maximum installed capital is $544,094.

These are separate one-variable thresholds. They cannot be combined as if all four could worsen simultaneously while preserving the result. Near a threshold, small measurement or cost errors can change the decision.

The operational question comes first

If the source and demand do not overlap in time, or the temperature difference is inadequate, nominal recoverable heat is not useful heat. Storage or a heat pump might change the solution, but would require a new scope, new costs and a new model.

ILLUSTRATIVE ASSESSMENT / 06

Evidence needed and risks to resolve

All work below remains open in this fictional case. The responsible roles describe who should supply or challenge the evidence; they do not name an appointed contractor or an existing OceanBlocks engagement.

Open question and consequence	Evidence needed	Accountable role
Do usable heat source and demand coincide? Low overlap can erase the business case.	Time-aligned source and demand logs covering representative operating modes, shutdowns and seasonality.	Facility operations lead
Are temperature, pressure and fluid conditions compatible? Contamination, fouling or corrosion can limit recovery.	Measured conditions, composition, fouling history and heat balance; engineer review of material and exchanger suitability.	Process engineering lead
Will fuel actually be avoided at the assumed efficiency and price? Fixed charges or poor turndown can reduce savings.	Marginal tariff and contract review, boiler performance data, load profile and part-load assessment.	Energy manager and finance lead
Can the system be installed without unacceptable production or safety risk?	Tie-in plan, hazard review, isolation and bypass design, outage allowance and production-loss estimate.	Facility engineering and safety leads
Is installed cost complete and commercially credible? Scope gaps can overturn payback.	Budget quotations with inclusions and exclusions, layout, piping routes, civil scope, schedule and contingency basis.	Project engineer and cost estimator
Will controls improvements change the heat sink? Double counting can overstate the result.	Rebased demand after efficiency opportunities are assessed; compare standalone and combined cases separately.	Assessment lead
Who owns the interfaces and performance obligations? Unclear responsibilities create delivery risk.	Interface matrix, supply scope, commissioning protocol, performance test method and remedies.	Project sponsor and procurement lead

Verification standard: record the source, date, unit, operating context and owner for every material input. Resolve inconsistent data before replacing assumptions with verified values. Independent review is required for material performance or safety conclusions.

ILLUSTRATIVE ASSESSMENT / 07

A controlled path to the next decision

The recommendation advances an investigation, not a construction project. The next scope and fee would be agreed after reviewing data access, site constraints and the required decision.

Gate	Work product	Decision and owner
1 Establish the baseline	Reconciled heat and fuel balance, demand profile, tariff basis, and a signed list of remaining data gaps.	Assessment lead recommends whether the data supports further engineering.
2 Test the options	Controls opportunity review, source-to-sink heat balance, integration concept and updated standalone comparisons.	Engineering lead rejects incompatible options or defines the credible study scope.
3 Complete scoped feasibility	Costed concept, safety and delivery review, operational downside cases, project cash flows and independent challenge.	Project sponsor decides advance, hold or stop against a documented decision rule.
4 Authorise a project if justified	Approved design basis, responsibilities, permits pathway, procurement terms, financing and acceptance tests.	The relevant asset owner approves capital only after conditions are satisfied.

Conditions for the next gate

Advance when representative evidence supports useful heat delivery, credible installed cost, safe integration and an acceptable operating downside. Confirm that the heat supply remains dependable when recovery is unavailable.

Hold when data gaps, uncertain utility contracts, incomplete cost scope or unresolved integration constraints could change the recommendation. Identify the evidence owner and the next decision date in the live engagement.

Stop or redesign when usable heat is insufficient, the source and sink are incompatible, production risk is unacceptable, or credible economics fail the asset owner's actual decision requirements.

How the decision should be recorded

The decision note should state the selected option, the evidence relied on, the assumptions still open, the conditions of approval, the expenditure authorised and the person accountable for each condition. Approval to study an option must not be described as approval to build it.

ILLUSTRATIVE ASSESSMENT / 08

How to read and use this example

What this document demonstrates

This sample shows a structured way to define an operating problem, compare credible options, expose commercial sensitivities and connect a recommendation to evidence. Its value lies in the questions and decision process, not the fictional outcome.

What it does not establish

It does not establish technical suitability, engineering design, project readiness, verified savings, emissions reductions, regulatory approval, financing availability or a delivery commitment. It contains no client information, commissioned facility, named technology or live investment opportunity.

Model boundaries

The model assumes constant boiler efficiency, flat heat demand, constant marginal prices, fixed annual incremental maintenance and no degradation. Availability is represented through paired hours. Recovery output is defined at the useful demand interface. Fuel, heat and electricity remain separate energy quantities and must not be compared without the stated conversion assumptions.

The cash comparison excludes baseline costs common to all options, tax, financing, depreciation and escalation. No asset life, residual value, grant, carbon credit or emissions factor is assumed. No net present value, levelised cost or emissions reduction is claimed.

Information to bring to an initial discussion

Describe the facility and decision, the operating constraint, the site location, available energy and resource records, known integration limits, and the decision timetable. An initial discussion should use non-confidential information. Technical detail can follow through an appropriate confidentiality and review process.

An agreed scope before work begins

A live assessment may include a baseline review, site and resource evidence, options comparison, preliminary economics, material risks and a written decision recommendation. Scope, fee, access requirements and timetable are agreed before commencement.

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