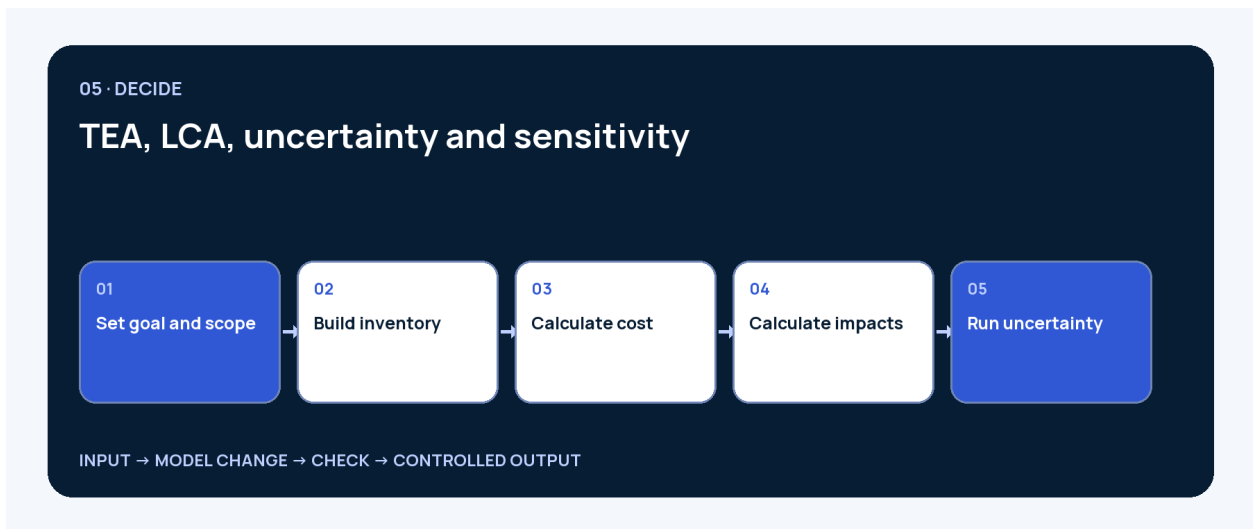




Axion

TEA, LCA, uncertainty and sensitivity

Derive cost and environmental impact from one controlled process basis



EDITION 2.6 · 19 AUGUST 2026 · MODULE MANUAL · 05 · DECIDE

Axion · Bioprocess engineering software



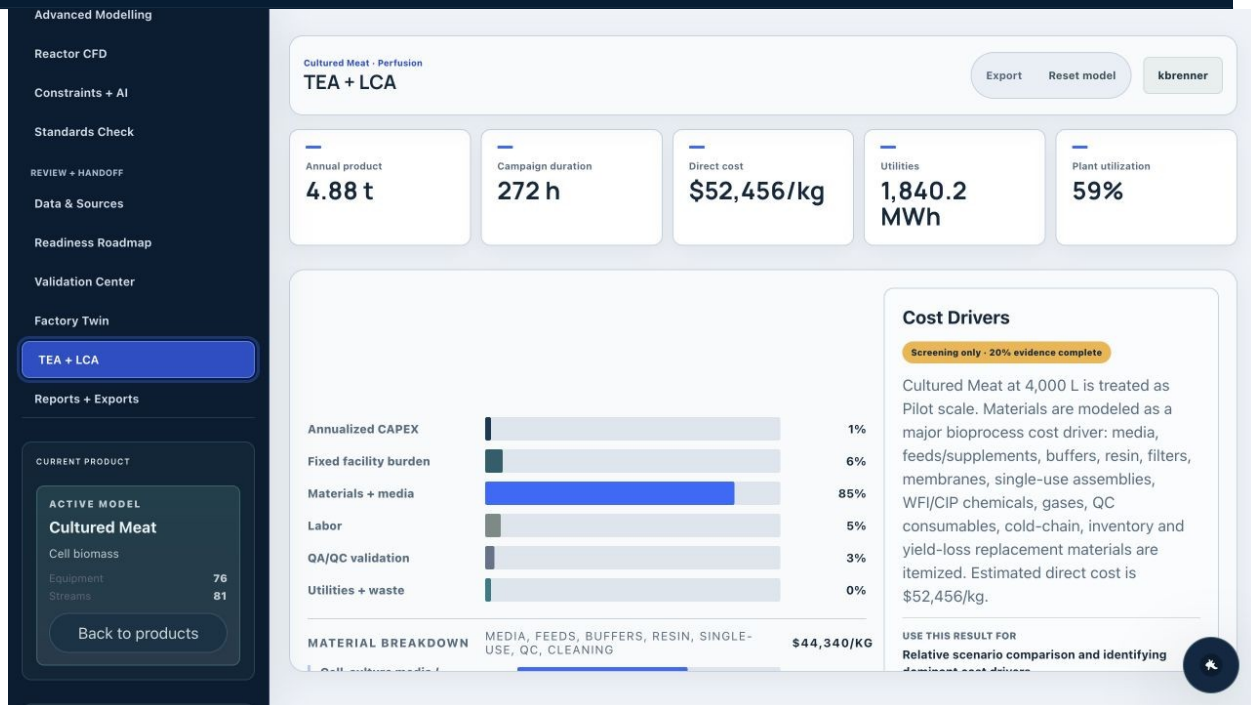
At a glance

Engineering decision	Path in Axion
Which process option is economically and environmentally preferable, under which assumptions and uncertainty?	Decide → Economics / LCA / Sensitivity

Primary users	Permitted maturity
TEA, LCA, Strategy, Process Engineering, Investment Review	Screening with proxies; Calibrated with supplier/site data; Validated after methodological and technical review

DECISION RULE

TEA and LCA must use the same product quantity, yield, time basis and system boundary. Axion traces flows, costs, factors, allocation, uncertainty and sensitivity to source.



Relevant Axion workspace for this module manual.



Prepare the model

Input	Why it is required	Ready when
Functional unit	Creates one denominator for all scenarios.	Product, quality, quantity, location and period are defined.
LCI and material flows	Covers media, buffer, energy, water, waste and transport.	Flow, unit, stage, geography and source exist.
Cost basis	Covers media, consumables, labour, utilities, waste, equipment and facility.	Price date, currency, region, range and source are documented.
Equipment and CAPEX	Links size, count, installation and scaling.	Quote/correlation, index, basis and life are set.
Allocation and cut-off	Controls co-products, recycle and excluded flows.	Method, rationale and sensitivity are documented.
Uncertainty	Prevents false precision.	Min/mode/max or distribution and correlations are set.

Preflight check

- Confirm the correct project, branch and controlled version
- Verify units, provenance and permissions
- Save a restore point before a decision-relevant change
- Keep blocking gaps visible

APPLICABILITY LIMIT

Database factors and price proxies are screening data until region, technology, year and supply chain are reviewed.



Workflow

1. Set goal and scope

1. Define decision, audience, boundary, FU, allocation and impact method.

VISIBLE RESULT

The study header is complete.

2. Build inventory

2. Classify boundary streams, utilities, cleaning, transport and waste.

VISIBLE RESULT

LCI contains external exchanges and explicit lifecycle stages.

3. Calculate cost

3. Calculate variable/fixed OPEX, CAPEX, working capital and output basis.

VISIBLE RESULT

Cost stack and cost/kg close to the same production amount.

4. Calculate impacts

4. Apply factors to quality-reviewed exchanges.

VISIBLE RESULT

LCIA shows category, unit, stage and contributor.

5. Run uncertainty

5. Run Monte Carlo with documented distributions and seeds.

VISIBLE RESULT

Median, P5/P95 and stability are visible.

6. Assess sensitivity

6. Compare key drivers and scenarios.

VISIBLE RESULT

Driver ranking explains the decision and actions.



7. Interpret and export

7. Document hotspots, trade-offs, limitations and gaps.

VISIBLE RESULT

The complete package is reviewable and opens correctly.



Review the result

Review criterion	Pass condition	If it fails
Scope and structure	The documented criterion is satisfied and supported by traceable evidence.	Correct the model or keep the output Not decision-ready.
Units and balances	The documented criterion is satisfied and supported by traceable evidence.	Correct the model or keep the output Not decision-ready.
Evidence and uncertainty	The documented criterion is satisfied and supported by traceable evidence.	Correct the model or keep the output Not decision-ready.
Reproducibility	The documented criterion is satisfied and supported by traceable evidence.	Correct the model or keep the output Not decision-ready.
Review state	The documented criterion is satisfied and supported by traceable evidence.	Correct the model or keep the output Not decision-ready.

DECISION RULE

Database factors and price proxies are screening data until region, technology, year and supply chain are reviewed.



Troubleshooting

Observation	Likely cause	Correction
The result looks plausible but cannot be explained	Inputs, units, model version or evidence are missing.	Open the relevant register, restore traceability and rerun.
A change affects unexpected outputs	Dependencies or imported mappings were not reviewed.	Inspect the change plan and before/after diff; undo if required.
The module appears complete but readiness is low	Required industrial evidence is still missing.	Assign the visible gaps and keep maturity at Screening or Not decision-ready.



Handover and next steps

Artifact	Recipient	Must contain
Module result package	Engineering reviewer	Inputs, calculations, results, units, intervals, maturity
Readiness register	Model owner	Gap, required work, owner, due date, intended use
Controlled version	Project team	Branch, version, change note, reviewer and restore point

Completion check

- The active project, branch, version and intended use are visible.
- All inputs have units, provenance, review state and uncertainty where relevant.
- Blocking model, physical, numerical and evidence gaps are closed or assigned.
- The result maturity matches the available evidence.
- A controlled output package opens correctly and includes limitations.

[Open Axion](#) [Book technical onboarding](#)