Semantic Knowledge Graphs and Ontologies at TotalEnergies

Executive One-Pager

TotalEnergies has already invested in semantic foundations through the TotalEnergies Semantic Framework (TSF) and SousLeSens. The next step is to make this capability visible, reusable, and operationally useful across business domains and technology platforms.

TSF should be positioned as a semantic control layer: the governed source of industrial meaning that defines concepts, rules, mappings, standards alignment, and evidence links. It should feed platforms such as Cognite, Fabric, Collibra, Power BI, Alteryx, operational applications, and future AI agents with consistent meaning.

Why This Matters

Operational data is already connected through multiple systems, platforms, dashboards, and documents. The remaining bottleneck is shared meaning. Different teams and tools can describe the same equipment, degradation pattern, inspection event, cost, or risk through different labels and assumptions.

This creates friction when leadership needs fast, auditable answers:

- Which FPSO assets, equipment families, or tags are degrading faster than expected?
- What is the impact on the LifeX investment plan, maintenance schedule, and risk profile?
- Which decision reduces risk while avoiding over-investment, and how can it be justified?

Semantic knowledge graphs help answer these questions by connecting evidence, concepts, rules, and decision rationale.

What TSF Brings

TSF provides the governed semantic layer that platforms can consume:

- Canonical industrial concepts and definitions.
- Ontology patterns aligned with standards such as Basic Formal Ontology (BFO) and W3C semantic web standards.
- Mappings between source systems, equipment tags, functional locations, documents, and business objects.
- Rules, constraints, and evidence links that make decisions traceable.
- A reusable semantic asset base that can scale across use cases.

SousLeSens supports this ambition as an open-source ontology management and graph exploration platform financed by TotalEnergies.

Why LifeX Is The First Focal Point

LifeX is a strong first production focal point because it combines high-value FPSO assets, fragmented evidence, cross-FPSO comparison needs, and direct CAPEX/OPEX decisions.

The LifeX semantic data product should connect:

- Inspection evidence and technical documentation.
- Equipment classes, tags, and functional locations.
- Similar equipment patterns across FPSOs.
- Standards, rules, thresholds, and degradation logic.
- Risk, schedule, cost, production, and integrity impacts.
- Investment-ready decision rationale.

LifeX should prove that TSF can move from semantic assets to daily decision support.

Target Architecture

The traditional data stack should continue to operate:

LifeX data → operational applications → data platforms → BI / agents → decisions.

The semantic control layer sits beside that stack:

LifeX data → domain knowledge capture → TSF / SousLeSens semantics → analogs and query patterns → decisions.

The SKG stores governed semantics, identifiers, mappings, rules, curated graph data, and evidence links. Operational data can remain in source platforms such as Cognite, Fabric, Collibra, SAP, and document stores. Query mediation translates decision terms into source-specific identifiers and fields, reaches the relevant APIs or query endpoints, and returns results with provenance.

Recommended Next Move

TotalEnergies should move LifeX from pilot validation to governed production deployment by creating the first LifeX semantic data product.

Immediate priorities:

- Agree the LifeX decision support questions, also known as competency questions in ontology work.
- Define the semantic data product scope: concepts, mappings, rules, source links, APIs, and decision outputs.
- Connect TSF outputs to the platform ecosystem, starting with LifeX-relevant Cognite, Fabric, Collibra, Power BI, and reporting workflows.
- Establish ownership for semantic assets, versioning, reuse, and drift resolution.

The objective is simple: keep meaning governed once, then expose it across platforms so business teams, applications, and AI systems can make decisions from the same industrial reality.