

AIMING TRUE

An analytical approach to capital investment for a more reliable, resilient and efficient electrical network

2026 Edition



Why do electric utilities need to adopt a new strategic approach to capital allocation?

Electric utilities in North America are facing a perfect storm: **aging assets, accelerated electrification, climate uncertainty, proliferation of distributed energy resources (DER), increased risk of wildfires, and exploding demand from data centers.**

In this context, traditional and deterministic methods of capital planning and allocation, often based on engineering expertise and static risk matrices, are no longer sufficient.

Direxylon offers an analytics-based, integrated, and bottom-up approach to decision support that optimizes spending related to network maintenance, resilience, and asset replacement.



ABOUT DIREXYON

SPEED, TRANSPARENCY, AND GRANULAR MODELING

In a context where energy companies must contend with multiple uncertainties related to climate, the rise of distributed energy resources (DER), industrial growth, regulatory requirements, and emerging technologies, ad hoc analyses are no longer sufficient to support optimized capital allocation that correctly align with long-term performance imperatives.

Leaders need a platform that can quickly generate scenarios, demonstrate the soundness and validity of each recommendation, and optimize network investments based on a detailed understanding of its assets, their current condition, their physical interactions, and their behavior over time.

**1**

The ability to quickly generate a large number of scenarios:

the key to bolster decision-making

**2**

A “glass box” model:

transparency as the foundation for credible analyses

**3**

Bottom-up analytical models:

linking asset condition to business decisions,
starting with the distribution network



1 The ability to quickly generate a large number of scenarios: the key to bolster decision-making

Today's investment plans can no longer be set in stone.

Electric utilities face:

- Load shocks (e.g., from data centers)
- Unpredictable DER trajectories
- Unprecedented climate uncertainty
- Rapid regulatory changes
- Supply chain disruptions

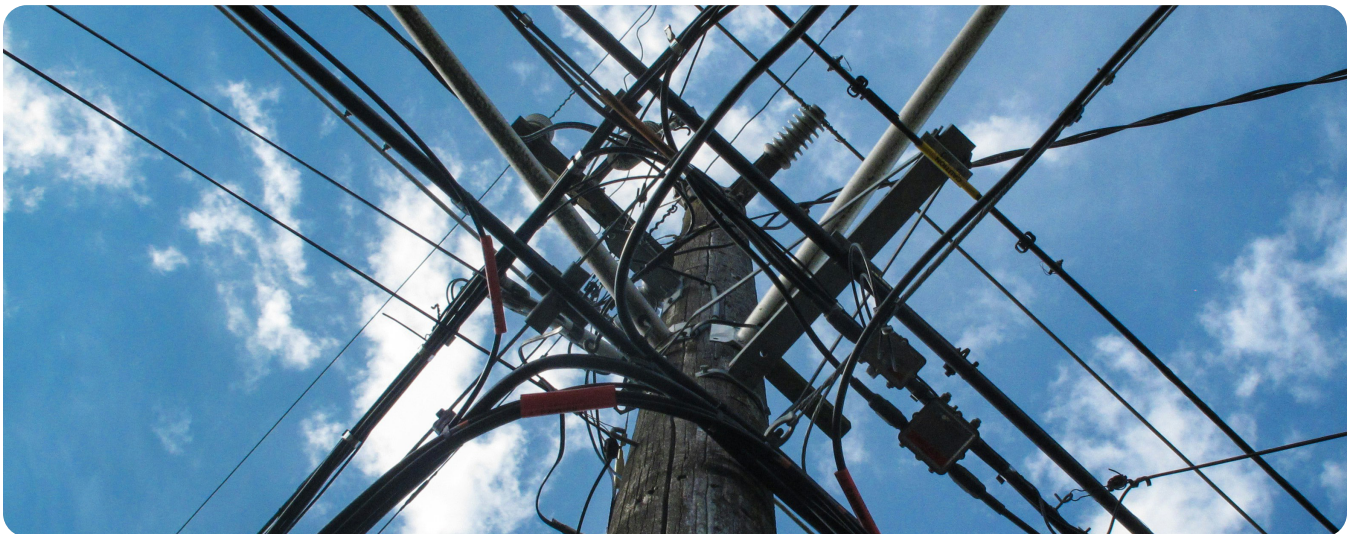
The value of a model no longer lies solely in the quality of its calculations, but also in its ability to **swiftly generate dozens of scenarios** that enable decision-makers to:

- test multiple investment strategies,
- compare their financial and operational impacts,
- quickly adjust planning when the environment changes.

DIREXYON has the analytical agility to **recalculate, recalibrate, and replan—continuously.**

**TO LEAD IS TO
FIND CLARITY IN
UNCLEAR
SITUATIONS**

Energy companies face complex, dynamic, and highly uncertain environments: the capacity to continuously recalibrate is paramount.





2 A “glass box” model: transparency as the foundation for credible analyses

Electricity companies must be wary of opaque models (“black box”) that submit results that end up being undefendable for:

- regulators,
- lenders and analysts,
- engineering teams,
- decision-makers.

DIREXYON chooses instead a glass box approach:

- Each parameter is visible and can be modified;
- Each logical relationship is traceable;
- Each recommendation can be explained (“Why this asset?”, “Why now?”, “Why this level of investment?”);
- Propositions can be customized by internal teams to reflect contextual changes.

This transparency is essential for gaining organizational buy-in, facilitating regulatory audits, and strengthening stakeholder confidence.

It also allows the existing organizational expertise to take full stewardship.

DIREXYON doesn’t have a superseding role: it integrates the experts’ knowledge into models and promotes collaboration. In highly specialized organizations, this approach drives credibility and adoption, setting aside any fears of expertise replacement.

**BUILDING TRUST REQUIRES
OPENING THE DECISION BOX
AND MAKING ITS INNER
WORKINGS VISIBLE.**

**A model’s impact depends on its
capacity to be understood. Each
recommendation must be traceable,
explainable, and convincingly
arguable.**



3 Bottom-up analytical models: linking asset condition to business decisions

Top-down models quickly “bottom out”:

- They don’t consider time variability (hours, days, seasons).
- They don’t grasp the specific behaviors of local networks, stations, transformers, or geographic areas.
- They do not granularly optimize investment, maintenance, or integration of DERs.

Conversely, DIREXYON’s bottom-up modeling offers:

- Individual asset analyses, starting with the distribution network components;
- Detailed load profiles, based on granular historical data (hours, days, seasons) rather than aggregated averages;
- Precise physical interactions (flux, voltage, hosting capacity, premature deterioration);
- Costs relating to maintenance, outage interventions, infrastructure reinforcements, burying, etc.

This granular modeling then feeds into a **decision twin**^{*}, which is based on explicit decision trees that reproduce the managerial logical resolution process and translate the technical analysis into an effective arrangement. This granularity provides:

- Genuine optimizations (not approximations);
- Accurate diagnostics;
- “What if?” scenarios;
- Highly targeted investment plans;
- Clear demonstrations of the cost-benefit ratio for each asset.

In other words, optimization requires accuracy—and DIREXYON provides it.

**WITH A DECISION TWIN, THE
DECISION-MAKING PROCESS
BECOMES LUCID, CONSISTENT,
AND OPTIMIZABLE.**

**To optimize, you need a detailed
understanding: how the load is
comprised, how it fluctuates, and
how assets respond over time.**

^{*} The **decision twin** complements the digital twin by morphing network and asset analyses into investment decisions. Without it, the digital twin remains essentially descriptive; with it, it becomes a true decision-making tool.

A SHARED ENVIRONMENT

DIREXYON breaks down silos by centralizing the analyses and decisions of production, distribution, and transportation teams. This integrated vision enables energy companies to make consistent and informed decisions across the entire network.

What feeds the platform

DATA SETS (*data fabric*)

Historical data concerning operations, maintenance, inspection, and investment

ASSET MODELING (*digital twin*)

Bottom-up reproduction of the network and the behaviour of its components (e.g., deterioration curves, failure probabilities)

DECISION MODELING (*decision twin*)

Modeling of trade rules and trade-offs based on actual constraints (such as borrowing capacity, delivery capacity, etc.)

SIMULATOR DIREXYON

What the platform enables

Maintenance-investment trade-off

Inter-portfolio balancing

Prioritization of interventions: vegetation control

Prioritization of interventions: wildfire mitigation

Service costs modeling (cost-to-serve)

Inter-network modeling

Tariff impact modeling

WHAT STRATEGIC QUESTIONS ENERGY EXECUTIVES ARE ASKING

Decision-makers must navigate between the finer details of their network and the long-term strategic trade-offs. The topics that really matter are those that link up the actual state of the assets, the dynamics impacting the network, and the decisions that involve huge sums. Here are five interrogations that constantly appear at the top of organizations' agendas.

micro



1

How can I optimize my spending and investments in maintenance and replacement?



2

How will the rise of DERMS impact my investments in the network?



3

How would regional network planning impact my medium / long-term investments?



4

How should I allocate capital across different portfolios to create value while accounting for risk?



5

How can we control the growth in demand while maintaining the social acceptability of rates and investments?

macro

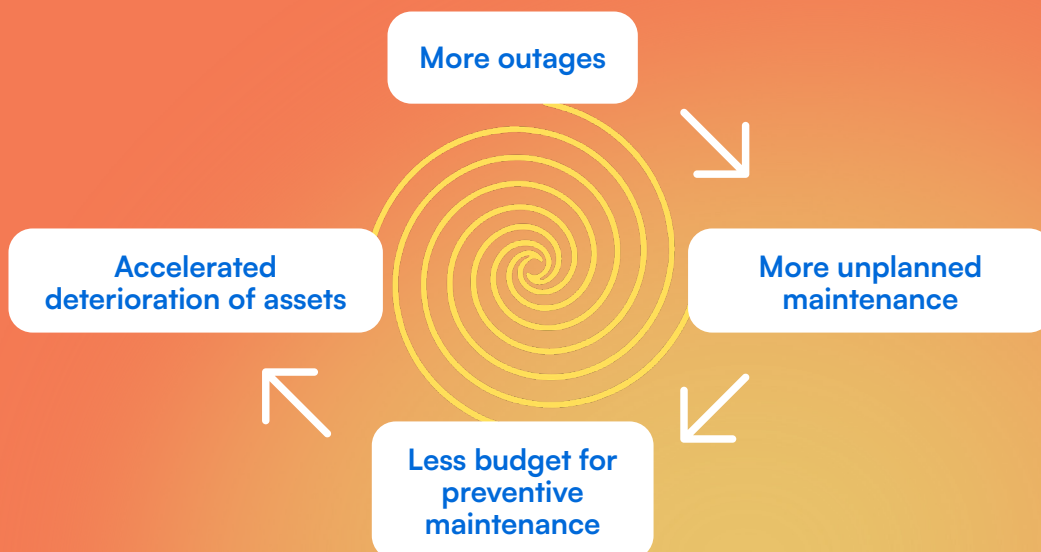
1 How can I optimize my spending and investments in maintenance and replacements?

WHY THIS IS IMPORTANT

- **Demand for maintenance funds always exceeds supply**, so critical assets and areas must be rigorously prioritized.
- Poorly targeted maintenance leads to breakdowns, emergency costs, and regulatory risks.
- Support capital expenditures (capex) often account for **40 to 60%** of annual investments; poor trade-off assessment jeopardizes value for customers and shareholders.
- Regulators now require analytical justification for maintenance and replacement programs



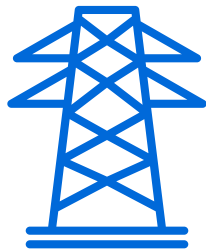
A NON-OPTIMIZED APPROACH LEADS TO A DOWNWARD SPIRAL



DIREXYON module: Maintenance-investment arrangements

THE CONTEXT

The utility pole inspection schedule of this large distribution network operator was significantly longer than common industry practices. This situation posed increasing risks to the network's reliability and safety, while making it difficult to assess the investments needed to accelerate inspections.



30-50%

Reduction in inspection costs

The use of advanced analytics (AI, computer vision, risk-based targeting) typically reduces inspection costs by 30 to 50% by focusing efforts on the most vulnerable assets.

WHAT WAS IMPLEMENTED

The organization reimagined its pole management strategy by testing different inspection cycles and prioritizing interventions in high-risk areas. With the help of **DIREXYON**, it simulated several scenarios to compare their financial, operational, and risk impacts, while visualizing the effects on asset condition and service levels.

THE RESULTS

Informed investment decisions

In a matter of days, the organization was able to finely estimate the costs associated with different pole inspection and replacement cycles and compare their medium- / long-term implications.

Improved prioritization of interventions

Utility pole management has been optimized by putting the emphasis on high-risk areas, thus reducing overall risk exposure without disproportionately increasing costs.

Integrated upscaling vision

The scenarios were analyzed using key indicators relating to costs, number of interventions, average age of poles, and risk levels, while preparing the model to integrate new performance indicators related to the effectiveness of investments.

QUESTION 1 (cont'd)

HOW CAN ANALYTICAL MODELS HELP?

- Modeling of asset deterioration and probabilistic failure curves
- Criticality analysis to identify high-risk assets, areas under stress, corridors with dense vegetation, etc.
- Identification through spatial analysis and historical data of sites where **maintenance outlays—including for vegetation control and network reinforcement**—generate the best, risk-adjusted return on investment (ROI)
- Continuous optimization of the “preventative maintenance / equipment replacement” duo (support capex), to minimize total cost of ownership (TCO) over time. **Potential reduction of 30-50% in TCO**
- Quantification of the impacts on the System average interruption frequency index (SAIFI), the System average interruption duration index (SAIDI), and other regulatory metrics

WHAT YOU GAIN WITH DIREXYON

- An integrated decision-making model to build up the **optimal intervention program** over time, by asset class and network area.
- A highly granular approach to target the assets and circuits that should be given priority (maintenance or replacement).
- Optimizing investments in IoT:
 - **Which assets should be equipped with sensors?**
 - **Which ones do not warrant it?**
 - **Which critical assets should be outfitted with more than one sensor?**
- Interactive dashboards showing financial / operational / pricing impact of various strategies.
- Robust and transparent analytics to champion investment plans before regulatory instances.

30-50%

Potential reduction in total cost of ownership (TCO)





2 How will the rise of DERMS impact my investments in the network?

WHAT LEADERS ARE ASKING THEMSELVES

How does the integration of DERMS (distributed energy resource management systems) and the growth of distributed energy resources changes the planning, the investment needs, and future reliability?

WHY THIS IS IMPORTANT

- DERs can reduce infrastructure requirements or increase stress on the grid and make it more vulnerable if the DERs are poorly placed or integrated.
- EV charging stations, residential solar power, and storage infrastructures are already changing load profiles and flux, and their impact will continue to grow.
- DERMS require the implementation of new sensors, controls, and communication capabilities.
- Without a bottom-up network modeling, electric utilities risk overinvesting or creating operational weaknesses.



QUESTION 2 (cont'd)

HOW CAN ANALYTICAL MODELS HELP?

- Forecasting of hosting capacity under different DER penetration scenarios (variable in time and space)
- Power flux modeling and congestion analyses
- Determination of areas where DERs enable capex savings—or induces capex depletion
- Integration of DERMS → impact on network's reliability, stress, and reinforcement needs

WHAT YOU GAIN WITH DIREXYON

- Asset models ready for DERs and integrated into capex planning
- Scenarios for quantifying distribution and transmission investments that can be postponed or avoided
- Investment roadmaps optimized for different scenarios

50%

Reduction of required CAPEX





3

How would regional network planning impact my medium- / long-term investments

WHAT LEADERS ARE ASKING THEMSELVES

How much capital investment could be avoided if transmission/generation planning were optimized at a regional level, rather, than at the level of a single jurisdiction?

15-20%

Reduction in total investment required to meet increased demand

WHY THIS IS IMPORTANT

- Several jurisdictions are overinvesting in reliability due to a lack of regional coordination.
- Regional planning helps avoid redundancy in assets.
- Regulators are increasingly seeking to control costs for the customers' sake.
- Regional integration supports low-cost decarbonization.

HOW CAN ANALYTICAL MODELS HELP?

- Multiregional modeling of flux (thermal, voltage, stability)
- Multiterritorial production modeling
- Determination of opportunities for interconnections or capacity sharing
- Quantification of avoided investments and impacts on rates

WHAT YOU GAIN WITH DIREXYON

- Interregional planning module that simulates various collaboration scenarios
- Quantification of systemic value created by the coordination of investment planning
- Robust analytical support for regulatory requirements

HOW TO MAKE MY NETWORK MORE RESILIENT AGAINST CLIMATE CHANGES?

Which assets are most vulnerable to new climate conditions and where should investments be made to reduce the risk of massive outages?

WHY THIS IS IMPORTANT

- Extreme weather events account for more than 50% of major disruptions.
- Extreme temperatures accelerate the deterioration of assets.
- Regulators and investors demand credible climate adaptation plans.
- Taking financial constraints into consideration, interventions showcasing the highest “resilience per dollar” ratio should exclusively be implemented.

HOW CAN ANALYTICAL MODELS HELP?

- Spatial modeling of climate risks (wind, heat, flooding, ice, etc.)
- Climate adjustment of breakdown curves
- Quantification of “resilience ROI”: interruptions avoided, emergency costs reduced
- Determination of optimal measures: relocation, replacement, reinforcement, targeted infrastructure burying

WHAT YOU GAIN WITH DIREXYON

- Analytical prioritization of resilience investments
- Dashboard to support climate-related regulatory obligations
- Decision assistance models to choose the most cost-effective measures

4

How should I allocate capital across different portfolios to create value while accounting for risk?

WHAT LEADERS ARE ASKING THEMSELVES

How to allocate capital across multiple functions—reliability, resilience, DER, digital, growth—while taking into account risks, expected performance, and regulatory constraints?

WHY THIS IS IMPORTANT

- Electric utilities must juggle with conflicting needs: reliability, resilience, growth, large industrial customers, digital modernization, and electrification.
- Operational and regulatory risks must be quantified, not just described.
- Fumbled allocation of capital engenders lower value for the customer and increased financial risks.
- Justifying investment portfolios becomes a major preoccupation in relation to regulatory demands.

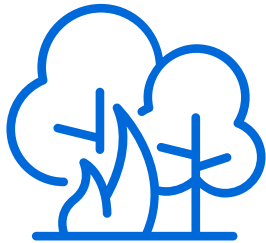


DIREXYON module: Prioritization of interventions - wildfire mitigation

HOW CAN I CREATE RESILIENCY IN MY NETWORK AGAINST WILDFIRES?

THE CONTEXT

In a stringent regulatory environment regarding wildfires, a large utility company in California needed to demonstrate its ability to plan, justify, and document its risk mitigation strategies. The challenge was to reconcile short-term regulatory compliance, long-term risk management, and credible investment decisions to satisfy authorities.



20%

Reduction in vegetation management costs

WHAT WAS IMPLEMENTED

A risk-based planning approach has been implemented to structure the decision-making process. The framework incorporated asset prioritization, deterioration models, decision trees, and investment constraints, in order to enable proper simulations of different wildfire mitigation scenarios and compare their impacts in terms of costs, risks, and network performance.

THE RESULTS

- **Implementation of a documented, consistent and verifiable risk management framework** that facilitates communication with regulatory authorities.
- **Ability to identify and quantify fire risks** related to assets and prioritize interventions accordingly.
- **Adjusting maintenance and replacement strategies** to find the right balance between regulatory compliance, risk reduction, and long-term sustainability.
- **Analytics applied to planning and intervention prioritization typically enables a reduction of approximately 20%** in vegetation management costs, by avoiding ineffective work and targeting areas with the greatest risk mitigation impact.



QUESTION 4 (cont'd)

HOW CAN ANALYTICAL MODELS HELP?

- Risk modeling for each portfolio (breakdowns, costs, regulatory impacts, operational impacts)
- Efficient frontier analysis to determine the optimal risk-return balance for the entire investment plan
- Multi-year scenarios that take into account different unknowns (climate, rise in DERs, data centers, supply chains)
- Prioritization of investments based on risk-adjusted net value (risk-adjusted ROI)
- **Potential impact: based on a weighted average cost of capital of 6%, deferring investments over a period of 10 to 20 years reduces by approximately 16% the present-day value of the paid amounts.**

WHAT YOU GAIN WITH DIREXYON

- Optimization tool that balances multiple portfolios based on expected risks and returns.
- Full transparency that bolsters arrangement decisions when presented to regulators.
- Unique ability to coalesce technical, financial, and operational risks in a single platform.
- Ability to articulate and promote trade-offs between subsidies to customers (e.g., for heat pump installations) and construction of new infrastructures.

16%

Reduction in the present-day value
of paid amounts



TESTIMONIALS

What our customers have to say



We had the data and the reports, but there was no clear link between information and action. DIREXYON enabled us to determine where to invest and how to improve the network in a relevant and convincing way.

— CEO of a medium-sized energy company in Canada



We thought the problem stemmed from a lack of data. DIREXYON helped us understand that the pivotal question was knowing what to ask for. Their approach brought clarity and structure to our asset management decisions.

— CEO of a major energy company in the United States



A proactive and targeted approach to interventions can generate savings of up to 50% while maintaining or even improving service levels. DIREXYON has been a real game changer in the way we manage investments.

— Senior executive at a major energy operator in North America





5

How can we control the growth in demand while maintaining the social acceptability of rates and investments?

WHAT LEADERS ARE ASKING THEMSELVES

How can we manage the rapid and unpredictable demand in energy from data centers, strategic industrial projects, and new production platforms, while still protecting households from significant rate increases?

WHY THIS IS IMPORTANT

- The growth in electricity demand presently stems from the combined appetite of data centers, low-carbon industrialization and emerging domains such as hydrogen and green metals.
- Grid connection requests can reach several hundred megawatts and disrupt the network's transportation and distribution requirements.
- The necessary investments amounts to billions of dollars and must be carefully balanced.
- Public opinion remains highly sensitive to the tariff impact of new energy-intensive projects.

HOW CAN ANALYTICAL MODELS HELP?

- Forecasts that incorporate AI trends, location of hyperscalers, and land availability
- Cost-to-serve modeling by site or by potential sector
- Determination of which connection points require the least investment
- Multi-scenario simulations that predict effects on investment and residential demand

WHAT YOU GAIN WITH DIREXYON

- **Analytical module that encompasses all energy-intensive sectors and helps to identify the optimal location of new industrial projects and data centers**
- **Detailed estimate of network reinforcement for each growth scenarios**
- **Comparison of different hypotheses that can showcase the impact on residential and industrial customers**
- **Guidance for the design of fair tariff mechanisms that support industrialization while preserving social acceptability.**

Conclusion

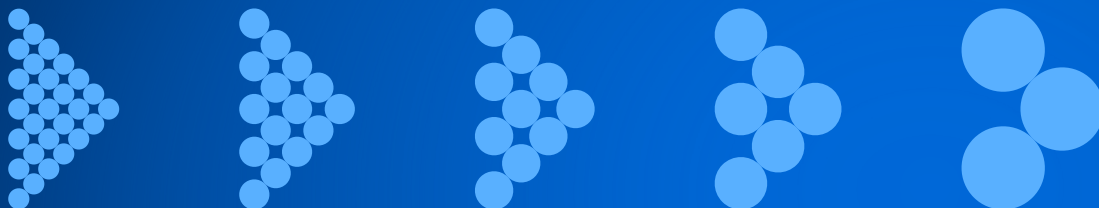
THE DIREXYON EDGE

DIREXYON is not your run-of-the-mill analytical tool. It is a comprehensive platform built around a decision twin that faithfully reproduces the determination logic of energy companies. It offers a detailed and granular understanding of the network, high-speed recalculation capabilities, and the transparency needed to rally experts, meet regulatory requirements, and substantiate the credibility of the process.

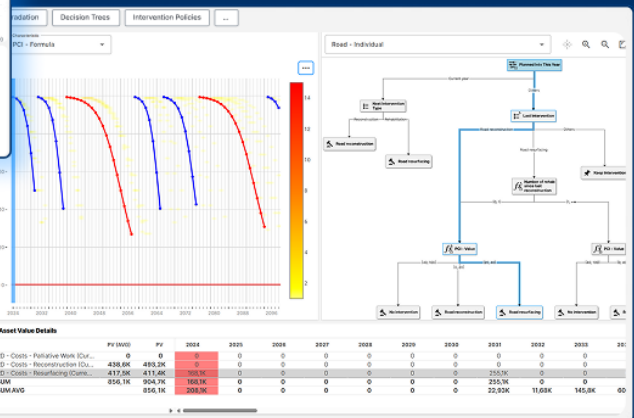
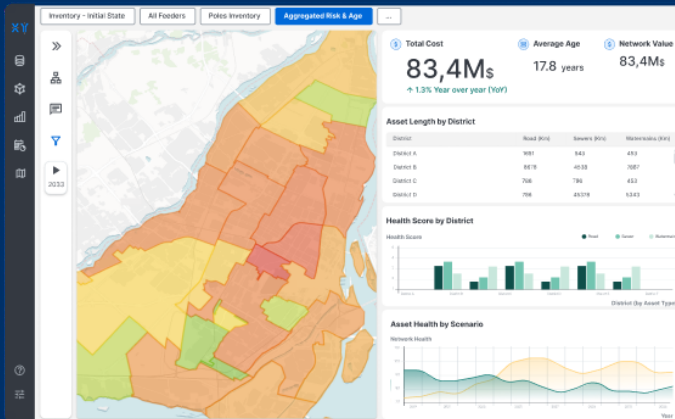
By embracing the entire analytical process, from detailed asset modeling to strategic portfolio-level decisions, **DIREXYON** eliminates the disconnect between the technical analysis, the financial mediation, and the long-term planning. Each scenario becomes explainable and compelling, each recommendation can be thoroughly analyzed, and each decision is buttressed by solid data and clear decision rules.

While other solutions only offer targeted functions, **DIREXYON** fuses the granularity of a digital twin, the intelligence of a decision twin, and the ability to link data, physical behaviors, and operational impacts into a single platform. This merger of capacities enables the reunification of silos, promotes agility in the decision process, and rallies teams around a common understanding of the network and the risks.

By combining precision, transparency, and analytical speed, **DIREXYON** empowers executives with the ability to anticipate, prioritize, and make smart decisions, in an environment where every investment call has a lasting impact on performance, resilience and value creation.



A LOOK AT THE PLATFORM



Optimized Portfolio | **Source Portfolio**

LISTE | **CARTE**

Intervenant	Status	Calendrier	Début	Fin	Coût	Bénéfice	Programme
PPOP4168	Inclus	Reposé	2030	2039	\$ 547	17	Ingénierie
PPOP4168	Inclus	Reposé	2029	2033	\$ 547	17	Ingénierie
PPOP4168	Inclus	Devenir	2026	2038	\$ 547	17	Ingénierie
PPOP4168	Inclus	Devenir	2025	2032	\$ 547	17	Ingénierie
PPOP4168	Inclus	Maintenu	2025	2029	\$ 547	17	Ingénierie
PPOP4168	Inclus	Devenir	2025	2032	\$ 547	17	Ingénierie
PPOP4168	Inclus	Reposé	2028	2038	\$ 547	17	Ingénierie
PPOP4168	Inclus	Reposé	2028	2038	\$ 547	17	Ingénierie
PPOP4168	Exclus	Rejeté	2030	2035	\$ 547	17	Ingénierie
PPOP4168	Exclus	Rejeté	2030	2035	\$ 547	17	Ingénierie
PPOP4168	Exclus	Rejeté	2028	2033	\$ 547	17	Ingénierie

Summary

# Projets	Start	End	Total cost	Benefits
8 - 12	2025 + 3	2039 - 3	\$ 622,00 ↓ 22%	8 700 ↑ 34%

For more information, visit direxyon.com