



FutureScale^x

CASE STUDY

Assessing CO₂ utilization pathways to establish a booming e-fuels business

Executive Summary: FutureScaleX designs innovation investment strategy and CO2 utilization pathways for leading energy company.



SITUATION

A global energy supermajor sought to allocate product and innovation capital to monetize captured CO₂, aiming to establish a business unit for low-carbon products. The selected pathways needed to align with its existing assets, produce marketable molecules, and operate in a relatively open competitive landscape.

CHALLENGE

CO₂ utilization remains highly nascent, with weak market signals and most pathways still in the research phase, lacking project-level success stories. The client faced limited innovation spending and required a highly selective approach to support its e-fuels and e-chemicals strategy.

SOLUTION

FutureScaleX (FSX) developed a capital allocation strategy, evaluating technology readiness levels (TRL), economics, patent landscapes, and R&D investment trends for six technical pathways and ten CO₂ products. FSX also identified emerging startups in each pathway for potential collaboration opportunities.

IMPACT

- Classified CO₂ utilization pathways into Horizon 1, 2, and 3 opportunities.
- Recommended region-specific best practices and budget allocation strategies.
- Built a pipeline of emerging startups for potential partnerships and collaborations.



Business context

Our client, an energy supermajor, is committed to the energy transition and views low carbon fuels as a key tool for long-term diversification. With ambitious emission reduction targets, the company is actively investing in emerging technologies such as carbon capture, green hydrogen, and biofuels.

To advance its e-fuels strategy, the client engaged with FSX to analyze the landscape of CO₂ conversion (CCU) pathways and determine where to allocate innovation funds across the value chain. The ultimate objective was to capture CO₂ emissions from its fossil fuel operations and convert them into monetizable products, supporting the growth of its e-fuels business.

Business requirement

To shape its R&D and innovation strategy in CO₂ conversion, the client sought comprehensive insights in three critical areas:

- **Technical Feasibility:** Assess the technology readiness levels (TRL) and commercialization readiness levels (CRL) of CO₂ pathways and end products, including e-fuels, methanol, and carbon monoxide (CO).
- **Competitive Landscape:** Analyze the positioning of competing oil and gas players in the CCU ecosystem, highlighting their strategic focus areas and potential blind spots.
- **Partnership Ecosystem:** Build a pipeline of promising startups and academic research institutions for potential technology collaborations.

To meet the client's multi-faceted objectives, FSX developed a holistic framework to direct its innovation capital allocation.

The FSX solution framework

FSX utilizes a 3-step process to conduct technical feasibility, peer benchmarking, and partner ecosystem development

START-UP & COLLABORATION ANALYSIS

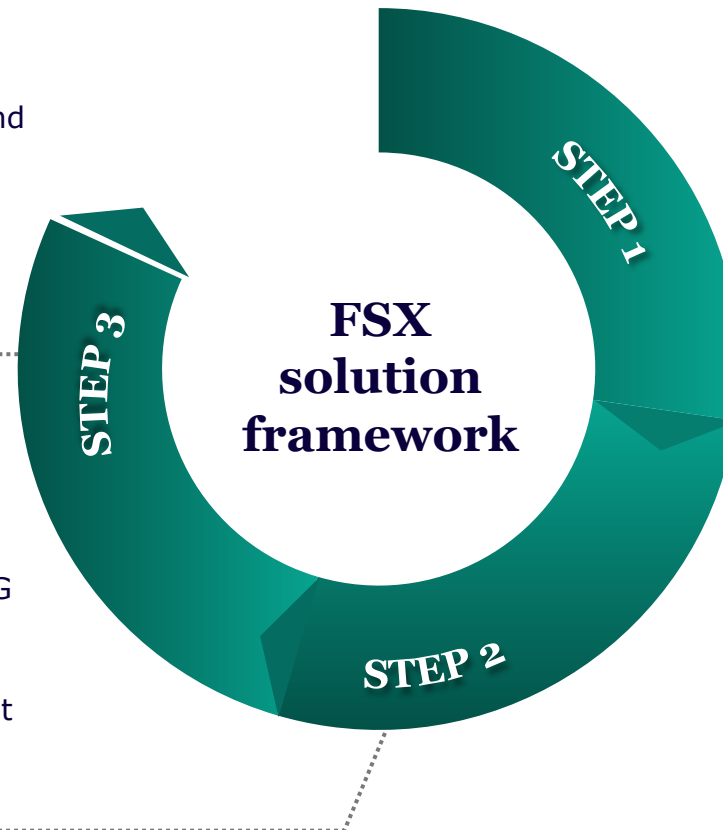
- **Partnership ecosystem:** Assess various joint ventures, technology partnerships, led by O&G players in CCU
- **Startup engagement:** Identify collaborations and investments of O&G companies in CCU startups.
- **Market approach:** Analyze research collaborations with universities and grants provided to academic institutions.

TRL ASSESSMENT & PEER BENCHMARKING

- **TRL screening:** Build pipeline of ongoing CCUS projects to ascertain TRLs; shortlist pathways and end products for deeper study
- **Competitor analysis:** Investigate competing O&G players activity in IP publishing, academic work, and R&D capital allocation
- **Benchmark:** Compare positioning of client against competing peers; identify areas of agreement, areas of disconnect

TECHNOLOGY LANDSCAPE & PEER IDENTIFICATION

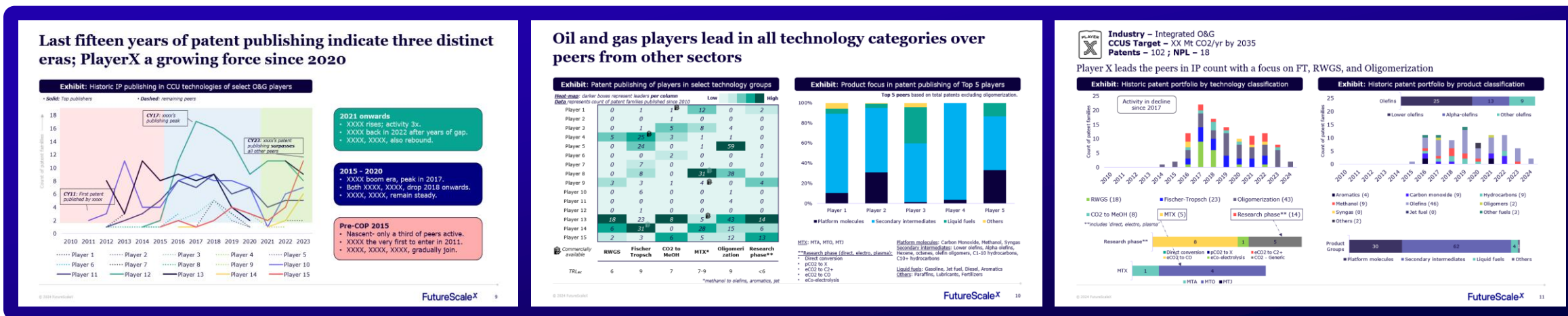
- **Global CO2 policies:** Foundational study of policies and regulations favorable for CCU
- **CCU pathways:** Prepare robust overview of all conversion pathways (ex: CO2 electrolysis) and the subsequent end products (ex: methanol)
- **Competitor universe setup:** Screen energy and industry peers who are direct competitors to the client and are active in CO2 utilization



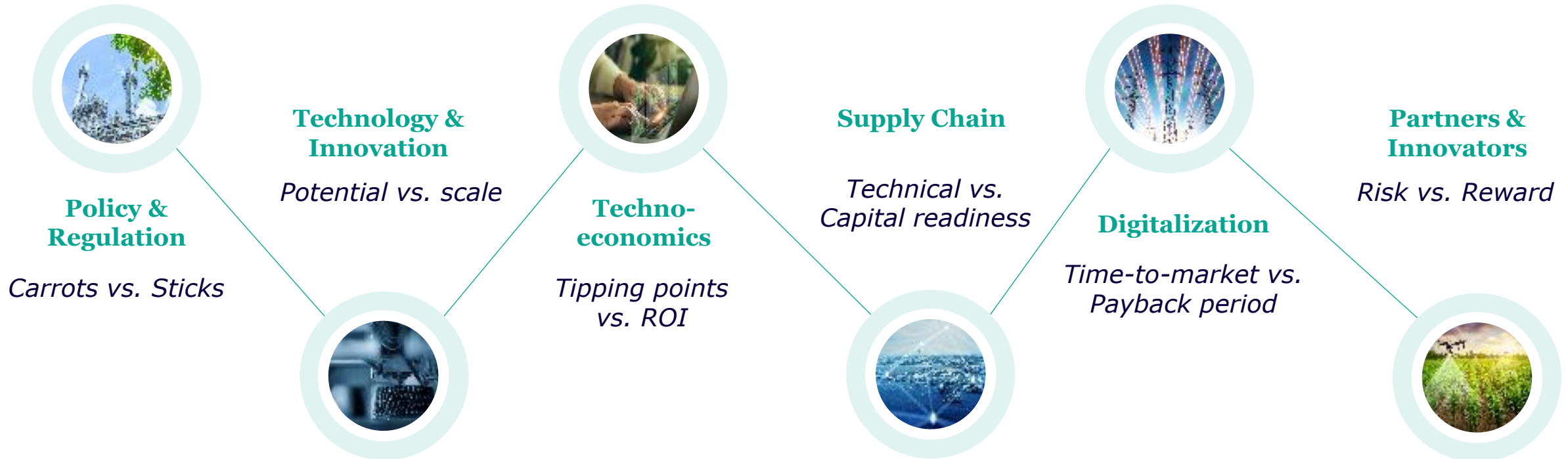
Impact

- Delivered a comprehensive assessment of CCU pathways, mapping each by technology readiness levels (TRL), R&D intensity, and a CO2 product roadmap across Horizon 1, 2, and 3 opportunity timeframes.
- Provided in-depth analysis of emerging trends and competitor research priorities in CO2 utilization and methanol conversion, aligned with broader corporate objectives.
- Identified and presented a layout of hypercompetitive technology segments and underexplored white spaces to guide the client's innovation budget allocation.
- Evaluated O&G collaborations across the CCU value chain, including partnerships with green hydrogen suppliers, chemical companies, catalyst providers, and other key stakeholders.

Sample output



Methodology: The FSX Sustainable-Growth-as-a-Service™ Methodology



Connected, systems-level thinking to identify the tipping points and solutions that matter.



Are you ready to grow sustainably?

At FutureScaleX, we believe that the future of business lies in sustainable growth. Our six-lens methodology is more than just an approach—it's a movement towards a more resilient and sustainable future.

FutureScale^X

Connect with us.

To request more information such as a meeting, demo, trial, or referral, please visit our website:

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