

Unlocking Bankability: Targeted Support Mechanisms for Green Chemistry

Identifying and Assessing the Impact of Support Mechanisms on the Bankability of Green Chemistry Projects

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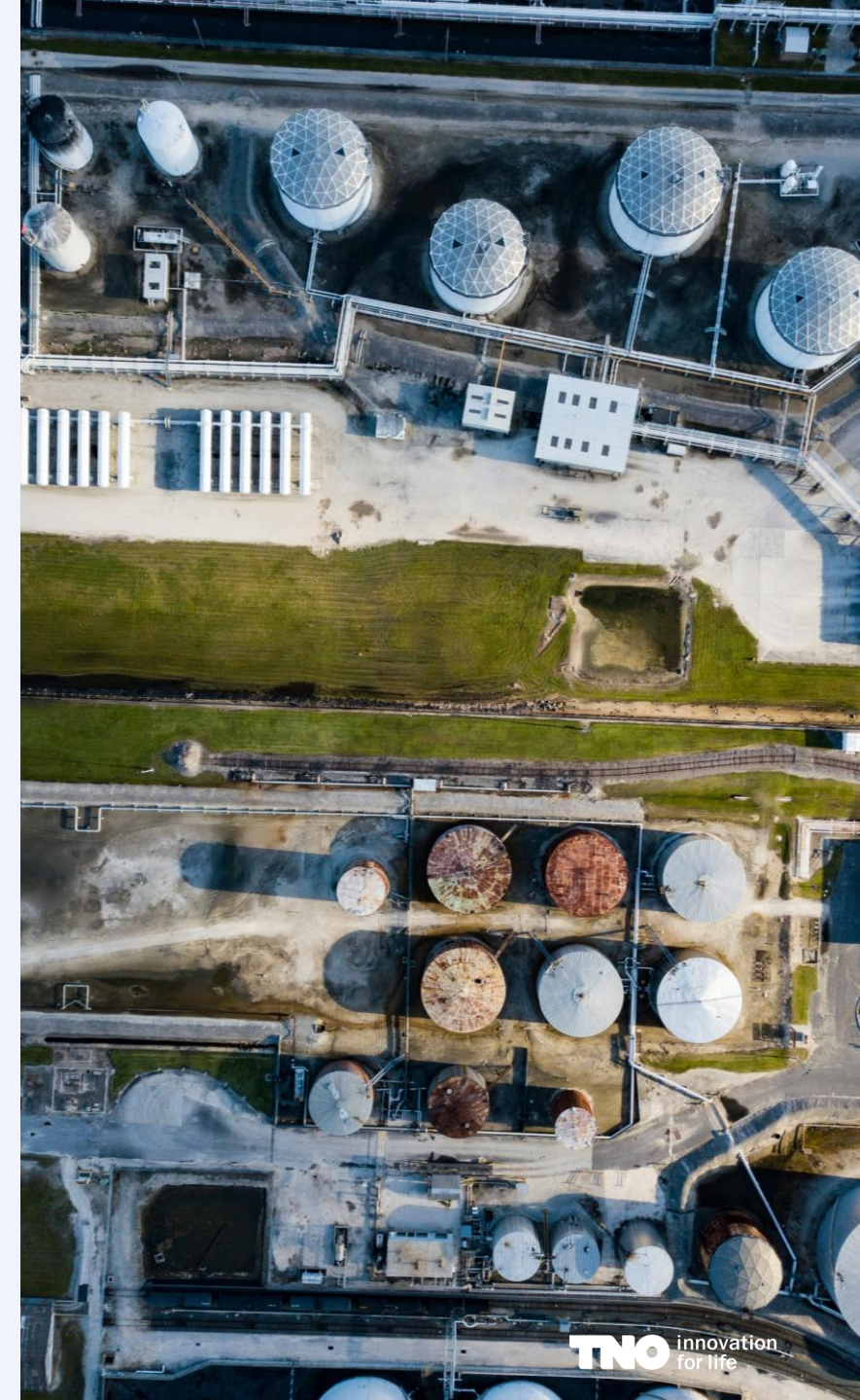
This study combined insights from existing TNO studies, a series of expert interviews, and two Financing Roundtables with business case modelling for two representative case studies: (i) **biomass gasification to methanol** and (ii) **polylactic acid (PLA) production**. Drawing on these complementary perspectives, **the study identifies key financing bottlenecks, evaluates the effectiveness of different support mechanisms, and prioritises those with the greatest potential to materially improve project bankability**. The findings from the study can also be applied more broadly to the scaling of similar value chains, such as bio-based or synthetic fuels and circular value chains.

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Securing Financing is a Key Bottleneck for Scaling Sustainable Technologies

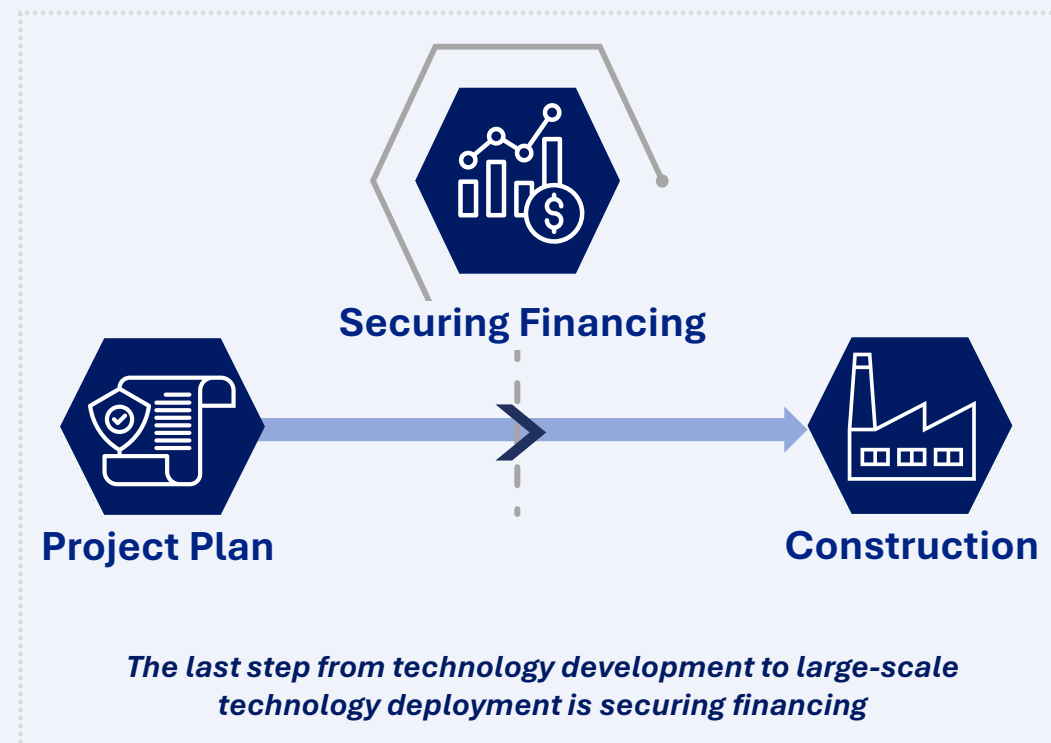
The transformation of Europe's chemicals system from fossil-based to sustainable feedstocks will require **significant investments to scale First-of-a-Kind (FOAK) industrial projects and value chains**. FOAK projects hold the key: they must prove operational performance and build new supply chains to turn national ambitions into tangible production capacity.

FOAK green chemistry projects face **significant challenges in reaching Final Investment Decision (FID) and attracting private capital**. Currently, most commercial-scale FOAK projects never leave the engineering stage due to high investment requirements and significant risks across the value chain, often resulting in a risk-allocation stalemate. These characteristics hinder bankability and make FOAK assets difficult to structure under conventional project finance models, which rely on proven performance and stable cash-flow generation. This restricts accessibility to large-scale private investment, creating a bottleneck for project scaling and the broader industrial transformation.

Large-scale FOAK deployment will require support mechanisms to feasibly derisk projects and unlock private sector financing. FOAK success creates data and replicability, reducing the perceived risks for subsequent projects and enabling Next-of-a-Kind (NOAK) project development.

This study therefore investigated:

- **Business case risks** along the value chain for FOAK green chemistry projects
- **High-priority support mechanisms** for overcoming core bankability constraints



FOAK Green Chemistry Projects Present a Growing Investment Opportunity, But Residual Risks Constrain Investment

Green chemistry projects represent a **growing investment opportunity** at the intersection of industrial defossilisation, materials security, and long-term infrastructure capital. Green chemistry presents a compelling opportunity for financiers: bio based and circular chemical assets require **large investment tickets**, operate as **long-lived, potentially strategically important industrial assets**, and when supported by the right mandates and offtake structures, can deliver **stable infrastructure-like cash flows**. However, FOAK projects face structural financing barriers stemming from high CAPEX requirements, limited operational references, and feedstock and market uncertainties, which subsequently constrain access to conventional project finance.

Government support can act as a catalyst, deploying targeted risk sharing and market creating interventions to absorb residual FOAK risks that exceed private sector appetite will unlock the scale of private capital required to accelerate deployment. Well-designed tools are needed to effectively bridge the gap between what the market is able to finance and the risk profile of early commercial projects. By **selectively assuming residual technology and value chain risks, improving boundary condition factors, and creating a market for sustainable products**, governments can help to unlock financing from private lenders and institutional investors, significantly increasing the total capital available for FOAK deployment.

Investment Considerations	
Key Opportunity	Description
Large ticket sizes	Green chemistry projects, like bio-methanol and PLA production, are often highly capital-intensive, with individual projects often requiring investment tickets in the hundreds of millions of euros. The high capex intensity requires the deployment of large-scale, long-duration investments aligning with the investment profile of institutional investors seeking sizeable, long-term allocations.
Strategic production assets with long lifetimes	Commercial-scale green chemistry assets are typically long-lived industrial assets and, in some cases, like for methanol, can form the backbone of multiple key chemical products. Once fully operational, they can generate stable, infrastructure-like cash flows over longer time horizons.
Stable demand from industrial offtakers	With stringent emission reduction targets, offtake mandates, and incentives in place for sustainable chemicals, long-term offtake contracts can underpin predictable revenues and cash flows.
Greening financial portfolios	Green chemistry projects provide banks and institutional investors with an opportunity to transition their portfolios by financing the shift from fossil-based production to low-carbon alternatives. Beyond project-level returns, these investments can reduce financed emissions, increase exposure to future-proof industries, and contribute directly to the decarbonisation of the industrial economy.

Priority Support Mechanisms to Unlock Bankability for Green Chemistry Projects

Typically, the business case for green chemistry projects faces residual risks and strained project economics. This study therefore investigated support mechanisms based on expert interviews, Financing Roundtables, and a business case analysis. Support mechanisms are categorised according to i) **market creation**, ii) **direct financial support**, iii) **guarantees**, and iv) **case-specific policy support**. All support mechanisms are targeted at fundamentally viable projects that are constrained by bankability challenges, rather than being used to support projects with structurally weak business cases.

The table provides a summary of the risk addressed and effect of each support mechanism on business case metrics. High-priority support mechanisms considered to have the most significant impact on improving bankability were selected and highlighted in **blue**.

Support Mechanism	Risk Addressed	Effect
Market Creation		
Offtake mandates	Offtake and willingness to pay risk	Creates demand and enables revenue generation
Government as a launching customer & strategic public procurement	Offtake and willingness to pay risk	Secures offtake and revenue streams
Direct Financial Support		
CfD mechanisms	Willingness to pay risk	Provides revenue stabilization
Capex subsidy	FOAK capital risks	Lowers required debt and equity funding
Liquidity facility	Operating performance risk	Provides liquidity during ramp-up and decreases risk of default on debt repayments
Guarantees		
Loan guarantee on project-level	FOAK capital risks	Reduces repayment risk for lender
Loan guarantee on portfolio-level	FOAK capital risks	Reduces repayment risk for lender
Technology performance guarantee	Technology and construction risk	Enables provision of technology performance guarantees (from EPCs) and reduces repayment risk for lender
Risk sharing fund	Technology and operating performance risk	Creates a market-based financial buffer and collective interest in successful project delivery
Case-Specific Policy Support		
Case-by-case support	Value chain risk, policy/regulatory risk	Targeted government support to absorb residual risks on a case-by-case basis

Achieving Bankability Requires Targeted Mechanisms that Support Market Creation, De-Risk Ramp-Up, and Unlock EPC Participation

A key prerequisite for moving green chemistry projects forward is the **creation of a viable market** for absorbing higher-cost sustainable products. Without sufficient and predictable demand, bankable business cases are difficult to establish. Results indicate that secure, long-term revenue streams based on stable offtake is a stronger determinant of bankability than once-off reductions in upfront capital costs.

While Capex subsidies and loan guarantees can improve project economics and reduce financing costs, they generally do not resolve the underlying challenge of insufficient cash flow visibility and uncertain market demand. In practice, market demand based on stable, enforceable **offtake mandates**, for example, ReFuelEU Aviation or PPWR recycled plastic content requirements, will be ramping up in the coming years towards 2050. Alternative market creation or revenue stabilization mechanisms for FOAK projects are needed to support sufficient offtake in the short-term. Instruments such as **Contracts for Difference** (CfD) mechanisms or strategic government procurement can serve as short-term bridging solutions, enabling projects to have stable revenue streams while EU-level offtake mandates gradually create structural long-term demand. Although CfD mechanisms improve revenue stability for produced volumes, revenue risk still remains for the facility not ramping-up to sufficient production capacity within the planned timeframe.

A second structural barrier therefore relates to the **ramp-up phase**, where delays and cost overruns remain inherently unpredictable for FOAK projects. This leads to uncertainty in the ramp-up and quality of production volumes and subsequent cash flow generation. Project developers are unable to completely plan for these risks, and private investors and lenders are generally unwilling to underwrite open-ended exposures with unpredictable cash flows. A dedicated **liquidity facility** emerges as a key enabling instrument, providing temporary financial support to bridge this phase and prevent otherwise viable projects from failing due to liquidity constraints before reaching stable operations.

Bankability Engineering Framework

Allocate

Every risk must have an accountable owner

FOAK projects require a **layered de-risking architecture** that integrates contractual, financial, and policy mechanisms to transform uncertainty into credible repayment paths.

Absorb

Public finance instruments can absorb residual risks

Public instruments can crowd in private capital by de-risking the early projects that validate technology and market performance. Targeted grants, guarantees, liquidity facilities, and market creation mechanisms play a complementary role by **absorbing residual risks that market parties and investors cannot feasibly absorb**.

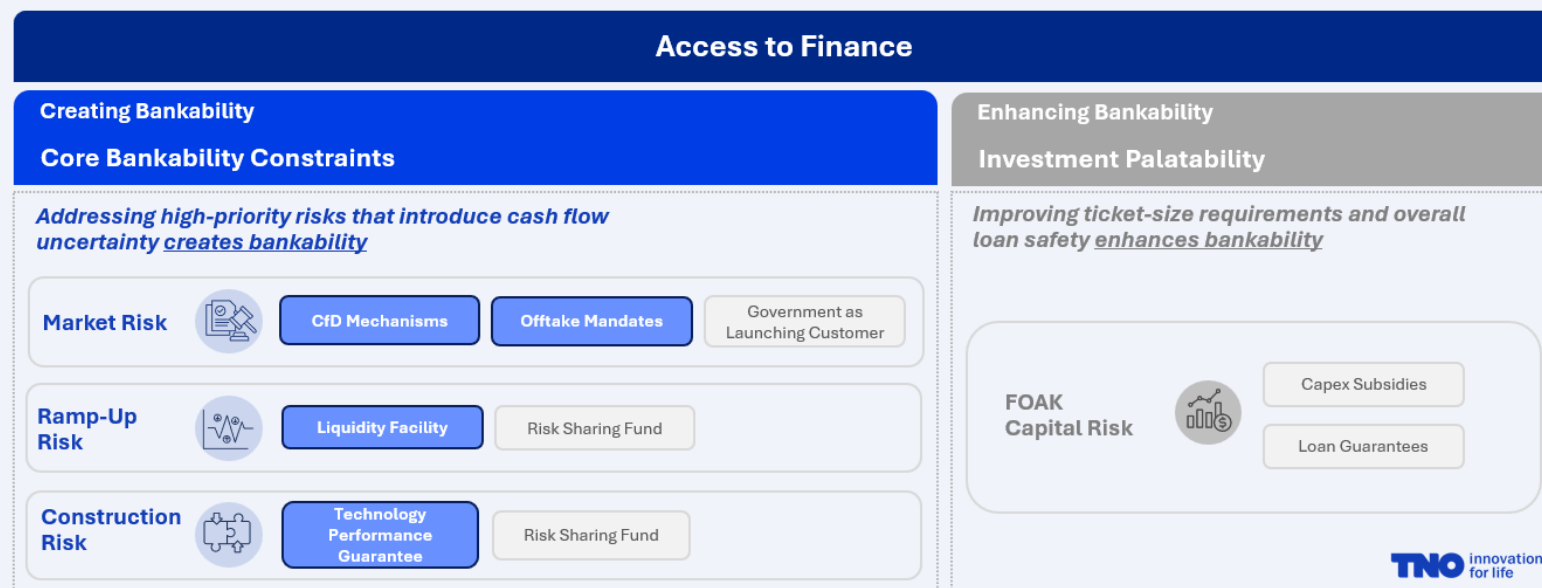
Accelerate

Proven FOAKs create track-record for scale-up and replication

FOAK success creates data, confidence, and replicability, **reducing the perceived risks for all subsequent projects** and enabling NOAK project development and full industrial rollout.

Achieving Bankability Requires Targeted Mechanisms that Support Market Creation, De-Risk Ramp-Up, and Unlock EPC Participation

Thirdly, a fundamental tension in the **allocation of technology and construction risk** was highlighted. Lenders typically prefer turnkey performance guarantees from engineering, procurement, and construction (EPC) contractors to ensure predictable timeframes, costs, and initial operating performance. For FOAK projects where benchmarks are not yet available, EPC contractors are often unable to assume these risks in full, particularly where technology performance remains unproven at scale. This creates a structural mismatch between lender requirements and market willingness to absorb risk. Addressing this gap requires alternative risk-sharing mechanisms, such as a **technology performance guarantee fund**, a risk sharing fund, the development of third-party technology insurance solutions, or EPC co-investment (“skin in the game”).



Finally, while instruments such as **Capex subsidies and partial loan guarantees** can improve project economics and make projects more palatable for investors, they **do not fundamentally change the underlying risk profile**. These instruments enhance bankability, but do not necessarily create bankability. As a result, they are unlikely to be sufficient on a standalone basis for unlocking large-scale private financing for FOAK projects.

Overall, **creating bankability** for FOAK projects requires a combination of support mechanisms that address the three core bankability constraints simultaneously: (i) **creation of a viable market for sustainable products**, (ii) **coverage of unpredictable ramp-up risks**, and (iii) **feasible allocation of technology and construction risk**.

Addressing Market Risks: CfD-Like Support and Offtake Mandates

Addressing Core Bankability Constraints

Market Risk



CfD Mechanisms

Offtake Mandates

Government as
Launching Customer

Bridging revenue stabilization through CfD-like support

Revenue certainty is an essential determinant of bankability. CfD mechanisms aim to **subsidize the gap between market price and production cost**, where sustainable alternatives, like bio-methanol and PLA, typically have higher production costs and are unable to compete with fossil-based alternatives in traditional markets. This type of instrument covers the unprofitable margin and creates revenue certainty. Existing CfD-like instruments in the Netherlands, like SDE++ and the Opex component of the NIKI subsidy scheme, could be expanded to provide more comprehensive support for the green chemistry sector.

Impact: Allows sustainable products to be absorbed in existing markets through subsidizing the unprofitable margin, thereby reducing price risk and improving long-term revenue stability for project developers and financiers.

Creating demand through offtake mandates

Regulatory requirements that create demand through **obligating market parties to absorb minimum shares of sustainable alternatives**, such as blending mandates, creates structural demand and long-term market visibility. This encourages willingness to pay for more expensive, sustainable products and enables businesses to derive value for their products from the market. Mandate mechanisms should be enforced by stringent penalties that are higher than the cost of compliance and underpinned by clear regulatory timelines. This allows investors to plan around the duration and phasing of mandated volumes.

Impact: Creates structural demand for sustainable products by requiring market parties to absorb minimum volumes, thereby reducing demand risk, increasing willingness to pay, and providing long-term market and revenue visibility for project developers and financiers.

Addressing Construction and Ramp-Up Risks: Technology Performance Guarantee Fund and Liquidity Facility

Addressing Core Bankability Constraints

Ramp-Up Risk



Liquidity Facility

Risk Sharing Fund

Government-backed liquidity facility

FOAK projects face substantial uncertainty during the ramp-up phase, where facilities are operational but undergoing optimization to reach high-yield and stable production. **Delays in reaching operational milestones can create cost overruns and liquidity shortages**, while commercial lenders and equity investors are often reluctant to provide additional financing at this stage. A dedicated **ramp-up liquidity facility run by public finance institutions or public intermediaries could provide temporary financing to bridge this gap**. Structured as a loan or revolving credit line, the facility could offer flexible repayment terms, be subordinated to senior debt, and carry below-market interest rates. This would enable projects to cover cost overruns and working capital needs during ramp-up to bridge unexpected funding gaps. Access should be limited to fundamentally viable projects that have passed technical, financial, and commercial due diligence. To maintain aligned incentives, project sponsors should be required to co-invest alongside the facility.

Impact: Prevents short-term liquidity issues from derailing otherwise viable projects, thereby protecting both private and public capital already committed.

Construction Risk



Technology Performance Guarantee

Risk Sharing Fund

Capex support + technology performance guarantee fund

A **Capex subsidy combined with a technology performance guarantee fund can create a complementary de-risking package that addresses both upfront financing constraints and downstream construction risk and EPC participation**. Capex support improves project economics by reducing upfront investment needs, while a technology performance guarantee fund enables EPC participation by backstopping residual technology performance risk that exceeds the EPC contractor's acceptable risk exposure. A technology performance guarantee fund run by public finance institutions or public intermediaries could operate as a pooled risk-sharing mechanism, where multiple projects access a shared facility. EPC contractors should retain a meaningful first-loss position, while the fund covers residual performance liabilities beyond a predefined threshold, thereby enabling EPC participation. Public capital could take a subordinated position alongside private financiers in the fund, with EPCs paying a risk-based premium for fund access to support partial cost recovery.

Impact: Reduce upfront investment needs and enable EPC participation in plant performance guarantees, thereby improving project risk profile and lowering overall project costs.

Case-By-Case Policy Support for Strategic FOAK Projects

Addressing Core Bankability Constraints

Market Risk



Construction Risk



Ramp-Up Risk



Case-By-Case Support

Facilitate strategic projects with case-by-case policy support

Case-by-case support can be designed specifically for select strategic FOAK projects that are close to a viable, but not yet bankable, business case. Support is based on residual risks that remain after standard risks have been allocated to market parties and may include both financial and non-financial support mechanisms. This arrangement could follow an orchestrating format, where policy makers, various financiers, and industry actors work together towards **bespoke support instruments that address the main bottlenecks for specific cases**.

Public institutions can place **targeted financial support**, such as guarantees, tailored subsidies, or subordinated financing at precise points in the capital stack, aligned with the project's risk profile across development, construction, and early operational phases. Under this model, private parties remain leading in financing, while government takes a balancing role by only stepping in where absolutely necessary, with minimal capital, and only alongside existing and new private financiers. Non-financial support may focus on increasing investor confidence through **resolving policy or permitting bottlenecks and connecting value chain segments and stakeholders**.

The aim of the case-by-case approach is to **shorten the lead time between technology development and project deployment** by enabling critical milestones to be achieved earlier, reduce key risks more quickly, and capture market opportunities in a timely manner.

Impact: Resolve project-specific bottlenecks to accelerate FID.

Enhance Bankability Through Capex Subsidies and Loan Guarantees

Improving Investment Palatability

FOAK
Capital Risk



Capex Subsidies

Reduce investment requirement through Capex subsidies

While Capex subsidies support the capital stack through reducing private financing requirements and improve the project IRR and equity returns, Capex subsidies do not directly address key bankability constraints, such as technology performance risk, ramp-up risk, or value chain uncertainties (e.g. feedstock and offtake). As a result, Capex support may **improve project economics but has limited impact on unlocking large-scale debt financing on its own**. Capex support can make projects more palatable by lowering investment needs, but unless the Capex subsidy covers a considerable portion of the upfront costs, a Capex subsidy on its own is generally considered insufficient to materially change the financing dynamics of FOAK projects.

Impact: Improve project economics through reducing overall investment requirement, but does not address core bankability constraints.

FOAK
Capital Risk



Loan Guarantees

Improve overall loan safety through loan guarantees

While loan guarantees could improve financing conditions and increase lender comfort, their impact on lending decisions may be limited. A loan guarantee **improves the palatability of the investment, but does not target underlying technology or cost overrun risks** that may cause loan repayments to default. With partial guarantees, the residual risk exposure for banks can remain significant, particularly in FOAK projects with multiple unresolved risks across the value chain. As a result, loan guarantees alone may not be sufficient to unlock debt financing, but can play an important role as part of a broader risk-mitigation package.

Impact: Improve project economics through reducing overall loss exposure, but does not address core bankability constraints.

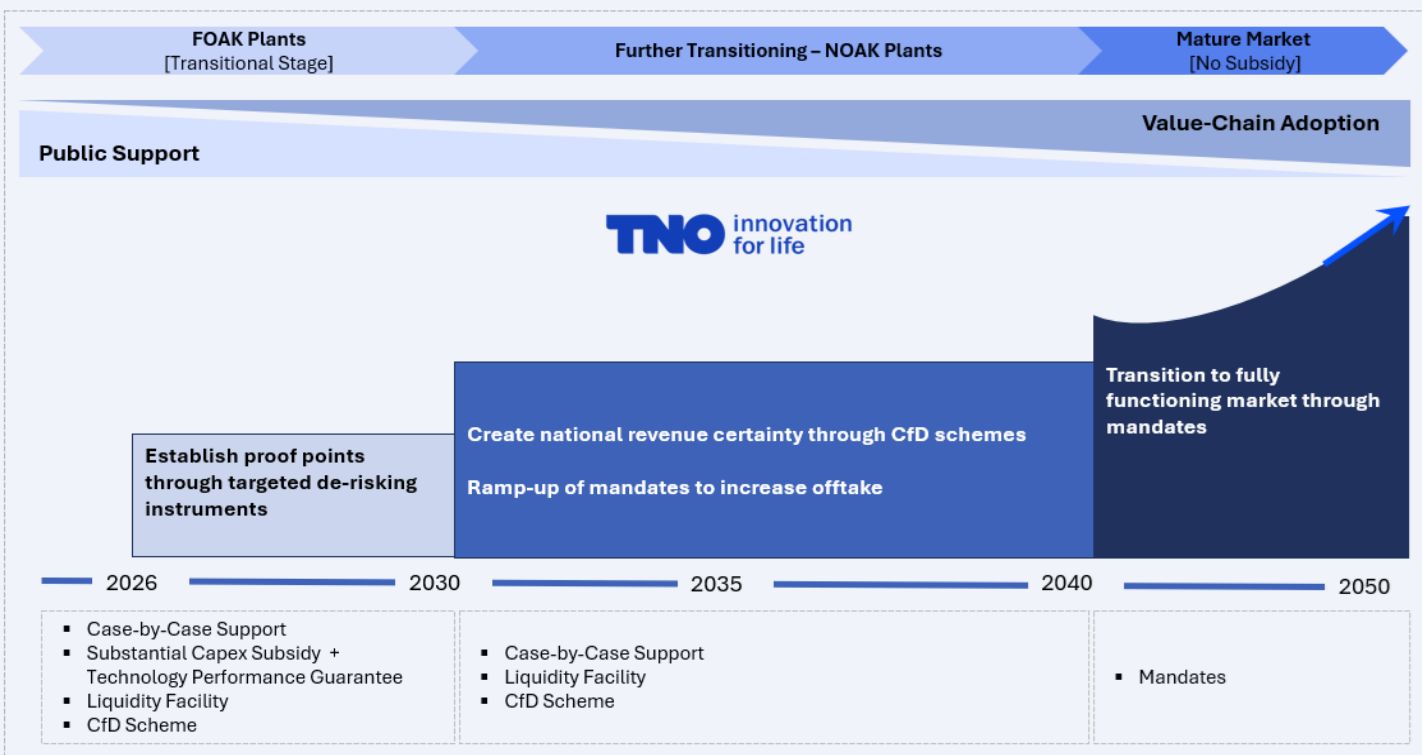
Public Support Need Decreases as FOAK Proof-Points are Developed

Support mechanisms could play different roles at different stages of project deployment and value chain development, from FOAK projects to NOAK projects to a fully functioning market.

In the short-term, targeted public funding support will be needed to address FOAK-specific technology, ramp-up, and market risks. Technology risk and ramp-up support for initial projects should create proof-points and benchmarks to reduce the risk profile of subsequent projects. Initial revenue stability can be bridged through targeted CfD-like mechanisms, double-sided auction mechanisms, or guaranteed offtake from state-backed entities.

As NOAK projects begin benefiting from the learnings and reference points created by FOAK projects, public support will be required to a lesser extent. **Public capital should play an increasingly smaller role as NOAK project deployment increases.**

In a **fully functioning market** in which multiple NOAK projects are operating and new value chains are established, **projects should be commercially viable without direct public funding support.** Offtake mandates create sufficient demand and willingness to pay. At this stage, private capital should be able to finance projects on standard market terms.



Team & Contact Details



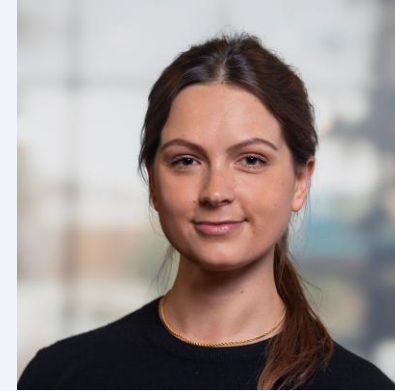
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