

Scale-Up Debt – A New Asset Class for Hardware Founders

Frankfurt, 16 June 2026

New Industrial Cleantech is meeting a financing gap for scaling

Deploying novel technologies is critical for resilience, geopolitical independence, and energy security

Deployment Finance Gap

- **Large CapEx:** Require funding at infrastructure-scale
- **Tech Risk** Medium/Low (TRL7/8): higher than PF, lower than VC
- **Asset valuation** doesn't scale exponentially: not fit for VC finance
- Many pioneering projects struggle through “financial valley of death”

Early-stage VC

Project Finance

*FOAK Stage
Risk-Return Mismatch*

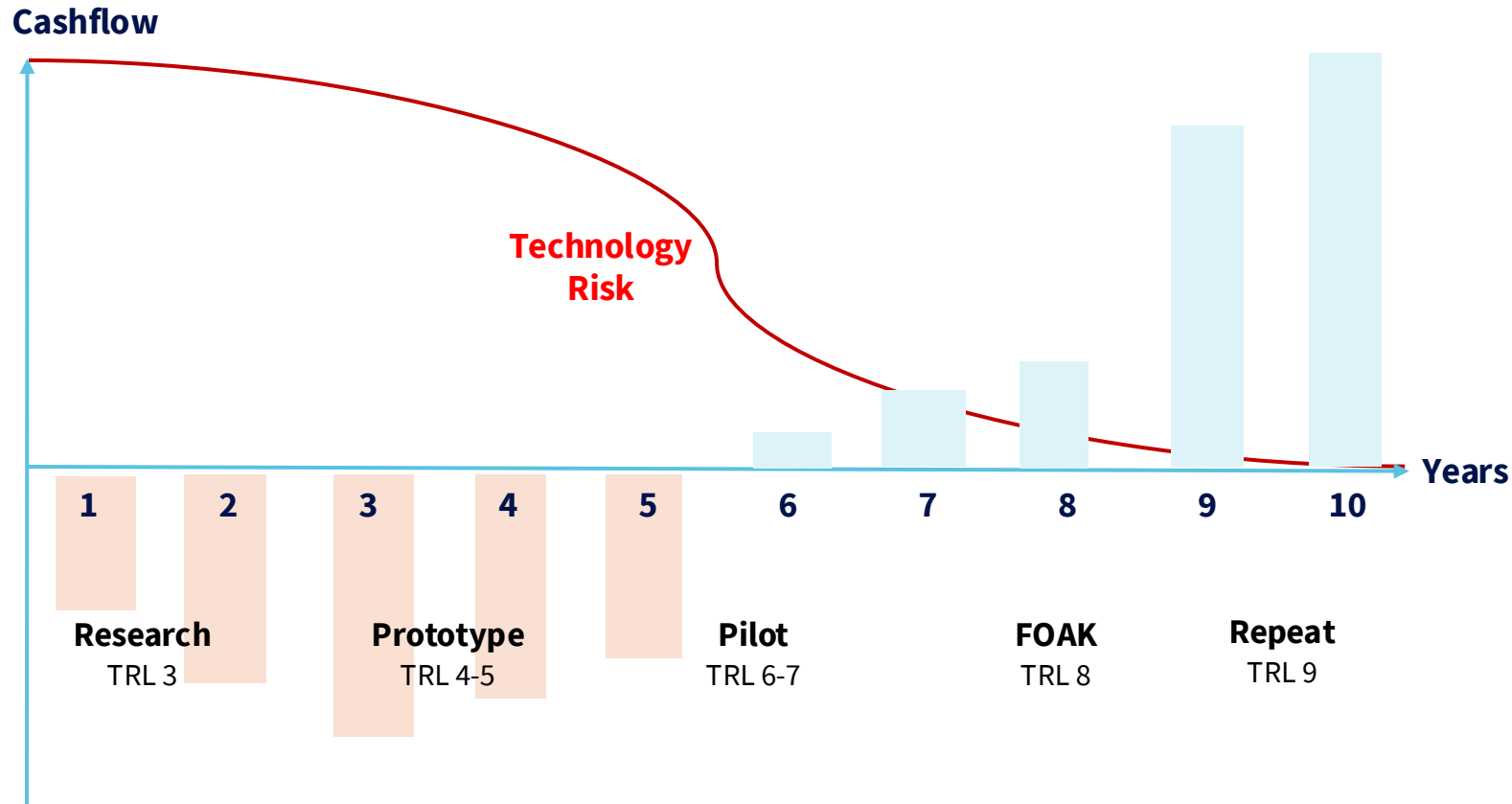
- **Capital: VC Funds**
- Invest in Growth Expenditures (OpEx)
- Benchmark: Software Startups
- Require exponential growth
- **IRR expectations too high**

- **Capital: PE/Infra and Debt**
- Invest in Low Risk Tech
- Benchmark: Repeater Projects
- Prefer XXL Project Size
- **Risk Tolerance too low**

Capital Stack is not aligned: Financing timelines rarely match

Hardware ventures struggle to scale because their capital needs, risk and cashflow profiles do not fit existing financing models

HARDWARE STARTUP CASHFLOW



CHALLENGES

- **Hardware:** High upfront CAPEX required
- **Tech Development:** long period of negative cashflow
- **Cashflow:** Too low to ramping up production
- **Bank loans** come in too late - only available after profitable production started
- **Venture capital** can't really finance production facilities

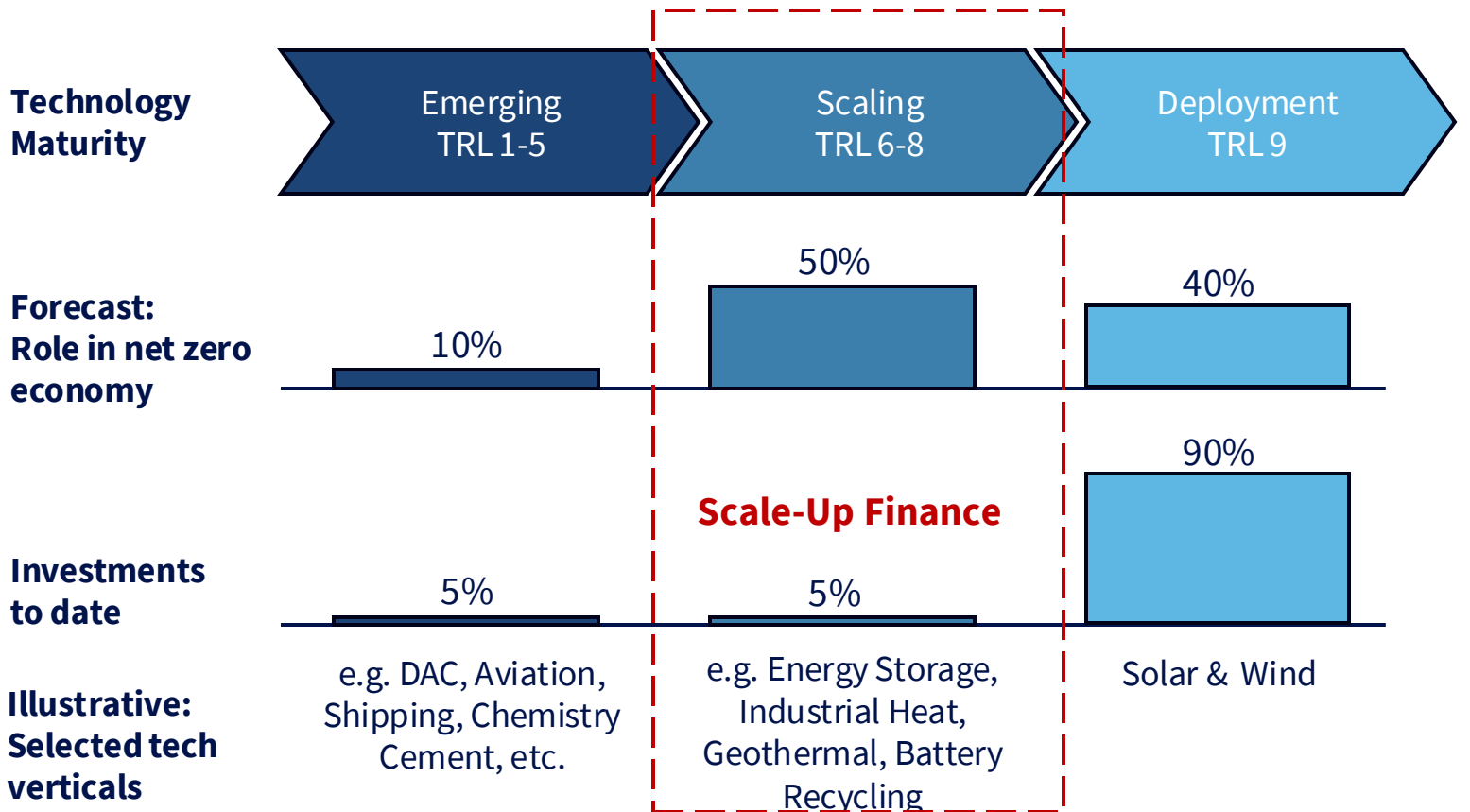
Traditional financing models fail to meet the capital demands of hardware scale-ups

Most technologies for the net zero economy are already invented – the challenge now lies in scaling them with financing structures that match their maturity

INVESTMENT GAP

- **Investor Paradox:** Even with potential for profitable large-scale production, hardware startups face difficulty raising the capital required to scale up production
- **Unlocking Scale-Up Finance:** Tailored fund structures for early commercial assets can drive faster production and make Europe more competitive globally

TECHNOLOGY AND CAPITAL LANDSCAPE



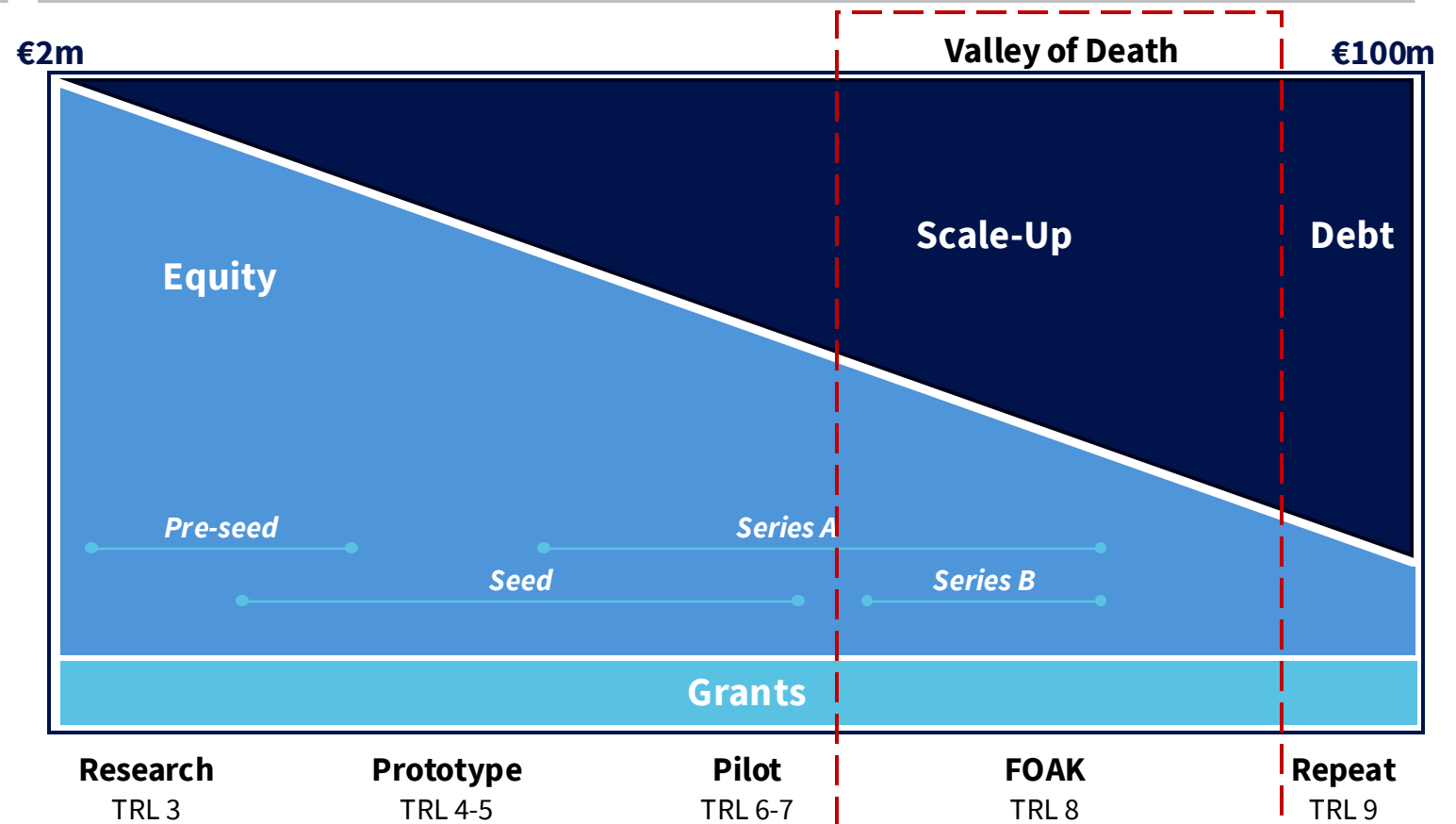
Recap: Learnings on Scale-Up Finance – and the Way Forward

The roundtables aim to close the Scale-Up Finance Gap by combining insights on Credit, Risk Management, and Project Finance. Current objective: Co-developing and validating a bankable SPV structure

KEY LEARNINGS

- **Venture Capital:** Insufficient for asset-heavy scale-ups that need more capital than equity alone can provide
- **Risk Management:** Investment hinges on risk structuring, isolation, and transfer, not deal size
- **Capital Stack:** Asset-heavy scale-ups require the full mix of equity, debt, and grants
- **Credit:** Properly structured debt can unlock significant scale-up financing
- **Project Finance:** The AssetCo model from early-stage wind energy offers a proven blueprint

FINANCING GAP



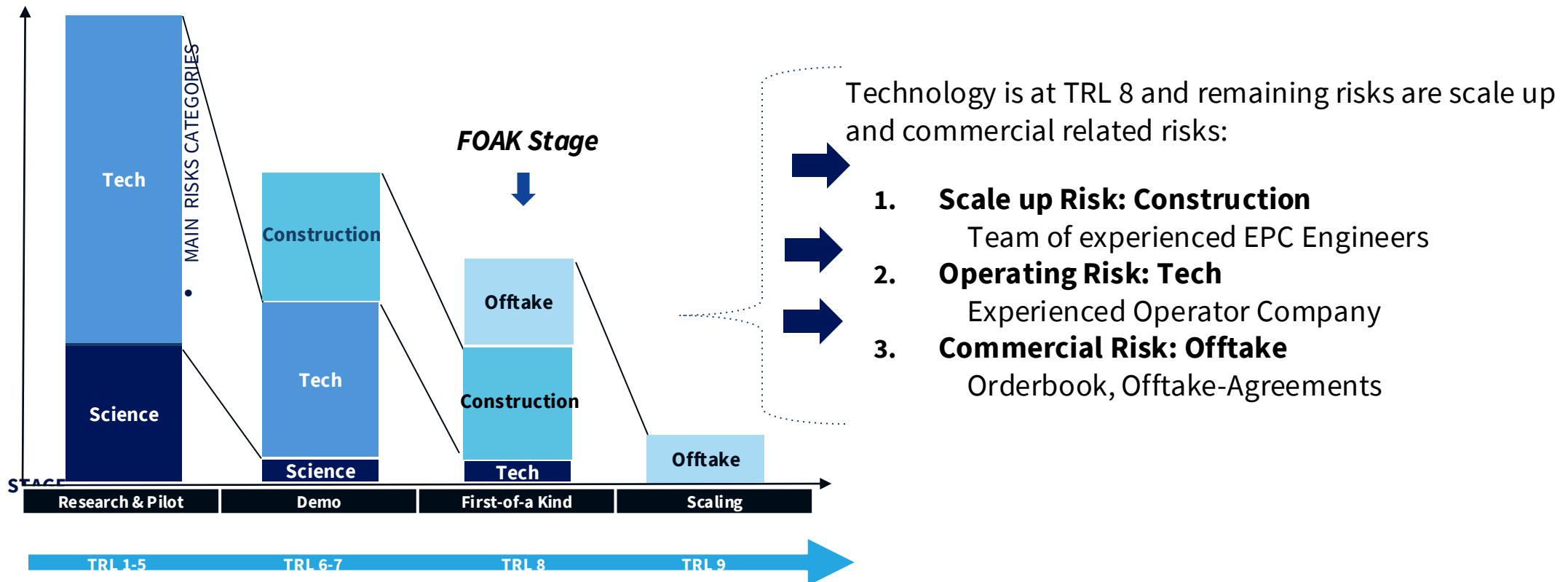


2. Learnings: Achieving Bankability

While FOAK Facilities have low technology risks, commercial and operating risk needs to be managed

Key Risks in the Scale Up Process

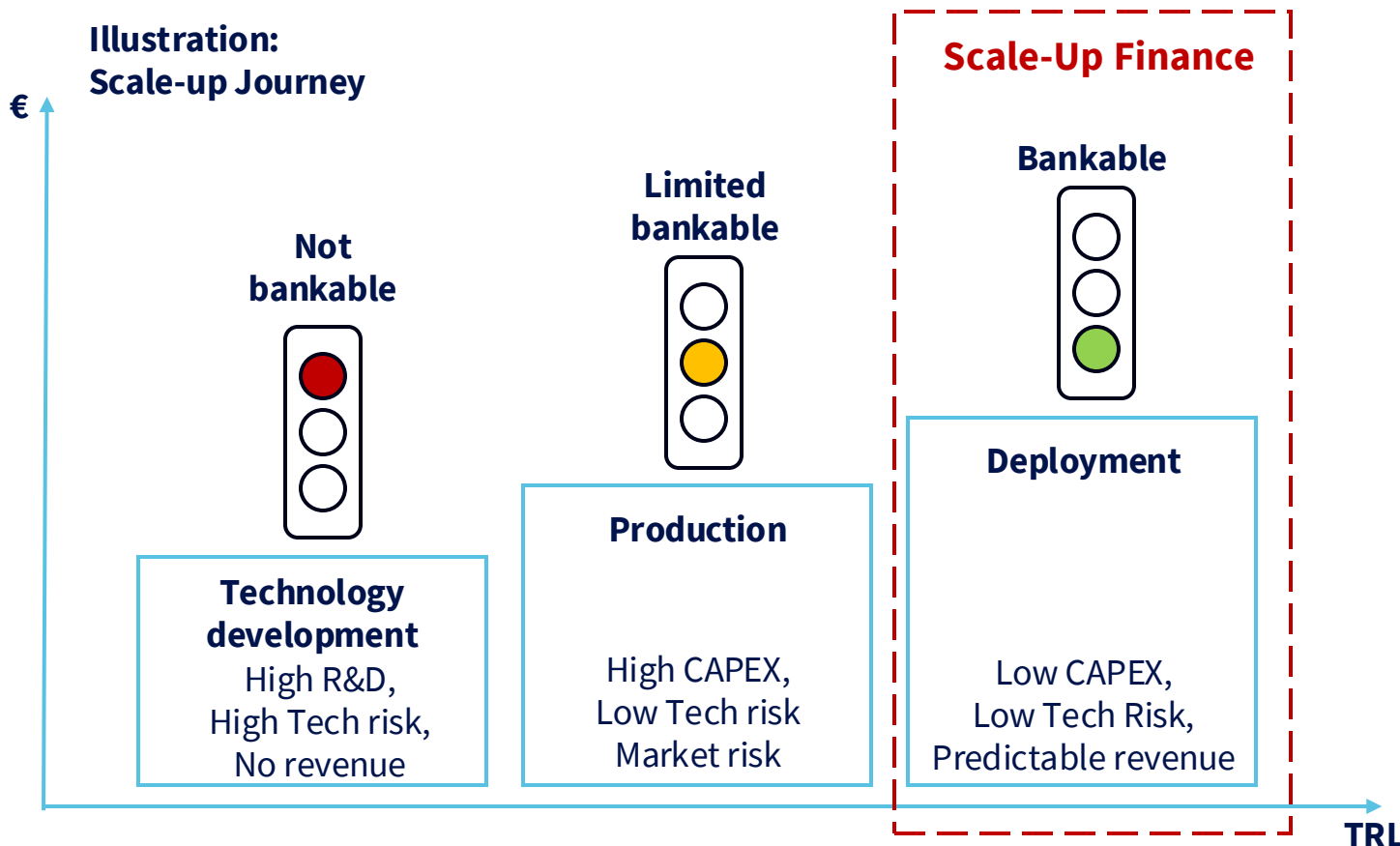
FOAK Risk Disentangled



Hardware finance can work when focusing on predictable revenue

Private financing becomes viable only when technology performance is proven, credible de-risking applied, and revenues are predictable and contractually secured

BANKABILITY ALONG THE VALUE CHAIN



Note: "Bankable" means a project generates sufficient cash flow at a low/medium risk to service a loan contract.

CONDITIONS FOR PRIVATE DEBT

1. Technical performance demonstrated (\geq TRL 7/8)

Technology with proven functionality and reliability under real-world conditions to limit risk for customers and financiers

2. Revenue: Offtake contracts are enforceable

Long-term and legally robust offtake agreements ensure predictable cash flows and minimize counterparty risk

3. De-risking credible (insurance or guarantees)

Credible instruments, such as insurance schemes or performance guarantees, provide additional security and confidence to private financiers

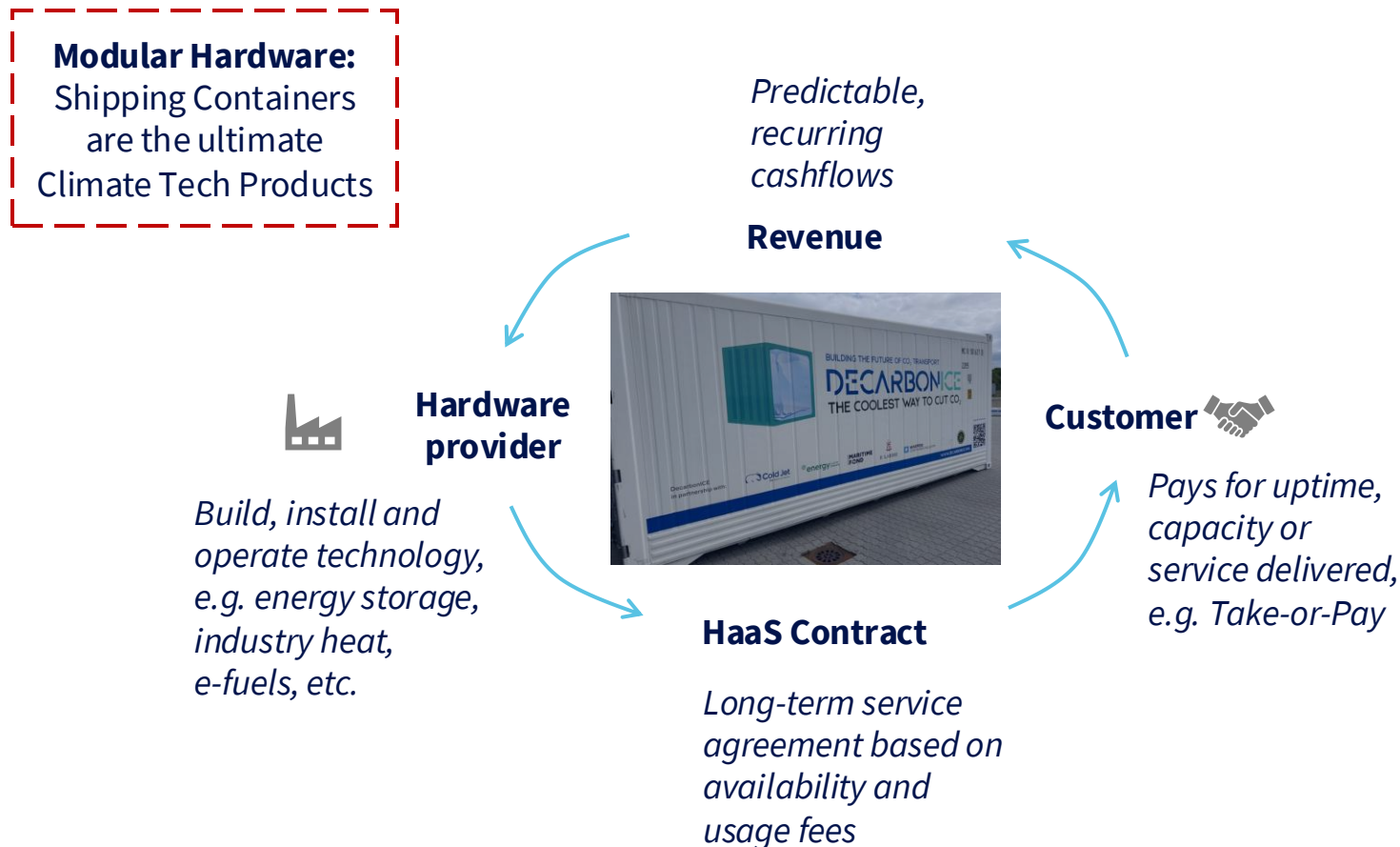
Public Banks: Guarantees can be effective for de-risking during early deployment, helping attract initial private capital.



Hardware-as-a-Service converts capital assets into revenue

By offering hardware through long-term service contracts, a HaaS model transforms capital-intensive assets into predictable, financeable revenue streams while retaining ownership by the technology provider

HARDWARE-AS-A-SERVICE MODEL:



HOW IT WORKS

- **The provider installs and operates hardware systems** such as energy storage units, industrial heat systems, e-fuel reactors, DAC modules, biochar kilns, etc.
- **Customers pay for availability and usage**, rather than purchasing the equipment outright
- **Predictable long-term contracts** turn high-CAPEX assets into steady, debt-financeable revenue streams
- The **provider retains ownership**, enabling reuse, refurbishment, or redeployment after contract expiry
- **Finance flexibility:** This model can potentially be adapted to also support rent, lease, and purchase financing.

A photograph of a large industrial facility, possibly a refinery or chemical plant, at dusk. The sky is a mix of orange, pink, and blue. Several tall, dark smokestacks are visible against the sky. The plant itself is a complex of steel structures, pipes, and walkways, many of which are illuminated from within, creating a warm glow. In the foreground, there are several large, white, cylindrical storage tanks with metal railings on top. A network of pipes and conduits runs across the scene. The overall atmosphere is industrial and somewhat serene due to the twilight lighting.

3. Learnings: Modular SPVs for Scale-up Finance

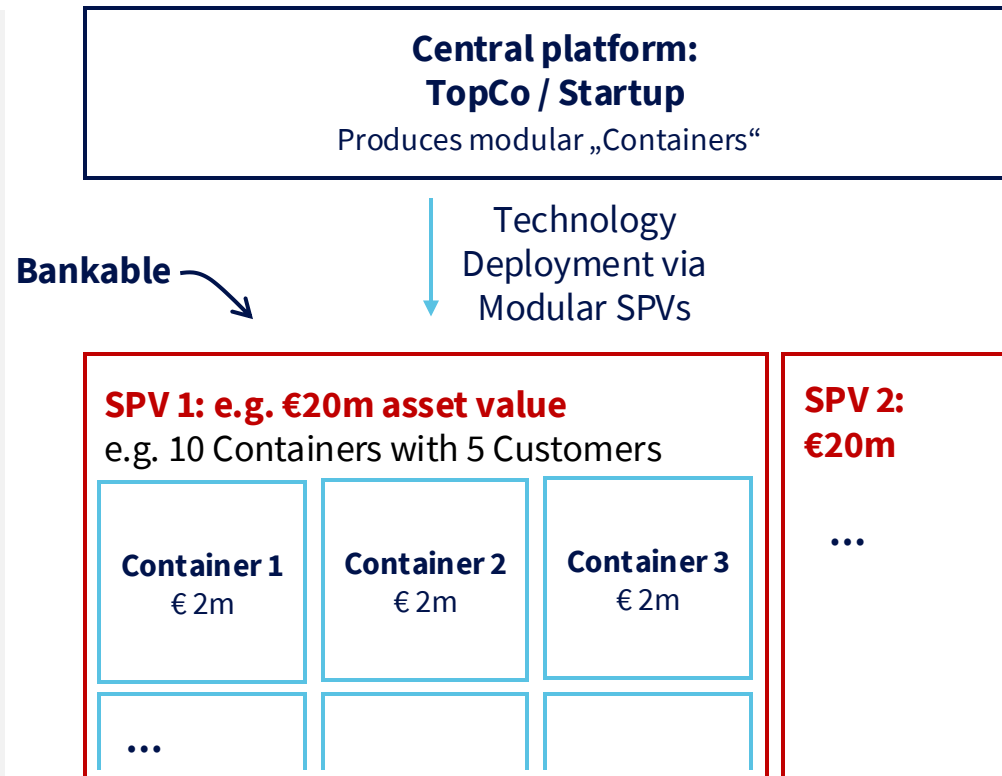
Modular SPVs enable lean project structures to make small assets bankable at scale

Standardised, lean project structures enable cost-efficient replication of small-scale deployments at scale

BACKGROUND

- **Small project sizes are unattractive** due to disproportionately high transaction costs for legal, technical, and financial structuring
- **To make these assets bankable** and replicable, a lean, standardised project finance architecture is required
- **A central platform (TopCo)** provides shared services, standardized templates, and coordinated governance across multiple projects.
- **TopCo manages core functions** such as legal setup, technical validation, financing frameworks, and asset management

STANDARDIZED ASSETCO MODEL



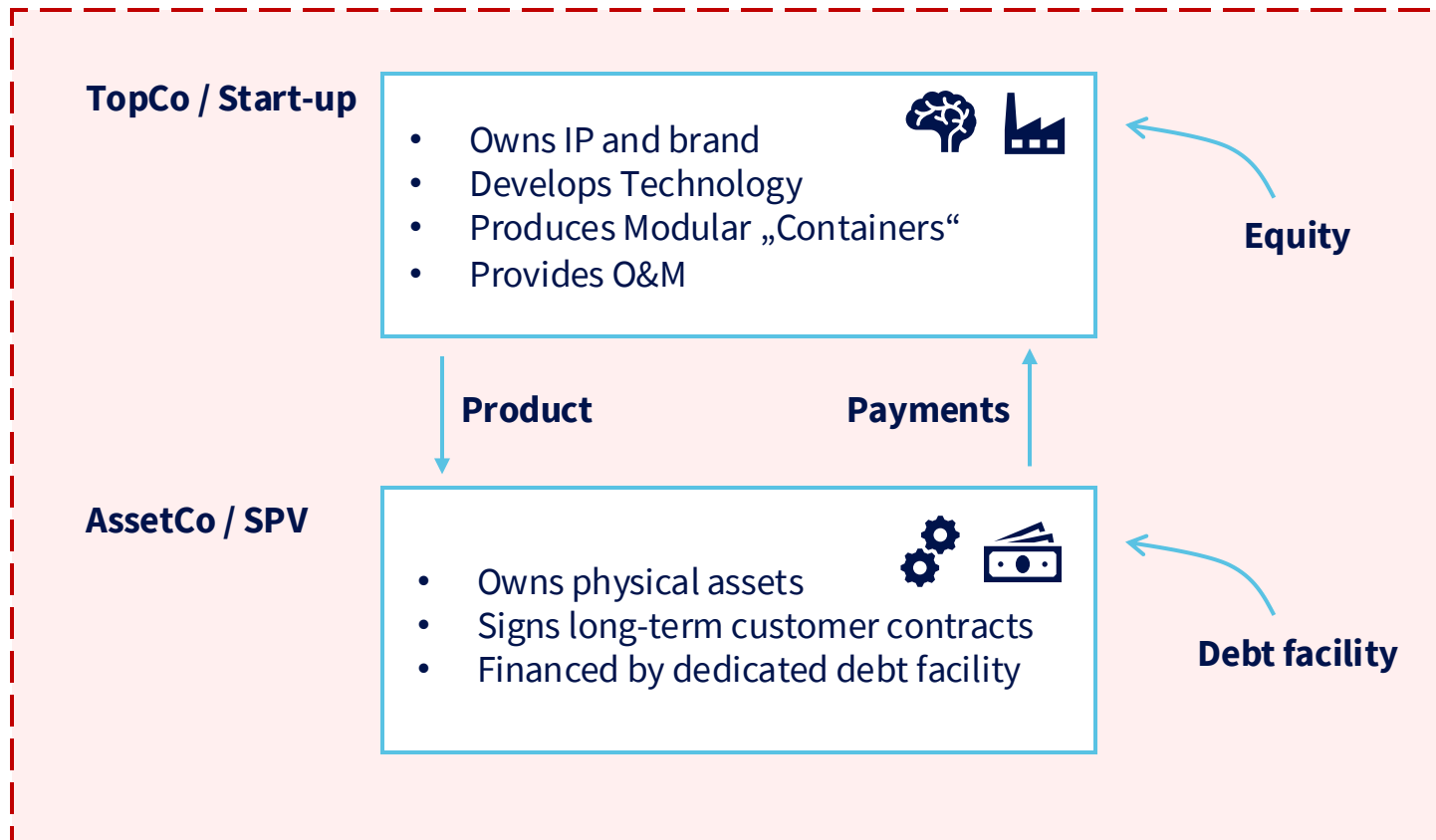
How can we design lean, cost-efficient project structures that make small-scale hardware deployments viable and replicable?



SPVs isolate project risk, enabling lenders to finance assets directly

Proposed structure allows scale-ups to leverage debt for asset financing while keeping technology and supply chain risk separate at the TopCo level

SPV STRUCTURE



HOW IT WORKS

- **TopCo / Startup** holds IP, technology, and brand and attracts funding.
- **Separate AssetCo (SPV)** owns and operates the physical assets financed with project-specific debt.
- The **SPV pays interest from project revenues** and refinances the principal once operations are proven stable.
- If the SPV defaults, lenders have recourse only to project assets, protecting the parent company.
- *Pitfall:* Many “SPVs” are not truly independent; if control or guarantees flow back to the TopCo, risk isolation and bankability are undermined.

No Contracts, No Capital: Long-Term Certainty Drives Investment

Long-term contracts (e.g. take-or-pay) with predictable revenues and limited termination rights needed to provide the cashflow certainty to make projects bankable

CONTRACTUAL REVENUE MODEL



CONTRACT REQUIREMENTS

- Fixed annual service fees create stable cashflows suitable for debt financing.
- Limited termination rights to protect against early contract exit
- Take-or-pay or availability-based HAAS contracts ensure payment regardless of usage
- Penalties to discourage early termination
- HAAS Contract terms should mirror loan tenor, e.g. 5 years Scale-Up Debt + 5 years bank refinancing



4. Designing for Finance: Structuring Matters

Scale-Up Credit Funds can finance initial deployment, while banks take over through refinancing based on commercial proof

SPVs sit outside the VC model – they require structured, bankable finance to operate and scale



- **Venture capital fund lifetimes** (typically 10+2 years) are often **shorter than hardware scale-up cycles** (10–15 years).
- Capital requirements increase significantly during industrialization (factory construction, certification, supply chain build-out).
- SPVs or production entities often outlive fund commitments – they do not generate “exits”, so they cannot rely on equity financing alone.
- Instead, they require structured, long-term capital that bridges the transition from equity funding to bankable debt.
- **Goal: reach bankable maturity → stable cashflows, repeatable unit economics.**

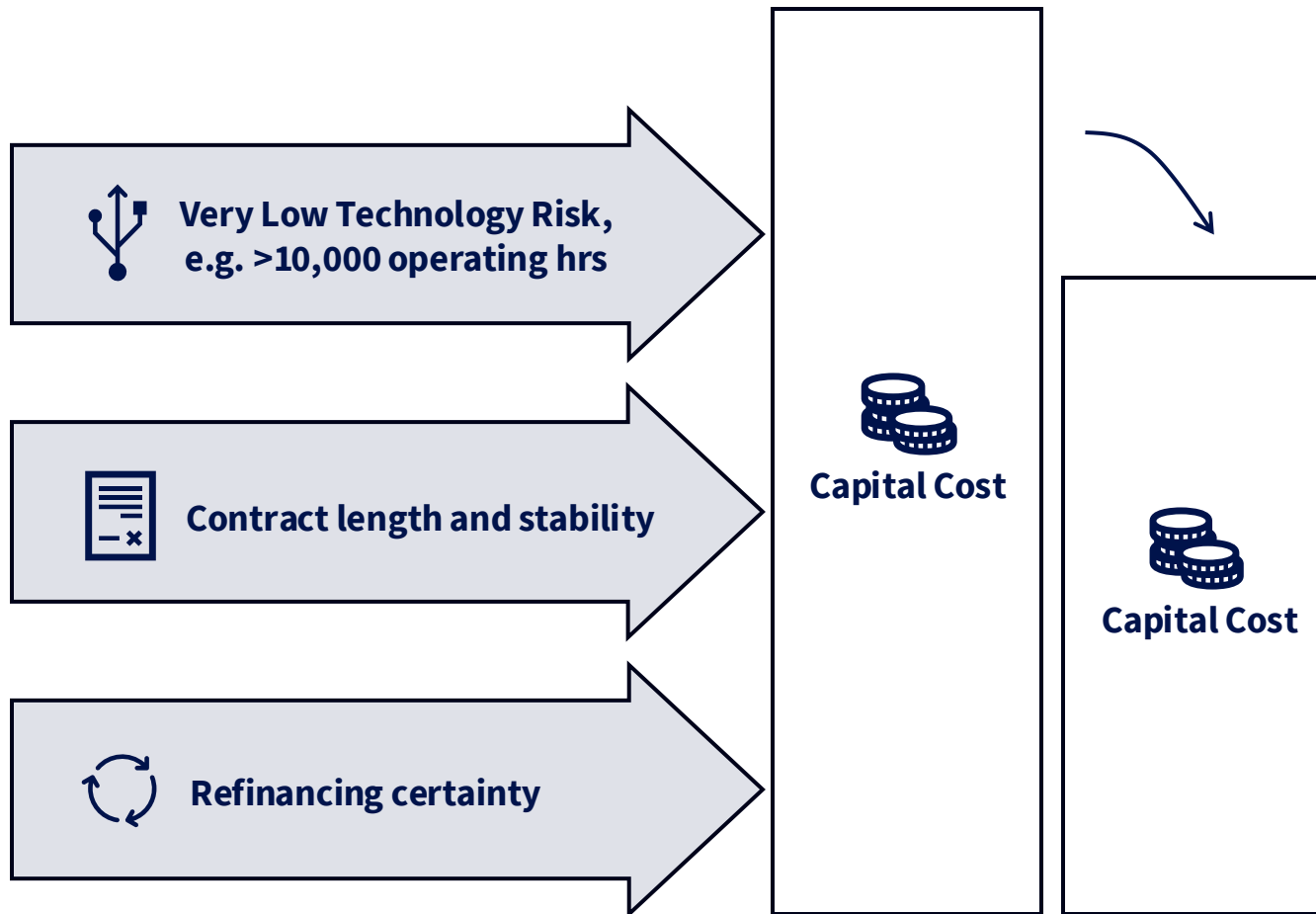
What do banks actually need?

- Stable operating cashflow
- Contractual visibility (offtake, service, or lease agreements ≥ 3–5 years)
- Proven hardware (no tech risk)
- Standardised documentation (SPV, IP ownership)
- Pure debt structure (no equity or hybrid instruments)
- ...



Structuring for Credit: Limit the risk, limit the cost

A lean, transparent project structure with proven technology, stable contracts, and a clear refinancing path limits risk exposure and helps to lower the cost of capital



- Reduce capital cost through a lean structure:**
- Minimize standby / undrawn capital fees
 - Lean SPV structure = lower fees
 - Clear refinancing path limits lender risk

How can we de-risk projects early on and provide debt for non-containerised solutions ?



Thank you

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Contact:

tobias.lechtenfeld@techfornetzero.org



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