



Financing sustainable liquid fuel projects in Europe

Identifying barriers and overcoming them



European Investment Bank

ADVISORY



EIB Study on Sustainable Liquid Fuels

3rd Sustainable Maritime Fuels Forum
Brussels, December 5th, 2024



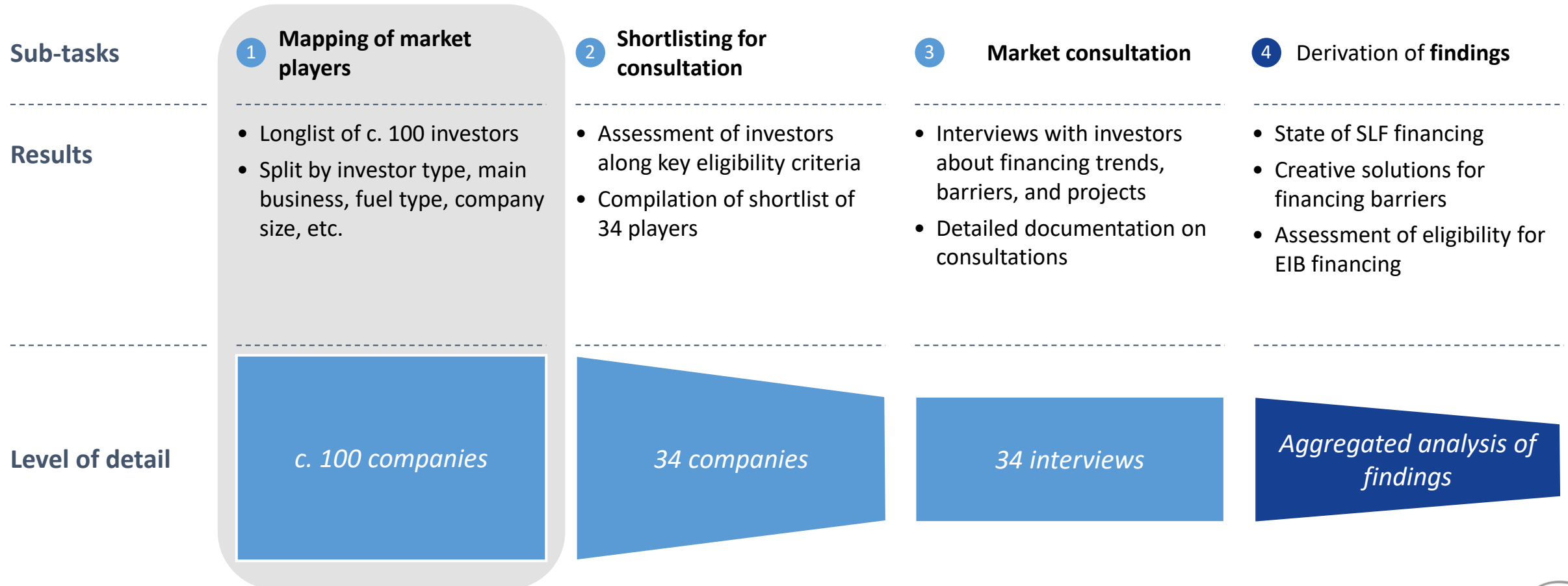
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A. Methodology

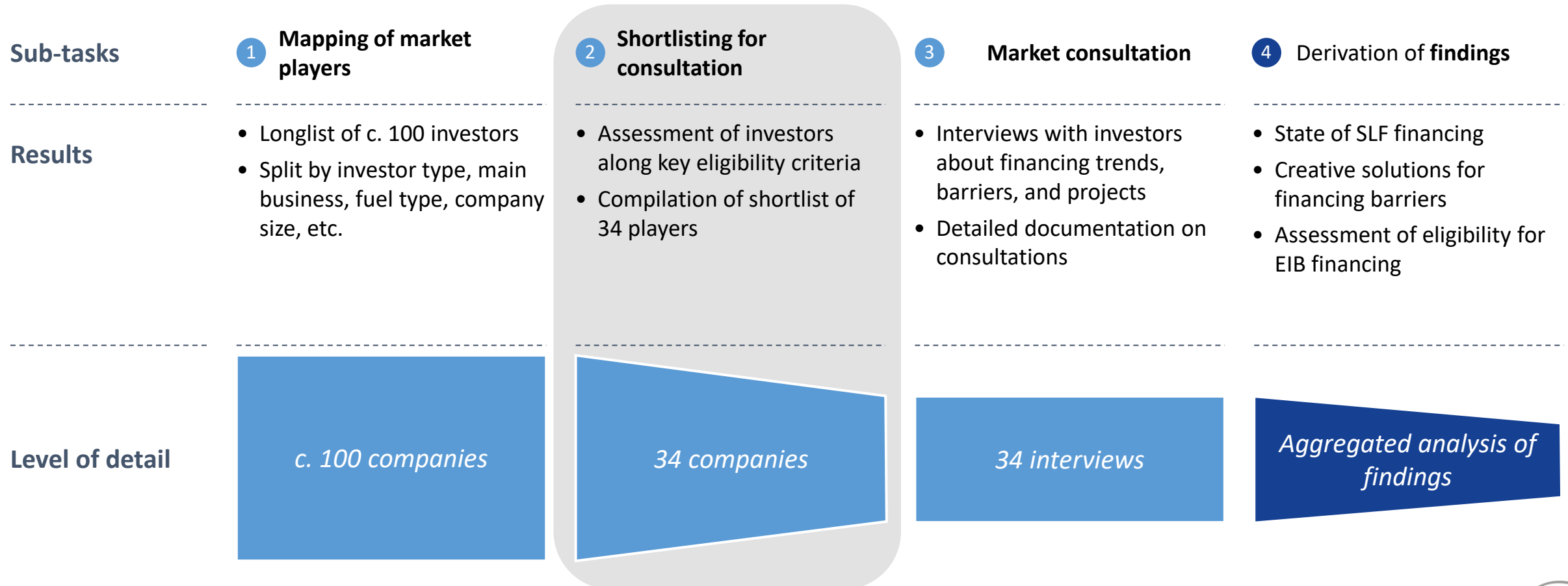
Access to finance conditions were evaluated based on the consultation of 34 market players

Scope of the market consultation



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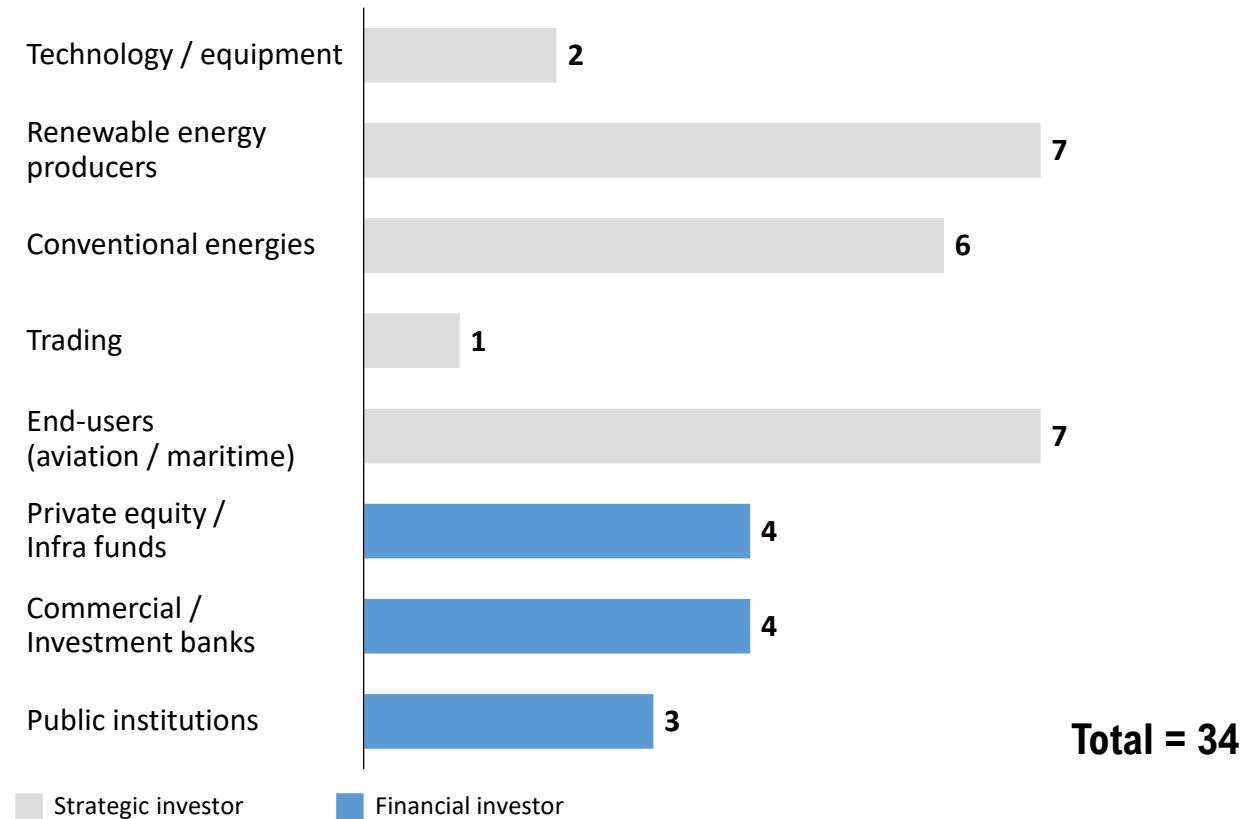
Scope of the market consultation



34 interviews with strategic and financial investors covering various value chain segments

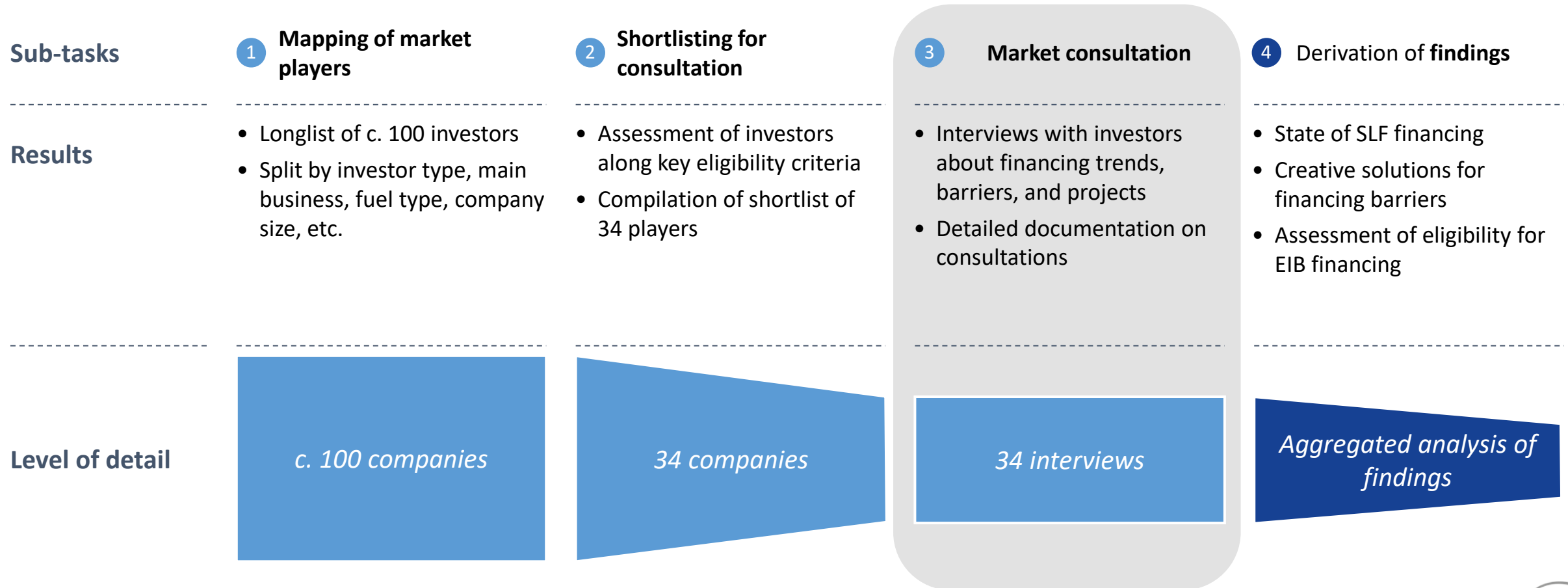
Short-listed interview sample description (1/2)

Backgrounds of interviewees [# interview participants]



Access to finance conditions were evaluated based on the consultation of 34 market players

Scope of the market consultation



Interviews were based on semi-structured questionnaires – Market players indicated their perceived trends, barriers and recommendations

Semi-structured questionnaire as guidance for consultation¹⁾

- Interviews were led following a semi-structured, digital questionnaire
- Questionnaire was sent to interview partners in advance as preparation for the interview
- Questionnaire based on qualitative and quantitative indicators – both were explained verbally in interviews
- Quantitative questions were based on a 1-10 rating with higher scores indicating higher relevance

The questionnaire covered 5 content topics:

- Players' SLF strategy
- Players' SLF pipeline
- Experiences with SLF financing²⁾
- Perceived barriers
- Recommendations to unlock SLF

- Quantitative questions included a 1-10 rating:
- Depending on the question, 10 indicates highest interest or highest perceived barriers
- A rating below 4 is counted as "not relevant for customer"

B. Insights into SLF strategy (2/2)

B3 Which off-taker segments do you target or intent to target?

1 = Not targeted 5 = Potentially targeted 10 = Certainly targeted

Segment	1 = Not targeted	5 = Potentially targeted	10 = Certainly targeted
Road	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Maritime	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Aviation	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B4 What is the typical investment size of your project [EUR m] and your desired return [%]?

Size	< 10	10 – 50	50 – 100	100 – 500	> 500
Size	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Desired return	0 – 5%	5 – 10%	10 – 15%	15 – 20%	> 20%
Desired return	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

B5 What equity share do you typically take in the invested projects?

Minority Majority 100% investment

Equity share	Minority	Majority	100% investment
Equity share	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

If minority, indicate your level of involvement:

B6 Please describe other key investment criteria you consider when investing in SLF projects:

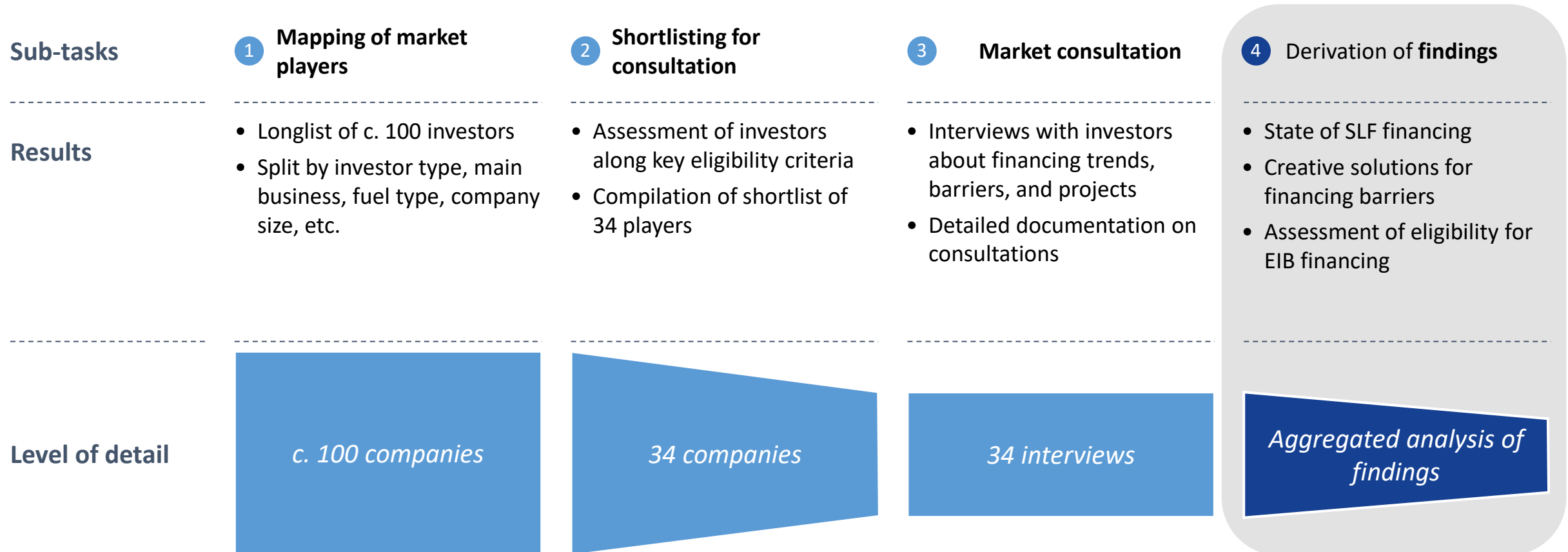
Several questions targeted indication of preferred options via tick-marks

Several questions required customers to fill in their answers freely

1) Questionnaires slightly differing between financial and strategic investors; 2) Chapter only relevant for strategic investors

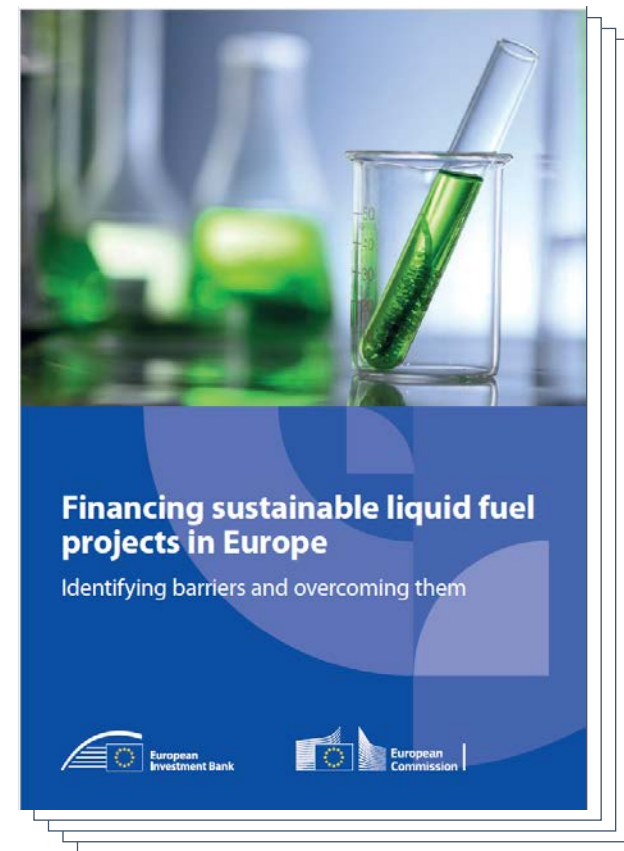
Access to finance conditions were evaluated based on the consultation of 34 market players

Scope of the market consultation



Market barriers and recommendations to overcome them were discussed in several workshops to derive a well aligned picture

Process to derive final recommendations

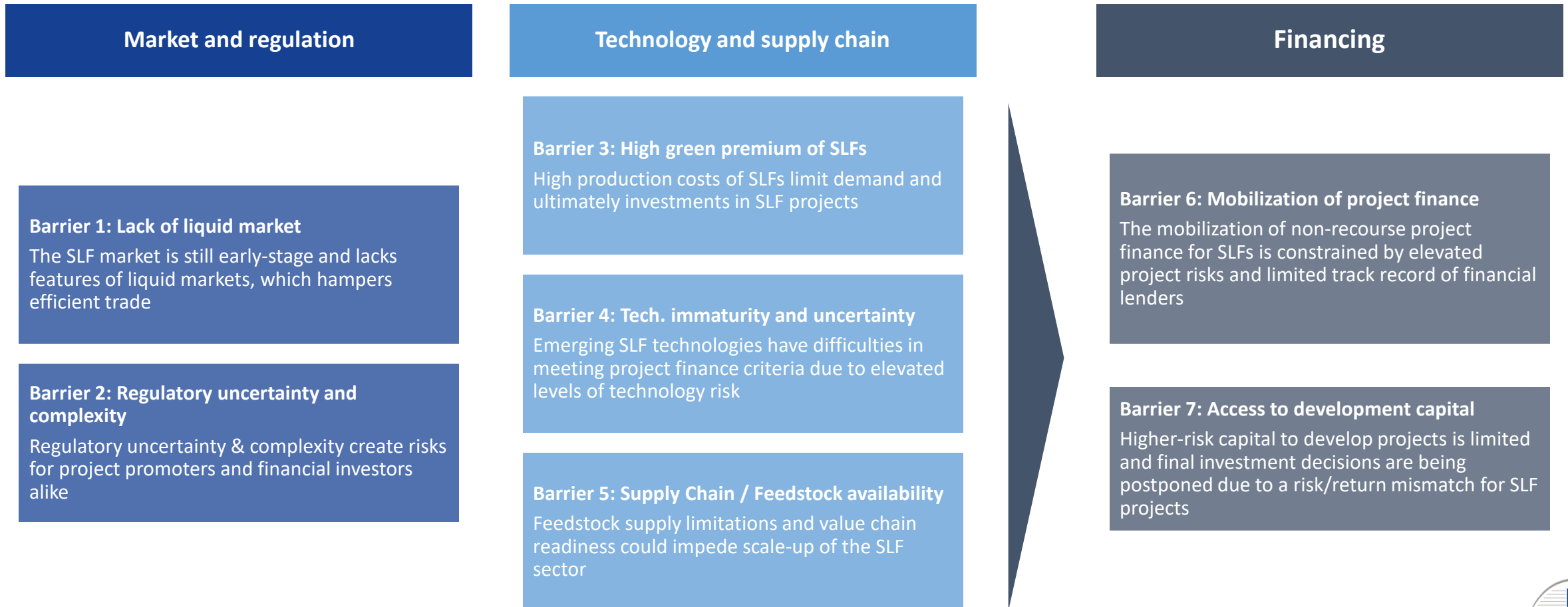




B. Results of consultations Barriers to Financing

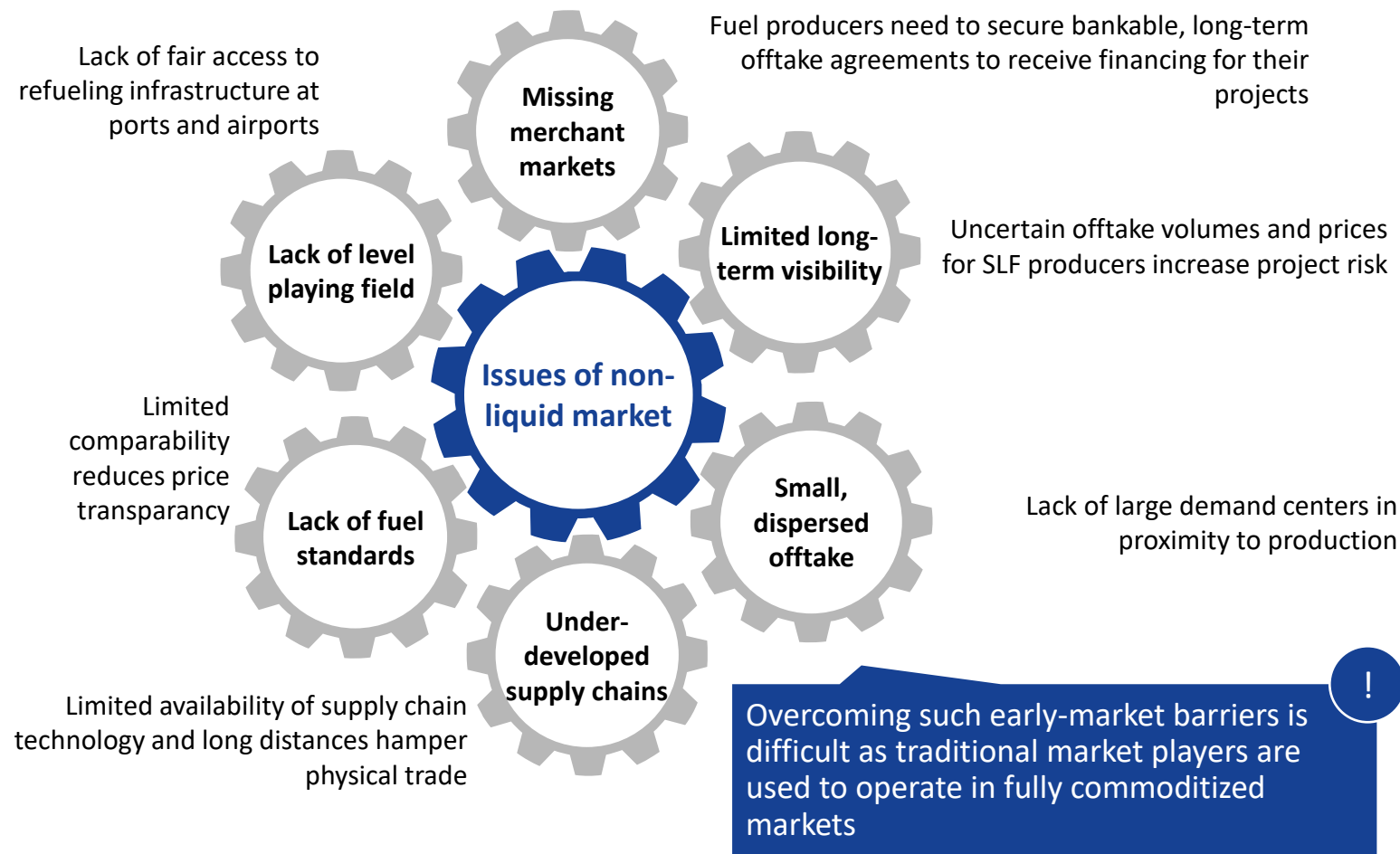
Seven market barriers were identified during market consultation

Key market barriers



The SLF market is still early-stage and lacks features of liquid commoditized markets, which hampers efficient trading

Barrier 1: Lack of liquid market



Voices from the market

“ Offtakers are cautious in signing long-term offtake because they are uncertain in which direction the market will develop. ”

- SLF producer

“ We believe that we need to bundle SLF demand enough to structure the market and start commoditizing SLFs. ”

- Fuel trader



Regulatory uncertainty and complexity creates risks for project promoters and financial investors

Barrier 2: Regulatory uncertainty and complexity

Ambitious regulatory environment

- The European Union is at the forefront of global efforts to fight climate change, which has been underlined by EU's ambitious and proactive regulatory framework
- Market players are very supportive of EU regulation and acknowledge EU's leading position
- However, they also pinpointed areas in which they require greater clarity



The regulator seems to underestimate the complexity of its regulation and its impact on market players. Companies must hire whole departments to keep up with complexity and development of regulation.

- SLF offtaker



Further improvement potential for regulatory framework

Remaining uncertainty on regulatory developments and implications

Lack of visibility of EU's long-term regulatory treatment of SLFs, e.g.,:

- **RED II/III:** Esp. lack of targets beyond 2030
- **ReFuelEU Aviation:** Esp. uncertainty of consequences if targets can't be fulfilled
- **FuelEU Maritime:** Lack of regarding implication of regulation
- **ETD¹⁾:** Uncertainty about final regulation

Strict definitions for RFNBOs

Strict criteria in delegated act on hydrogen and emission calculation for captured CO₂ may hamper market uptake

Complexity of regulation

Concerns about increasing complexity, especially regarding:

- Large number of relevant regulation
- Complex and lengthy regulatory procedures & lack of visibility on timelines
- Lack of harmonization across EU legislation (e.g., feedstock eligibility criteria)
- Pot. differences in national implementation

Lack of regulatory harmonization at global level

Potential competitive disadvantages for global operators with hubs in the EU

1) Energy Taxation Directive

High production costs of SLFs limit demand and ultimately investments in SLF projects

Barrier 3: High green premium of SLFs

Green premium as the key challenge

- Today, the green premium of SLFs is too high to make a positive business case, hindering investors to invest
- Blending mandates and penalty schemes will circumvent cost gaps for regulated demand
- However, regulated demand is increasing only slowly in early years

“

The only solution to unlock the SLF economy is to reduce the cost gap.

- Shipping company

”

“

It's difficult to make a positive business case as SLFs remain relatively expensive. Also, there is hesitation to be the first deployer as first projects will be the most costly.

- SLF investor

”

Main reasons for persisting green premium

Lack of economies of scale

- Currently still mostly low volumes
- Economies of scale can be achieved with increasing industrialization of SLFs and scale-up of production capacities
- Economic cost gap prevents investors from committing initial SLF investments

Insufficient CO2 pricing

- Current price of carbon emissions (i.e., ETS) not sufficient to cover cost premium
- Uncertainty about future carbon price development

High production and feedstock costs

- **e-Fuels:** Production expected to remain expensive due to expensive renewable electricity incl. high dependence on production location
- **Biofuels:** Feedstock costs expected to increase due to supply constraints (esp. advanced biofeedstocks)



Technology-related barriers are uncertainty of future tech. landscape, lack of tech. maturity, multi-project risks and lenders' lack of tech. expertise

Barrier 4: Technology immaturity and uncertainty

Key technologies still bear risks

- Today's commercially available production pathways (HEFA, FAME, alcoholic fermentation) are primarily based on food (i.e., 1G) feedstocks
- Numerous production pathways are currently being developed that could process advanced- and waste-based feedstocks, or electricity into fuels
- Such novel technologies are not yet bankable

“

Many financial investors lack knowledge about technological aspects of SLFs. There is a need to inform them to increase their confidence and willingness to invest.

- SLF research center

”



Uncertainty of future technological landscape and market-winning products

- **Aviation:** Difficulties in appropriately assessing winning production pathways
- **Maritime:** Obsolescence risk (methanol, ammonia, or e-LNG as winning product)
- **Road:** Future of SLFs in road transport overall doubtful



Lack of technology maturity for key SLF technologies

- Novel technologies (advanced feedstocks) are at pre-commercial stage
- Especially lenders perceive the technology risk for SLF technologies to be too elevated to allow them to provide non-resource financing



Multi-project and multi-technology risks

- SLF projects are interdependent and linked across the entire value chain
- The integration of multiple value chain steps in a single project is typical of early-stage sectors but increases overall project risk for financiers significantly



Lenders' lack of knowledge on emerging SLF technologies

- In the early market, lenders lack a solid understanding of the underlying technology fundamentals of sustainable fuels
- Better understanding will be necessary for adequate risk assessments and financial products

Feedstock supply limitations and value chain readiness could impede scale-up of the SLF sector

Barrier 5: Supply Chain / Feedstock availability

e-Fuels



- **CO2:** Starting from 2041, industrial CO2 will not be counted as avoided in the production of e-fuels anymore
- **H2:** Relatively few locations in Europe with beneficial conditions to produce green H2 economically
- **Electricity:** Massive build-out of renewable energy generation capacity perceived as significant challenge

Biofuels



- Today's advanced biofuels are largely produced from agricultural waste, used cooking oils, and animal fats
- These are only limited scalable, which could lead to shortages once blending mandates increase after 2030
- More advanced biofeedstocks (e.g., cellulose, algae) need to be unlocked through technology development

Up- and downstream value chain coordination



- Future feedstock supply and demand centers will likely be geographically separated based on favorable production characteristics (esp. e-fuels could well be produced outside of Europe)
- Such international value chains require the massive build-out of transport infrastructure, which is not in place today
- Market players are thus calling for improved visibility of infrastructure development

Voices from the market

“ Additionality criteria currently limit e-fuel production to Scandinavia and the Iberian Peninsula. That won't be enough.
- SLF investor ”

“ Feedstock sources for HEFA will soon be fully used. For BtL, it is very limited as well.
- Logistics company ”



The mobilization of non-recourse project finance for SLFs is constrained by elevated project risks and limited track record of financial lenders

Barrier 6: Mobilization of project finance

Risks preventing lenders from financing SLF projects

Market risks: Esp. high green premium as a concern depending on reg. development

Commercial agreements: Long-term offtake necessary but difficult to secure

Technology risks: Technologies partially still in pre-commercial phases

Contracting: Innovative technology OEMs partially can't provide tech. guarantees

Creditworthiness: Counterparties partially not able to provide bankable guarantees

Risk mitigants required to provide limited recourse finance

- **Robust business case:** Based on achievable SLF market prices and production costs
- **Long-term offtake:** Commitments for a significant share of production capacity
- **Long term supply:** Durable supply agreements for key feedstocks
- **Appropriate contracting and construction strategy:** Providing an adequate risk allocation structure

In the current market, it remains difficult for companies to achieve these requirements, leading to limited access to project finance

Voices from the market

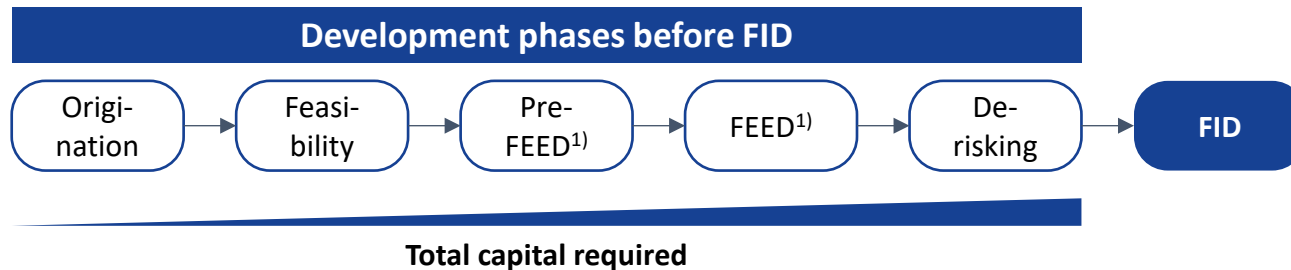
“ One of our biggest challenges is to de-risk projects enough for senior lenders to provide project financing and reach FID.
- SLF project developer ”

“ Bankability requires robust risk-return profiles. Loan repayment needs to be assured even in stress scenarios. Current SLF projects do not fulfill our bankability criteria to qualify for project finance.
- Commercial lender ”

Higher-risk capital to develop projects is limited and final investment decisions are being postponed due to a risk/return mismatch for SLF projects

Barrier 7: Access to capital for development phase of projects

Bringing SLF projects to FID is expensive



- Bringing **SLF projects through the various stages of development** requires financing in the **tens or even hundreds of millions of euros**
- Even projects that have attracted sufficient capital and reach the final investment decision are **partially not undertaken due to poor returns or low expected competitiveness** in the future

Access to develop. finance is scarce

Independent developers / SMEs

- Lack sufficient funds to finance development phases on their own
- Private equity and infrastructure funds currently with very limited involvement (but interest is increasing)

Larger incumbents

- Potentially have sufficient funds to finance development phases on their own
- Face the challenge to balance higher risk activities in sustainable fuels and their ongoing legacy business (slowing down their current involvement)

Voices from the market

“ More medium-scale investments are necessary to help first projects reach commercial stages. Esp. raising sufficient funds to execute engineering studies is difficult

- Infrastructure fund

“ Current projects lack economic competitiveness. In addition, strict regulatory hurdles from European legislators, rising interest rates and overall cloudy economic outlooks put project economics and feasibility to the test. Hence, most FIDs have been delayed.

- Biofuel producer

1) Front End Engineering Design



B. Results of consultations Recommendations

Based on market consultations and an in-depth analysis of their findings, a series of recommendations was developed

Recommendations to facilitate access to finance

Recommendations

Market development

Recommendation 1:

Introduce supply and demand side mechanisms to increase cost-competitiveness of SLFs

Recommendation 2:

Further improvement of existing regulatory framework to increase investor confidence and attract financing

Recommendation 3:

Support the emergence of a liquid commodity market for SLF

Financing

Recommendation 4:

Improve knowledge of and access to EU financing instruments for project developers

Recommendation 5:

Support the development of an SLF financing ecosystem

Recommendation 6:

Adapt existing financing toolboxes of EU entities such as the EIC and Innovation Fund

Recommendation 7:

Continue to support SLFs projects via EIB's existing financial instruments, which are fit-for-purpose

Recommendation 8:

De-risk selective industrial-sized projects with credit enhancement mechanisms to unlock private capital

The green premium could be decreased by covering the cost difference, reducing sustainable production costs, or increasing fossil production costs

Recommendation 1: Introduce supply and demand side mechanisms

Goal

- Reduce green premium beyond current measures (e.g., ETS)
- Reduce "first-mover-disadvantage"
- Facilitate development of positive business cases

Lever

- Introduction of new supply and demand side mechanisms



Mechanism 1: **Contracts for difference**

- Guarantees to cover the difference between a pre-defined settlement price and the achieved market price
- Facilitate deployment of first industrial-scale plants while remaining technology agnostic
- Difference frequently carried by a public institution, e.g., funded by ETS revenues

Mechanism 3: **Increased fossil fuel surcharges**

- Directly reduces the difference between fossil and sustainable fuels
- Could be achieved by expanding and strengthening the EU ETS system
- German renewable energies surcharge as frequently mentioned model

Mechanism 2: **Tax incentives**

- Tax benefits for SLF production can increase cost competitiveness (IRA as frequently mentioned example)
- Relatively low complexity and direct effect of support for producers
- Comprehensive approach possible linking incentives directly to the production of SLFs

Other mechanisms

- Double-sided auction schemes for SLFs
- Increased financial volumes for the European Hydrogen Bank (to drive down H2 costs)
- Secured offtake via green public procurement

While the regulatory framework already supports SLF market uptake, it can be further improved to increase market confidence

Recommendation 2: Further improvement of existing regulatory framework

Goal

- Increase confidence and understanding of investors in supportive regulatory framework

Lever

- Finalization of regulatory framework
- Trust-worthy signals for long-term regulatory stability



1. Improving predictability of regulatory development for today's investments, e.g., by

- Introduction of ambitious blending mandates in all transport sectors
- Harmonization of long-term decarbonization targets with those of industry associations
- Inclusion of long-term targets under RED III (beyond 2030)
- Finalization of key regulations (e.g., ETD)
- Swift implementation of EU directives into national law
- etc.

2. Improving market understanding of regulation, e.g., by

- Reduction of cross-references across different regulations
- Simplifying sustainability criteria, penalty schemes for non-compliance, and CO2 emission calculations
- Common approach to implementation on national level
- Increasing visibility of regulation (e.g., via digital platform)

3. Grandparenting of regulatory limitations that could lead to bottlenecks, esp. for

- Today's industrial CO2 sources beyond 2041
- Electricity sourcing criteria for renewable H2
- Sustainability criteria for biofeedstocks if advanced feedstocks remain limited

The SLF market can be supported by introducing characteristics of a liquid market before high market volumes are achieved

Recommendation 3: Support the emergence of a liquid and commoditized market

Goal

- Turn the SLF industry into a liquid commodity market
- Facilitate large-scale trade and enable EU decarbonization targets

Lever

- Market making mechanisms
- Removal of early market inefficiencies



1. “Book-and-Claim” mechanisms

- Practice in which sustainability claims of consumers are separated from physical flow of goods
- Would allow companies who have paid the SLF premium to claim the volumes as part of their fulfilment of blending mandates without having to physically use the SLFs
- Already assessed by the EC

2. Regional SLF demand clusters – Potentially built around existing H2 clusters

- Formation of demand nests for SLFs and/or their key feedstocks around regional demand centers (e.g., ports, industrial zones) improving overall economics
- Support could take the form of collaboration initiatives and matchmaking platforms (e.g., comparable to Hydrogen Valley platform)

3. Market maker mechanisms and/or demand and supply aggregators

- Publicly backed market makers or intermediaries bundling supply and demand
- Market makers could counter, e.g., volume/maturity mismatches, limited long-term visibility, counterparty credit risk, etc.



Knowledge of and access to EU's existing financing support needs to be improved to grant access to SLF project promoters

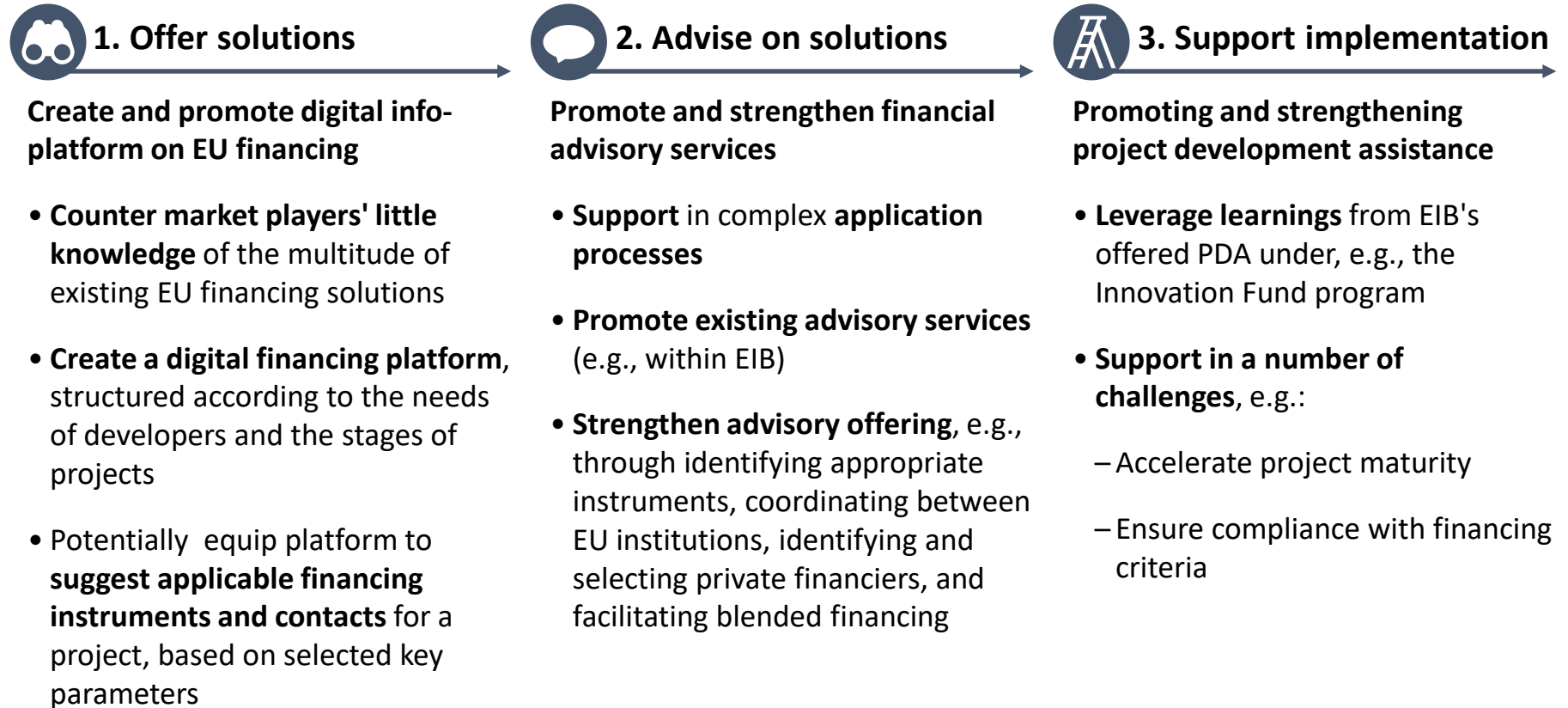
Recommendation 4: Improve knowledge of and access to EU financing instruments

Goal

- Increase market players' usage of existing EU financing solutions/ instruments

Lever

- Promote offered products and services
- Facilitate access to knowledge



Maturing the stakeholder ecosystem for SLFs can result in improved sector involvement and collaboration between involved parties

Recommendation 5: Development of an SLF financing ecosystem

Goal

- Emergence of a dynamic SLF (financing) ecosystem
- Increased access to private financing

Lever

- Publicly supported matching of private financiers and project promoters



1. Blended finance instruments

- **Solution:** Increase offering and awareness of combined financing from public and private investors
- **Benefit:** Significant involvement of private investors at lowered risk
- **Existing examples:** EU and EIB partnership with Breakthrough Energy

3. Project de-risking through knowledge-sharing

- **Solution:** Sharing of lessons learned by EU institutions (EC DGs, EIB, EIF, ...), e.g., in expert seminars/workshops
- **Benefit:** Facilitated project de-risking, risk assessments, etc.
- **Existing examples:** "Finance Masterclasses" from "Smart Cities Market Place"

2. Matchmaking financial and strategic players

- **Solution:** Forming of alliances including financial players and project promoters and organization of matching sessions
- **Benefit:** High transparency, continuous and close exchange
- **Existing examples:** Investor networks for "Smart Cities Market Place"

4. Cross-value chain SLF cluster collaboration

- **Solution:** Expansion of cross value chain alliances to allow for high sector involvement
- **Benefit:** Facilitated sector development through close interaction of parties
- **Existing examples:** EC-supported RLCF alliance

Existing financing toolboxes can already grant access to funding for the SLF market – Minor adjustments could increase that access

Recommendation 6: Adapt existing financing toolboxes of EU entities

Goal

- Channel significant funding resources into the SLF market efficiently

Lever

- Continue existing EU funding schemes
- Increase access to existing EU funding schemes for SLF developers



1. European Innovation Council funding

Current offering

- Total budget of EUR 10 bn to support game changing innovations
- Offers grants of EUR 2.5-4 m in combination with equity
- Well suited to provide support to SLF innovators and start-ups aiming to develop novel production pathways

Recommendation

- Increase focus on deep-tech and early-stage startups
- Increase focus on SLF technologies

2. EU Innovation Fund

Current offering

- Budget of latest call amounts to EUR 4 bn
- Can cover up to 60% of project costs for low-carbon projects including in all transport sectors
- New "middle" tranche for projects in the EUR 20-100 m range
- Aims to create financial incentives for companies to invest in the demonstration of innovative, low-carbon technologies

Recommendation

- Monitor effects of the latest call on SLF project funding
- Detailed analysis of access barriers to SLF projects, if number of supported SLF projects remains low
- Ensure sufficient chances of success for SMEs and independent project developers

EIB's thematic impact finance and funds-of-funds products can provide meaningful financing – Adaptation could increase their effectiveness

Recommendation 7: Continue to support SLFs projects via EIB's existing financial instruments

Goal

- EIB to support SLF projects via direct involvement

Lever

- Focus existing, suitable instruments on SLF projects



1. EIB thematic impact finance

Current offering

- Thematic venture debt and project financing of up to 75 million euros (secured by EC via risk guarantees)
- Selected sectors targeted including SLFs
- Total budget of EUR 1 bn available largely allocated already

Recommendation

- In collaboration with EC, commit additional resources to thematic impact finance and allocate significant share to SLF project realization
- Facilitate access to pure project developers and replace predictable cashflows as key condition
- Increase current ticket size to also cover industrial-scale project financing

2. EIF – Funds-of-funds

Current offering

- Indirect equity finance to the benefit of small and medium-sized enterprises
- Significant minority stakes in SME-, mid-cap-, infrastructure, and environmental funds to provide a catalytic effect on commitments from private investors

Recommendation

- Invest in funds that focus on SLF as a key investment theme in their broader fund strategy
- Establish / target dedicated SLF funds focusing on SLF technology innovators and project developers
- Potentially introduce higher-risk taking tranche from public sources in funds

EIB should de-risk first industrial-scale SLF investments for the market to gain experience and trust in technologies and projects

Recommendation 8: De-risk selective industrial-sized projects

Goal

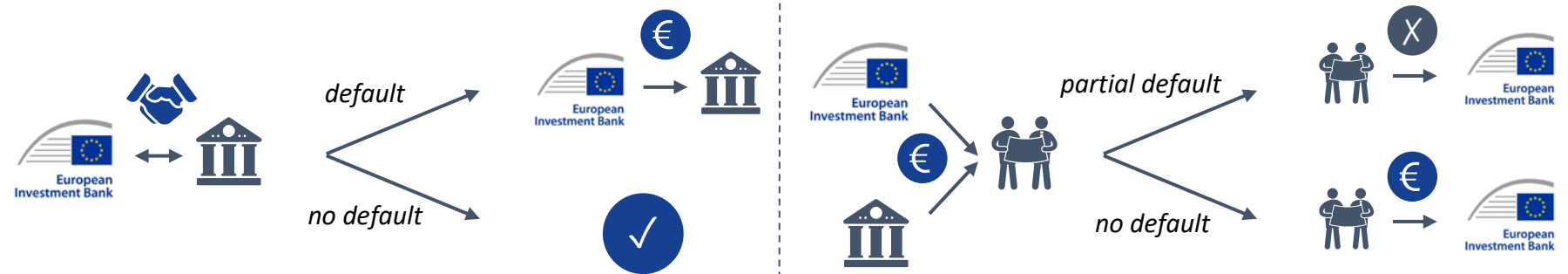
- Realize first industrial-scale production projects across several technologies
- Gain experience from those lighthouse projects and increase willingness to invest in the market

Lever

- De-risked financing of first-of-a-kind projects



EIB can de-risk first investments in industrial-sized projects, e.g., via



1. First-loss guarantees

- In first-loss guarantees, a third party compensates lenders up to a stated percentage of the underlying loan, if the borrower defaults
- Such guarantees can save financial resources if required provisions to cover the guarantee amount are lower than the guarantee amount itself
- First-loss guarantees could be developed as thematic guarantees as the market matures (i.e., covering only specific risks)

2. Subordinated loans

- Subordinated loans are repaid only after the senior debt has been fully repaid, and hence reduce the probability of default for senior lenders
- Public participation in projects could send a strong signal to the market and “crowd-in” private investment

Next steps?

Implementation of recommendations for the EIB Group

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THANK YOU

