

› THE IMPORTANCE OF FINANCE FOR EUROPE'S ENERGY TRANSITION

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Energy Transition Studies
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OUTLINE

- › Project overview
- › The Paris Climate Agreement: what is the role of the energy sector?
- › The Energy Transition: what is the required scale of financing?
- › Financing costs: why are they so important for the energy transition?
 - › What is the Weighted Average Cost of Capital (WACC)?
- › Recent trends in financing costs for renewable energy in Europe
- › What are the key drivers of financing costs for renewable energy in Europe?
 - › Competitive procurements
 - › Divestment from fossil fuels
- › Prospects for Europe's energy system
- › Key takeaways
- › Potential future research

PROJECT OVERVIEW

- › One of the 'knowledge projects' funded by Ministry of Economic Affairs and Climate
- › **Objective:** Broaden our knowledge in the domain of financing the energy transition
- › **Roadmap:** Towards broad support for the energy transition
- › **Approach**
 - › Literature review on financing the energy transition and financing costs for renewable energy in Europe
 - › External expert interviews (IRENA, Eclareon, OECD, Ecofys)
 - › Internal expert interviews (Geosciences, ETS)
 - › TIAM-ECN as a tool to demonstrate the impact of financing costs on renewables deployment in Europe
- › **Outputs**
 - › Literature repository: more than 60 resources on the Cluster site
 - › Journal "Perspectives" / "Policy Forum" piece
 - › This publicly available slide pack

THE PARIS CLIMATE AGREEMENT

WHAT IS THE ROLE OF THE ENERGY SECTOR?

- › **The Nationally Determined Contributions (NDCs)** – pledges made by countries to reduce their GHGs post-2020 – **constitute the cornerstone of the Paris Agreement (PA)**
- › **The energy sector has a key role to play.** Energy supply is responsible for about 35% of total global anthropogenic GHGs; 90% of energy-related emissions are CO₂ from the burning of fossil fuels (IPCC, 2014)
- › **NDC implementation and a successful energy transition** requires coordinated global action including capacity building, institutional strengthening, and **financing** from public and private sector sources

THE ENERGY TRANSITION

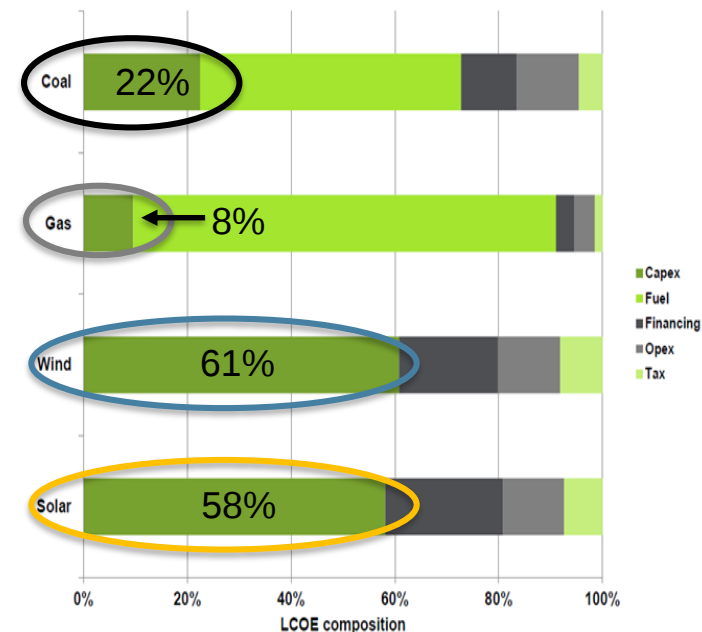
WHAT IS THE REQUIRED SCALE OF FINANCING?

- › IPCC SR “1.5 °C” (2018) “Annual investments in low-carbon energy are projected to average **0.8-2.9 trillion US\$ globally to 2050** in 1.5 °C pathways, overtaking fossil investments already by around 2025” (McCollum et al., 2018)
- › Average annual additional investments needed for the EU alone to meet its climate and energy policy targets are projected to be **€ 38-180 billion to 2030**
- › Given the scale of investment needs for low-carbon power generation, **further cost reductions are critical**
- › Research has focused primarily on technological cost reductions, but limited attention has been given to **the impact of financing costs on the energy transition**

FINANCING COSTS

WHY ARE THEY SO IMPORTANT?

- › Most renewable power generation technologies are characterised by high capital-intensity and have minimal (or zero) fuel costs during operation
- › CAPEX is by far the largest component of total Levelised Cost of Electricity (LCOE) for renewables (c.60% for wind and solar)
- › Financing cost thus has a significant impact on the LCOE for renewable power generation technologies

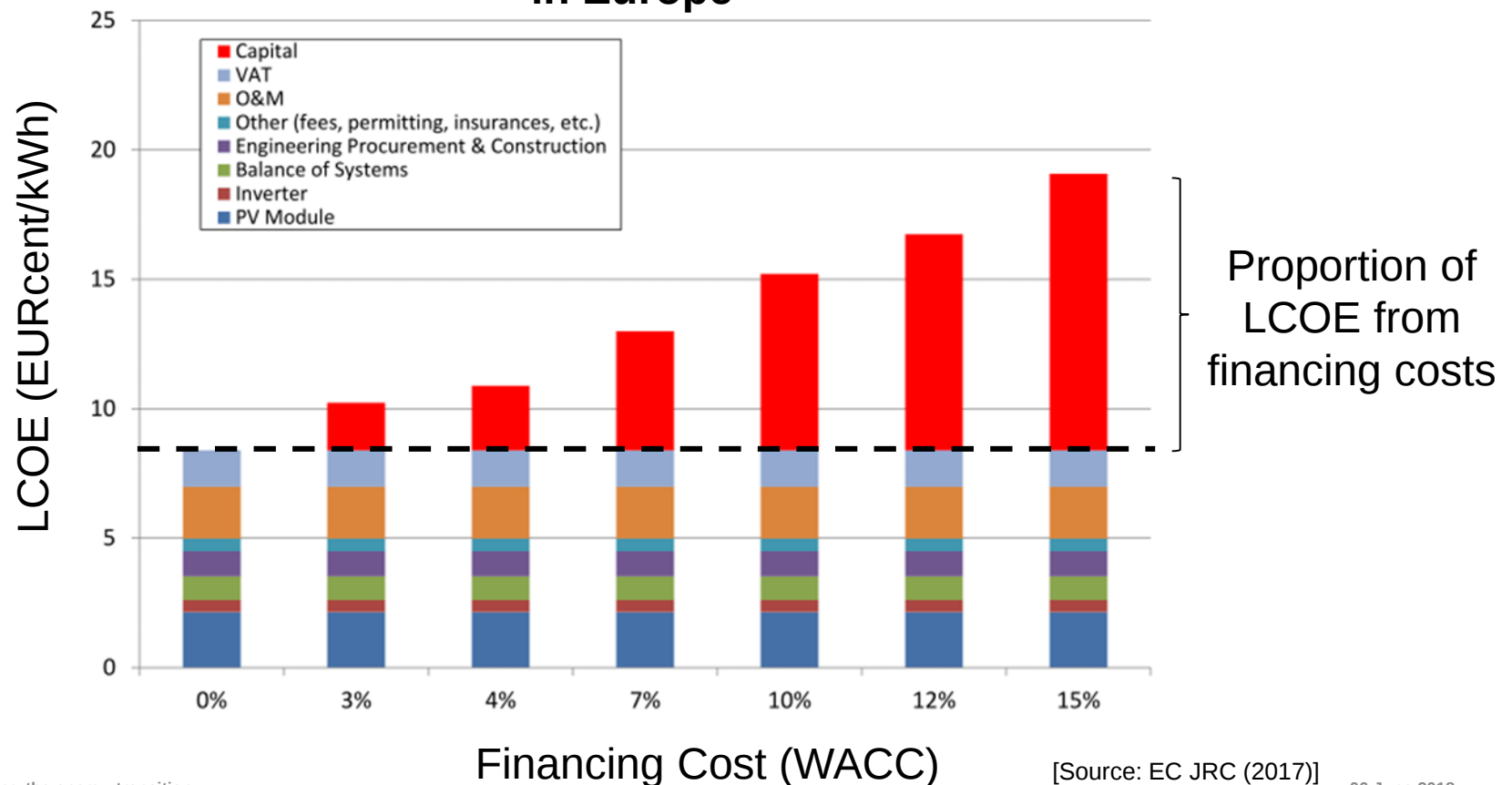


[Source: Citi Research, 2015]

FINANCING COSTS

WHY ARE THEY SO IMPORTANT?

Impact of financing costs on LCOE of residential solar PV in Europe



FINANCING COSTS

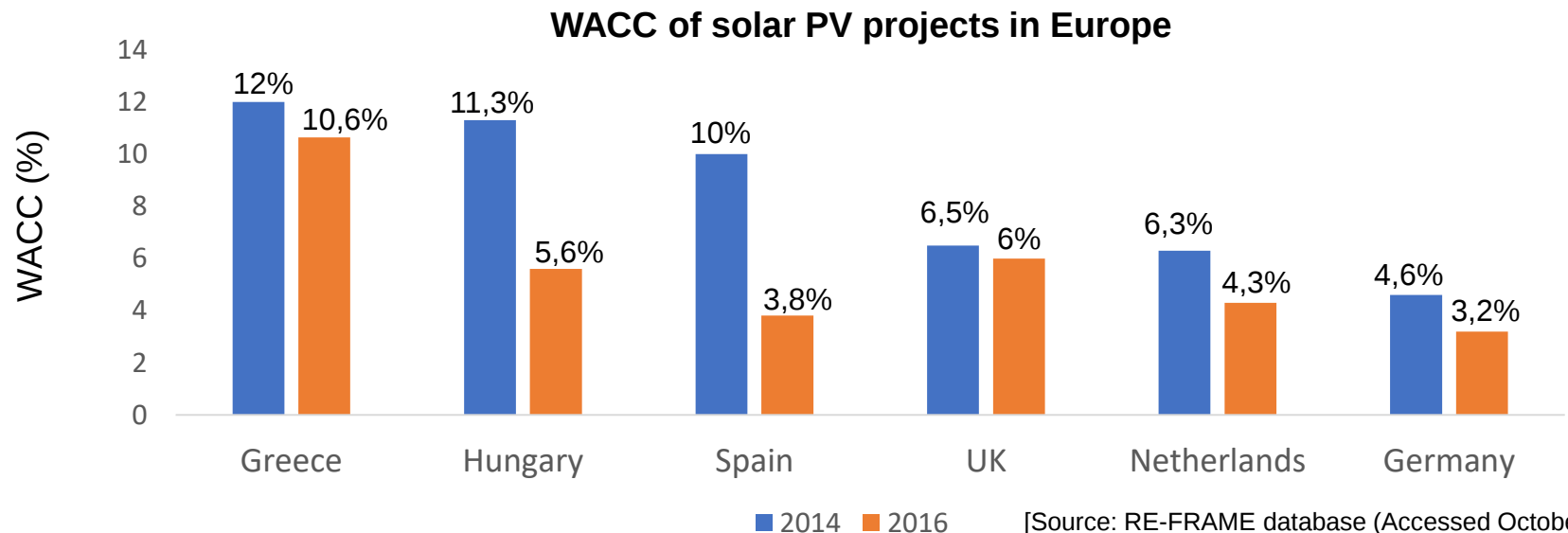
WHAT IS THE WACC?

- › Weighted Average Cost of Capital (WACC)
- › The WACC is a commonly used measure of the financing costs for a project
- › It is a combination of the following components:
 - › **Debt rate:** what does it cost for the company/project to borrow money?
Interest rate from a bank or yield from bonds issued on capital markets
 - › **Equity rate:** what is the rate of return required by an investor?
Direct equity investment or return on shares issued on the capital markets
 - › **Capital structure:** what is the proportion of debt and equity of the investment?
Often weighted more towards debt. Perhaps a 70:30 ratio or even more at 80:20

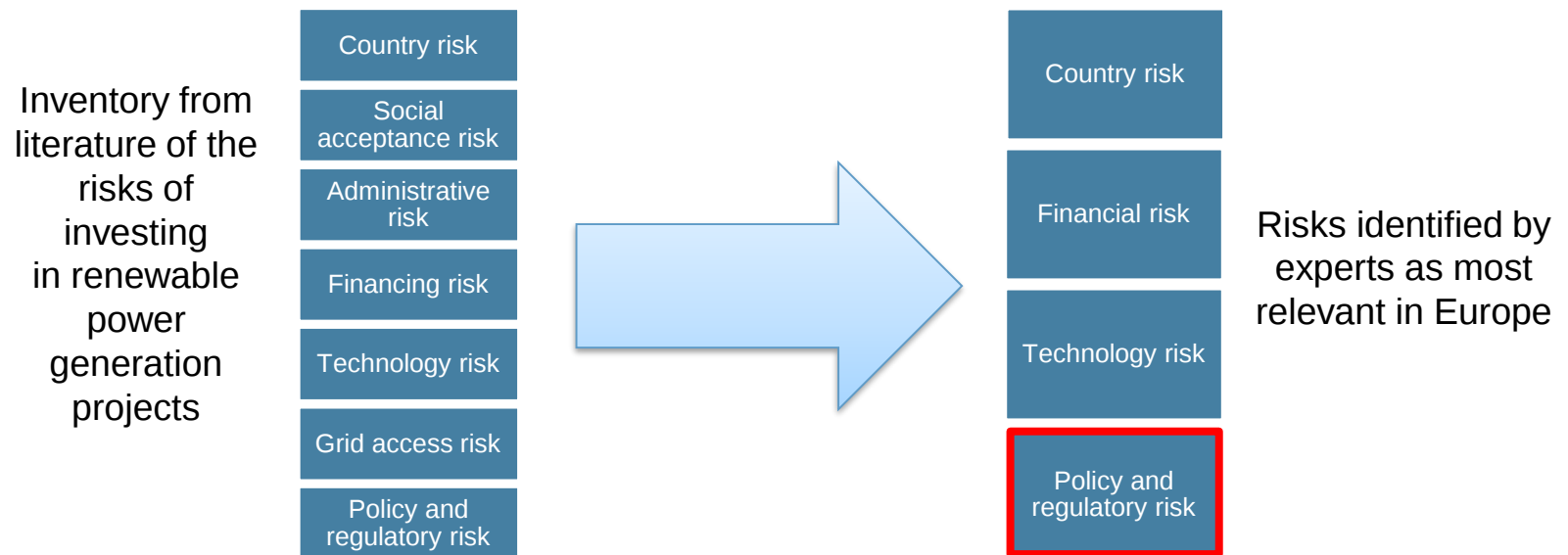
$$\text{WACC} = D/(D+E) * \text{Debt rate} * (1-\text{tax rate}) + E/(D+E) * \text{Equity rate}$$

RECENT TRENDS IN FINANCING COSTS FOR RENEWABLE ENERGY IN EUROPE

- › RE-frame database (Fraunhofer and Eclareon) assigns average annual WACC values to wind and solar PV projects across all EU-28 member states
- › Experts interviewed who are working on the design and implementation of projects
- › Results show a falling trend in all countries covered from 2014 to 2016



WHAT ARE THE KEY DRIVERS OF FINANCING COSTS FOR RENEWABLE ENERGY IN EUROPE?



[Sources: Ecofys, DiaCore project, IRENA, Eclareon]

- › WACC is not just an exogenous quantitative parameter
- › TNO in its capacity as advisors to policymakers can influence what drives the WACC

WHAT ARE THE KEY DRIVERS OF FINANCING COSTS FOR RENEWABLE ENERGY IN EUROPE?

- › **Country risks:** varying economic indicators (e.g. inflation and interest rates) lead to a disparity in WACCs across countries. Mainly stable in Europe, but still important to consider
- › **Technology risks:** as technologies mature, perceived risks by financiers are lower and WACCs fall. Already the case for wind and solar; potential for other technologies to follow
- › **Financial risks:** more mature financial markets with competitive banking systems (e.g. Germany) mean lower risk premiums applied by investors
- › **Policy and regulatory risks:** consistent, transparent, sustainable renewables promotion policies can help to reduce the WACC for renewables projects

FUTURE DRIVERS TO FOCUS ON

1. COMPETITIVE PROCUREMENT

- › Some governments in Europe have started to shift from feed-in tariffs to market-based renewable energy support schemes e.g. competitive procurement
- › **Competitive procurement could help to lower financing costs** for renewables by creating competition among project developers and between commercial banks
- › Already, auction designs for offshore wind in the Netherlands have focused on **establishing long-term stability and investor security**, resulting in low bids and even subsidy free projects (RVO, 2017)

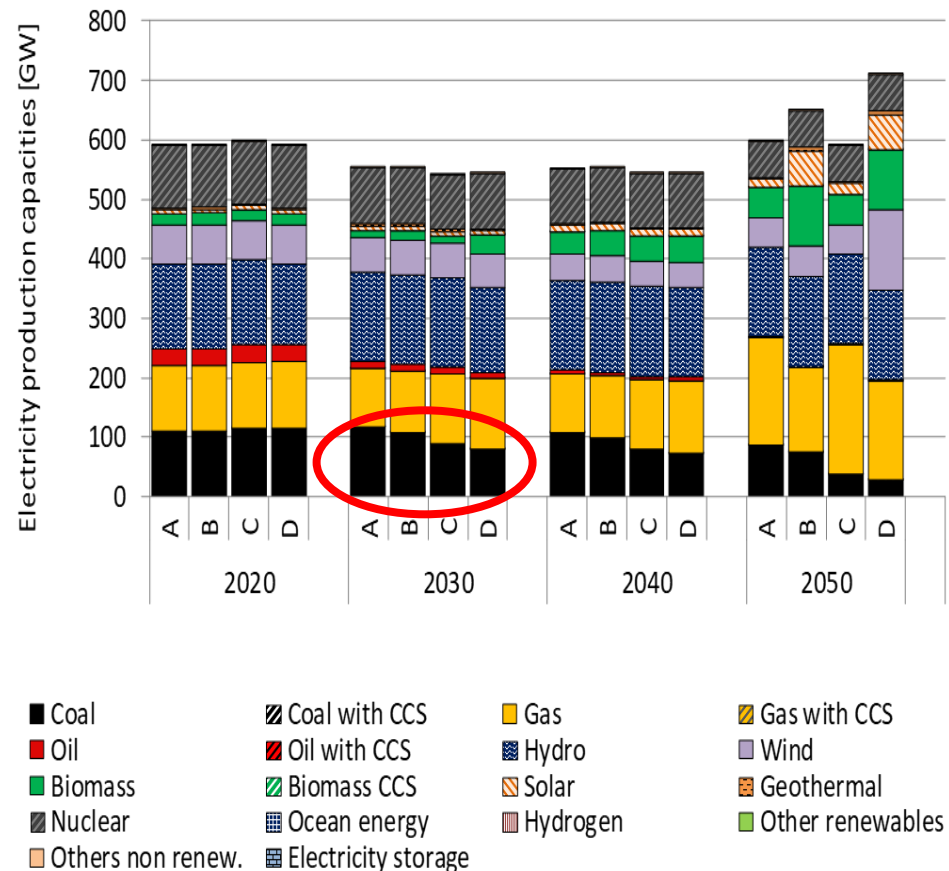
FUTURE DRIVERS TO FOCUS ON

2. DIVESTMENT FROM FOSSIL FUELS

- › The **current scale of divestment is relatively small** compared to the size of the fossil fuel industry (market capitalisation of 4.9 trillion US\$ (BNEF, 2014))
- › But, **divestment could have a ‘signaling effect’** that deters large investors, reducing the availability and raising the financing cost for fossil fuel projects
- › **The insurance industry is a key player** with total assets under management of 31 trillion US\$ globally. Major names (Allianz, Aviva, Zurich) have already shifted assets away from fossil fuels, and some are refusing to underwrite coal operations

PROSPECTS FOR EUROPE'S ENERGY SYSTEM

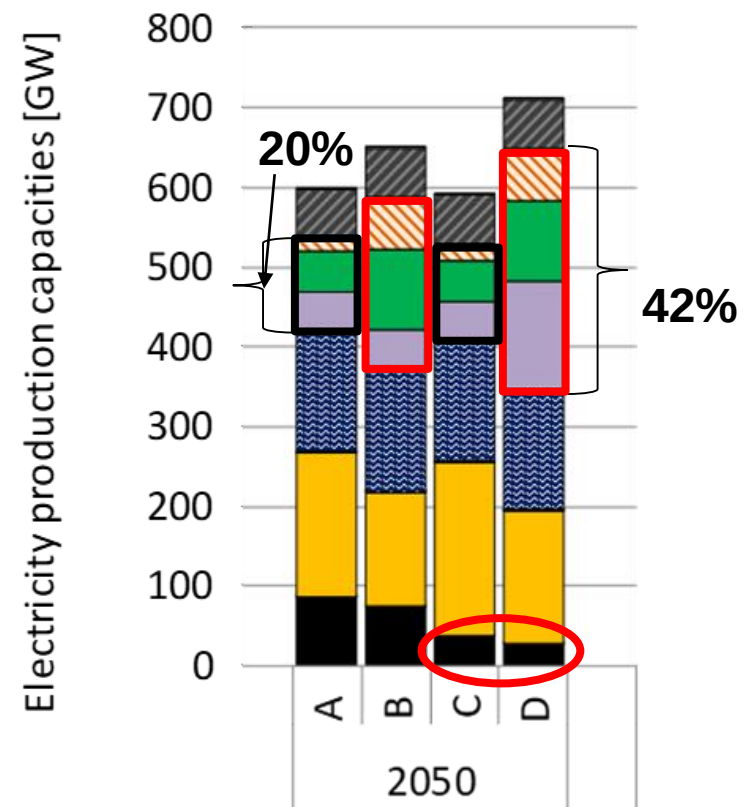
- › In all scenarios renewables play progressively a larger role in fulfilling Europe's energy needs
- › Already in 2030 shifts in financing costs impact the power supply mix, notably in terms of the diminishing role played by coal based electricity generation
- › In 2050 we see substantial changes for essentially all contributions to the mix



PROSPECTS FOR EUROPE'S ENERGY SYSTEM

Substantial changes to the power mix by 2050

- › A much larger share of renewables in scenario D (42%) than in A (20%) (excl. hydro)
- › Coal becomes marginalised in C and D, as divestment gains momentum and the insurance industry responds strongly to climate change
- › Renewables (biomass, wind, solar PV) play a much larger role in scenarios B and D than in A and C, as an increase in the use of competitive procurements helps to drive down financing costs for renewable electricity investments



KEY TAKEAWAYS

- › Reducing financing costs is critical to driving down the cost of renewable energy, and thus to help accelerate the energy transition
- › Research on financing costs and ways to reduce these for renewables is limited
- › We know that financing costs vary over time, across EU Member States, between technologies, and individual projects, but research into why is limited
- › We believe two key drivers of financing costs deserve more research attention in the future: 1) competitive procurement and 2) divestment from fossil fuels
- › There is a clear role for TNO to conduct research in this domain, to provide knowledge and advice to policymakers and other energy transition stakeholders

POTENTIAL FUTURE RESEARCH

- › What specifically is causing the differences in financing costs across EU Member States, technologies, projects and time?
 - › Collecting data at the project level could better enable policymakers to understand how and where to act in order to mitigate risks and lower financing costs
- › What is the role of policy makers in facilitating banks to lower their lending rates and investors to lower their required rates of return?
- › What is the role of policymakers in unlocking the potential of institutional investment in renewable energy projects?
- › What role can securitisation of renewables projects play in scaling up availability of capital and lowering financing costs for renewables?

› **THANK YOU FOR YOUR ATTENTION**

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