

ROADMAP 2050

FINANCING FOR A ZERO-CARBON POWER
SECTOR IN EUROPE

A FINANCIAL SECTOR'S VIEW ON THE DECARBONISATION OF
THE EUROPEAN POWER SECTOR



P R E F A C E

The European policy debate on power sector decarbonisation has so far been focused on the technical feasibility and economic impact of the transition to a low-carbon power sector. Driven by various Roadmap studies, including the European Climate Foundation (ECF) *Roadmap2050: a practical guide to a prosperous, low-carbon Europe*, there is now widespread acceptance that near full decarbonisation of the power sector is technically possible at low economic cost to society and with significant co-benefits in terms of climate change mitigation, health impacts and security of supply among others.

The debate is now moving towards the practical achievability of the transformation and one of the immediate hurdles is financing the new power system. This is because more than 80% of our 2050 power supply still needs to be built, with many of our current assets reaching the end of their economic life in the next 40 years. With the fact that many of the new assets will be more capital intensive than the old ones, it becomes clear that this poses a huge investment challenge. For power generation and transmission alone the Roadmap 2050 analysis estimated a €1.3 trillion investment over the next 15 years. Or roughly a doubling of the historic investment rate in the power sector.

This new report presents the findings of a consultation with Europe's financial sector, facilitated by the ECF, on the investment challenge. Many interesting views are expressed, but the overarching message is that the decarbonised power system will not be financed via traditional financing models. The scale of investment is simply too large for utilities to carry on their balance sheets and the accumulated risk is too high.

But this is not the end of the story. If we can find new creative ways of financing, if governments can put in place strong and sustainable policy frameworks, if different actors can be aligned and accept their role in the new reality and new access to capital can be found, then the transition can be realised.

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EXECUTIVE SUMMARY

There is a funding gap that creates a need to find new ways to attract different types of investors to the power sector. There is a strong consensus within the financial community that new financing models will need to be found to finance the low-carbon transition alongside existing approaches. All electricity generation is highly capital intensive, but low-carbon generation is characterized by being more so. Shifting to a low-carbon energy future will, therefore, require an increased rate of investment in the power sector. The scale and speed of investment required means that conventional sources of finance such as balance sheet borrowings and project finance will not deliver the full scale of capital required.

Sufficient capital can be found among, in particular, institutional investors, who now control the larger share of the world's investment capital. These investors have typically been under-exposed to the power sector and are increasingly interested in becoming more directly involved in this market. In order to attract institutional investment at scale, these investments must be able to meet their risk and return requirements.

Consequently, this analysis points to the need for a rethink of the market structure to enable faster recycling of capital and a restructuring of investments as asset-backed securities or bonds that would interest this new investor group. Alternatively, ways need to be investigated to enable more institutional investors to directly invest in generation assets.

The policy framework needs further alignment of EU energy policies. The investment community sees Europe as a patchwork of different policy regimes, which at the same time are highly interlinked. The current fragmented framework often limits the activities of investors to a small number of countries and triggers country-hopping behaviour.

Financiers, and especially longer-term investors, see further harmonization and integration of energy policies as a facilitator for greater investment. At the same time there is a clear understanding that this should be a gradual, well-managed transition.

“INVESTORS ... SEE FURTHER INTEGRATION OF THE EU'S PATCHWORK QUILT OF ENERGY POLICIES AS A FACILITATOR FOR GREATER INVESTMENT RATES.”

An 'investment-grade policy framework' goes beyond the energy and climate policy as many of the financial institutions are increasingly managing financial regulation, such as Basel III and Solvency II.¹ These regulations have an impact on the way investors can allocate capital. If viewed in isolation, policy reforms in one area may not lead to the desired outcomes. For example, Solvency II may have a negative impact on insurance companies' capacity to hold the long-term maturities of green bonds.

Given the importance of an investment-grade framework, market reform and support policies require an increased dialogue between policy makers and financiers. An immediate priority is a discussion about the potential impacts of Solvency II and Basel III on planning for a transition to a low-carbon economy.

1. The Basel Accords are recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision, which have set framework for the international regulation of the banking sector. As a response to the financial crisis new stricter Basel III regulations were issued. Often called "Basel for insurers," Solvency II is somewhat similar to the Basel banking regulations, aimed to reduce the risk exposure of insurance companies in Europe. Solvency II is scheduled to come into effect on 1 January 2013.

One of the immediate issues that surfaces is the limited dialogue between policy makers and the financial community. Both for financiers and institutional investors there are very few sustained platforms where policy proposals are discussed with the financial community or where the sector can input into the policy process. There is a need for a more frequent and detailed dialogue between policy makers and the whole spectrum of financial sector organizations.²

It was also noted that a dialogue with financiers can offer very different insights than a dialogue with industry members as was shown in the case of the expansion plans in the UK for offshore wind. The industry has a different view on market development than the finance community and thus brings different perspectives to the table.

The finance community sees managing the risk of the low-carbon transition as the key role of governments. This means not only creating the policy framework, but also allocating the public capital to optimally attract private sector investments. The key focus of governments should be to design and implement a robust, stable policy framework with clear and sustainable support mechanisms, as the main risk seen by the financial community in low-carbon technology investments is policy risk. At the same time government could use some of the limited available public capital to optimally attract private sector finance. Financial involvement from government or government-backed institutions will help to increase projects' credit rating and thus lower the cost of capital. Some government interventions mentioned are traditional guarantee facilities along the lines of traditional industry support from Import-Export Banks, first loss positions, government-backed guarantees, and credit enhancement via the European Investment Bank and 'green investment bank'-type institutions.

The potential for investment-grade climate-related bonds should be further explored, as they can be one of the key levers to attract institutional investors at a larger scale. If a liquid market can be developed, this would introduce a mechanism to enable refinancing of new and existing assets, increasing the speed of scale up, and allow for a more flexible financing of the power market. However, this would only work if climate-related bonds can compete with regular bonds in terms of risks and returns.

As part of a broad public debate, there should be increased attention to the price of electricity. Shifting to a decarbonised energy system will result in higher electricity price, particularly in the next 20 years when many of the high-capital investments in the system are made. In the longer run, over the 40 year period up to 2050, the Roadmap 2050 analysis shows us price levels are roughly of the same order in all modeled pathways including 'business-as-usual'.³ Some industry figures believe a key challenge will be to create acceptance for higher energy prices.

2. A positive example of how the financial community can help robustness of policy is the recent consultation process on EU Project Bonds, where the financial community provided input on the technical set-up of the facility. However, even in this consultation, the eligibility criteria which in the end will have an important impact on the overall policy framework and the actual investments done were out of scope in this process. Another positive example is the IIGCC, which is increasingly successful in convening a dialogue between institutional investors and policy makers.

3. For a full analysis, see www.roadmap2050.eu.

INTRODUCTION

1.1 Why this report?

This report has been prepared as a contributing study to the *Roadmap 2050* project initiated by the European Climate Foundation.⁴ This project aims to provide evidence-based supporting analysis to the European decision making process on the transition to a low-carbon economy.

The findings in this report represent the views from the financial community on some of the key issues in the energy debate, looking at trends in the financial and power sector, with a specific focus on low-carbon *power generation*.^{5, 6} The report aims to provide insights on the role and interests of the many different actors in the field, the role of governments and government institutions in driving investments in the power sector and the use of financial instruments and mechanisms to support policies. The report aims to inform policy makers and the various policy agendas that are increasingly facing financing issues.

1.2 Why consult the financial sector?

The full decarbonisation of the EU power sector by 2050 is a crucial element in mitigating climate change risk in Europe. The *Roadmap 2050* initiative, facilitated by ECF in 2010, has shown this decarbonisation is both technically possible and economically feasible, but there are many practical and political challenges to achieving this end state as cost-efficiently as possible. One of those challenges is finding the approximately €1.3 trillion of investment required in power generation and grid connections over the next 15 years.⁷ This investment will be made by the private sector, but the public sector will need to provide the policy framework and technical support to enable this low-carbon transition.

The investment challenge is vast and highly complex. The willingness of various actors to provide the finance depends on many factors, e.g. financial,

regulatory, and political. Different actors have different risk appetites, return expectations, ways of working, flexibility, etc. It is important for policy makers to understand the role of the different actors to design and implement effective policies that can help drive private sector investments in energy.

1.3 Who was consulted?

To better understand the thinking on this issue in the financial sector, the ECF and partners, from July 2010-January 2011 convened a number of meetings, held interviews and issued questionnaires to over 100 actors from different parts of the financial supply chain, i.e. long-term holders of capital (pension funds, insurers), asset managers (private equity firms, fund managers), intermediaries (rating agencies, investment banks), commercial banks, and users of capital (utilities, grid operators).⁸

For the purpose of this consultation the finance supply chain was split up into five groups, each representing different players in the financing of power sector assets:

- Users of capital, e.g. utilities, transmission systems operators, manufacturers. Utilities are traditionally the providers of power to consumers and construct, own and operate power generation capacity. The EU power market is dominated by utilities that have seen two decades of deregulation of the market and have moved from a Regulated Asset Base-model to a market-driven power sector.
- Brokers of capital, e.g. investment banks, capital markets, advisory firms for private funding, credit rating agencies. This diverse group of actors play a pivotal role in facilitating access to the capital markets, providing information on projects, liquidity and credit ratings, and linking project developers to capital providers.

4. See Annex 3. Also see www.roadmap2050.eu for more information on this initiative.

5. As transmission grids are to a large extent still state-owned entities, which investments costs are socialised to the consumer, the private sector has only limited involvement in grid financing. As a result and although crucial for the further development of a low-carbon power sector, grid financing has not been the key focus of this study.

6. Generation includes on- and offshore wind, solar, biomass, geothermal, hydropower, nuclear and CCS-technology.

7. Analysis by McKinsey taken from *Roadmap 2050* (ECF, 2010), www.roadmap2050.eu

8. A full list of organisations is listed in Annex 2.

They can be seen as the intermediaries who make the market transparent and make sure the mechanics of the market work.

- Providers of debt, e.g. commercial banks, European Investment Bank (EIB), European Bank for Reconstruction and Development (EBRD). These institutions play a crucial role in providing debt finance to projects. Most projects are financed using debt and equity, usually in a 75:25 to 80:20 ratio. The equity to debt ratio is also called leverage, *i.e.* the amount of debt a project can attract on its equity. During the financial crisis, debt was much harder to find, as banks were reluctant to take on more risky projects. The debt market is now slowly recovering which has a positive effect on both the volume and tenor of loans. Aside from project finance, the larger banks tend to follow their corporate clients in the regions and sectors they are active in, which takes them increasingly to the low-carbon sector.
- Agents of long term capital, e.g. private equity companies, infrastructure funds, fund managers of listed equity. The private equity providers can be seen as the project sponsors, as they provide the necessary first money on the table to attract debt to reach a financial close.
- Principal holders of long-term capital, e.g. sovereign wealth funds, pension funds, endowments, investment funds, foundations, insurance companies. These represent a large pool of assets under management. However, they are bound by fiduciary responsibility, which means they have to invest prudently and tend to take a longer-term perspective on their investments. Institutional investors have traditionally been relatively underexposed to the power market and have mainly invested via listed equity only. Although there is interest to become more active in the power sector, the investments have to be made to fit this group's preference.

1.4 How to read this report?

This report is broken down into findings on five key issues that we identified in the consultation process. These issues are:

- The transformations in the power market required to get from where we are now to the low-carbon future.
- The role of different investors in the transition and their investment behaviour.
- The risk and return characteristics of low-carbon investments and the barriers to investing.
- The role of government policy in driving change in the power market and the impacts of financial regulation.
- Policy implications and potential solutions that could create a more robust policy framework.

The findings are accompanied by quotes and paraphrases from the interviews, roundtables and questionnaires carried out in the course of this consultation.

THE EU POWER MARKET WILL BE IN TRANSITION FOR THE NEXT 40 YEARS

1. We are facing a shortage of capital in the financing of a decarbonised power sector

As the EU power market is entering a new era of transformation to a decarbonised end state traditional ways of financing are increasingly facing difficulties and it is unlikely that the required assets will be built if we do not change our thinking on how the transition should be financed, and how this financing should be risk managed by governments.

- As the renewables market is maturing and the demand for renewable energy is increasing, projects are becoming bigger and more complex. Larger scale wind and solar projects, especially those in the offshore wind sector, are very capital intensive and require large players with strong balance sheets to finance them. Also, it is increasingly difficult to find financiers who are willing to provide the full finance for these projects and often a consortium of financiers is needed to come to financial close.
- The same logic to some extent works for the financing of nuclear new-build and carbon capture and storage (CCS). CCS is currently still in the government supported demonstration phase and will need to see significant technology learning before commercial role-out can happen.⁹ For nuclear, strong government support is needed in the pre-construction phase and the government has to accept (part of) the liability for the long-term storage of waste and disaster risk.

2. There is not enough capital available from the active financial actors in the power sector in the current system to meet decarbonisation targets

There have been a number of studies that provide estimations of the investment challenge to meet low-carbon requirements.¹⁰ Although each of these studies have their own scope, assumptions, technological assumptions, etc., they all point out roughly the same trend, namely that a significant increase in investment levels is required in the next two decades.

This conclusion is not surprising as low-carbon technologies by definition are very capital-intensive assets with relatively low operational cost. Over the full lifetime of the assets the economic costs level out for the various technologies. As such, many of the studies argue that regardless of the decarbonisation path that is chosen, the overall cost to society is more or less the same.

Recognising the need for a fast scale up of capital allocation to the energy sector, this study addresses the question whether the financial actors that are currently active are capable of raising enough capital to meet this increased demand.

“WE NOW HAVE TO FOCUS ON LARGE-SCALE CAPITAL DEPLOYMENT INTO THE NECESSARY AREAS. WE NEED A GRAND INDUSTRY PLAN - ENERGY POLICY 2.0.”

9. Estimations are that commercial role out of CCS will only be happening after 2020.

10. E.g. Roadmap 2050 (www.roadmap2050.eu) calculated €1.3trn investment in the next 15 years for generation and grids; Accenture, Barclays (2011), Carbon Capital: Financing the low-carbon economy, estimate about €508bn in the next 10y for generation and another €529bn for electricity distribution.

3. *The power market of the future dictates a more capital-intensive industry*

In the last decade the renewables industry has moved from the ‘proof of concept’ stage, via demonstration and scale-up stage to a situation where most technologies are now increasingly reaching market maturity and some are close to grid parity. And as technologies moved down the technology development curve, the types of financing changed as well, with a shift from venture capital to the public credit and debt markets.

Also the financing model is increasingly changing. Where projects used to be financed on a project-by-project basis, in the future the maturing technologies, due to the scale and complexity, will need to find more efficient ways of financing that allows for a faster investment rate.

This new reality will see a strong role for utilities to increase their investments in low-carbon assets. Utilities are the primary actors who can really take on the large-scale complex generation assets, such as offshore wind projects or nuclear new builds. However, utilities are struggling to finance these projects on their balance sheets.

4. *Europe’s utilities are experiencing increasing pressure on their balance sheets*

Utilities have many generation assets sitting on their balance sheet so much of their capital is actually locked-in and cannot easily be freed up to be reinvested. Many of the larger utilities are struggling to hold on to their credit rating, which makes it harder for them to access low-cost capital from the capital markets. As a result they have been trying to sell of underperforming assets.

Despite these challenges there is little doubt that utilities will play a major role in constructing future (low-carbon) generation assets. The fragmented market of small players, e.g. the solar industry in Germany, does not have the financial or human capacity to construct all of the large-scale assets required.

“THERE IS LITTLE DOUBT UTILITIES WILL PLAY A PIVOTAL ROLE IN THE CONSTRUCTION, OPERATION AND MAINTENANCE. THE QUESTION IS WHO WILL BE THE LONG-TERM OWNERS OF THESE ASSETS.”

5. *We need a new financing model that will attract institutional investors*

A new way to finance these assets could be to redefine the role of the different actors in the financing value chain and to find new actors who can provide part of the financing required as part of a market reform package.

- The new financing model should allow for a very intensive scale up of investments in low-carbon technologies. The investment levels required to meet 2050 targets are up to double the historic investment rate for the next 15 years.¹¹
- The new model should be attractive to institutional investors (sovereign wealth funds, pension funds, insurance companies) to provide capital to the power sector. Historically, these long-term holders of capital tended not to be directly active in this sector, but they do hold a large pool of capital, which could be attracted under the right conditions.
- In the new financing model, there would be a stronger disconnect between the long-term owner and the operator of the asset. Utilities would still be the natural operators of the plants, but would look for ways to sell of (parts of) these assets to third party investors as soon as the most prominent construction and technology risks are very much reduced.¹² This can be done in a number of ways,

11. Various studies, including European Climate Foundation (2010), Barclays & Accenture (2011), Ernst&Young (2010) have come to different estimations of the required investments partly due to differences in scope.

12. E.g. for an offshore wind project, after approximately 3 years of operation, the costs of repair and recalibration are much reduced and become very manageable.

e.g. via direct investments or asset-backed securitisation. As a result utilities would be able to rapidly free up capital and increase their investment rate, while still maintaining the operational control of the assets.

- In the short term investors and ratings agencies remain shy of new technology risk and the scale and novelty of implementations. Corporate debt issuance linked to such assets would allow investors to gain a better appreciation of the assets being built and allow time for confidence in the potential for asset-backed securitization to be then introduced.
- A policy framework strongly supporting the transition to a decarbonised power sector would need to be put in place. This framework would need to set the right system boundaries and incentive structure that is attractive, stable and robust, and ideally has limited complexity complexity and has the need of long-term investors – especially bond holders – in mind.

“WE NEED A TWO-STEP PROCESS IN WHICH UTILITIES FIRST BUILD AN ASSET PORTFOLIO AND THEN SELL IT POST-CONSTRUCTION TO INSTITUTIONAL INVESTORS. RECYCLING CAPITAL WILL BECOME MORE IMPORTANT IN THE FUTURE.”

THE ROLE OF DIFFERENT INVESTORS AND THEIR INVESTMENT BEHAVIOUR

6. Banks are 'creatures of precedent' and tend to avoid new and different projects

Banks are 'creatures of precedent' and look to track record and deals getting done which will lower risk perception, and will go to locations (and policy regimes) where the deals are easiest to do. There is a need to accelerate inroads on projects such as offshore wind in these new larger markets sooner, in order to educate investors and thereby facilitate a widening of the capital base.

Expected return on equity is generally higher, in line with the higher risk profile of equity investments. As many governments have put in place policy frameworks to reward equity, e.g. a clear support scheme for renewables investments, equity has been available for many renewable projects. However, as current policies are moving to more restricted support schemes, the market for equity is less attractive than a few years ago. Although equity is still available, there is little additional equity being made available for the sector.

“YES, THERE IS A HUGE UNDERINVESTMENT TAKING PLACE AT THE MOMENT. THIS UNDERINVESTMENT WILL LIKELY LOCK US (GB) INTO A GAS-HEAVY OCGT ASSET BASE - EASY AND FAST TO CONSTRUCT AND FINANCE.”

7. Financiers see the European power market as lacking of direction

Banks are slowly recovering from the financial crisis and are increasingly looking for interesting deals in the power sector. Utilities have experienced the economic crisis relatively late and are behind the banks in their recovery. Governments after proposing (green) stimuli are now increasingly implementing austerity measures, which also hit the power sector. This coincides with an emerging

discussion on the sustainability of existing support mechanisms in the longer run. This has an impact on the availability of capital in the current market.

For project finance, in most regions, banks are arguing there is a lack of strong bankable projects coming forward for financing. The banks are looking for more deal flow (project proposals) and claim there is a shortage of (risk) equity to attract debt provided by banks. Looking at the track record of equity investors in renewables, their performance is not so good. There have been positive exceptions – sometimes caused by 'bad policy', such as the Spain case – but profit margins have been tight, with some projects under-performing, e.g. onshore wind projects in the UK.

8. Financial actors are usually actively investing in only a few Member States

One immediate effect of a fragmented EU policy, is that financial actors are usually actively investing in only a few Member States, e.g. those in which their clients are active, or in which they have a good understanding of the market conditions.

Financiers admit to having a strategy of that could be described as 'country hopping'. Every 4-5 years investments are made in different Member States depending the energy policy developments and the attractiveness of the renewable energy market. There is competition between EU countries for the same pool of investment capital, which may result in inefficient policies that could be unsustainable in the longer run. The complexity of energy markets and the volatility of support mechanisms are considered a hurdle that holds back investors to move to other geographies.

9. Financiers are sceptical of utilities' ability to access the capital they need

Another aspect that has emerged in the conversation on the financing question is the level of ambition in the utilities plans to meet Member States' renewable action plans and the ability of the financial community to finance these ambitions.

Member States have developed national renewable energy action plans (NREAPs) to meet Europe's 2020 targets, which comprise of a significant scale up, e.g. Round III in offshore wind in the UK foresees 32GW of new build towards 2030.

Utilities' expansion plans to meet these ambitions show an enormous increase in market capitalisation, close to doubling and sometimes more than doubling their current market capitalisation in renewables. In short, these plans show all utilities' investments growing at an incredible pace in the next 15 years.

The financial community, confronted with these numbers, were very sceptical on the ability of utilities to find these levels of capital to invest in this sector.

10. As renewables head for a capital shortage, only the top 10% of projects are being funded

In combination with the limited flexibility of banks to increase their lending, and limited capacity of private equity players to make available new funds, the sector seems to be heading for a serious credit crunch. The emerging picture from the above observations, is one where under current market conditions only the best projects are being financed (roughly the top 10%), leaving the bulk of projects required struggling to find finance. With a massive scale up required in the next 15 years, the current system will simply not be able to provide the funding required.

11. Rating agencies do not value renewable energy assets

Rating agencies, which provide the credit rating for utilities, negatively value the utilities exposure to these assets, as they are perceived as higher risk assets. As a result a higher exposure to these asset classes will have a negative impact on the availability

of low-cost capital from the markets.

Recognising this problem – and for a range of other reasons – utilities have tried to reduce their exposure to these types of risks by investing off balance sheet, *i.e.* co-investing in joint ventures. Rating agencies, however, still attribute these investments to the rating of utilities as they see these investments as 'too large to walk away from.'

“VIEWED IN ISOLATION, OFFSHORE WIND PROJECTS, CONNECTED TO SHORE, WITH CAPACITY GUARANTEE, COULD YIELD A GOOD RETURN OF 9%-11% POST TAX NOMINAL OVER A 10-15Y PERIOD. THAT WOULD BE AN INTERESTING RETURN FROM AN INFRASTRUCTURE INVESTOR POINT OF VIEW. FROM AN EQUITY INVESTOR POINT OF VIEW THAT WOULD BE LESS INTERESTING – AS THIS WOULD BE LINKED TO THE REST OF THE UTILITY'S BALANCE SHEET WITH ALL THE HIGH-CARBON ASSETS AND OTHER RISKS.”

12. Institutional investors requirements are a good match for renewable energy investments

As a result of the growing understanding that there will be limited capital available in the current system, there is an emerging debate on finding new actors who could be attracted to the power market. This debate mostly focuses on institutional investors, *i.e.* pension funds and insurance companies. As institutional investors operate under a fiduciary duty, which dictates a very clear risk-return strategy. This also introduces the possibility of a 30 year investment horizon, which fits very well with the lifetime of power assets. Operational risks and costs are very low once the asset is up and running for a number of years, and the returns can be guaranteed for a long period – at least when supported by a n effective subsidy regime.¹³

“WE [INSTITUTIONAL INVESTORS] LIKE THE BORING STEEL AND CONCRETE LONG-TERM CONTRACTED ASSET. 20 YEARS IS A VERY ACCEPTABLE TIMEFRAME.”

Institutional investors are looking to fill a very specific gap in their portfolios and are looking for long-term stable returns, low-risk, and limited complexity products. Traditionally, they invest most of their capital in government bonds and (partially) stocks that follow the index (following the market trends to slightly outperform). Institutional investors tend to invest globally and across sectors, moving their assets around to meet these requirements. The larger institutional investors have small teams that invest directly in (infrastructure) projects. Often these investors operate under a fiduciary mandate, which prevents them from radically changing their investment behaviour.

Risk, return, policy stability and solvency are key factors on the institutional investor side. If these are not aligned to present a clear direction then this does not help send a signal to capital providers about the scale of capital required.

13. There are ways to repackage assets to be attractive to institutional investors

The current investment opportunity is not per se attractive to institutional investors because of the higher risk exposure in the pre-construction phase and the volatile policy regime. There are, however, ways to repackage power market assets or restructure investment opportunities in such a way that would make them attractive to these investors. Apart from investments in listed equity, there are roughly, two ways via which institutional investors can invest in the power sector: one is to actively take a direct stake in generation or grid assets, the other is by acquiring asset-backed securities.

“IN ORDER TO BRING IN INSTITUTIONAL INVESTORS THE PRODUCT HAS TO BE EASY TO UNDERSTAND. DO NOT TRY TO OVER-ENGINEER THE PRODUCT. MORE COMPLICATION WILL REDUCE LIQUIDITY.”

13. We have seen that policy regimes are not always as strong as one would expect even in Europe. One investor remarked on Spain's announcement to revise its feed-in tariff policy: “A developed market like Spain is not where you would expect this type of policy risk”.

14. *Standardisation of contracts could help with bundling*

It is clear that direct investment cases are still rather exceptional and many of the contractual conditions are set on a case-by-case basis and that the actors who are looking for these kind of opportunities form a relatively small group. For some investors it is clear however that, if there are ways to simplify and standardise these types of contractual arrangements, there would be a significant potential in attracting more capital in this way.

"AS A PROGRESSIVE LARGE PENSION FUND WE HAVE LESS THAN 1% OF OUR TOTAL ASSETS IN RENEWABLES. THIS IS A NEW MARKET FOR US."

15. *Institutional investors should be encouraged to take more direct stakes in generation or grid assets*

This practice is mostly limited to the larger institutional investors, e.g. the Danish and Dutch pension funds, who have dedicated small teams that are looking for direct investments in infrastructure. Overall a limited portion of the total assets under management of these funds – between 1-2% – is available for this type of direct investments, but this is potentially a very large pool of capital.¹⁴ These investments however, are not solely directed at the power sector, but are competing with a range of opportunities in infrastructure. Also, this capital is not freely 'available' as it is allocated to other sectors at the moment.

There are a number of examples where institutional investors have taken a direct stake in operational generation assets. In these cases, the sold assets would have been operation for a number of years, removing many of the associated risks and providing a track record of stable returns.

Recently, a number of interesting projects were

announced where institutional investors have taken a direct stake in assets in the construction phase. These cases are very interesting as in this stage the associated risks are much higher. In contractual agreements, these investments are packaged in a way that would protect institutional investors on the downside and excludes them from better performance on the upside. In this way the arrangement is attractive for all parties involved. The most prominent example is the arrangement between Dong (a Danish energy company) and PGM (a Dutch pension fund) to take a 24.8% stake in a 367MW offshore wind farm under construction. In the contractual arrangement risks were packaged so that this would be an attractive proposition, and DONG retains responsibility for the operations.

"THE LOW-CARBON INVESTMENT OPPORTUNITY CAN BE SEEN AS A SQUARE PEG TRYING TO FIT A ROUND HOLE. THE PEG - BEING THE HIGHER RISK LOW-CARBON PRODUCT - CAN BE MADE ROUNDER BY DE-RISKING, WHICH THEN WOULD ATTRACT MORE CAPITAL. OR THE HOLE - BEING THE INVESTMENT COMMUNITY ACTING ON MARKET CONDITIONS - CAN BE ALTERED TO BETTER ACCOMMODATE THESE LOW-CARBON INVESTMENTS. THE BEST WAY IS TO USE EXISTING MECHANISMS, NEW AGENTS, AND NEW PLAYERS, TO ROUND THE PEGS SO THAT THE CAPITAL MARKETS CAN ACCOMMODATE THEM."

14. In potential the institutional investors represent a very large pool of capital. For example, the IIGCC with 72 mostly EU-based members represents about €6.5 trillion. On January 2010, a group European-, US- and Australian-based institutional investors released a statement 'post-Copenhagen' calling for progressive action on climate change. This group at that time represented €13 trillion of assets.

THE RISK AND RETURN CHARACTERISTICS OF LOW-CARBON INVESTMENTS AND THE BARRIERS TO INVESTING

16. Low-carbon technologies are in different stages of development

Low-carbon energy investments are in different stages of development. Some technologies are close to or on grid parity (onshore wind), or have come down the technology learning curve very fast (solar PV), while other technologies are not as far developed and are facing new challenges (offshore wind), still in demonstration phase (CCS), facing political and social challenges (nuclear, CCS). The risks associated with each technology as a result vary, but some general points can be made.

Strong renewable support regimes across Europe have stimulated investments in these sectors and have played an important role in bringing down technical costs for specific technologies. Other global developments, such as the strong Chinese backing for renewable technologies, can be expected to deliver a new round of technology cost reductions.

“INSURANCE COMPANIES HAVE AN IMPORTANT ROLE TO PLAY AS THEY CAN BUY DOWN SOME OF THE SPECIFIC RISKS INVOLVED WITH LOW-CARBON ENERGY PRODUCTS. THERE IS MUCH EXPERIENCE WITH WEATHER RISKS, FINANCIAL RISKS ETC. BUT ALSO STEPS ARE TAKEN IN THE REALM OF POLICY RISKS.”

17. Flexibility in size (bundling) is one of the key and necessary elements to attract institutional investors

Renewable energy projects can be scaled-up and down to fit within investors parameters. In comparison nuclear investments were mostly considered too big and risky for direct investments (apart from ethical considerations).¹⁵ This is relevant as deal-size was often mentioned as a factor of interest. Although low-carbon investments share the same capital intensity, they vastly differ in many other characteristics, including deal size. Renewable projects are by nature smaller in scale than traditional energy projects, although offshore wind projects are increasing in size, while nuclear projects are extremely large investments. Institutional investors are usually looking for relatively high minimum deal sizes (€30-50m is no exception). One way to tackle this is by bundling renewable projects to create larger portfolios.

18. Of all the risks that were discussed, policy risk is the most difficult risk to manage

All investments carry risks and provide returns. As the risks of investments are higher, the return should meet that higher risk. In most investments the most important risk is the economic risk of an investment, *i.e.* the risk that an investment will have a return below the expected rate. By providing a guaranteed return on investment using a feed-in-tariff scheme, the economic risk is taken away, and replaced by a dependency on support policy, which creates a risk in its own right.

15. It must be noted that nuclear projects have often seen innovative ways of risk sharing in which risks were sliced up in manageable parts, which were shared across a range of investors and even large (industry) consumers.

Most project-related risks (construction, technology, sponsor, inflation, and even weather risks) can be priced into a investment decision. By applying specific risk mitigation mechanisms (insurance, diversification, hedging) an investor can address the risk and become comfortable with it. Not so with policy risk. Policy changes are unpredictable and can have unlimited effects on the profitability of the investment. In this regard, nuclear power is an extreme example where the profitability of an investment is fully dependent on the political decision to extend, retire early or shut down production. But this also holds for taxation and to a lesser extent carbon pricing under the EU ETS.¹⁶

“WE HAVE TO ADDRESS POLICY RISK, TECHNOLOGY RISK, EXCHANGE RISK, EXPROPRIATION RISK. THE LAST ONE WE GENERALLY USE EXPORT/IMPORT BANKS FOR; TECHNOLOGY AND EXCHANGE RISK WE HAVE LOTS OF TOOLS FOR. THE HARD ONE IS POLITICAL RISK.”

The current EU policy landscape, especially with regard to support mechanisms, is perceived by investors as volatile with the partly retrospective policy changes in Spain viewed as the clearest example of how changes in policy not only have a direct negative effect on local investments, but also have a spill over effect on other countries. The immediate negative effect in Spain also shows the delicate nature of setting and retaining the right level of support.

“LET’S PUT THINGS IN PERSPECTIVE: TOTAL RENEWABLES SUBSIDIES TO MAKE THE LOW-CARBON POWER TRANSITION WOULD ADD UP TO €30 BILLION A YEAR ACROSS THE EU, THE COMMON AGRICULTURAL POLICY PROVIDES A €50 BILLION SUBSIDY PER YEAR.”

The impacts of the Spanish regulatory actions are EU wide and have rippled out further afield to investors that might have been expected to provide capital into Europe (e.g. US investors that might have allocated capital to specialised equity funds). Other national policy debates are fuelling the uncertainty over regulatory stability, e.g. in Germany renewables support adds about one-third to the wholesale energy price for consumers.

The expectations are that policy volatility will remain a key issue for the foreseeable future as Europe is coming to grips with the low-carbon agenda. As a result it is likely that the investment rate will fall behind the required investments to stay on track for a decarbonised power sector. This will reduce decarbonisation options, *i.e.* the degrees of freedom to decarbonise, and will likely lead to more costly decarbonisation in the future.

16. Again referring to how the events in Japan resulted in an immediate moratorium on nuclear in Germany, Italy, and a review - or «stress test» - in the whole of Europe.

THE ROLE OF GOVERNMENT POLICY IN DRIVING CHANGE IN THE POWER MARKET AND THE IMPACTS OF FINANCIAL REGULATION

19. Increased EU coordination is required for an effective power market

Although Europe is centrally coordinating its climate, energy efficiency and renewable energy targets, energy policies are still to a very large extent designed and implemented on a national Member State level. The decarbonisation agenda in general, and power sector decarbonisation specifically, is fuelled by strong European ambitions.¹⁷ It is increasingly clear that from both a technical – e.g. cross-border connectivity – and economic – e.g. energy pricing – perspective, increased European coordination and alignment of policies is required for a effectively operating and cost effective power market.

Policy to a large extent determines investment behaviour directly but also indirectly by creating a virtuous cycle of investments, as expected returns are rewarded and lead to further strengthening on expectations.¹⁸

As such, there seems to be a disconnect between the EU-level, long-term ambitions for the decarbonised economy and the nationally oriented power and support policies.

“CURRENT POLICIES DO NOT MATCH THE 2050 PLAN. IT’S AN ONGOING STRUGGLE TO MATCH POLICY WITH THE RISK PROFILE OF THE INVESTORS WE ARE TRYING TO ATTRACT.”

20. Financiers see the EU energy market as fragmented and too complex for active scale-up

Although the EU is increasingly providing a clear vision on a Member State level the direction of policy and the policy framework is much less clear. From the perspective of the financial community, the EU energy market is seen as a patchwork of 27 separate markets with their own set of ambitions, rules and regulations, regulating authorities, and price structures. Furthermore, the power market is considered to be very complex both from a technology, pricing and support mechanism perspective.

As a result the accessibility of the power sector for both incumbent and new financial actors is limited. This raises questions about how the policy landscape, further harmonisation and European level coordination could be beneficial to provide better access for capital.

“ON THE ROLE OF GOVERNMENT: THERE IS AN INCREASING, STRONG CASE FOR A ‘NATIONAL BUILDING PLAN’ APPROACH SUCH AS THE GAS/ELECTRICITY PLANS OF THE 70S, BUT FOCUSED ON LOW-CARBON INFRASTRUCTURE. THESE SHOULD BE NATIONALLY FOCUSED AT FIRST. BY THE TIME THE VARIOUS MEMBER STATES START BUILDING THE CASE FOR FURTHER INVESTMENTS IN INTERCONNECTION WILL EMERGE.”

17. See for example the EU *Roadmap 2050* recently presented by commissioner Hedegaard, COM(2011) 112/4, <http://ec.europa.eu>.

18. See *A New Growth Path for Europe* (2011), European Climate Forum et al., www.newgrowthpath.eu

21. Financiers see the EU as the body that provides the long-term vision

The EU, by providing a high level framing of the policy direction on climate, e.g. via the EU ETS, 2050 vision documents and roadmaps, are setting the long-term vision for Europe's low-carbon development. Member States have to develop national energy policies within the EU vision.¹⁹ In its capacity as an oversight body, the EU can perform a credibility check on national policies, e.g. the European Commission can provide strong feedback on national renewable energy action plans (NREAPs) to ensure the EU as a whole is on track to meet its 2020 targets. A strong check on the credibility of the individual plans will help to build investor confidence in the market.

The role of the EU versus Member States in the power market, i.e. the level of involvement that would deliver the optimal financeable framework, will require further debate that should take place in the context of the post 2020 policy debate, which will start soon.

22. Support mechanisms have worked very well in targeting the development of nascent technologies but might not be suitable for maturing technologies

The sustainability of support mechanisms for renewable technologies is increasingly under scrutiny. A prominent example is the Spanish announcement to reduce its premiums on its feed-in-tariff in June 2010. But also in other geographies the debate on the costs of renewable energy support schemes is very active. As mentioned earlier, the absolute level of support will rise as more renewables are supplying energy to the grid, which will put upward pressure on wholesale prices, e.g. in Germany roughly a third of the wholesale energy price is for renewables support.

“THE PROBLEM WITH REGULATION IS THAT WHEN IT COMES OUT NOBODY UNDERSTANDS ITS FULL IMPACT. IT TAKES TIME TO FULLY PRICE IT.”

23. Investors want a durable pathway rather than a perfect or uniform one

In the debate on the sustainability of support mechanisms, the ideal situation suggested by financiers is to create a harmonised EU-wide scheme. However, the political and economic reality is different. EU support policies for renewables have been developed bottom-up by different Member States, which has resulted in approaches that are similar on a high level, but very different in the detail. And although a convergence to more harmonised schemes is already underway, a harmonised system is not achievable and – more importantly – not a prerequisite for investments. More important is the need for a clear and durable path that is effective rather than have a perfect or uniform system across Europe.

“POLICY MAKERS NEED TO CREATE A STRONG FRAMEWORK THAT IS FINANCIALLY ROBUST AND TAKES INTO ACCOUNT FINANCIAL REGULATION.”

24. Under Basel III banks will no longer be able to hold long-term assets, like renewables

Not only energy policy but increasingly financial policy and regulation dictate the investment appetite for the financial community.

The Basel Accords are recommendations on banking laws and regulations issued by the Basel Committee on Banking Supervision, which have set framework for the international regulation of the banking sector. As a response to the financial crisis new stricter Basel III regulations were issued

When the Basel II regulation was introduced, this had a lot of impact on the way of working of the banking system. Due to a more stringent risk control mechanisms many of the private equity practices of commercial banks were sold. Basel III has a lesser impact but the most important backlash is that banks will no longer be able to hold on to long-term assets.

19. The EU ETS is one of the few instruments that actually dictates national policy, with limited national influence apart from the allocation of allowances. Other instruments, such as the energy savings and emission reduction directives just set the target for Member States to achieve using national policies.

25. As Solvency II rules impact, regulators need to better understand risk profiles

Often called “Basel for insurers,” Solvency II is somewhat similar to the Basel banking regulations, aimed to reduce the risk exposure of insurance companies in Europe. Solvency II is scheduled to come into effect on 1 January 2013.

As Solvency II is now introduced for the insurance sector, this will have a serious impact on the asset liability management of insurance companies.

As part of Solvency II insurers will have to assess the risks associated with their capital allocations and hold higher levels of liquid assets to match these risks. The role of the regulator is to judge the process of allocation and the assessment of the risk.

One risk is that higher capital allocations to low-carbon power assets, be it bonds, direct investments or asset-backed securities, will result in a higher liquidity demand, which could lead to disinvestments and reallocation to other less risky assets, such as short term government bonds.

The other risk is that insurance companies will need to increase their holdings of AAA rated bonds at the expense of AA and A rated that are the province of utility companies, quasi-government offerings and the like. This would significantly reduce investment funds available to the energy sector.

This risk is further increased by the tendency to lump low-carbon assets together, while in fact they are very different. Long-term corporate bonds carry very different characteristics to asset-backed bonds, *i.e.* with the former risks increase over time, whereas with the latter they decrease. This should be reflected in regulation pertaining to asset allocation, which it is currently not.

Also, as these investors have lost their solvency positions as a result of the economic recession, these investors are increasingly under close supervision from national regulators. With increasing demands on the solvency of their assets portfolio, it is crucial for regulators to understand the risk profile of specific investments and for policy makers to take a broader view than just energy policy in isolation.

“SOLVENCY II WILL LIKELY MOVE CAPITAL AWAY FROM RENEWABLES INVESTMENTS AND INTO LOW-RISK SHORT-TERM GOVERNMENT BONDS.”

POLICY IMPLICATIONS AND POTENTIAL SOLUTIONS THAT COULD CREATE A MORE ROBUST POLICY FRAMEWORK

26. Governments should leverage their access to low-cost capital by offering selective wraps and warranties

Governments can use their access to low-cost capital to support investments in the low-carbon energy sector. In support of EU and national policies, government backed financial institutions – *i.e.* the European Investment Bank (EIB) or European Bank for Reconstruction and Development (EBRD) and the UK Green Investment Bank (GIB) – can provide a range of products that can help to bring down risks in the sector or inject catalysing money to attract more private sector financing.

Government backed institutions (EIB, GIB) have a potentially important role in reducing project risk *e.g.* through the provision of wraps and warranties, but the role they can play must be viewed in the wider context of the policy framework.

“GIVEN THE LACK OF PUBLIC FUNDS AVAILABLE WE NEED BETTER WAYS OF LEVERAGING PRIVATE CAPITAL. THE EIB 100% FINANCING TO A SLOVENIAN COAL PLANT DOES NOT FIT THAT PICTURE.”

The EIB strategy currently allows for financing in different sectors as long as the investment is in line with EU policy. As this is not very specific the EIB will invest in a wide range of projects in the power sector, both in high- and low-carbon, which are in line with different often-conflicting EU policies. For example, last year the EIB announced a controversial co-investment with the EBRD of €770m in a coal plant in Slovenia. The loan met the EU criteria to support the economic development of new Member States, but arguably was at odds with EU environmental and

health policies. Furthermore the investment didn't have any private sector leveraging, *i.e.* the plant was fully funded with public money.

As policy risks are considered to be one of the key challenges to scaling up investments there is an increased focus on solutions to tackle this risk. On a macro-level a more harmonised EU policy that has clear long- and medium-term objectives would provide clarity on the policy direction. At the same time more ideas are floated to strengthen government policy commitments in more direct ways using new and existing institutions (of which the UK GIB is one) capable of developing supporting financial products and technical assistance to achieve policy imperatives.

“WE NEED INSTRUMENTS TO TAKE KEY RISKS OUT OF THE EQUATION, SUCH AS STATE GUARANTEES, PLUS A SERIOUS AMOUNT OF CREATIVITY.”

27. A climate bond market can be created for liquid asset backed low-carbon securities

A key challenge is to get banks and utilities to refinance to unlock capital tied up in mature projects and recycle it into development of new projects. There is significant opportunity to refinance renewable energy assets with asset-backed securities, either using the European “covered bond” approach or setting up special purpose vehicles to hold the assets. There may also be pressure on banks to divest such assets under the new Basel III rules. By retiring established assets into high-security lower-yield vehicles suitable for institutional investors, banks will be able to focus on the higher-yield project development lending they do best.

“THERE IS A MARKET FOR GREEN BRANDED, VANILLA FLAVOURED BONDS - WHEN FACED WITH THE CHOICE INVESTORS WILL CHOOSE GREEN OVER NON-GREEN AS LONG AS THE RISKS ARE THE SAME.”

In theory there is much support for bonds that are ‘green flavoured’, with institutional investors typically saying that, presented with green and brown investments with the same investment grade rating, they would choose green in recognition of the macro risks of climate change.

However, to build a market for these bonds one would need volume and comfortable parties. A central issue in the context of the potential to use bonds is: how will we create liquidity? Meaning that investors are looking for the capacity to sell bonds whenever conditions dictate, whereas this is difficult if external factors (such as regulatory changes *etc.*) make that unfavourable.²⁰

Liquidity issues are one of the risks that governments should target in this context, i.e. the shortage of liquid assets that are required under the new pension fund and insurance industry regulations. Assets need to be available at low risk. More generally, banks and capital markets don’t have visibility on the costs of liquidity. Another way of looking at this is the unknown cost of illiquidity, meaning that it is hard to price into normal activities the drying up of capital market conditions we have experienced from time to time since October 2008.

Investors need to hold long-term assets to match their liability profile, but these have high price volatility and are sometimes hard to sell (or require discounting in illiquid moments). This constitutes a regulatory risk. For a pension fund to develop a long-term product it would still need to be liquid

in relation to the market 20 years from now. For example, financing Photo Voltaic (PV) liquidity may be needed in 5 years, which will leave an investor exposed to the financial market should that situation arise.

A further need is for standardization with the labeling of climate bonds. Investors seeking to manage portfolios that maintain a preference for investment grade climate bonds need to be assured that the bonds they buy from various entities can justifiably claim to address climate change. The simplest way to do this will be to adopt a widely respected standard supported by credible organisations in the environmental and investment community.

28. Inflation linking is important for investors

Another important element of the return profile of renewables investments is to have “inflation linking”. Under a fixed tariff support policy, returns fluctuate with the electricity price. If the price goes up due to inflation, the subsidy income goes down. This is harmful for investors, especially institutional investors. Currently there is no “inflation compensation” in the support schemes in all EU countries, but it does exist in Belgium and the UK and has been successfully applied in other (infrastructure) markets.

Inflation linking does raise the point how risk is shared between government and private capital: inflation linked could mean that the government treasury accepts a more volatile subsidy expense, to give the investor a more predictable return of an inflation linked income.

20. A number of examples were presented where infrastructure bonds, e.g. for bridges and railways, were impossible to sell in a secondary market creating a fixed liability for the holders.

29. Political risk insurance has significant potential to reassure investors about policy risk

One of the more promising ideas to bring down policy risk in an effective, low-cost manner, is the development of an EU or even country based “policy risk insurance” mechanism that would allow investors to insure themselves against the risk of governments changing their support policies.

The policy risk insurance mechanism is an established model, for example Multilateral Investment Guarantee Agency (MIGA) or export credit guarantees that is used especially in the context of less stable regimes in emerging countries to increase direct private sector investment.

The model works as follows. If the viability of an investment depends upon, for example, feed-in-tariffs remaining in place in a specific territory for a certain period of time and this period is guaranteed

by policies currently in place, then a public or even public-private facility could be used to insure against a change in the policy retroactively.

In the case of low-carbon investment, this has the added benefit of alignment of risk with interest. As the government takes a large stake in the insurance of policy change they are accepting the political risk of the investment. The effectiveness of such an arrangement will be to carefully target and underwrite risks that are blocking investment combined with a pricing that is not prohibitively expensive.

Although some further analysis has to be done to move this idea to practical implication, there is a huge potential that this arrangement, both on a Member State level, *e.g.* supporting policies alongside a green investment bank, and on an European level, where the EU would underwrite the risk of Member States taking retrospective action.



CONCLUSIONS

The capital requirement to decarbonise the power sector is significant. New high capex assets will come online as older low capex assets are retired. Over a 40 year period, the economic impact of this transition will be limited, especially if we take into account the increased volatility of fossil fuel and carbon prices, but in the short run there will be a major increase in capital demand.

The consultation undertaken in the production of this report, demonstrated that the investment community is not yet fully aware of the challenge ahead. However, when confronted with the estimated numbers, they voice serious concerns on current developments in the market and the impact they will have on the future capacity of investors to provide capital to the power sector.

The policy framework that would need to attract capital is not sustainable enough for the long run and mostly attracts project finance for emerging technologies. Reducing the policy risk is considered the easiest way to attract more capital.

In the transition to a decarbonised power system new ways of attracting finance need to be found. This also means that new financial actors need to be attracted, as the existing financiers are seriously concerned about financing the utility sector in traditional ways. The picture of a utility sector that doubles the value of its assets with the same number of actors does not sound very realistic to the finance community.

The new financing model should include a greater and more visible role for institutional investors, via bond markets, direct investments or other ways, which will only be possible if their risk and return requirements are met.

Policy makers should increase their effort to include financiers in the policy making process to understand the issues that financiers have and to deliver better, more sustainable policies. To some extent this will require more European coordination, leading to both better European and better national policies.

Finally, the financial community is hard hit by financial regulation and under scrutiny from financial regulators since the financial crisis. It is for good reasons new risk curtailment regulation, such as Basel III and Solvency II, are implemented. However, from a carbon reduction perspective, policy makers have to realise that these regulations may impact the capital availability for low-carbon investment.

The power sector decarbonisation challenge is not a single policy agenda item, confined to the energy policy quarter, but rather a cross-cutting issue that requires strong European and Member State coordination across a range of stakeholders, both from industry and the financial sector. This consultation shows that the financial sector is very willing to engage with policy makers to develop new ideas and help create robust policies that can meet our low-carbon policy imperatives.

ANNEX I - CONTRIBUTING COMPANIES

This initiative has tremendously benefited from the input from individuals and experts from the financial sector, who have shared their thoughts and views openly and in great depth. The European Climate Foundation and our partners in this initiative would like to thank the following organisations for their contributions to this report.

ABN Amro	Eneco	NIBC Infrastructure Partners
Acciona	Energistyrelsen	Offshore Wind Finance
Allianz	Englefield Capital	Parhelion Underwriting
Ampere fund	F&C	PensionDanmark
APG Asset Management	FiH	PFA
Arise Windpower	First Reserve Int. Ltd.	PGGM
ASN	Frontier Economics	PricewaterhouseCoopers LLP
ATP	Garrigues Medio Ambiente	Qualitas Equity Partners
AUGUSTA & CO	Gas Natural Fenosa	Rabobank International
Aviva Investors	Goldman Sachs	Railpen Investments
AXA Investment Managers Limited	Government of Singapore Intesa SanPaolo (Equiter) Investment Corporation	re CEE investment
Banesto Project Finance	Green Growth Capital	REE
BBVA Quality Funds	Hg Capital	Riverstone Europe LLP
Borsa Italiana	Holland Financial Centre	Robeco
BNP Paribas	HSBC BANK PLC UK	Santander
Caser Pensiones Entidad Dewey & LeBoeuf	Iberdrola	Santander Project Finance
Gestora de Pensiones, S.A.	Infrastrutture S.p.A.	SEB
Centrica	ING Group	SEFEP
Citi	Lexicon Partners	SNS Asset Management
Climate Change Capital	Linius Capital	Societe Generale
Credit Agricole	Lloyds TSB Bank plc.	Standard & Poor's
Credit Suisse	Macquarie	StormHarbour
DONG Energy A/S	Mercer	Sumitomo Mitsui Banking Swiss Re
Ecologia y Desarrollo	Mizuho Corporate Bank, Ltd	The Royal Bank of Scotland
E.ON Climate & Renewables GmbH	Mn Services	Triodos Bank (Spain)
ECODES	Moody's	UniCredit Bank AG
Ecofin Ltd	Morgan Stanley	Universidad Comillas Madrid
EDPR	NAB	USS
EIB	National Grid PLC	Vestas Wind Systems A/S
	Newton Investment Management	Wellington Partners
		West LB

In particular we would like to thank the following organisations for hosting the project's roundtables: Rabobank (Utrecht, The Netherlands), ATP (Copenhagen, Denmark), and BBVA (Madrid, Spain).

Disclaimer – We took great care to represent the emerging views as objectively as possible in this document, however the opinions stated do not necessarily represent those of the individual organisations as listed.

ANNEX II - PROJECT TEAM AND ACTIVITIES

The project was coordinated by the European Climate Foundation with expert support from key partners in the field. The project team consisted of:

- **Mark Woodall**, founder and ex-CEO of Climate Change Capital
- **Kirsty Hamilton**, Associate Fellow leading the renewables initiative, Chatham House
- **Sean Kidney**, Founder and Chairman, Climate Bonds Initiative
- **Ingrid Holmes**, Programme Leader Low-Carbon Finance, E3G Third Generation Environmentalism Ltd.
- **Stephanie Pfeifer**, Executive Director, and **Ole Beier Sørensen**, Chairman, Institutional Investors Group on Climate Change (IIGCC)
- **Joanna Lee**, Chief Partnerships Officer, and **Marieke Beckman**, Manager, Corporate Partnerships, Carbon Disclosure Project
- **Peter Sweatman**, CEO and Founder, Climate Strategy & Partners
- **Angela Whelan**, Director of Research, and **Praveen Gopalan**, Researcher, Ecofin Research Foundation
- **Martijn Broekhof** (*project coordination*), Associate, European Climate Foundation

The work was further supported with analytical input from Climate Change Capital and Bloomberg New Energy Finance.

From September 2010 to January 2011, the project team has engaged with the financial community in the following activities:

- In October and November 2010 a survey was carried out amongst 200 investors to generate a first understanding of the financial community's perspective of the low-carbon landscape (carried out by the *Carbon Disclosure Project*).
- From October 2010 to February 2011 the project team members has undertaken in depth interviews with 44 institutions from different parts of the finance supply across Europe (carried out by Mark Woodall, Martijn Broekhof, Sean Kidney, Ingrid Holmes).
- From October 2010 to February 2011, 4 roundtables were held in Madrid (Spain), London (UK), Copenhagen (Denmark) and Utrecht (The Netherlands). A smaller lunch-event was held in Milan (Italy). At these roundtables we discussed the issues as presented in this document and discussed the regional context (moderated by Kirsty Hamilton).

ANNEX III - ROADMAP 2050 BACKGROUND

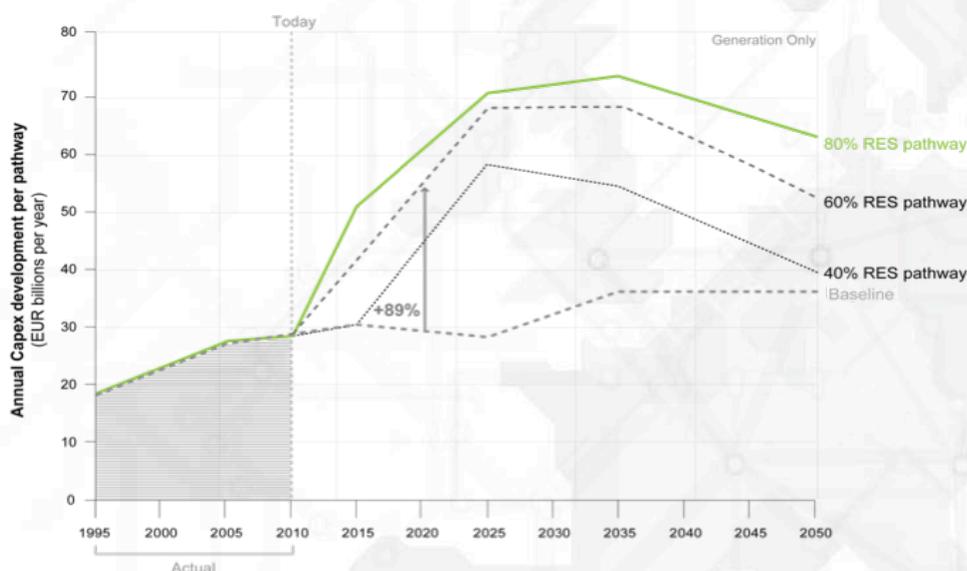
In April 2010, the European Climate Foundation launched the *Roadmap 2050*.²¹ This event marked the end of the first phase of a unique study that has been facilitated by ECF. In October 2009 the European Council set an appropriate abatement objective of 80-95% GHG emission reductions by 2050. To demonstrate how this policy target could be achieved, the ECF initiated a study to build a fact-base behind an EU-wide 80% reduction target.

The study was carried out by expert organisations in the field: Imperial College London, KEMA, McKinsey & Company, Oxford Economics, the Office for Metropolitan Architecture, The Energy Research Centre of the Netherlands (ECN) and E3G. It consisted of a wide range of technical, macro-economic and policy analysis and was supported by a series of industry stakeholders consultations. The process was supported and informed by a core working group of leading utilities, transmission operators, equipment manufacturers, academics and NGOs.

The outcomes of the study were as surprising as they were promising. The study not only demonstrated that full decarbonisation of the power sector is technically feasible with existing technologies, it also showed that this transition makes much economic sense. A decarbonised system can deliver the same system stability at the same price as a high carbon system. With the *Roadmap 2050* – and complementary studies done by others²² – there is now a defensible and politically endorsed blueprint for how the European electricity market can be decarbonised by 2050 and an illustration of four different pathways that could be followed to achieve this objective.

Roadmap 2050: Financing for a zero-carbon power sector in Europe

The *Roadmap 2050* study showed the importance of the power sector in the decarbonisation of our economy. It demonstrated that the decarbonisation of this sector can be achieved using existing proven technologies at an economically affordable rate without compromising system reliability. However, it also showed the need to dramatically increase the investment rate in both power generation and grid connection in the next 15 years.



21. The Roadmap 2050 was funded by the European Climate Foundation. ECF was the sole author of the Roadmap 2050 report, is solely responsible for its content and a guardian of the content. All the project's analyses and key data can be found on www.roadmap2050.eu.

22. E.g.: PwC (2010) 100% Renewable Electricity – A roadmap to 2050 for Europe and North Africa; Eurelectric (2010) Power Choices: Pathways to Carbon-Neutral Electricity in Europe by 2050; Greenpeace (2010) Energy [r]evolution: a sustainable world energy outlook; UK government (2010) 2050 Pathways Analysis.

ECF and its partners have engaged with the financial community in order to:

- Increase the level of awareness of the *Roadmap 2050* outcomes and related studies.
- Ensure that the financial opportunities and implications are properly understood.
- Better understand how the selected financial institutions would respond to different financing opportunities, and what policies would help fast scaling up.
- Better understand the attitude towards 'new' policy concepts – e.g. national or EU wide Green Infrastructure/Investment Banks – that can help drive low-carbon financing.

The project builds on the momentum created by the launch of the *Roadmap 2050* and a series of reports that highlight a similar challenge and opportunity for the financial sector. Much work has been done following the financial and subsequent economic crisis to construct a robust fact base for an increased investment in the low-carbon transition of our economy as many recognise the risk of locking ourselves into a high-risk high-carbon pathway.²³ This discourse is now at a stage where the evidence base is robust enough to create strong policies that will engage the EU-wide and Member State-level debates on various policy areas. These include but are not limited to the EU energy and climate policy agendas, the EU budget review, Member State level energy market reform and financial sector reform agendas.

23. E.g.: Chatham House, Bloomberg New Energy Finance, UNEP, SEFI (2010), *Private Financing of Renewable Energy: A guide for policy makers*; Ecofin Research Foundation, The Climate Group, Global CCS Institute (2010) *Carbon Capture and Storage: Mobilizing private sector finance*; E3G (2010), *Green bonds: The missing piece of the jigsaw*; E3G (2010), *Financing energy efficiency: Bringing together the Green Infrastructure Bank, green bonds and policy*; Aldersgate Group (2010), *Financing the Transition: A Strategy to Deliver Carbon Targets*; IIGCC (2010) *Shifting Private Capital to Low-carbon Investment*.



ROADMAP 2050

FINANCING FOR A ZERO-CARBON POWER SECTOR IN EUROPE

EUROPEAN CLIMATE FOUNDATION, 2011.