

EUCERS Newsletter

Newsletter of the European Centre for Energy and
Resource Security (EUCERS)

Issue 75, May 2018

Introduction

Dear readers and friends of EUCERS,

It is my great pleasure to welcome you to this edition of the EUCERS newsletter, in which we present you with two articles.

In the first article, Danae Kyriakopoulou, the Chief Economist and Head of Research at OMFIF, elaborates how considerations about environment, sustainability and governance increasingly influence investment decisions.

The second article, Ricardo G. Barcelona, delivers an analysis how asset allocation can be made profitable in times of energy uncertainty.

As always, please feel free to keep us informed about your research projects and findings as we look to remain at the forefront of new knowledge and innovative ideas.

Thank you for your interest in EUCERS and for being part of our community.

Yours faithfully,
Thomas Fröhlich
EUCERS Newsletter Editor

In this Month's Edition:

- **Introduction**
- **Newsletter articles**
 - ESG concerns shape allocation decisions.
By Danae Kyriakopoulou
 - Adaptively profiting from energy
uncertainties. *By Ricardo G. Barcelona*
- **Announcements**
- **EUCERS on the Road**
- **Publications**
- **Contact EUCERS**
- **EUCERS Advisory Board**
- **Acknowledgements**

ARTICLES

ESG concerns shape allocation decisions

By Danae Kyriakopoulou

Climate-related risks are expected to intensify, and public investors are adapting their investment strategies to reflect their commitment to responsible ownership. Several public investors have joined the UN Environment Programme's portfolio decarbonisation coalition, a platform for investor leadership on climate change. As long-term investors responsible for securing the financial future of their members and citizens, public investors such as public pension funds and many sovereign funds are naturally concerned about environmental, social and governance issues in the companies and projects they invest in.

The adoption of the United Nations 2030 agenda for sustainable development and the associated sustainable development goals by 193 UN member states in September 2015, the ratification of the Paris agreement on climate change in 2016 and the release of the final recommendations of the Financial Stability Board's task force on climate-related financial disclosures in June 2017 have highlighted policy awareness of the environmental threats to the planet. This has added impetus to the green finance agenda to combat these threats.

Environmental degradation can affect asset values directly

Equities and bonds, as well as real estate and infrastructure, can be subject to risks such as droughts and floods, or gradual changes such as reduced snowfall and rising sea levels in tourist areas. Environmental regulations can have indirect effects on markets and asset valuations, by introducing legal risk and changes to business models, so-called transition risk. Climate-related risks are expected to intensify over time, demanding more attention from financial market participants.

Divestments and decarbonisation strategies

Public investors are adapting their investment strategies to reflect their commitment to responsible ownership and their understanding of environmental risks to economic and financial returns. Often this has taken the form of divestments from companies and industries that contradict

Danae Kyriakopoulou is OMFIF's Chief Economist and Head of Research, heading the organisation's economics staff and providing intellectual leadership and direction to its economic research agenda. She is a frequent speaker and contributor on these themes in international publications, conferences and the media. Previously she was Managing Economist at the Centre for Economics and Business Research. She has also served as Economic Adviser to the Institute of Chartered Accountants in England and Wales and has worked at the Bank of Greece. She holds a BA in Philosophy, Politics, and Economics and an MSc in Economics for Development from Oxford University.

funds' commitments to ESG principles, such as tobacco or carbon-exposed companies.

European and North American pension funds are leading the way. In December 2017, the European Parliament passed a resolution calling on all public and private institutions to divest from fossil fuels. In January 2018, New York City followed similar decisions in California and Washington and announced it would divest the \$5bn fossil fuel investments held by its five public pension funds over the next five years.

These strategies have proved financially costly. A study commissioned by Calpers in 2015 found that it had potentially forfeited \$3bn in returns because of its divestment policy, prompting the fund to reconsider its decision. While the board of Calpers decided to maintain the ban following a vote in December 2016, the study exposed the contradictions for public investors striving to be ethical and profitable at the same time, highlighting the need for creative responses. In August 2017, the New Zealand Superannuation Fund designed a new global equity benchmark that excludes companies with a high carbon impact but provides the same returns as the general global benchmark. This demonstrates it is possible to hedge against environmental risks without having to sacrifice returns.

Norway's NBIM is one of the main drivers of ESG-driven divestments and exclusion. Since 2006 it has divested from 16 nuclear weapons producers, and since 2010 from 20 tobacco producers. It has enacted conduct-based exclusions linked to environmental damage, human rights violations and corruption.

In 2016 it initiated a campaign to reduce the carbon footprint of its portfolio. Following three tranches of exclusions over 2016 and 2017, it divested from 6 companies involved in the production of coal or coal-based energy, with a further 13 placed under observation because of the coal criterion. In February 2018, the Norwegian ministry of finance appointed an expert group to review whether the country's sovereign fund, known as the oil fund, should invest in other energy stocks.

In a more formal commitment, several public investors have joined the UN Environment Programme's portfolio decarbonisation coalition, a platform for investor leadership on climate change. The PDC, founded in 2014, seeks to mobilise and convene institutional investors committed to gradually restructuring their portfolios to support the transition to a low-carbon economy.

Active ownership strategies

At times, there may be obvious contradictions between the best ways to achieve financial returns and the collective ESG values of the citizens and members that sovereign funds and public pension funds represent. An example was that of Australia's Future Fund holding tobacco shares while the Australian government was promoting itself as a global leader in the fight against Big Tobacco.

As large investors, sovereign funds and pension funds can exert considerable influence over investee companies by exercising shareholder rights to encourage them to increase their ESG responsibilities. The growing availability of proxy advisory services, which help institutional investors to decide how to vote in shareholder meetings, has bolstered the trend of activist ownership.

In March 2018, Sweden's AP7, along with the Church of England Pensions Board, joined Australia's Local Government Super in preparing a shareholder resolution calling on Rio Tinto, the mining group, to rethink its membership of coal lobby groups. Such active ownership strategies can help improve reporting and transparency standards, and enhance the sustainability of public investors' portfolio companies.

Out of the subset of asset owners whose portfolios are partially managed externally, 76% of respondents to an asset allocation survey of global public investors by OMFIF in 2018 said they require external managers to

consider environmental and sustainable issues in their investments. This includes NBIM. Even though only Nkr51bn (\$56bn) of its investments are under external management (equivalent to around 5.3% of its capital), five mandates are for environment-related investments.

At the same time, 73% of public investors said green issues have an important role in informing their real asset investments specifically, while the remaining 27% deemed them 'somewhat important'. No investors thought they were 'not important'. Given the important financial and institutional role of many public investors, their promotion of these standards may promote similar trends in their domestic economies.

Investing in sustainable assets

A further channel through which sovereign funds and public pension funds address ESG considerations is actively investing in sustainable assets. An emerging area is green assets. The majority of these investments are in real assets such as green infrastructure, energy-efficient real estate, renewable energy production, clean transportation, and water and waste projects. The most popular use for proceeds from green bonds (itself the most common green asset among public investors) is renewable energy projects. At \$51bn, in 2017 they represented a third of the total, closely followed by low-carbon buildings and energy efficiency at \$5bn. Clean transport and sustainable water management jointly added another \$5bn, with smaller shares going to sustainable waste management (\$6bn), sustainable land use and forestry (\$5bn) and adaptation strategies (\$4bn).

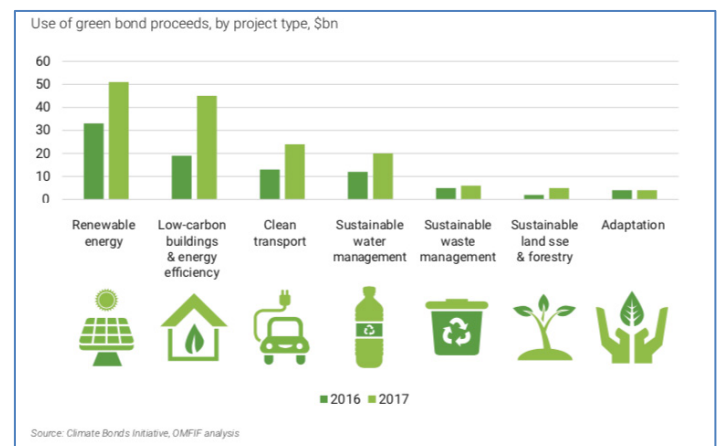


Figure 1: Renewables and real estate dominate green bonds proceeds

Sovereign funds have come under pressure to diversify into green finance because of weak oil prices over recent years. African sovereign funds from Senegal, Nigeria and Morocco are supporting green infrastructure initiatives such as solar panel farms and clean energy and water projects. In the Middle East, Mubadala and the Abu Dhabi Investment Authority are some of the biggest investors in renewable energy and green infrastructure among sovereign funds globally. In Europe, NBIM has a mandate to invest Nkr30bn-Nkr60bn in 'environment-related investments', while Asian public investors such as China's State Administration of Foreign Exchange and the Hong Kong Monetary Authority's Exchange Fund are leading in terms of green debt funding.

While NBIM is an exception and few institutions have formally set targets, OMFIF's survey findings show that ESG is an important concern for many. A majority of respondents (73%) said they invest in green or sustainable assets.

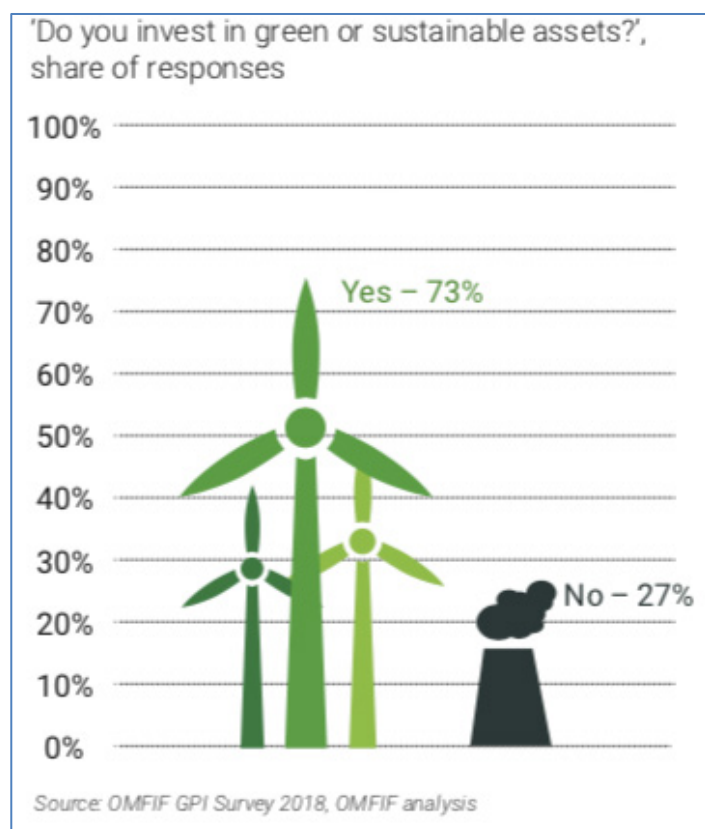


Figure 2: Three-quarters of respondents invest in green assets

Accessing green assets

Green bonds are defined by the Organisation for Economic Co-operation and Development as debt instruments used to finance green projects that deliver environmental

benefits. They are differentiated from regular bonds by their commitment to use the funds raised to finance or refinance green projects, assets or business activities.

The market has picked up momentum over the past three years. The value of green bonds issued doubled for two consecutive years, from \$1bn in 2015 to \$82bn in 2016 and \$155.5bn in 2017, the highest level of annual issuance on record.

Sovereigns have also played an important role in the development of the market. Poland was the first nation to issue green-labelled debt, raising EUR750m in five-year paper. Proceeds were used to finance and refinance projects such as renewable energy generation, clean transportation and sustainable agricultural operations.

It was followed by France, which issued EUR7bn of green bonds in January 2017, with proceeds used to finance and refinance expenditure in six sectors: energy efficient buildings, energy efficient transportation, renewable energy, living resources and biodiversity, adaptation and pollution control.

Fiji, at the time the chair of COP23, the UN climate change conference, was the third country and the first emerging market economy to launch a green bond in October 2017, with a EUR50m deal.

Poland's second issue, and new issuances by Nigeria, Indonesia and Belgium have since followed. Indonesia's bond was also the first sovereign green sukuk. Sovereign funds and pension funds have played an important role in providing demand for these issues. ABP was one of the main subscribers to the Belgian bond, with a EUR360m purchase. Despite these developments and such rapid growth, the green finance market remains a minuscule part of the overall asset universe. Total outstanding green bond issuance stood at \$221bn worldwide at the end of 2017, according to the Climate Bonds Initiative, amid the broader category of climate-aligned bonds valued at \$895bn. This compares to more than \$100tn for the total fixed income sector.

But sustainable investments are gaining prominence in global public investors' portfolios. Sovereign funds and public pension funds surveyed by OMFIF said that 61% of their overall fund investments are allocated to sustainable

funds. Very few respondents said ‘all investments are sustainable’ and made ‘according to ESG principles’.

Future plans and barriers to accessing green assets

With a total of \$21.5bn in assets under management, a commitment by sovereign funds and pension funds to increase their allocation to green investments even marginally would represent a substantial increase in the market.

The most enthusiastic investors in these assets were central banks and pension funds from North America and Europe. This year’s survey reveals the following trends: 18% of sovereign funds and public pension funds surveyed responded that they were planning to ‘significantly increase’ (by more than 3%) their green bond investments over the next 12-24 months, compared with 6% last year, with a further 18% expecting to increase (by up to 3%) their investment (compared with 32% last year).

The increasing demand for green assets by these investors is gradually raising supply as efforts concentrate on the legal and regulatory requirements of these assets. However, there is still a long way to go to a fully developed market for green investments. International standardisation on what constitutes a green bond is lacking. This is a major obstacle to the expansion of sustainable finance initiatives. Another drawback is the lack of a global monitoring mechanism to ensure compliance with the parameters set by frameworks such as the green bonds principles or climate bonds standards.

Some progress is being made: in March 2018, a group of investors worth almost \$3tn, including NBIM and the Caisse de Depot et Placement du Quebec, announced that they will work with the UN environment finance initiative and the Financial Stability Board’s task force on climate-related financial disclosures to create a first set of climate-related investor disclosures.

The results from OMFIF’s survey show how the picture is changing. When asked about the reasons for not investing in green and sustainable assets, the public investors that do not currently do so were reluctant to respond.

The two most popular reasons given were that such an action would not fit with the funds’ strategies and that there is a lack of suitable projects. None of the respondents

suggested cost or legal and regulatory barriers as reasons for not investing in green and sustainable assets.

Responding to the same survey question, some funds cited insufficient data as a concern and highlighted the risk of ‘greenwashing’. Lack of data to incorporate environmental risk assessment in financial decision-making has traditionally been an important hindrance to the development of the green finance market.

To address this need a group of six sovereign funds (NBIM, the New Zealand Superannuation Fund, and four funds from Abu Dhabi, Kuwait, Saudi Arabia and Qatar) met at France’s Elysee palace in December 2017 to establish the ‘One Planet Sovereign Wealth Fund Working Group’. The group aims ‘to accelerate efforts to integrate financial risks and opportunities related to climate change in the management of large, long-term asset pools’ and committed to ‘developing an ESG framework to address climate change issues, including methods and indicators that can inform investors’ priorities as shareholders and participants in financial markets’.

An important reason given by respondents regarding their reluctance to invest in green assets was that it may be too complex. This complexity creates the need for investors to rethink their approaches and organisational structures, and hire new staff to bring in additional skills and experience to access these assets. This is part of the broader trend of the professionalisation of investment approaches among public investors seeking to access real assets, as documented in a report published by OMFIF and BNY Mellon in June 2018.

This article is a shortened version of the *OMFIF Special Report on Sustainable Investment*, part of *OMFIF’s Global Public Investor* publication, available under <https://www.omfif.org/analysis/global-public-investor-2018/>

Adaptively profiting from energy uncertainties

By Ricardo G. Barcelona

While energy is freely available in nature, security, availability, and affordability continue to dominate policy and strategic discourse. These questions are incorrectly framed as resource adequacy problems. As a result, policy confronts energy transitions by encouraging more explorations, as in the case of coal oil and gas, or by promoting new sources as substitutes. Policy's preferred instruments are subsidies, undertaken with presumptive omniscience of "winning champions" that often floundered financially. This resource abundance fallacy continues to haunt and, perpetuates a green paradox. Generous subsidies, the sun's abundance, and solar cell's rapid costs declines, could oftentimes result in firms that struggle to earn decent returns.

Part of the answers lie in how energy as a business is understood, and how uncertainties from energy transitions are framed as opportunities. The business of energy comprises the transformation of resources into a merchantable commodity, that involve the control of resources, mastery of transformation technologies, and once converted, the ability to bring energy to markets. Seen in this light, how humanity's energy needs are met would evolve with technologies and societal preferences, where one resource is dynamically substituted for another. Hence, energy transitions occur through interacting effects of economics, firms' strategy and investment decisions, and policy actions, influenced by perceived societal needs.

The environmental false dichotomy – “evil carbon, redeem with renewables” – leads to destructive paths. With “decisive” political will, some governments push to shut down coal and nuclear, and hasten gas' demise. Albeit the “exuberant altruism” that drives policy, financially robust energy firms lost their glitter, while generous subsidies fail to sustain thriving “green energy” champions. When media's enthusiasm is unmatched by the outcomes of green investments, these questions need answers: Why do things never turn out as they were projected? Is energy strategy always going to be a tale of unfulfilled promises?

Ricardo G. Barcelona is a honorary research fellow at the Centre for Climate Financing and Investments, Imperial College London, and a professorial lecturer at the School of Economics, University of the Philippines. He served in senior leadership roles at Royal Dutch Shell, Netherlands and London. As investment banker, he was a top rated equity analyst and adviser whilst at SBC Warburg and ABN Amro/Rothschild. Ricardo holds a PhD in Management from King's College London.

Unequal markets, contextual decisions

Wide scale variable renewables deployment remains elusive, in spite of generous subsidies. The default policy mantra seldom delivers: *Subsidize your way to decarbonize the economy*. Lenders follow suit by limiting funding to coal-fired power assets. With these twin actions, wind and the sun would energize our economies – but they do not. What about the press reports – more than half of new installed capacities are wind and solar? Adjusted for output, half of MW installed produces about 12% of new power supplies from solar, or 15% of wind given their lower conversion rates. In contrast, hydro, geothermal, coal and gas operate at close to 90% utilisation rates, hence requiring less MW to produce the required supply.

The less obvious culprits lie with capital budgeting's flawed logic that prescribe predictability as ideal, and the imagined well-ordered world that underpinned financial analyses. Market structures, and how competitive outcomes are achieved, is incongruous with net present values' (NPVs) sunk costs presumption. When volatilities are frowned upon, and stable cash flows are rewarded, fixed price-volume supplies are preferred. In this blinkered world, managers rank competing investments from highest to lowest NPVs. However, as prices, costs or volumes vary, and the value ranking shifts, erroneous decisions result. Just because financial analyses chose to ignore volatilities, a firm's initial endowments, and its effects on feasible outcomes, does not make dynamic energy markets less volatile.

What is attractive when prices are as forecasted may land a dud when markets become adverse. Without the flexibility to reverse decisions, or adapt operations or supplies to changing market conditions, managers could only watch their hoped-for payoffs dissipate. The common refrain becomes “unexpected” market moves that “surprised” the managers, hence the losses that were

“not anticipated”. Subsidies are aimed at equalising the costs of “expensive” renewables, such as wind or solar, with “cheaper” coal or gas. Implicitly, policy takes on an omniscience it does not possess in foreseeing “technology champions”. This premise suffers the same fate as capital budgeting, where volatile prices render indeterminate the correct subsidies when constant costs renewables are subtracted from volatile fossil fuel prices. To add to subsidies’ problems, rapid technology changes make obsolescence a reality that renewables technologies face. Hence, today’s champions could become tomorrow’s dinosaurs.

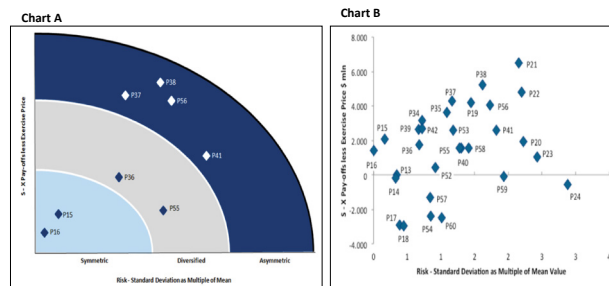
Market structures offer different incentives that reward managerial actions differently. By assuming prior investments as sunk costs, managers and policy ignore initial endowments of energy systems and firms. However, extant infrastructures and logistics facilitate adoption of hydro and geothermal, where volumes are modulated according to demand, while partly impeding rapid inclusion of variable supplies from wind or solar.

Monopolist faces no threat of pre-emption by credible players. To induce a monopolist to invest, subsidies will have to be substantially high. They have the luxury to wait until prices are very high, possibly caused by tight supplies, before they would commit to expand. The entry of decisive competitors, however, could spoil the monopolist’s honey pot. Under threat of being pre-empted, oligopoly players would tend to invest sooner and earn less (because price thresholds are lower) rather than be left completely out of the market. Add more competitors into the market, the threat of being pre-empted increases significantly, where competitive actions of rival firms would practically raise the risks of inaction. Thus, as markets become more competitive, firms are less likely to depend on subsidies to make their investments work. Under dynamic and uncertain energy markets, NPV’s linear and static logic of their presumed realities collide with what the energy market really is. When rival firms take strategic actions that are asymmetric, they impact market prices, costs or volumes that could result in diverging financial fortunes among competing firms.

Portfolio, flexibility, and competition: An alternative framework

Prior to renewables’ inclusion, energy supply was limited to resources diversification where fuel costs from coal and

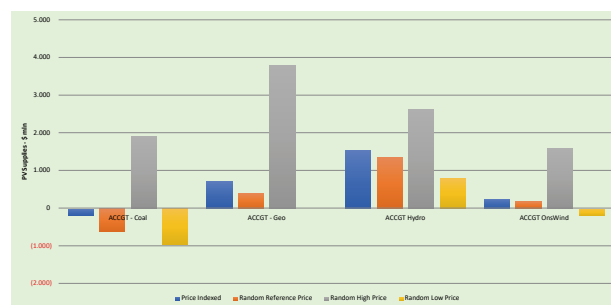
gas converged when they vary closely with oil prices. Following Arrow’s logic on diversification, we had an incomplete energy market. Renewables’ zero fuel costs added a security that completes the energy market, where uncorrelated fuel costs and energy prices embeds call or put options to mixed supplies portfolios. Hence, when there is pricing or volume flexibility, renewables earn higher returns when energy prices are high. In markets where energy prices are fixed, renewables reduce fuel costs. Conversely, falling energy prices reduces the option values as excess returns or fuel costs savings diminish.



Source: Barcelona (2015). Journal of Applied Corporate Finance, 27(1).

Figure 1: Portfolio Payoffs and Risks Framework

Figure 1 simulates cash returns and risks of mixed supplies portfolios (Chart B), with the Portfolio Strategic Payoffs and Risks Framework (Chart A) to inform investment decisions. Positive strategic payoffs result when cash payoffs exceed what was invested, while risks are deviations from expected cash payoffs. Counter-intuitively, volatile coal or gas prices, when highly correlated to energy prices, result in stable cash margins equivalent to fixed costs recovery. Diversifying gas (P15) into hydro (P36) increases returns sufficiently to offset higher risks. Loss making coal (P57) becomes value accretive when diversified with hydro (P55). In contrast, adding gas to hydro (P21) rebalanced portfolio, significantly reducing risks that outweigh returns erosion (P38). Volume and pricing flexibility avoids losses, where supplies are interrupted when supply costs exceed periodic energy prices.



Source: Barcelona (2017). Energy Investments. London: Palgrave Macmillan

Figure 2: Excess Cash Value vs Gas-only Supplies

Figure 2 shows diversified portfolios' excess strategic payoffs relative to gas-only supplies under different energy price scenarios. Interestingly, diversifying coal with more efficient gas improves portfolio value, while the reverse erodes when more profitable gas is diluted by more expensive coal. In contrast, hydro and geothermal add value, with wind value eroding only under persistently low energy prices. Correctly estimated, renewables' value accretion questions the need for subsidies. Renewables inclusion become a calculated move by firms to thrive under uncertain markets.

Reaping late-movers' benefits: Invest now, or wait

For each MW installed, hydro and geothermal generates respectively 7,446 MWh and 7,884 MWh a year. Onshore wind produces 2,891 MWh while solar 1,752 MWh, with enhanced offshore wind at 5,782 MWh. These differences imply that the decision to invest or wait would vary with the how much is saved from system costs declines, against the foregone revenues, hence cash margins.

PV's financial fortunes turn for the worst when gas dominates the energy system, resulting in lower prices (Figure 3: Deferral Value – Gas Dynamic Volume). PV could only survive financially with large injections of subsidies. With little prospect of making ends meet, waiting for system costs to fall farther is more prudent than investing now.

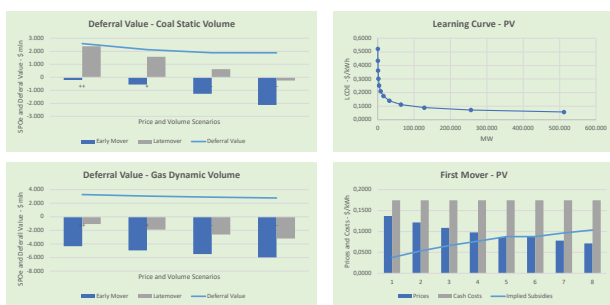
Making economic choices work

Evaluating renewables' value within the contexts of portfolio, under conditions of pricing and volume flexibility, question the need for subsidies. Mixed supplies match resources to what the market needs, and hedge firms' values by embedding call or put options.

Policy and managers share a common limitation: None are endowed with omniscience to know where the experiments would lead to. While policy lacks the flexibility, managers could adapt to reverse or accelerate the pace of their actions.

Agile firms create and play in profitable market niches by adaptively profiting from uncertainties.

This article is an abstract from Ricardo's new book - *Energy Investments: An adaptive approach to profiting from uncertainties*, that has been published in November 2017 with Palgrave Macmillan, London



Source: Adapted from Barcelona (2017). *Energy Investments*. London: Palgrave Macmillan.

Figure 3: Learning Curves, Deferral Values, and Late-movers' Benefits

The first mover (Figure 3 – First Mover – PV) is locked-in with “expensive” supplies. As costs fall, the early movers' assets are rendered obsolete by technological advances. Firms may need more subsidies, or losses spike to put them out of business.

Coal-dominated systems' higher prices are friendlier to PV's economics (Figure 3: Deferral Value – Coal Static Volume). Under very high (++) , high (+) or low (-) power price scenarios, the late-movers could achieve positive portfolio values. The early mover could earn positive returns when prices are very high (++) . By waiting, firms are financially better off.

DISCLAIMER

The views expressed in this Newsletter are strictly those of the authors and do not necessarily reflect those of the European Centre for Energy and Resource Security (EUCERS), its affiliates or King's College London.

EUCERS ON THE ROAD

15.05.2018 Düsseldorf, Germany	Frank gave a presentation on „Globale Energiemegatrends und lokale Herausforderungen – Folgen in der Energiewirtschaft“ (“Global Energy Mega Trends and Local Challenges – Consequences for the Energy Industry“) at the Energieforum organized by TaylorWessing (Düsseldorf) and ProventisPartners (Munich)
03.05.2018 Baunatal, Germany	Frank gave a presentation on „Globale Energiepolitik – Energiewende in der Kritik“ („Global Energy Policy – Energiewende in the Criticism“) at the KAS-Seminar at Viessmann Deutschland GmbH

PUBLICATIONS

Umbach, Frank, “Internationale Energie- und Rohstoffwirtschaft: Strategische Megatrends und Implikationen für M&A-Strategien” („International Energy and Raw Material Economy: Implications for M&A Strategies“, ProventisPartners, Munich, May 2018, 55 pp.

SOCIAL MEDIA



Follow @eucers on Twitter.



Like us on Facebook: www.facebook.com/EUCERS



Catch up with us on www.YouTube.com/EUCERS

CONTACT EUCERS

If you have found our Newsletter interesting, wish to hear more about our activities, or, indeed, contribute with ideas or essays, please contact Thomas Fröhlich, Newsletter Editor EUCERS on thomas.froehlich@kcl.ac.uk or call 020-7848-1912.

EUCERS ADVISORY BOARD

The EUCERS Advisory Board supports the activities of EUCERS King's College London. We would like to thank and present the members of the board.

Professor Michael Rainsborough, Chairman of the Board, Head of War Studies, King's College London

Marco Arcelli, Executive Vice President, Upstream Gas, Enel, Rome

Professor Dr Hüseyin Bağcı, Department Chair of International Relations, Middle East Technical University Inonu Bulvari, Ankara

Andrew Bartlett, Managing Director, Bartlett Energy Advisers

Volker Beckers, Chairman and non-Executive Director of Reactive Technologies Ltd, Vice Chairman (since October 2016) and Member of the Board of Directors (non-Executive Director) of Danske Commodities A/S, Denmark and Chairman, Chair Audit Committee of Albion Community Power Plc

Professor Dr Marc Oliver Bettzüge, Chair of Energy Economics, Department of Economics, University of Cologne; Director of the Institute of Energy Economics at the University of Cologne (EWI) and President of the Supervisory Board, ewi Energy Research & Scenarios

Professor Jason Bordoff, Professor of Professional Practice in International and Public Affairs, Founding Director, Center on Global Energy Policy, Columbia University, New York

Professor Brahma Chellaney, Professor of Strategic Studies, Centre for Policy Research, New Delhi, India

Dr John Chipman, Director of the International Institute for Strategic Studies (IISS), London

Iain Conn, Group Chief Executive, Centrica plc

Professor Dr Dieter Helm, University of Oxford

Professor Dr Karl Kaiser, Director of the Program on Transatlantic Relations of the Weatherhead Center for International Affairs, Harvard Kennedy School, Cambridge, USA

Frederick Kempe, President and CEO, Atlantic Council, Washington, D.C., USA

Thierry de Montbrial, Founder and President of the Institute Français des Relations Internationales (IFRI), Paris

Chris Mottershead, Vice-Principal (Research & Development), King's College London

Hildegard Müller, Chief Operating Officer (COO) Grid & Infrastructure of Innogy SE

Janusz Reiter, Center for International Relations, Warsaw

Professor Dr Karl Rose, Senior Fellow Scenarios, World Energy Council, Vienna/London

Professor Jonathan Stern, Chairman and Senior Research Fellow, Natural Gas Research Programme, Oxford Institute for Energy Studies

ACKNOWLEDGEMENTS

We would like to thank our Partners and Supporters



And our Media Partners:

