



Advantage Financial Ecological Footprint Report ***(Spring 2015)***

Environmental Footprint and the Cost of Capital in the Utilities sector.

Since the start of the great financial crisis, power utilities are experiencing a period of intense changes and the sector's ecological footprint is a major driver of this. There will be winners and losers, and investors are taking notice of the huge volatility of the sector stock market index, which was comparable only to that experienced by banking. This third edition of the Advantage Financial Ecological Footprint report is devoted to the power utilities sector.

The disrupting factors of the business model are on the one hand the growth in renewables such as solar and wind, the substitution of nuclear for coal since Fukushima and the volatility of oil and gas prices. These changes affect the generation phase of the electricity value chain, but changes are on the horizon for the distribution business, with continuing geopolitical risk in the gas transmission business and the potential growth of consumer empowerment with the gradual diffusion of the smart grid for electricity.

These developments play in a different way according to the product and energy mix of each market player and with the different regulatory outlook that is observed in each individual country. The Euro Zone crisis has added to the strain in the sector, with a stagnating demand outlook and with the removal of energy subsidies for the renewable resources within the most impacted sovereigns.

We look at the impact of the ecological footprint of electric utilities on their cost of capital from a number of different perspectives.

We ask the following questions:

- We know from the first *AD Ecological Footprint Report of 2013* that there is a proportionality between the ecological footprint and the cost of debt as measured by the implied probability of default for a large sample of nonfinancial corporations. The study looked at the relationship at a given point in time. A more interesting per-



spective for investors is to know if an improvement in the ecological performance will bring to a decrease in the implied cost of debt. This is the first question we answer in the sequel. We provide some evidence to the effect that, over the 2008-2013 period, a decline in GHG emissions of electric utilities is associated with a decline in the implied cost of debt.

- Measuring the ecological footprint across all sectors implies a loss of sector specific information. By focusing on the Power Utilities sector, we can look for more granular measures of the footprint. On the one hand, we can aggregate plant level data of Toxic Emissions as collected by the EEA and relate these to a measure of the cost of debt. Again, we find a positive correlation between the scaled measure of the toxic impact of air pollution by electricity generation plants, and the implied cost of debt.
- Furthermore, we can directly collect data on the energy input mix to electric generation. This is particularly important in order to assess the role of the increasing importance of renewable resource capacity in electricity generation. We ask whether Green investment entails a lower bankruptcy risk than more conventional sources of generation. We collect evidence indicating that the higher is the share of renewable electricity generation at firm level, the lower is, on average, the implied cost of debt.
- We also look at the future trends for further greening of the sector and how they affect the cost of capital of the main peers. We follow a recent report by the sustainability team of UBS which scales the exposure of major European Electricity utilities to the expected impact of a shrinking in traditional generation business and of the counterbalancing solar, electric cars and smart grid opportunity, which is particularly relevant for the German, Italian and Spanish markets. We find a positive correlation between stock market performance momentum during the past five year and the exposure to these themes.
- The report concludes with a brief analysis of the European corporate green bond market, which is attracting considerable investor interest, where Utilities are the most important issuers to date.



Summing up, we find that going green tends to reduce the cost of capital on average.

This is a remarkable result given the many influences that affect the energy mix of Electric Utilities.

1. Change in Greenhouse emissions vs. change in the implied cost of debt

We know from the first AD Ecological Footprint study of 2013 that there is a proportionality between the ecological footprint and the cost of debt, as measured by the implied probability of default for a large sample of nonfinancial corporations. The study looked at the relationship at a given point in time. A more interesting perspective for investors is to know if an improvement in the ecological performance will bring to a decrease of the implied cost of debt.

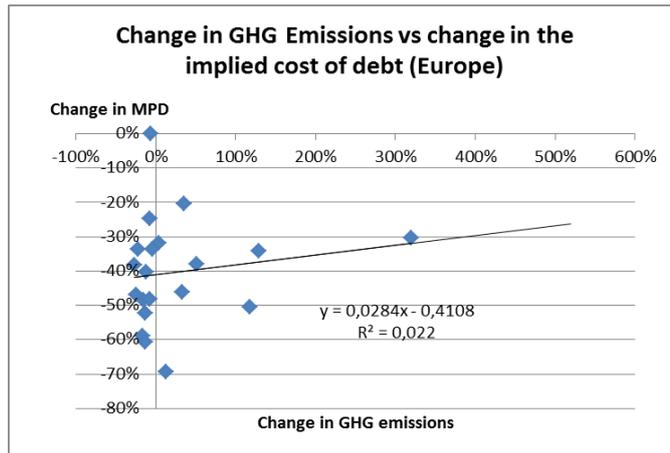
We ask if the firms that showed the highest deterioration in GHG emissions shows the highest increase in the implicit probability of default, which is the main determinant of credit spreads. We find that this is the case, at least on average. Chart 1.1 below show the correlation between the change in the implied probability of default, measured by the Merton model ¹ and the underlying change in greenhouse gas emissions (GHG), for a sample of European power utilities over the 2008-2013 period. Chart 1.2 shows that the relation is even stronger if we add to the sample the US market observations as in the first AD Ecological Footprint study of 2013.

Summing up, a deterioration in the level of GHG emissions is mostly related to an increase in the use of for dirty sources of energy, such as coal, at the expense of more clean sources, such as natural gas or renewables. More on this in the following.

¹ The Merton model of default risk computes the implied probability of default of an issuer based on information taking from the leverage of the company and the volatility of its stock. It is a common measure of default risk for companies which are listed but do not raise bond financing.

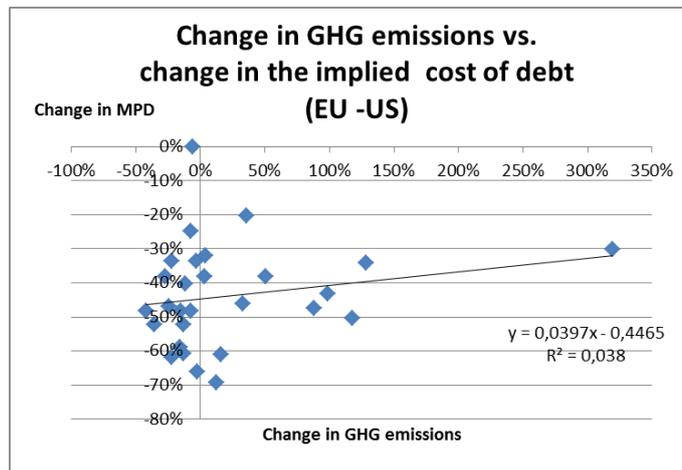


Chart 1.1



Source: Advantage Financial, EEA

Chart 1.2



Source: Advantage Financial, EEA

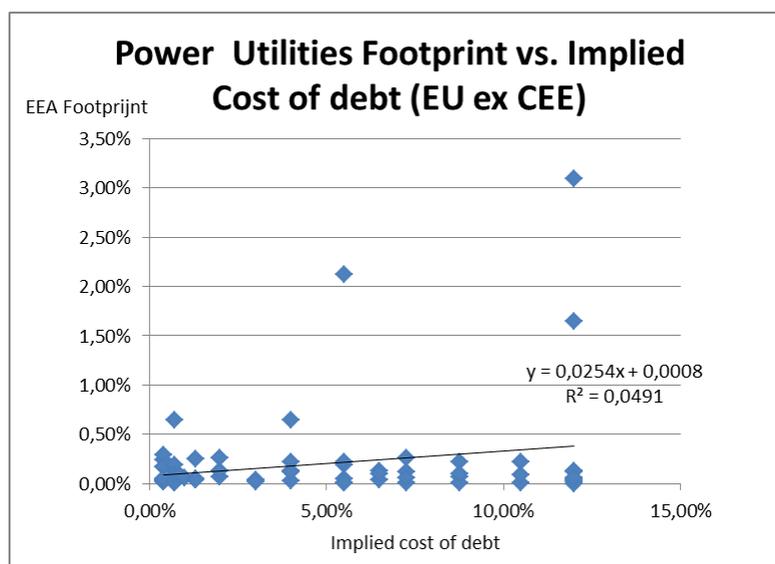


2. Power generation ecological footprint versus the synthetic cost of debt.

Measuring the ecological footprint on a cross section basis implies a loss of sector specific information. By focusing on the Power Utilities sector, we can look for more granular measures of the footprint.

On the one hand, we can aggregate plant level data of Toxic Emissions as collected by the EEA and relate to a measure of the cost of debt based on the interest coverage rate of each company. Chart 2.1 shows that we find a positive correlation between the scaled measure of the toxic impact of air pollution by electricity generation plants, and the implied cost of debt.

Chart 2.1



Source: Advantage Financial

Table 2 below shows the top 40 western European Utilities by Toxic and greenhouse emission footprint as computed by the European Environmental Agency.² The plant data were aggregated by power operator and hence they refer to the energy generation mix of each operator. On this criteria, the ecological footprint of Italian Utilities is better than the average,

² <http://www.eea.europa.eu/data-and-maps/data/plant-by-plant-emissions-of-so2-nox-and-dust-and-energy-input-of-large-combustion-plants-covered-by-directive-2001-80-ec-1>



and the most polluting operator in Italy is indeed the German operator E.ON, which just disposed these plants to the Czech energy Group EPH.³

In general, the plants with the highest ecological footprint are coal plants. They are more likely to fail annual environmental and health security tests. In extreme cases the regulator and the courts may ask for suspension of production, which also impact their revenue generation capacity and their risk of default. Similar problems may result if green activist protest against the operation of new or existing coal plants.

Table 2 EEA Toxic Heatmap footprint for Western European electricity generation utilities

Company name	Country	Dam Tot %/sales
ESSENT ENERGIE PRODUCTIE B.V.	Netherlands	6,84%
E ON ESPAÑA SL	Spain	3,09%
THAMES POWER SERVICES LIMITED	United Kingdom	2,12%
E.ON ITALIA S.P.A.	Italy	1,65%
GAS NATURAL FENOSA TELECOMUNICACIONES SA	Spain	0,65%
EDF EN FRANCE	France	0,64%
PX GROUP LIMITED	United Kingdom	0,38%
USKMOUTH POWER COMPANY LIMITED	United Kingdom	0,29%
KRAFTWERK VOERDE OHG DER STEAG GMBH UND RWE POWER AG	Germany	0,26%
VULKAN ENERGIEWIRTSCHAFT ODERBRÜCKE GMBH	Germany	0,26%
KRAFTWERK MEHRUM GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG	Germany	0,25%
MAGNESITAS NAVARRAS SA	Spain	0,24%
GEMEINSCHAFTSKRAFTWERK KIEL GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG	Germany	0,22%
RWE NPOWER PLC	United Kingdom	0,22%
ZANDVLIET POWER	Belgium	0,22%
GEMEINSCHAFTSKRAFTWERK VELTHEIM GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG	Germany	0,22%
CENTRICA SHB LIMITED	United Kingdom	0,19%
GKH - GEMEINSCHAFTSKRAFTWERK HANNOVER GESELLSCHAFT MIT BESCHRÄNKTER HAFTUNG	Germany	0,19%
HC ENERGIA GAS SOCIEDAD LIMITADA	Spain	0,18%
GDF SUEZ ENERGIA ESPAÑA SA	Spain	0,17%
VATTENFALL EUROPE GENERATION AG	Germany	0,17%
ESB INDEPENDENT ENERGY LIMITED	Ireland	0,17%
EGGBOROUGH POWER LIMITED	United Kingdom	0,13%
SEABANK POWER LIMITED	United Kingdom	0,13%
DRAX POWER LIMITED	United Kingdom	0,13%
IRIDE SERVIZI SPA	Italy	0,13%
BIZKAIA ENERGIA SOCIEDAD LIMITADA	Spain	0,12%
PUBLIC POWER CORPORATION SA	Greece	0,12%
GDF SUEZ THERMIQUE FRANCE	France	0,12%
CALENIA ENERGIA SOCIETA PER AZIONI	Italy	0,12%
GROSSKRAFTWERK MANNHEIM AKTIENGESELLSCHAFT	Germany	0,12%
SCOTTISHPOWER GENERATION LIMITED	United Kingdom	0,12%
RWE POWER AKTIENGESELLSCHAFT	Germany	0,10%
E.ON KRAFTWERKE GMBH	Germany	0,10%
OY ALHOLMENS KRAFT AB	Finland	0,10%
ENIPOWER SPA	Italy	0,09%
AES KILROOT POWER LIMITED	United Kingdom	0,09%
VASKILUODON VOIMA OY	Finland	0,09%
VATTENFALL A/S	Denmark	0,07%

³ The relationship is even stronger for the EEC power utilities sector.



Source: Advantage Financial, EEA

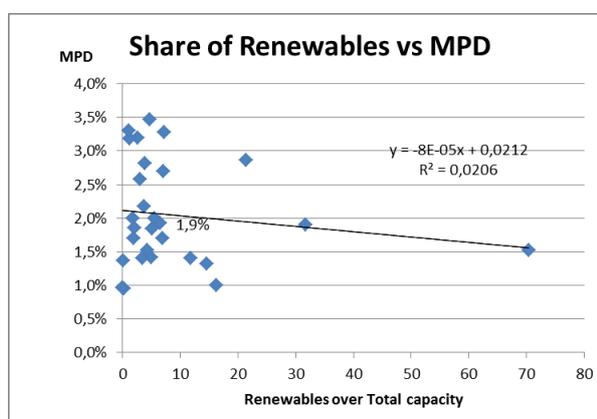
3. Does Green Energy have an impact on the cost of debt?

The above evidence shows that coal production is not only dirty but also affects bankruptcy risk. We now ask the flip question, which relates to the increasing importance of renewable resource capacity in electricity generation in countries such as Germany, Italy and Spain. Is green good for bondholders? Is green just a socially responsible choice that must entail a higher bankruptcy risk than more conventional sources of generation? In Chart 3.1 below we collect evidence showing that the higher is the share of renewable electricity generation at firm level, the lower is, on average, the implied cost of debt measured by the Merton probability of Default.

Additional evidence comes from Chart 3.2.a and 3.2 be, where we compare the implied cost of debt of Enel Green Power versus its parent Enel SpA and of EDP Renovaeis versus its parent EDP (Electricidad du Portugal). In both cases the renewable subsidiary shows a lower implied cost of debt than the parent.

These results are interesting because many commentators hint at the very bad economic performance and related bankruptcy of many startups active in the production of solar panels. In general, renewables are a good source of diversification for the electric generation business. This is not only related to the economic subsidies that this kind of generation enjoys, but also to the priority in capacity generation over non-renewable sources of energy and to the increasing impact of economies of scale in the unit cost of renewable energy.

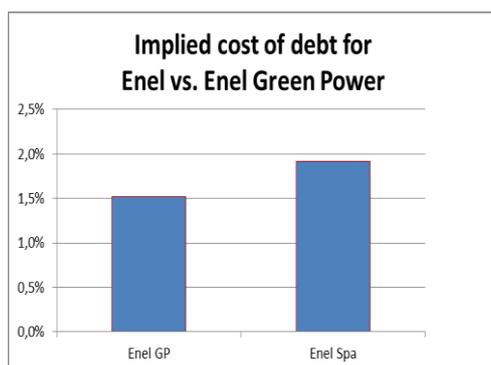
Chart 3.1





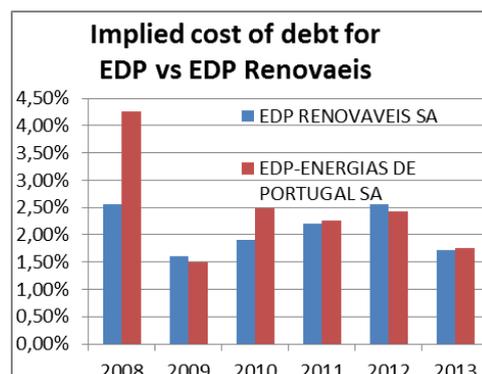
Source: Advantage Financial.

Chart 3.2.a



Source: Advantage Financial.

Chart 3.2.b



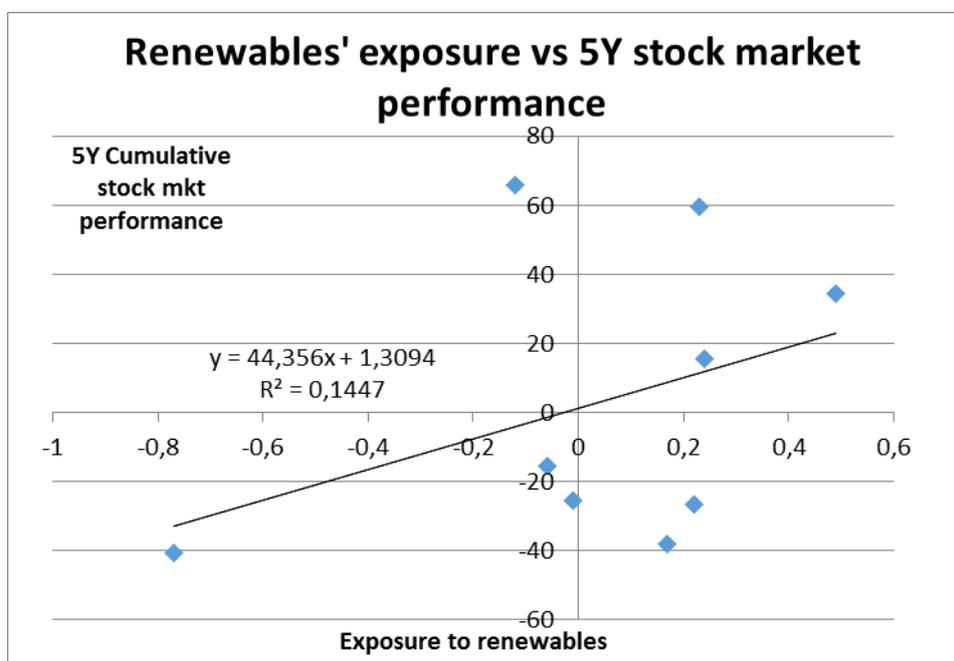
Source: Advantage Financial.

4. Who is better placed to capitalize on the smart grid opportunity?

We now look at the future trends for further greening of the sector and how they affect the cost of capital of the main peers. We follow a recent report by the sustainability team of UBS which scales the exposure of major European Electricity utilities to the expected impact of a shrinking in traditional generation business and of the counterbalancing solar, electric cars and smart grid opportunity, which is particularly relevant for the German, Italian and Spanish market. ⁴ In Chart 4.1, we report a positive correlation between stock market performance momentum during the past five year and the exposure to these themes to the main Eurozone power utilities. Enel is one of the best performers.

Chart 4.1

⁴ UBS Global Research; Q-Series, Global Utilities, Autos and Chemicals. "Will solar, batteries and electric cars re-shape the electricity system?", 26 August 2014



Source: Advantage Financial, UBS

5. Green Bonds issuance by the European Utilities sector

Green Bonds are a form of socially responsible investing (SRI)—aligning investor interest in environmentally-sound projects with their desire to invest in fixed income securities. More than €35bn self-labelled Green Bonds were issued in 2014, well ahead of 2013 levels, with investor demand remaining high throughout the year. Utilities represented the largest non-financial issuing sector with more than 60% of nonfinancial corporate issues.

There is no uniform definition of a “Green Bond” but it is generally thought of as a debt security the proceeds of which have been earmarked for use in special projects that advance



environmentally-friendly objectives Investments in renewable energy, energy efficiency, climate-friendly projects. ⁵ Table 5.1 below shows the main types of Green Bonds.

Table 5.1. Type of Green Bonds

Type	Definition
Corporate self-labelled (new)	Bonds issued by corporations and explicitly labelled as green
Green ABS (new)	Asset-backed securities whose cashflows come from a portfolio of underlying receivables such as loans, leases and PPAs. The receivables are associated with green (eg. renewable energy, energy efficiency) projects.
Supranational/international	Bonds issued by supranational or international organisations like multilateral banks, development banks and export credit agencies
Government	Bonds issued by national, regional or local governments to finance green projects. This includes US municipal bonds.
Project bonds	Bonds backed by the cashflows of an underlying renewable energy project or portfolio of projects

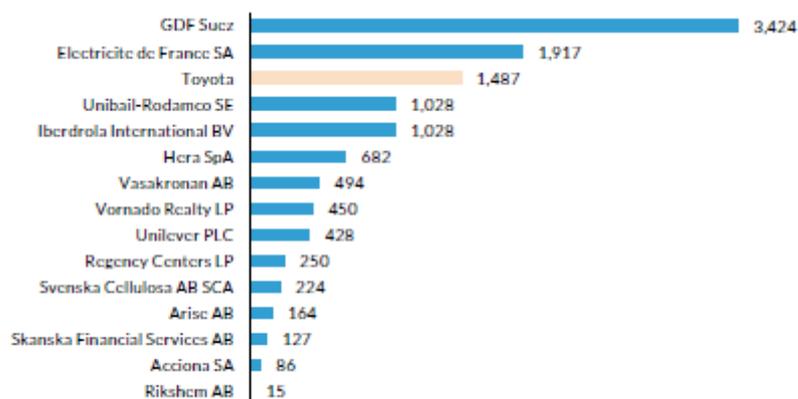
Source: Bloomberg New Energy Finance

The use of proceeds for self-labelled corporates varies widely with then business model of the issuers. The Utilities, such as GDF Suez, Iberdrola, EDF or Hera, are active in the renewable energy development and intend to use their bond proceeds to invest in renewable and energy efficiency projects both directly and troogh their dedicated subsidiaries. Chart 5.1 below shows that these four utilities are among the most important issuers in the European market.

⁵ The financial community is active in developing standards for this sector, such as the Climate Bond Initiative, and a few independent rating operators such as Vigeo, Cicero and DNV are increasingly active in certifying the uses of proceeds of green bonds. The green bond market is still in its infancy, however, and there is ample room for improvement.



Chart 5.1 Green Corporate Bonds outstanding by Issuer



Source: Kepler Cheuvreux, Bloomberg

Among non financial issuers, Commercial and real estate property companies are the second largest issuer of green bonds after utilities with a share of around 20% of total issuers. Unibail-Rodamco, Vasakronan and Regency Centers are the biggest commercial and retail property issuers of green bonds to date; they use the of their bonds to increase the energy efficiency of building portfolios.

The opportunity of the green bonds market for the property sector is huge, and more so for our country, where property is the biggest item in the wealth of the economy. Buildings account for around 20% of total greenhouse gas emissions in the economy and any improvement in their energy efficiency has a major impact on the improvement of the environment and on the growth of the economy. New investments aimed at improving the efficiency and the economic footprint of buildings will impact both aggregate demand and aggregate supply. On the demand side, new investments will have a multiplier effect of jobs (the green sector is labour intensive) and will help to restart the construction business. The effect of improving energy efficiency on the supply side is less well known, but in fact recent



studies show that these improvements are the major driver of productivity improvements in the economy. ⁶

Financing these green energy projects is challenging as one has to overcome issues of size (the property sector is extremely fragmented, even the commercial one), property rights (there is the need to align the interest of owners and tenant) and outcome measurement (energy savings do not count as positive cash flows and hence cannot be securitized). This is an area where financial innovation and finance skills can really add value for the economy.

Summing up, fostering and financing new investments to improve the economic footprint of the buildings and real estate is a very important topic and needs more attention. We will analyze it in the next edition of the Advantage Ecologic Footprint Report.

Milan, March 8th, 2015

⁶ R. Haynes and B. Warr, 2009, "The economic growth engine. How energy and work drive material prosperity", Northampton, Edward Elgar Publishing