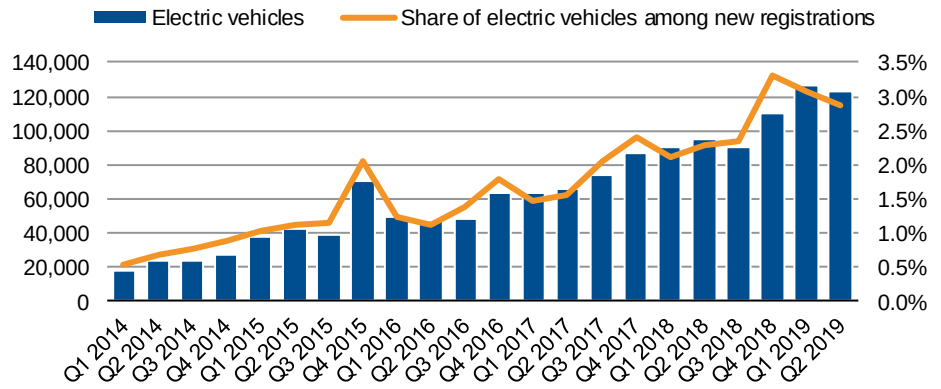
Mobility transition and utilities
Governments, utilities face emissions, opportunities, challenges from electric-car boom

Electric car sales are growing fast from a low base in Europe, confronting governments and utilities with new opportunities and challenges as extra transport-related demand for electricity is set to reshape the electricity market and emissions patterns.

Should take-up of electric cars continue at pace to reach 20% of cars on the road in Europe by 2030, driven in part by tougher EU regulations but also improving infrastructure, such growth would increase electricity demand by 5-10% (160-320 TWh) and replace around 80bn litres of today's diesel and petrol consumption. European registrations (EU+EFTA) of electric cars have risen strongly this year, by 35% yoy in H1 2019 to 250,000 compared with a drop of 3.1% in overall passenger car registrations to 8.4m.

Figure 1: Electric passenger car registrations in Europe (EU+EFTA)*



* Electric cars (battery and plug-in hybrid electric vehicles) Source: ACEA, Scope Ratings

For governments seeking to meet climate-change and other environmental goals, the impact is likely to be mixed even though road transportation accounts for around a quarter of all CO2 emissions in Europe. Assessing the environmental impact of e-mobility will involve examining a trade-off between reduced pollution particularly in urban areas and changes in indirect pollution (CO2 and other GHG emissions) depending on the energy mix used in power generation in the country in question.

So far, the countries where electric-car demand in Europe has taken off tend to be those smaller European markets, such as Norway, Switzerland, Sweden, Finland where the national power mix is already skewed in favour of low-carbon energy production from renewable energies but also nuclear. Countries where take-up has been slow have tended to be the larger economies such as Germany, Italy and Spain which remain relatively dependent on coal and gas.

For utilities, growth in electricity demand should benefit companies across the industry's value chain – from generators to grid and storage operators and energy suppliers – though the burden of capital spending will fall most heavily on electricity distribution in urban areas. The modest overall increase in electricity demand that growth in e-mobility implies should fall well short of straining Europe's power supplies though it could have important consequences for the load curve by exaggerating demand at peak periods.

One potential challenge for utilities, however, is that companies outside the electricity sector will seek to cash in on growing demand for electricity and e-mobility services. Oil & gas companies such as France's Total SA and Anglo-Dutch oil major Royal Dutch Shell have started investing in electricity generation as they look for long-term diversification away from fossil fuels. So too have industry outsiders such as German agricultural-trading conglomerate BayWa which has launched corporate e-mobility services.

Analysts

Sebastian Zank, CFA
+49 30 27891 225
s.zank@scoperatings.com

Marlen Shokhitbayev, CFA
+49 30 27891 127
m.shokhitbayev@scoperatings.com

Media

André Fischer
+49 30 27891 147
a.fischer@scopegroup.com

Matthew Curtin
+33 6 22763078
m.curtin@scopegroup.com

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Scope Ratings GmbH

Lennéstraße 5
10785 Berlin

Phone +49 30 27891 0
Fax +49 30 27891 100

info@scoperatings.com
www.scoperatings.com

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EU environmental regulations are driving shift toward e-mobility

Road transportation contributing 20-35% of CO2 emissions

Road transportation makes up around one quarter of CO2 emissions in the Europe, though it is as high as 35% in some countries with low-carbon electricity generation such as Austria, France and Sweden.

No major progress yet to reduce CO2 emissions from road transportation

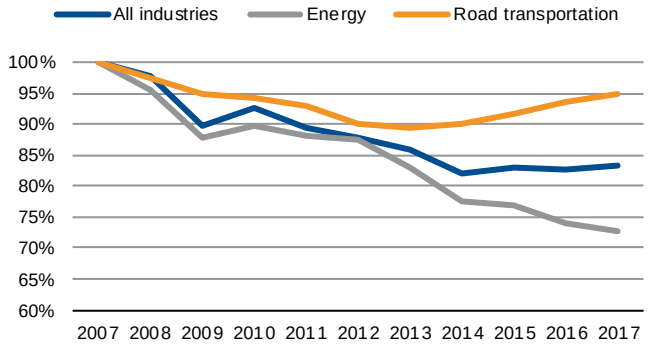
Not only is the sector a large contributor of CO2 and other greenhouse gases, but emissions have risen in recent years (see Figure 2) as the number of cars on Europe's roads has grown while the energy sector itself has made significant progress in the reduction of emissions in the course of the energy transition with the mothballing of old thermal power plants and steady expansion of renewable energy capacities). Even if the vehicles themselves are more economical and cleaner-burning than in the past, their owners tend to drive them further and the proportion of more powerful, fuel-hungry sport utility vehicles in the sales mix has risen. Current emissions are more than 20% higher today than they were in 1990.

Tougher regulations for car manufacturers …

EU legislation has set new binding CO2 emission targets for the new passenger car and van fleets:

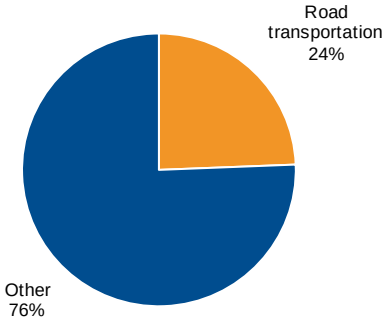
- Stricter EU fleet-wide targets for car manufacturers: vans (147 gCO2/km from 2020) and cars (95 gCO2/km from 2021 with a phase-in in 2020) – down from an average CO2 emission of 120 gCO2/km from new passenger cars and an average of 158 gCO2/km from new vans in 2018.
- Members of the European Parliament and EU ministers have agreed on a higher target (37.5%) to reduce EU fleet-wide emissions for new cars by 2030, compared to the European Commission's proposed target (30%).

Figure 2: Development of CO2 emissions in Europe (2007 = 100%)



Source: European Environment Agency, Scope Ratings

Figure 3: Large share of CO2 emissions 2017 in Europe stemming from road transportation



Source: European Environment Agency, Scope Ratings

… but also generous incentives for consumers

If Brussels is using the "stick" of tougher regulations to force car makers to produce an ever-growing proportion of low- and zero-emission vehicles, most individual European governments have offered industry and consumers "carrots" in the form of direct investment grants and tax advantages/breaks or both to stimulate a rising share of electric vehicles among new car registrations as part of the energy transition. But it's also the corporate sector which needs to encourage an increasing share of electric vehicles by providing the infrastructure and environment to make the ownership of an electric car no more difficult than owning any other type of car.

Emission savings from e-mobility depend on the electricity generation mix

One catch is that growth in electric-car usage does not necessarily lead to a decline in net CO2 and other GHG emissions. Looking at a simplistic comparison between the direct CO2 emissions of cars driven by the combustion of gasoline/diesel with the indirect CO2 emissions of electric cars shows that the latter might do more harm than good in some markets.

Hydro and nuclear fueled power markets would provide the largest CO2 savings from e-mobility

Our simplified calculations show that reducing CO2 emissions from switching from combustion engines to electric propulsion is most pronounced in markets like Norway, Sweden, Finland, France, Iceland, Austria or Switzerland - markets which benefit from the availability of hydro-electric and/or nuclear capacity – where a switch to electric form diesel/petrol care might avoid more than 75% of emissions (see Figure 4).

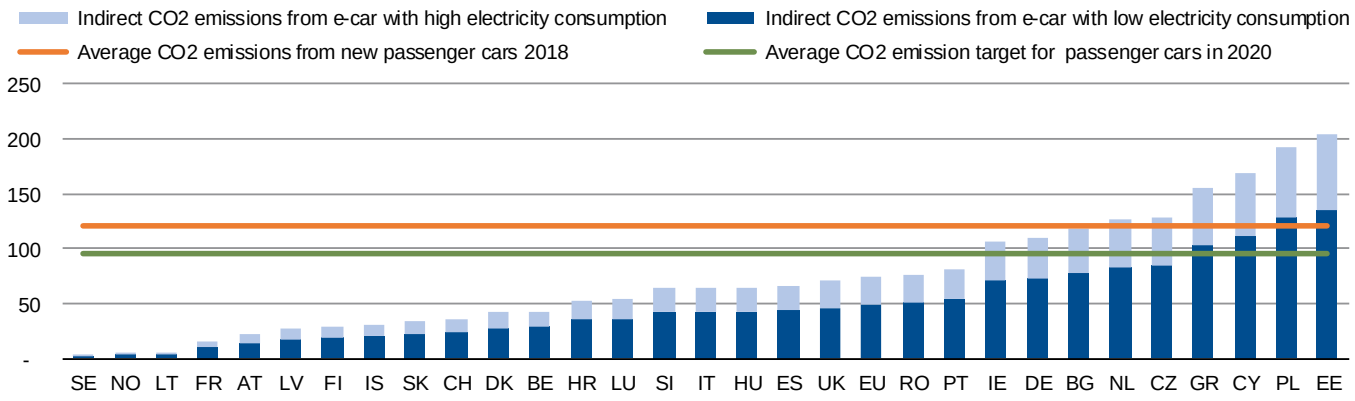
Driving an electric car would not save emissions in some countries

In other markets such as Czechia, Greece, Cyprus, Estonia and Poland, a switch to electric cars would in contrast lead to higher emissions today, given the countries' reliance on fossil fuels for electricity generation. More countries join this category when we consider the target of 95 gCO2/km for new cars in 2021 – assuming no change in those countries' energy mix which, we acknowledge, is unlikely as investment in renewable energy generation continues. Even in Germany, the switch to electric cars might not fully make sense for some models, bearing in mind the negative impact on the country's CO2 emissions from the plan to phase out nuclear power by 2022.

E-cars would virtually be fuelled by nuclear power in many markets

Nuclear power remains a vital source of electricity generation in several European countries – led by France and including Slovakia, Belgium, Hungary, Sweden, Bulgaria, Finland and Spain among others – which minimises the impact of increased electricity demand from growth in e-mobility on overall CO2 and GHG emissions.

Figure 4: Simplified comparison of CO2 intensity of electric cars based on country's power generation mix against CO2 emission intensity of new passenger cars[1]



Source: European Environment Agency, ACEA, Scope Ratings' calculations

Large European markets with below average ecar quotas

The crucial markets, however, where a take-up of electric vehicles would make a difference in terms of emission would be Europe's largest car markets where take-up of electric vehicles remains relatively low, but much power generation is still reliant on fossil fuels. Registrations of electric cars during H1 2019 in the TOP5 European markets which make up more than 70% of the European passenger car market came in below the European (EU+EFTA) average of 3.0% (Germany: 2.6%; Italy: 0.7%; Spain: 1.3%; France: 2.5% and the UK: 2.1%).

Reducing dependency on foreign oil imports

Besides emissions, one future benefit for Europe at large of the mass adoption of electric vehicles would be reducing the region's dependence on foreign oil imports. Assuming electric cars have a share of the market of more than 20% by 2030 would reduce fuel consumption by 20% in Europe which would be more than 60m tons of oil equivalents (80bn litres of diesel/petrol).

[1] Our calculations follow a simplistic approach of multiplying the average electricity consumption of electric cars which range from 16 kWh/100km (low) to 25 kWh/100km (high) with the specific carbon intensity of a country's electricity generation mix (based on 2016 reported numbers). We do not reflect CO2 emissions linked to the production of passenger cars and its components or do we take into account cross-border electricity flows between European markets. We also do not take into account emissions from the production of fuels and related infrastructure.

Opportunity or threat to utilities' business models?

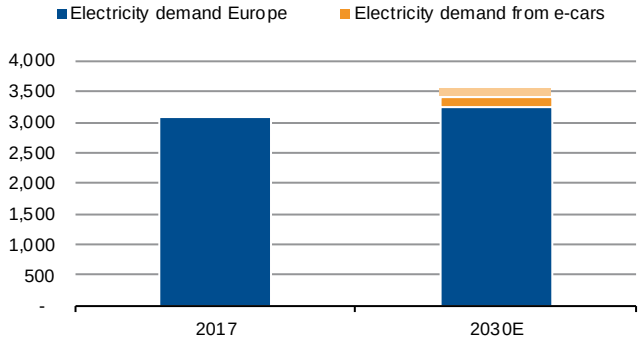
Rising electricity demand is always good for utilities

Power companies are set to benefit from a stimulus to electricity demand from the transportation sector which could compensate for efficiency gains or losses should more industrial production move outside Europe to lower-cost countries. Generators and suppliers should benefit from higher prices given the volume effect in the merit order system in individual markets (the prioritisation of which plants supply to power to the grid to optimise supply), helping strengthen cash flow.

Possible impact on stabilising wholesale prices

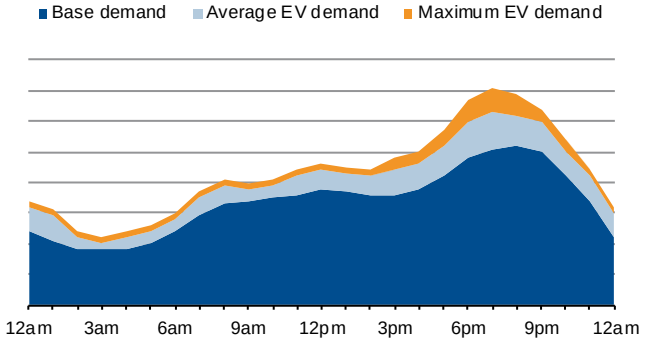
Assuming again a share of more than 20% of electric vehicles among total passenger cars by 2030 in Europe, electricity demand would rise – ceteris paribus – by an estimated 5-10% (see Figure 5). This may look modest, but it could prove significant in some markets like Scandinavia, with less excess generating capacity and a likely above-average share of electric vehicles. Such extra demand from a comparable stable sector would clearly help to stabilise wholesale prices when looking at the effects on a market's merit order. Increased peak demand would also improve margins for baseload power providers during peak hours.

Figure 5: Expected stimulus on electricity demand (in TWh) from rising share of electric vehicles[2]



Source: Scope Ratings' calculations

Figure 6: Simplified daily load curve with and without electric vehicles



Source: Scope Ratings' illustration

Pressure on the grid at peak load times if not smartly addressed

While the increased demand will unlikely cause any strain on the overall supply of electricity in Europe, given the region's spare capacity, the effect on the daily load curve on weekdays could be significant (see the simplified typical daily load curve in figure 5 with peak demand between 5-8pm when people return home and charge their cars) if not managed smartly by storage or coordinated load shifting, particularly in urban areas. Unrestrained electricity charging at home could significantly increase residential demand peaks, especially since charging is usually highest when people return home, coinciding with the normal daily peak demand. This would most likely affect lower-voltage distribution grids. Peaks in demand increasingly coincide too with peaks in supply as more intermittent renewable energy comes on line.

Extra investment and income for DSOs

On the other hand, a strained load curve would put a premium on investment in grid upgrades. While TSOs are mostly responsible for such capital expenditure, related to the broader energy transition (see Scope study: Germany's grid operators face growing multibillion-euro investment challenge), the DSOs which would likely face higher capex needs related to cable and transformer upgrades and additional exit points.

Growing importance of peak-load capable generation facilities

Any new surge in demand during peak-load hours would also remind governments and regulators of the importance of having peak-load capacity from gas- and coal-fired plants when intermittent generation from renewables—wind and solar—is not sufficient. Power storage is one segment where utilities might find new opportunities, such as German

[2] We take into account an average electricity consumption of 3,000-4,000 kWh per passenger car derived from an average mileage of 15,000-20,000km per annum.

utility Uniper which started producing methane gas derived from wind power at its Falkenhagen site in March this year and feeding it into Germany's gas pipeline network.

Opportunities for new supplementary business

We also think there are some supplementary business segments which utilities could exploit to improve diversification and customer loyalty in a world of growing e-mobility:

- Development of tailor-made solutions in power supply with bundled tariffs which could also have a positive effect on churn rates in light of the increasing willingness of consumers to switch energy suppliers;
- Expansion of energy storage solutions as buffers but also using electric vehicles to manage network congestion, reduce grid stabilisation costs (e.g. vehicle to grid);
- Expansion of business services such as:
  - Expansion of smart metering for peak load avoidance;
  - Involvement of the installation and O&M of charging stations in public areas and semi-public areas (close/at the sites of larger employers);
  - Linkage of recharging infrastructure to decentralised power generation (private roof-top solar panels) and decentralised storage such as power-to-gas.

Not all plain sailing: e-mobility lures in new players to electricity sector

The concerted efforts by the EU and national governments to accelerate the transition to renewable energy has disrupted the traditional business models of the region's power utilities.

Competition from oil & gas majors

But the electricity companies now confront the knock-on effect of those policies on other parts of the energy sector, most importantly the oil and gas sector. Oil & gas majors are increasingly looking at their long-term business prospects in a world that will likely be less dependent on hydrocarbons than in the past, hence their growing interest in electricity generation. The road transport sector is foremost in their minds given that is one area where electric power can more easily substitute for fossil fuels.

Total and Royal Dutch Shell pushing forward in e-mobility

French oil major Total is a good example. The company, whose goal is to have electricity production capacity of 10 GW by 2023, has acquired Belgium's Lampiris and France's Direct Energie, aiming to supply 7m consumers with electricity in these two countries from 2022. Total has also acquired battery manufacturer Saft. Another is Royal Dutch Shell. The Anglo-Dutch oil & gas supplier has announced its ambition to become world's largest electricity company by 2030s.

E-mobility services are growing but crowded market

Total and other oil majors also have their eyes on ancillary services such as maintenance and repairs, vehicle-recharging infrastructure, intelligent meters, installation of solar panels on rooftops among others. So do companies from outside the energy sector such as German agricultural trading conglomerate BayWa which has set up an e-mobility services unit.

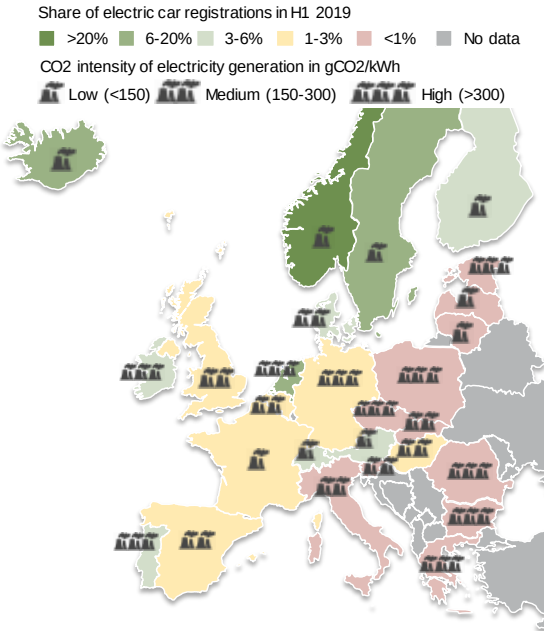
With automotive companies also natural competitors when it comes to e-mobility services, the utilities face a competitive field where judicious acquisitions and alliances may be critical for capturing a share of a growing market. German utility RWE has e-mobility partnerships with automakers Daimler and Renault. Shell, meanwhile, has acquired NewMotion, the owner of one of Europe's largest electric vehicle charging networks. Shell also has a partnership with IONITY, a joint venture between Daimler, BMW, Volkswagen, and Ford to develop a fast-charger network in Europe.

Appendix: E-mobility growth and green-power incentives

There are several quantitative and qualitative reasons for a positive investment decision relating to the switch to an electric vehicle. Besides the investment costs, we believe that people will most likely take into account practical aspects such ranges and charging times, availability of charging infrastructure, reliability in cold weather or the eco-friendliness of production, particularly related to batteries and eventually prestige.

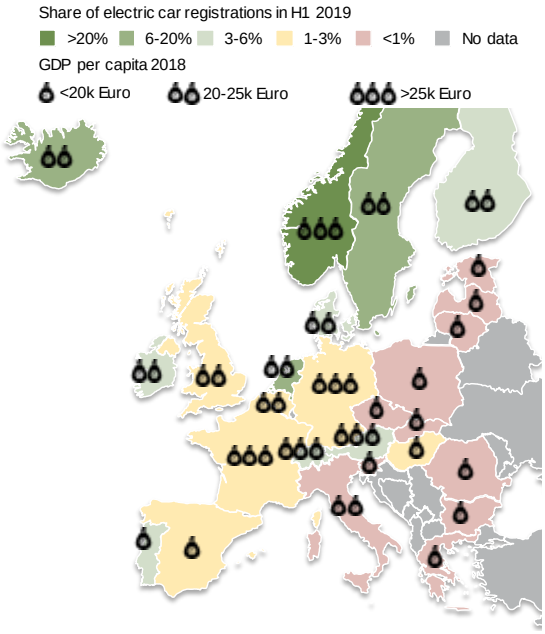
While we believe that people are not fully aware of all the factors contributing to the degree to which driving an electric car reduces CO2 and other GHG emissions in their country (figure 7), consumers' priority tends to be preserving household income (figure 8) and investment incentives in the form of tax reductions/exemptions for owners of electric cars or direct investment grants/switching bonus (figure 9). Countries that offer generous EV incentives and good charging infrastructure, are typically observing a bigger increase in EVs than countries with low or no incentives. While the operating costs in relation to charging are surely also a decision factor for potential buyers of an electric vehicle, the correlation between the two seems to be low if not inexistent (figure 10).

Figure 7: Electric car ownership and CO2 power-sector intensity in Europe



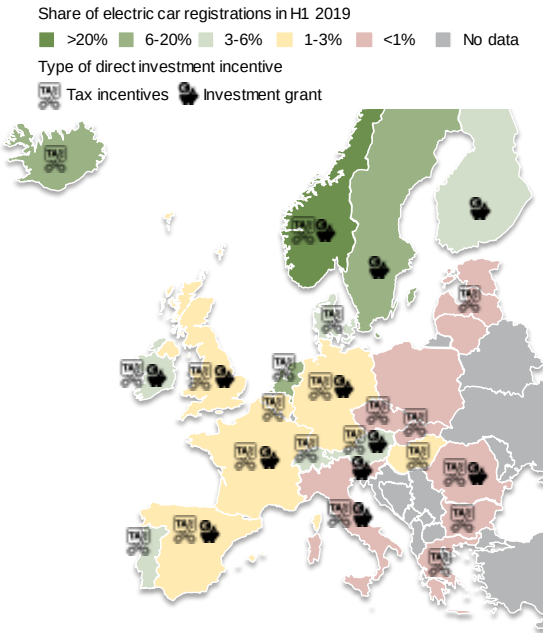
Source: ACEA, EEA, Scope Ratings

Figure 8: Electric car ownership and GDP per capita in Europe



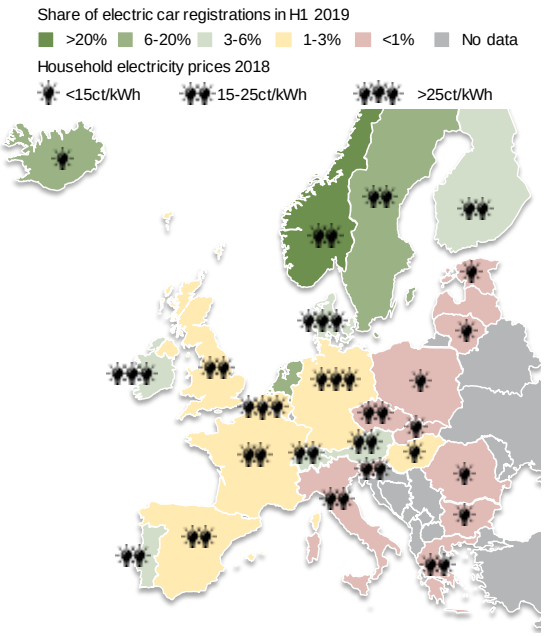
Source: ACEA, Eurostat, Scope Ratings

Figure 9: Correlation with governments' incentives



Source: ACEA, Scope Ratings

Figure 10: Correlation with end-customer electricity prices



Source: ACEA, Eurostat, Scope Ratings

Scope Ratings GmbH

Headquarters Berlin
Lennéstraße 5
D-10785 Berlin

Phone +49 30 27891 0

Frankfurt am Main
Neue Mainzer Straße 66-68
D-60311 Frankfurt am Main

Phone +49 69 66 77 389 0

Paris
1 Cour du Havre
F-75008 Paris

Phone +33 1 8288 5557

London
Suite 301
2 Angel Square
London EC1V 1NY

Phone +44 20 3457 0444

Madrid
Paseo de la Castellana 95
Edificio Torre Europa
E-28046 Madrid

Phone +34 914 186 973

Milan
Via Paleocapa 7
IT-20121 Milan

Phone +39 02 30315 814

Oslo
Haakon VII's gate 6
N-0161 Oslo

Phone +47 21 62 31 42

info@scoperatings.com
www.scoperatings.com

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