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# RESEARCH REPORT

FLORENCE  
SCHOOL OF  
REGULATION

## *An EU-wide survey of energy regulators' performance*

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in partnership with PwC*

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# ***Table of contents***

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1.	Introduction	3
1.1.	The background of the study	3
1.2.	The scope of the study	3
1.3.	The set-up of the study	3
1.4.	Independence and quality of the study	5
1.5.	The structure of the report	5
2.	Literature review	6
2.1.	Literature on regulatory substance	7
2.2.	Literature on regulatory governance	8
2.3.	Literature on regulatory matching	10
2.4.	Rationale of our study	10
2.4.1.	Methodology of the study	10
2.4.2.	Single-sector and multi-sector regulators	11
3.	Our survey	13
3.1.	Design	13
3.1.1.	Introductory questions	13
3.1.2.	Performance-related questions	14
3.1.3.	Additional open questions	16
3.2.	Response	16
3.2.1.	Geographic coverage	16
3.2.2.	Company profile	17
3.3.	Outcomes	18
3.3.1.	Performance-related questions	18
3.3.2.	Specific open questions	29
4.	Performance from an international perspective	31
4.1.	The set-up of interviews	31
4.2.	Main outcomes	32
5.	Conclusions and considerations	33
5.1.	Overall performance	33
5.2.	Performance from a national perspective	34
5.3.	Performance from an international perspective	36
5.4.	Considerations	36

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A.	List of references	37
B.	Data quality	39
C.	Questionnaire	43
D.	Regulator characteristics	48
E.	Response comparison of studies	49
F.	Segmentation outcomes	50
G.	Calculation methodologies	51
H.	Interview questionnaire	54

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# 1. Introduction

## 1.1. The background of the study

The Florence School of Regulation (FSR) has requested PricewaterhouseCoopers Advisory N.V. ('PwC') to jointly conduct a Europe-wide online survey among transmission system operators ('TSOs') and distribution system operators ('DSOs') of gas and electricity from a large number of European countries. The main purpose of this survey is to better understand the average qualification of European energy regulators' performance as perceived by national grid companies and the characteristics of the regulator (e.g. the size of the regulator, single- or multi-sector regulator) that may explain the given qualification.

In addition to the online survey as mentioned above, FSR has also asked PwC to interview a group of relevant European stakeholders. The main reason for the interview is to assess the regulators' performance from an international perspective, by considering their international roles as prescribed by the third package directives for an internal electricity and gas market in Europe.

## 1.2. The scope of the study

The study consists of three parts: (1) a literature review on previous studies on performance of regulators; (2) an online survey among national grid companies; and (3) interviews with European stakeholders.

The first part of the study (i.e. the literature review) is intended to provide a theoretical framework and the rationale for our online survey.

The second part of the study (i.e. online survey) mainly addresses the performance of national energy (i.e. gas and electricity) regulators at the national level. The performance of a regulator will be assessed based on the following four main indicators:

1. **Capability** of the regulator (e.g. energy sector knowledge, creating long-term regulatory commitment);
2. **Management & governance** (e.g. transparency, consistency of decisions);
3. **Effectiveness** (e.g. powers to undertake enforcement action, meeting policy objectives for the industry);
4. **Social benefits** (e.g. increasing overall efficiency in the sector, delivering lower tariffs for consumers).

Through a survey, individual grid companies are invited to provide an ordinal score to express their views on their regulators' performance level with respect to each of these four key indicators mentioned above.

In addition to the average performance of European regulators, we are also interested in the performance score of a specific subgroup of regulators with certain characteristics such as:

- single-sector (i.e. only responsible for the regulation of gas and electricity) versus multi-sector regulators (i.e. also responsible for other industries, besides gas and electricity);
- large and small regulators (in terms of FTE size or allocated budget).

The third part of the study involves interviews with European stakeholders to assess the international performance of national energy regulators with respect to their roles in promoting and facilitating the establishment of an internal EU gas and electricity market.

## 1.3. The set-up of the study

In this section, we explain the set-up of the online survey among grid operators and the interviews with European stakeholders.

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## The online survey

We have carried out the online survey to assess regulators' performance via three steps.



### *Step 1 – Selecting the sample and questionnaire*

In the first step, we have identified the following 21 European countries as the starting point for the survey. This group includes all sufficiently large EU countries and shows a fair representation geographically.

- Austria
- Belgium
- The Czech Republic
- Denmark
- Finland
- Germany
- Greece
- Ireland
- Italy
- Lithuania
- The Netherlands
- Norway
- Poland
- Portugal
- Romania
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- The United Kingdom

We have leveraged PwC's Global Energy Network to contact and invite regulation managers at TSOs/DSOs from these countries. We have not received any valid response from three countries (Ireland, Lithuania and Romania). So our final sample consists of 18 countries.

Subsequently, we prepared a list of questions, including open- and closed-ended questions related to the four performance indicators for regulators: capability, management & governance, effectiveness and social benefits (*please refer to Appendix C for the complete question list*).

### *Step 2 – Conducting online survey*

In the second step, we programmed the questionnaire prepared in the previous step by using the online survey software Sawtooth SSI Web. The questionnaire was launched on a dedicated website specially designed for the survey. We have circulated an invitation for our survey with the link to this website to selected TSOs/DSOs from the countries we had selected in the first step. The selection for these TSOs/DSOs is largely based on the existing business contacts that PwC Global Energy Network has. A minority of the contacts is directly provided by a regulator.

The survey went online on 5 June 2014 and was closed on 20 August 2014.

### *Step 3 – Performing analysis and synthesis*

The third step involves interpreting the results from the online survey. We aggregated the individual responses to underpin our conclusions and safeguard reliable conclusions.

Before the interpretation phase, we assessed the quality of the responses and addressed potential bias issues. This gave us a 'clean' data set that forms the basis of our overall conclusions. For instance, we invited a number of respondents from different countries for an interview to get more background and explanation of their answers. In this way, the quality of the answers can be cross-checked.

## Interviews with European stakeholders

In the light of the third package for an internal EU gas and electricity market, the international cooperation and coordination between national regulatory authorities have become increasingly important. These international aspects of regulators should therefore be considered when assessing their overall performance. To this end, we

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have set up an interview programme to interview some relevant European organisations and prepared a list of questions related to the national regulator's role in promoting and facilitating the establishment of the EU's Internal Energy Market (*please refer to Appendix H for the complete question list*).

We managed to interview representatives from the following EU bodies:

- European Commission (EC)
- European Federation of Energy Traders (EFET)
- European Network of Transmission System Operators for Electricity (ENTSO-E)
- European Network of Transmission System Operators for Gas (ENTSO-G)
- EURELECTRIC
- EUROGAS
- Gas Infrastructure Europe (GIE)
- International Federation of Industrial Energy Consumers (IFIEC)

These organisations represent a broad range of stakeholders, including energy producers, traders, grid operators, suppliers, consumers and the European Commission. The contacts of these organisations are provided by the Austrian national regulator E-Control.

## **1.4. Independence and quality of the study**

The independence of our research and the soundness of the methodology applied are critically important for FSR and PwC. We have made sure of this by applying academically sound methods and through an extensive review of our work by Prof. Dr Pollitt (University of Cambridge), a recognised expert in the field of international regulation practice, to safeguard an academic and objective approach. Also, PwC is a leading global assurance and advisory firm, with a strong and indisputable reputation for independence.

## **1.5. The structure of the report**

In Section 2, we start with a literature review on the academic studies addressing regulatory performance in a broader context. This provides a theoretical framework and motivation for the current study.

In Section 3, we focus on the online survey among grid operators and its outcomes. All the questions asked in the survey will be explained in detail. The size of the final sample, relevant company profile and the geographic distribution of the participating companies, as well as the quality of the responses will be addressed in this section. We will finally aggregate and analyse the outcomes of the survey. We will present the aggregated performance scores and their interpretations and will also statistically test the reliability of the outcome when applicable. Besides, we will address the difference between the current study and a predecessor survey reported in Nillesen (2008).

In Section 4, we address the regulators' performance from an international perspective based on the answers from our interviews with eight different European stakeholders as explained in Section 1.3.

In Section 5, we conclude with the key findings of the study based on the outcomes of the previous sections.

## 2. Literature review

Due to high initial investment costs, the network elements of critical infrastructure sectors such as energy, water, rail transportation and telecoms are characterised as being natural monopolies. In these sectors, it is economically unviable to have a second company build and operate the infrastructure. So regulation is needed to prevent the abuse of monopoly power and protect the interest of consumers, and also to ensure investors a sufficient incentive to make necessary new and replacement investments.

Literature on regulatory performance is present in abundance (see Berg, 2009). In assessing the regulatory performance, different approaches have been used. Berg (2009) indicates that some of the literature focuses on the effect of the regulation on the market that is regulated (i.e. **sector performance**), while other research focuses on the **regulatory system** itself.

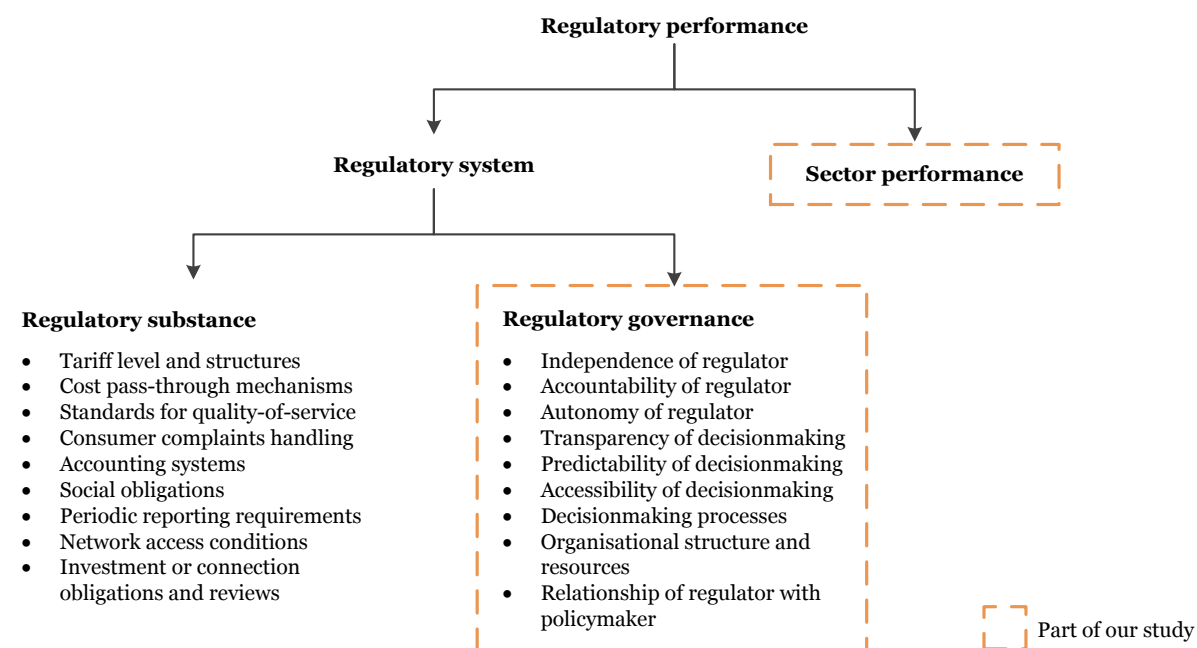
Sector performance of regulation commonly involves the main outputs of the regulation:

- The degree of protection for consumers against disproportionately high service fees and poor infrastructure service quality by the regulation; and
- The investment level required to secure the supply of infrastructure services.

According to Brown et al. (2006), the sector performance should be assessed considering whether the regulation supports or hinders in achieving the goals that the regulatory body has set up for the sector. We agree with Berg (2009) on the grounds that the regulator cannot be solely judged on the basis of sector performance – the entire regulatory system needs to be accounted for.

By the regulatory system for infrastructure, we mean “the combination of institutions, laws, and processes that give a government control over the operating and investment decisions of enterprises that supply infrastructure services”, which is the definition as per the World Bank (Brown et al., 2006, p. 17). Following the World Bank’s guidance, a full evaluation of the regulatory system should include several elements clustered in two basic dimensions of the regulatory system: the **regulatory substance** and the **regulatory governance**, as shown in figure 2.1. The regulatory substance refers to the ‘what’ of regulation, while the regulatory governance refers to the ‘how’ of regulation.

**Figure 2.1: Key elements of the regulatory system**



Source: Brown et al., 2006; PwC analysis



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The **regulatory substance** covers the **technical content of the regulation**, based on which the regulator takes actual decisions. Examples of regulatory substance are the choice regarding tariff setting or benchmarking techniques that are used. The **regulatory governance** involves the legal and institutional **design and processes of the regulatory system** (Berg, 2000), including aspects like independence, accountability, transparency, predictability, the organisation structure and the resources of the regulator (Brown et al., 2006).

Many of the studies found have primarily focused on one of these two dimensions of the regulatory system, i.e. regulatory governance or regulatory substance. In some studies (e.g. Jamasb & Pollitt, 2000), the regulatory substance was covered, while others mainly reported on regulatory governance (e.g. Nillesen, 2008). Our study is similar to Nillesen's work from 2008 and will primarily focus on assessing regulatory governance. It mainly considers the perceived performance of regulators with respect to credibility, independency and transparency. The study will also address some aspects of the sector performance of the regulation (i.e. social benefits of the regulation).

In the following sections, we will review selected studies on regulatory substance (*please refer to Section 2.1*). Subsequently, we will present an overview of selected studies on regulatory governance in Section 2.2. Finally, we will explain the rationale of our study in Section 2.3.

## **2.1. Literature on regulatory substance**

As mentioned earlier, many studies addressing the performance of regulatory systems focus on the regulatory substance. These studies generally study the performance of a single method or decision of regulators. Most of these studies compare between methods and decisions in different countries. In this section, we will zoom in on three studies that made such a comparison.

Jamasb and Pollitt (2000) studied the topic of incentive regulation and the status of the use of benchmarking (in incentive regulation of electricity distribution and transmission utilities) by regulators. They performed a survey among national regulators of 21 countries (17 OECD and 4 non-OECD countries) to evaluate to what extent benchmarking in incentive regulation was already adopted or intended to be implemented and what the main features of the adopted benchmarking methods and processes were. Their results showed that electricity regulators had adopted some form of benchmarking in several countries (13 of the 21 respondents) or were planning or considering to use benchmarking (7 of 21 respondents). With most of the regulators, that already adopted incentive regulation and benchmarking, the benchmarking was still in their first or second regulatory period. They also found that benchmarking was mostly used by regulators in countries that had well-developed competition, a spot market and a high degree of market liberalisation.

Finally, when the amount of published information and industry consultation were regarded as indicators for transparency of the regulatory process, most of the regulators did these things. The Netherlands, Great Britain and Norway were the European regulators considered to provide the best information.

Brophy Haney and Pollitt (2009) also performed a survey among electricity and gas regulators which focused on the benchmarking techniques used by regulators. Benchmarking is, according to the authors, essential for the efficiency improvements. In the survey — that got responses from the national regulators in 40 countries — questions were asked about the kind of benchmarking of network companies they used and about their benchmarking analysis process. They concluded that there were considerable differences between countries in the techniques and methods that were used.

To be able to perform a cross-country comparison regarding the level of sophistication in the use of efficiency analysis, a best-practice index was set up. This index is based on Lovell (2006) and depends on the use of the benchmarking techniques (i.e. DEA, COLS and SFA), the use of underlying data for efficiency analysis (e.g. panel data, Totex), the incorporation of environmental factors (e.g. customer density, age asset) and other specific adjustments. This best-practice index was used to score and thus rank the individual regulators in terms of benchmarking performance. The European regulators regarding electricity regulation that scored best in the index were (in order): (1) Austria, (2) Finland, (3) Belgium, (4) Hungary, Ireland and Norway and (5) Great Britain. Regarding gas regulation, the found order of European regulators is: (1) Austria, (2) Belgium, (3) Great Britain, (4) Denmark, Estonia, Hungary and Ireland and (5) Spain.

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In a 2013 paper, Brophy Haney and Pollitt analysed the theory and practice of international benchmarking of electricity transmission by regulators. This is done by performing desk research and a survey among 48 electricity regulators, of which 25 responded. The topic of the survey was the current practice in regulatory benchmarking of electricity transmission, which is a follow-up on the survey of Brophy Haney and Pollitt (2009). The survey questions cover the choice of benchmarking techniques, the detail of the benchmarking analysis and the current state of electricity transmission benchmarking and expectations for the future.

The authors reported that there is a significant difference between electricity distribution benchmarking and electricity transmission benchmarking and that regulators are aware that transmission benchmarking is more challenging than distribution benchmarking, due to the limited number of national transmission operators (often just one) and associated lack of good comparators. But 13 of the 25 regulators did use some form of electricity transmission benchmarking.

The first and second study (i.e. Jamasb & Pollitt, 2000 and Brophy Haney & Pollitt, 2009) focused on the benchmarking methods and processes applied by national regulators to gas and electricity distribution companies. The last study (Brophy Haney & Pollitt, 2013) focused on the methods for electricity transmission benchmarking. Together, they provide a good insight into the current international practice of benchmarking methods and processes.

As mentioned earlier, these studies mainly related to regulatory substance (i.e. technical content of the regulation) and these studies all involve surveys of regulatory agencies. Below, we consider literatures on regulatory governance.

## **2.2. Literature on regulatory governance**

In this section, we will address the academic studies on regulatory governance. Please note that regulator governance is a key part of regulatory performance.

Both desk research and surveys are commonly used in these studies to compare the performance of regulatory governance in different countries.

In 2003, Johannsen published a study on the assessment of regulatory independence of regulators. The study aims to describe and compare information on the design of the regulatory entities to come to a view on the current status of independence of regulators and factors determining this status. The study shows the results of a survey among eight European regulators with an emphasis on “independence in formal, legal/organisational terms rather than in behavioural terms” (p. 8). This means that this study focuses on the formal rules instead of how these are operated in practice.

Johannsen concludes that regulators’ independence varies between countries. An independence index was constructed based on four dimensions: independence of the regulator from government, from stakeholders, in decision-making and finally organisation autonomy. When scoring the eight regulators on this index, the Italian regulator topped the list, followed by those of Ireland and Northern Ireland. The author also indicates that this ranking needs to be interpreted carefully, due to the limited number of observations and the large variation between countries on each of the four measured dimensions.

Johannsen (2003) covers one specific element of regulatory governance (i.e. independence) and does not evaluate the broader scope of regulatory governance. Also Green et al. (2009) addressed some elements of regulatory governance. Some individual regulators have performed surveys to analyse their own performance (e.g. Plug et al., 2003). But to the best of our knowledge, an independent and objective comparison of regulators’ performance has only been done a limited number of times.

Larouche et al. (2013) have studied the impact of independence, accountability and resources of the regulator of different sectors on the perceived quality of these regulators. To this end, they did a desk research on the resources (budget size and number of full-time equivalent staff) of the regulators and the different aspects of accountability and independence. They also conducted an international survey among regulators, regulatees (companies subjected to the regulation) and academic experts to measure the perceived quality of the regulators. They particularly considered the possible correlation between independence, accountability and resources of the selected regulators.

The results showed that independence, accountability and the amount of resources of the regulator, indeed contributed to the perceived quality. So the authors advise regulators to ask for a greater independence and to offer more accountability. They also found that independence and accountability positively correlate with each other. Although this could mean that improving one of the two would be enough, they do suggest improving both independence and accountability in a balanced way, as it is the combination of the two that determines the perceived quality.

In 2008, Nillesen published the study ‘A Different Perspective on Energy Network Regulation: An International Survey of Regulation Managers’. In this study, various aspects regarding regulatory governance were analysed by doing a perception survey among network companies. This study is similar to our study, which we have described in detail in the next section.

Nillesen’s survey was held among 75 network companies (of which 43 were European) to assess their national regulatory system and included both open- and closed-ended questions. The indicators of regulators’ performance addressed in the study are the **quality of the regulator**, the **effectiveness of the instruments of the regulator** and the **achievements of the regulator**. We note that the third indicator relates to the sector performance of the regulation.

For each of these aspects, the regulation managers were asked to rate the regulator’s performance indicators as mentioned above. An overall score for the regulator and the best-practice regulators was also asked in the survey. Finally, the survey participants were invited to provide their views on the biggest challenges from a regulation perspective and actions that would improve the quality of the regulator.

When the score of an indicator was below 3 (out of 5), the indicator was negatively rated. If the score was above 3, the indicator was positively rated. The main outcomes of this study are summarised in table below.

**Table 2.2: Summary of findings of Nillesen (2008)**

	Positively rated	Negatively rated
<b>Quality of regulation</b>	<ul style="list-style-type: none"> <li>• Sector knowledge</li> <li>• Independence</li> </ul>	<ul style="list-style-type: none"> <li>• Incentivising optimal quality of service</li> <li>• Minimising regulatory uncertainty</li> <li>• Promoting timely investments</li> <li>• Promoting innovation</li> </ul>
<b>Instrument effectiveness</b>	<ul style="list-style-type: none"> <li>• Enforcement powers</li> <li>• Powers to get information</li> </ul>	
<b>Regulatory achievements</b>	<ul style="list-style-type: none"> <li>• Lowering tariffs</li> </ul>	<ul style="list-style-type: none"> <li>• Ability to balance the interests of all stakeholders</li> </ul>

Source: Nillesen (2008)

The average overall score that is given to all regulators is a 5.5 out of 10, although the European regulators receive a higher average overall score of 6.1. Of the national regulators in Europe, the regulator of the UK (Ofgem) is considered to have best-practice, together with the regulators of Finland, Norway and Austria. The three main suggestions to improve the quality of regulators are (i) retaining key staff and thereby increasing knowledge and decreasing reliance on consultants, (ii) improving the approach and way of working, and (iii) further improving the regulatory process and structure.

Most of the grid operators also indicated that regulation is high on their board’s agenda and that the five biggest challenges they were facing from a regulatory perspective are: (i) an increasing regulatory and administrative burden, (ii) increasing regulatory uncertainty, (iii) a lack of coordination between regulatory initiatives and actual market developments, (iv) a lack of realisation of the actual impact of regulatory policies on administration or IT requirements, and (v) the aligning of the business to the regulatory reality. They would characterise their approach towards their regulator as either cooperative and consensus-seeking or more content-driven. The regulator’s approach was seen as confrontational and legalistic, which is in line with our expectation.

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## 2.3. Literature on regulatory matching

The Florence School of Regulation investigated the interplay between “sector performance” and “regulatory systems”. In their five key research studies (2009-2014), the Florence School researchers showed that the properties of a “regulatory compact” (made, on the one hand, of a given energy sector and, on the other hand, of a given regulatory framework) is strongly influenced by the matching properties between the detailed characteristics of the energy sector and the detailed characteristics of the regulatory framework.

In Lévêque et al. (2009), it is shown that a perfect match in an isolated country might not perform for deeply interconnected sectors and interacting frameworks. In Saguan et al. (2011), they showed it again by studying the British regime for the BritNed interconnector as an entry gate to the EU internal market. Glachant et al. (2013a) demonstrated that the property of “matching” between the sector detailed characteristics and the detailed regulatory framework characteristics, as identified in 2009 and 2011, has a more general logical and analytical validity.

In Glachant et al. (2013b), they illustrated it again by applying it to the case of TSOs’ grid investments in the interconnected “market coupling area” consisting of The Netherlands, Belgium, Germany and France. In Glachant et al. (2014), they provide an empirical overview of existing regimes for granting rights to use hydropower, which suggests new extensions of this “sector / framework matching” property.

## 2.4. Rationale of our study

As mentioned before, our study is similar to Nillesen’s study (2008) and so can be seen as an adaption and an update of that study. The key differences with Nillesen’s work are as follows:

- We focus on European regulators (with a larger sample in Europe), while Nillesen also considered international regulatory bodies outside Europe, including regulators from the US, India and Australia
- Our questionnaire is more extensive than the question list used by Nillesen
- We included an econometric analysis to assess the relationship between the perceived performance of individual sub-indicators and the overall performance of the regulator (i.e. a statistical dependence between the score of each sub-indicator and the overall score)
- We explicitly consider the potential difference in perceived performance between single- and multi-sector regulators.

The motivation for the methodology used in this study is provided below in Section 2.3.1. A brief literature overview of single- and multi-sector regulatory approach will be discussed in Section 2.3.2.

### 2.4.1. Methodology of the study

According to the OECD (2012), “understanding and improving the perception of the regulatory environment matters to performance” (p. 7). How stakeholders perceive the regulator is an important indicator of regulators’ performance.

Several parties other than the regulator are present in the regulatory environment in the energy sector, including the government, consumers and network companies. The utilities are the stakeholders which are most dependent on the regulator and have regular interaction with the regulator. So it is sensible to ask about the utilities to assess the regulator. A perception survey helps do this. Although these surveys are increasingly used in OECD countries (OECD, 2012), they are not performed very often in assessing regulated grid companies’ view on the regulatory performance in the energy sector.

The OECD has published a relevant report with guidance on perception surveys. So the study ‘Measuring Regulatory Performance: A Practitioner's Guide to Perception Surveys’ has been used as the base to design the perception survey used in this study.

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One important aspect to keep in mind while designing the perception survey is the possible bias (positive or negative) of grid companies towards their regulatory system. Such a possible bias is named as *regulatee bashing* by Larouche et al. (2013). The OECD (2012) also mentions regulatee bashing as “business perceptions of regulation may be more negative than those of the general public. This may be due to the increased focus by businesses on the costs of regulation rather than on the benefits” (p. 49). We have taken into account this possible bias when designing the survey and while analysing the results. In our survey respondents are obliged to provide a reason when they assign a low score. It is worthwhile to note that a too positive score might not necessarily be good, since it could indicate regulatory capture, as described by Stigler (1971).

The primary focus of our study is, as mentioned before, regulatory governance. But it also touches upon the effects of the regulatory system on the sector. Although the study does not contain a full evaluation of the regulatory systems, it provides a valuable insight into the regulatees’ perception of regulatory performance.

Our questionnaire is based on the following ten key principles of regulatory governance as suggested by Brown et al. (2006):

- Independence
- Accountability
- Transparency and public participation
- Predictability
- Clarity of roles
- Completeness and clarity in rules
- Proportionality
- Requisite powers
- Appropriate institutional characteristics
- Integrity

### 2.4.2. *Single-sector and multi-sector regulators*

Our study will explicitly consider the potential differences between single-sector and multi-sector regulators. A single-sector regulator is exclusively responsible for the regulation of a specific sector (i.e. the energy sector in this study). A multi-sector regulator is a regulatory body with the responsibility to regulate multiple sectors (like energy, telecom and water). Traditionally, the vast majority of regulators are single-sector regulators. Outside Europe, many examples of multi-sector regulators can be found in Canada, the US, Singapore, Malaysia and South Africa (Intven & Tétrault, 2000). Within Europe only a few regulators are multi-sector regulators, like those of Latvia (since 2001), Germany (since 2005), the Netherlands and Spain (both since 2013).

Several studies have compared the single-sector and multi-sector regulatory frameworks (e.g. Schwartz & Satola, 2000; Hewitt, 2004; and Hellerstein & Associates, 2008). There are advantages and disadvantages to both the frameworks.

#### Single-sector framework

Supporters of single-sector regulation usually argue that the regulation of a single sector allows professionals to become more specialised and focused, which contributes to greater efficiency and effectiveness. Also they believe that single-sector regulators need to show greater accountability than multi-sector regulators, since single-sector regulatory bodies are watched more closely by the regulated sector.

Potential disadvantages of a single-sector framework are:

- Possibly larger inconsistency in the regulation application between different sectors, since every sector has a separate regulatory body with their own regulation approach;
- Higher total regulation costs of a country, as a result of the existence of different regulatory bodies.

#### Multi-sector framework

A key argument for supporting a multi-sector approach is that a multi-sector regulation model reduces the regulation costs by removing duplication of regulation staff and other resources. Other advantages of a multi-sector approach usually cited by supporters are:

- Increased independence, as a result of lower industry or political capture (Smith, 1997);

- 
- Higher predictability of regulation and lower market distortions, due to consistencies in regulation across different sectors;
  - Increased options for hiring high-calibre professionals.

However, potential disadvantages of a multi-sector approach are: (i) a possible dilution of sector-specific knowledge and (ii) possible delays in reform processes due to potential difficulties in achieving agreement between the relevant ministries.

## Practical examples of multi-sector regulators in Europe

In the Netherlands, the single-sector regulator has been integrated into a multi-sector regulator to create more effective and efficient regulation. A compact and powerful multi-sector regulator was thought to be able to cope with new developments like internationalisation, technological innovations and changing markets by adopting a flexible and integrated approach, whilst saving costs (Tweede Kamer der Staten-Generaal, 2012). Due to the short existence of the multi-sector regulator of the Netherlands, there has not been an evaluation of the change towards the multi-sector framework.

But such an evaluation does exist for the multi-sector regulator of Latvia. In this evaluation it was found that: “(i) the structure gives economies of scale and of scope in using scarce legal and economic regulatory expertise; (ii) the household ability to pay problem of the transition period was addressed by introducing tariff increases across sectors in a balanced manner; (iii) uniform tariff setting principles and information collecting procedures are applied in the regulation of the various sectors, reducing the risk for investments by establishing a predictable regulatory environment; (iv) the risk of ‘regulatory capture’ is less for a multi-sector regulator than for a single-sector regulator; and (v) as some utilities undertake cross-sector activities it is logical that the regulator is cross-sector” (Firma L4, 2004, p. 7).

Based on the evaluation, it can be concluded that the multi-sector framework of the Latvian regulator indeed led to increased effectiveness of the regulator, increased independence and a higher predictability of regulation.

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## 3. Our survey

This section is structured as follows. In the first subsection, the design of the survey is described and the questions are explained. In the second subsection, the characteristics of the participating companies and the respondents are discussed. In the final subsection, the outcomes of the survey are analysed in detail.

### 3.1. Design

This survey is designed to get insight into the views of regulated grid companies on their regulator's performance. The regulatory performance will be qualitatively assessed along the four dimensions: capability, management & governance, effectiveness and social benefits. The first three dimensions are the key elements of regulatory systems (more precisely, regulatory governance, please see figure 2.1), whereas the fourth dimension relates to the sector performance of the regulation.

The online survey was conducted in June 2014. The survey has been circulated among more than 170 transmission and distribution grid companies from 21 different European countries.

The survey was accessible through a dedicated website. PwC's Global Energy Network, an international network, contacted finance directors, regulation managers or employees of utility companies, with some degree of involvement with their regulator, to participate in the survey. Multiple contacts per company were contacted, but only one representative per company is included in the analysis. Responses were completely anonymous and confidential.

The survey consists of three parts:

- 1. Introductory questions**

- Respondents were asked to provide background information about their working experience with regulation and the company profile.

- 2. Performance-related questions**

- Respondents were invited to give their opinion on the performance of their regulator with respect to certain areas (e.g. such as industry experience, independence, consistency in decision-making) and the regulatory approach, the economic rationale and overall score of their regulator.

- 3. Specific open questions**

- Respondents were asked about challenges relating to regulation which the company is expected to face, the possible improvements and the best-practice regulators.

Please refer to Appendix C for the full online questionnaire.

#### 3.1.1. Introductory questions

Here respondents were asked to provide some background information about their company and their own role in the company.

The main purpose of these questions is to gather insight into the business profile of the companies who have participated in the survey and into the involvement and experience of the respondents with energy regulation. The background information can be relevant for analysing potential difference in perceptions of different grid operators. Also, it can be used to support the credibility of the responses. It is reasonable to assume that senior staff with substantial working experience of regulation and with intensive contacts with regulators generally will provide more reliable and realistic answers. The background information concerning the geography allows us to analyse the geographic distribution of the respondents.

We specifically asked the following questions: (i) the profile of the company, (ii) the name of the company, (iii) the ownership structure, (iv) the FTE size of the company, (v) the amount of regulated revenue, (vi) the company's regulator, (vii) the strategic importance of the regulation, (viii) the respondent's position in the

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company, (ix) the respondent's personal involvement with regulation issues, and (x) the respondent's experience with energy regulation.

### 3.1.2. Performance-related questions

In this part, respondents were asked to give their opinion about the performance of their regulator in different areas. The purpose of the performance-related questions is to gain a deeper insight into the grid operator's view on the overall performance of the regulator.

Our questions on the performance of the regulatory authorities are in line with the performance indicators as suggested by the World Bank (Brown et al., 2006).

We categorise the performance-related questions into four categories:

- 1) Capability
- 2) Management & governance
- 3) Effectiveness
- 4) Social benefits

Each category contains multiple sub-indicators. For each sub-indicator, respondents are invited to rate them on a scale from 1 to 5, where 1 is the lowest (i.e. most negative) and 5 the highest (i.e. most positive). To reduce the possible bias that the respondent randomly or intentionally provides very poor scores, the respondents are asked to provide an explicit example of reasons when they give a rating of 1 or 2. In this way, the respondent is forced to justify their low-scored answers. Also, we requested the respondent for reasons that can be verified by public sources whenever applicable. In addition, respondents have to rank the importance for each of the sub-indicators on a scale of 1 to 3 where 1 is unimportant, 2 is neutral and 3 is important.

#### Capability

This category covers the following aspects of the regulator: (i) sector knowledge, (ii) clarity of regulation objectives, (iii) ability to adapt to changing circumstances, (iv) ability to incentivise cost efficiency, (v) ability to promote financial sustainability of the network companies, (vi) ability to stimulate optimal quality of service, (vii) ability to influence environmental policies, (viii) ability to promote timely investment, (ix) willingness to promote technological innovation, (x) willingness and ability to create long-term commitment, (xi) timeliness of decisions, and (xii) quality of information services and communication.

*A priori* we expect grid companies to be 'neutral' or slightly positive on average (i.e. an average score equal to or slightly higher than 3) about their regulator's capability. For some capability indicators such as sector knowledge, clear definition of objectives and quality of information services and communication, a positive rate will be expected, given the length of existence of some of the regulators in our sample. We expect companies to be negative (i.e. average score lower than 3) about: incentives for optimal quality of service, promotion of timely investments, promotion of innovation and long-term commitment. These factors capture some of the challenges that regulators face when attempting to satisfy short-term policy objectives to lower tariff and longer-term regulatory and sector developments. Examples of the regulatory challenges are incorporating an effective measure of quality into incentive schemes or ensuring that investments are not only timely, but effective and efficient.

#### Management & governance

This category addresses the following aspects of the regulator: (i) transparency, (ii) consistency of decisions, (iii) policy to minimise regulatory uncertainty, (iv) independence, (v) integrity, (vi) accountability of its own actions, and (vii) fairness.

Overall, we expect grid operators to be positive (i.e. average score higher than 3) about management & governance. In particular, the regulators will be favourably valued on grounds of transparency, independence, integrity and fairness. These quality measures are the basic ingredients for good regulation and should be



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recognisable by regulated companies. We expect grid companies to be negative (i.e. average score lower than 3) about regulatory uncertainty and the regulator's accountability.

## Effectiveness

This category includes the following performance sub-indicators: (i) the power to take actions, (ii) the power of information acquisition and investigation, (iii) whether they succeed in meeting policy objectives for the industry, (iv) balancing interest of stakeholders, and (v) whether they succeed in reducing the regulatory and administrative burden.

We expect that the effectiveness of the regulator will be rated favourably (i.e. average score higher than 3), as a regulatory body is perceived to have the real power to enforce actions and investigate. Also, an independent regulator should balance the interests of different stakeholders. Grid operators are likely to be less positive about the success in reducing the regulatory and administrative burden.

## Social benefits

In contrast with capability, management & governance, and effectiveness, the social benefits relate to the sector performance (please refer to figure 2.1). This is an indirect performance indicator for regulators, as regulator actions influence the market performance of the sector. The category 'social benefits' covers the following aspects: (i) delivering lower tariffs for customers, (ii) ensuring security of supply, (iii) increasing overall efficiency in the sector, and (iv) contributing to the energy transition.

On average, we expect the regulation managers to be positive (i.e., average score higher than 3) on social benefits. Not many grid companies will suggest that they are charging excessive tariffs to their customers and that the market in which they operate is not efficient. Also, they should perceive a positive contribution from the regulator towards improving the security of supply.

For the contribution to energy transition towards renewables, we expect the companies to be less positive (i.e. average score lower than 3). This is because of the fact that regulation of renewable energy is not fully developed yet.

## Other performance-related questions

Besides the questions directly linked to the four key performance indicators, we also asked respondents to provide their views on the regulator's attitude towards their companies and their company's attitude towards the regulator.

Four possible attitudes were defined: (i) confrontational and legal-based, (ii) cooperative and consensus-seeking, (iii) expert role, analytical and content-driven (thought leader), and (iv) passive and reactive.

*A priori*, the most likely approach is that most companies will view the regulator's approach as confrontational and legal-based. It is likely that, given the different objectives between the companies and the regulator, the approach may end up being confrontational and legal-based, while the intention may initially have been more consensus-seeking. On the other hand, we expect that most companies will qualify their approach as either cooperative or consensus-seeking or as an expert role (thought leader). But we expect that companies will change their approach and resort to legal action once decisions are taken by the regulators that do not meet the company's expectations.

To test the objectivity and the independency of the regulator's decisions, we explicitly asked grid companies for their perceptions of whether there is an economic rationale behind the regulation they faced. They have to indicate this on a scale of 1 to 5 where 1 is 'not at all' and 5 is 'entirely'. It is likely that the regulation is driven by economic rationale, so we expect an average score higher than 3.

As the final question of this part, the respondents were invited to give an overall rating for the regulator's performance between 1 and 10, where 1 was the most negative and 10 the most positive. Given the amount of experience and knowledge many European regulators have built up over the years, we expect the regulators to pass (i.e. higher than 5). But it is likely that the spread of scores will be high, with some companies being very negative and some companies very positive about their regulator.

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### 3.1.3. Additional open questions

The main purpose of these specific open questions is to get insight into grid companies' views on the changes in the field of regulation and best practice regulators in Europe.

The respondents were asked three open-ended questions. The first question focuses on the changes facing the companies from a regulation perspective. The second question asks the regulation managers to name the changes in regulation that they would like to see. The final open question asks the respondents to identify, in their view, the best-practice regulator from our sample.

First of all, we do not expect that every regulation manager will have a clear-cut idea about the best-practice regulators across Europe. This is simply because they do not have the necessary knowledge of regulators in other countries. So possible bias in the responses is not possible, as the respondents may intend to name the regulators they know (for instance, the regulators from their own and neighbouring countries).

## 3.2. Response

In total, 66 grid companies took part in the survey.<sup>1</sup> Compared to previous surveys in the field of regulation, this sample size is considered relatively high (*please refer to Appendix E for a comparison*). We did not expect a proportionate response rate per country, as we did not know what the actual responses per country would be and as the total number of TSOs and DSOs varies considerably across countries (from a few to hundreds). Please note that the number of actual responses from most countries is limited; implying that the average score of individual country based on this survey may be not representative from a statistical point of view.

Before we analysed the responses, we tested the quality of the data points from the responses along the following quality indicators:

1. **Total elapsed time** for completing the whole survey: an extremely low elapsed time can indicate poor and unreliable answers.
2. **Page time** (=the time spent for answering the performance-related questions) has a similar function to the elapsed time, but is restricted to the key part of the survey.
3. **Consistency** tests the correlation between the scores for performance sub-indicators and the overall performance scores. A weak correlation indicates poor consistency.
4. **Credibility** of the respondent: we identified the function and the seniority of the respondents (in terms of their experience and involvement with regulation), assuming that senior respondents will provide more accurate responses.

Based on these tests, we concluded that the overall quality of the responses is fairly good. The detailed analysis of each quality indicator is presented in Appendix B.

### 3.2.1. Geographic coverage

The geographic focus of our research is Europe and we have circulated our survey among TSO and DSO companies from the following 21 countries.

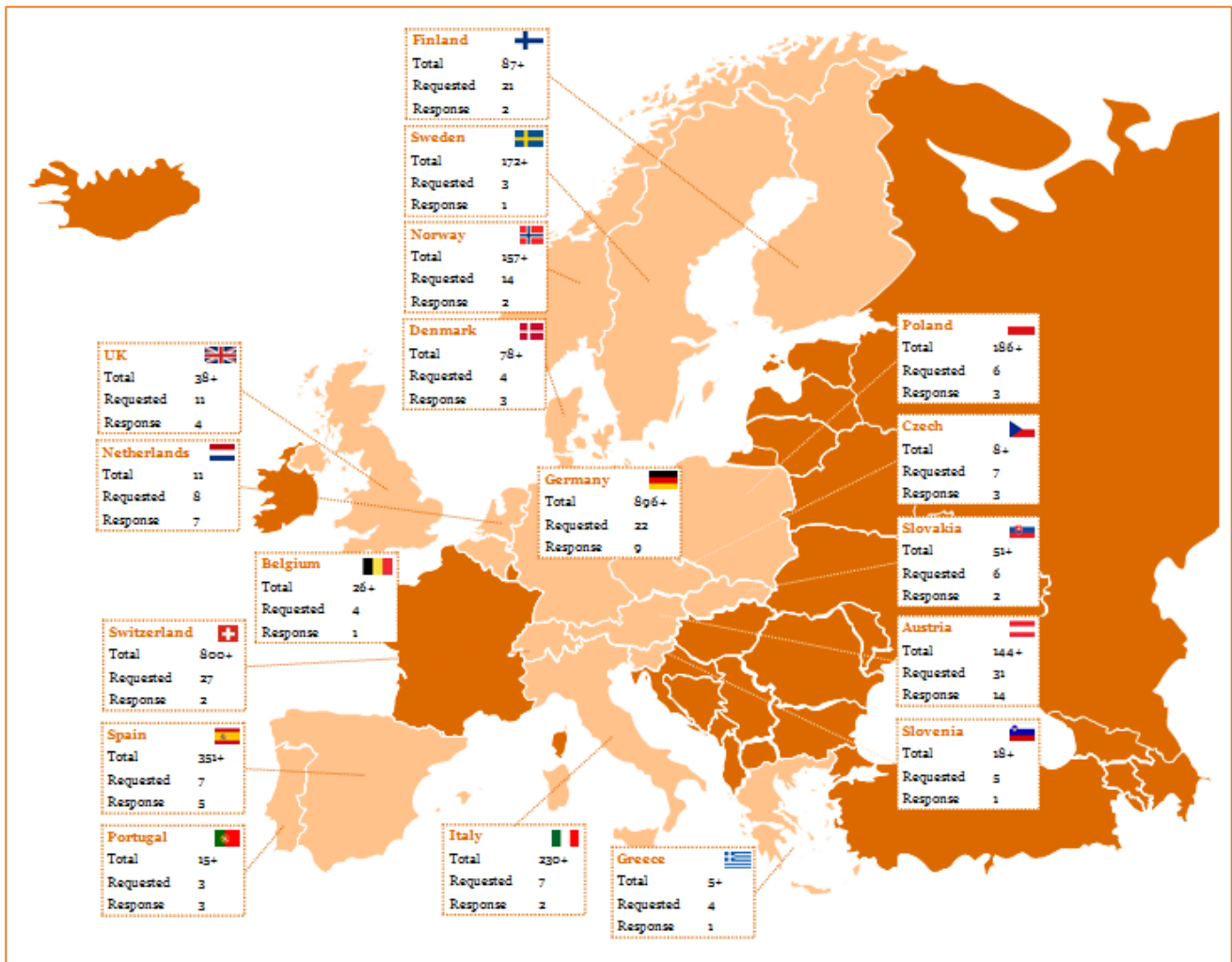
- Austria
- Belgium
- The Czech Republic
- Denmark
- Finland
- Germany
- Greece
- Ireland
- Italy
- Lithuania
- The Netherlands
- Norway
- Poland
- Portugal
- Romania
- Slovakia
- Slovenia
- Spain
- Sweden
- Switzerland
- The United Kingdom

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<sup>1</sup> The average score is used, when there are multiple respondents from the same grid operator.

From Ireland, Lithuania and Romania, no valid responses have been received. So we have excluded these countries from our sample. Figure 3.1 shows the number of responses, the number of grid operators invited to participate in the survey, and an indication of the total number of network companies in a country.<sup>2</sup>

**Figure 3.1: Geographical representation**



Source: PwC analysis; Eurelectric (2013); CEER (2013); IEA (2012) and websites of national regulators

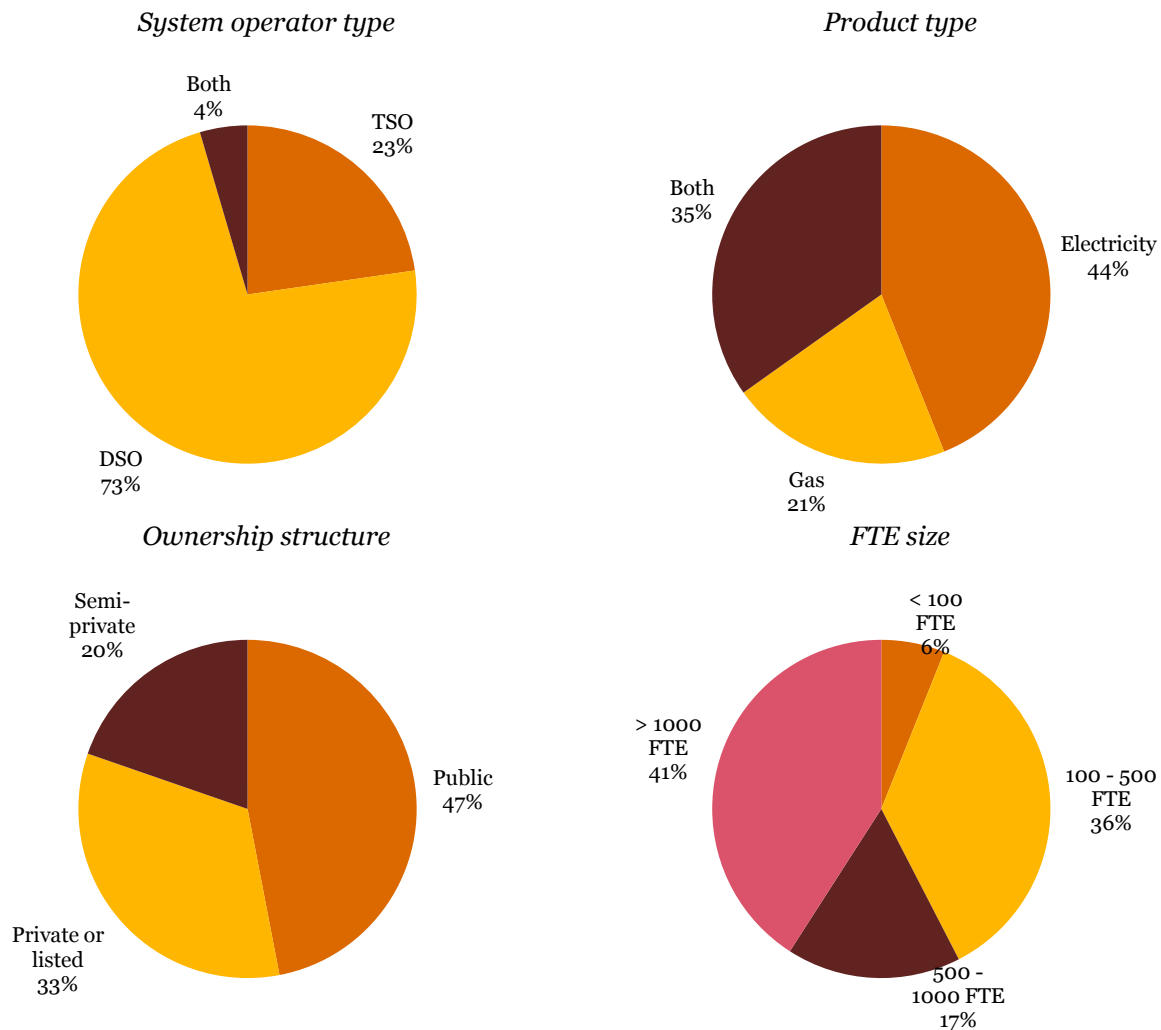
### 3.2.2. Company profile

Based on the answers in the first part of our survey ('Introductory questions'), a number of relevant characteristics of the business profile of the respondent's company are analysed. A summary of the results is shown in Figure 3.2.

We observe that most of the participating companies are DSOs (>70%). This is expected, as there are much more DSOs than TSOs in Europe. Both gas and electricity grid operators are well presented (21% gas and 44% electricity). Public and private-owned grid companies are almost equally represented in our sample (53% private or semi-private and 47% public). Most of the companies (ca. 60%) from our sample have more than 500 FTEs.

<sup>2</sup> Please note that only a minimum amount of total network companies are shown, as the exact number is difficult to get due to the possible overlap between gas and electricity grid companies.

**Figure 3.2: Company characteristics**



Source: PwC analysis

### 3.3. Outcomes

In this section, we analyse the outcomes of the performance-related questions (the second part of our survey) and the specific open questions (the third part of the survey). For the performance-related questions, we note there are 66 data points (answers) for each of our questions, as we have 66 participants. But for the specific open questions, we only have 65 data points (answers), since not every participant provided answers for this part of the survey.

#### 3.3.1. Performance-related questions

The perceived performance of a regulator is based on the average rating for its overall performance and the average rating for the performance of the regulator in the following areas: capability, management & governance, effectiveness and social benefits.

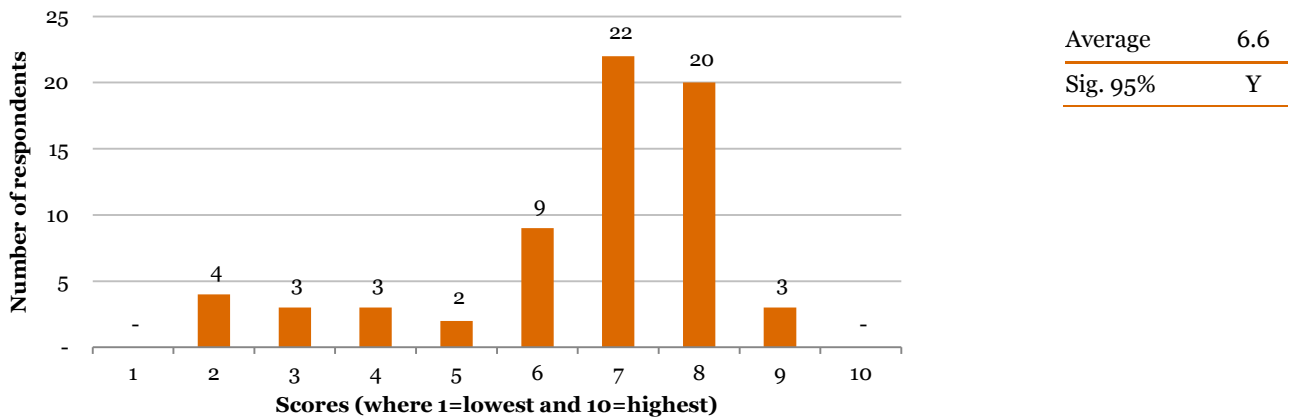
This subsection is structured as follows: first, we perform analysis on the overall performance. Second we examine the average score per individual sub-indicator of the four specific key indicators. Third, we perform segmentation analysis on the individual sub-indicators. Fourth, we compare overlapping sub-indicators and the overall performance score with Nillesen (2008). Finally, we present the outcome of the other performance related indicators: the regulators' and companies' approach, the economic rationale and the companies' strategies driven by regulation.

## Performance from a national perspective

In our survey, grid operators are asked to rate the overall performance of their national regulators by giving a score between 1 (worst) and 10 (best). With an average score of 6.6 for the overall performance, the national regulators in Europe are favourably rated by their regulated grid companies<sup>3</sup>. This positive rating is slightly higher than the outcome of the earlier study of Nillesen in 2008 (with an average score of 6.1 for regulators in Europe).

The figure below shows the distribution of the scores. A majority of the respondents (77%) gave a score between 6 and 8.

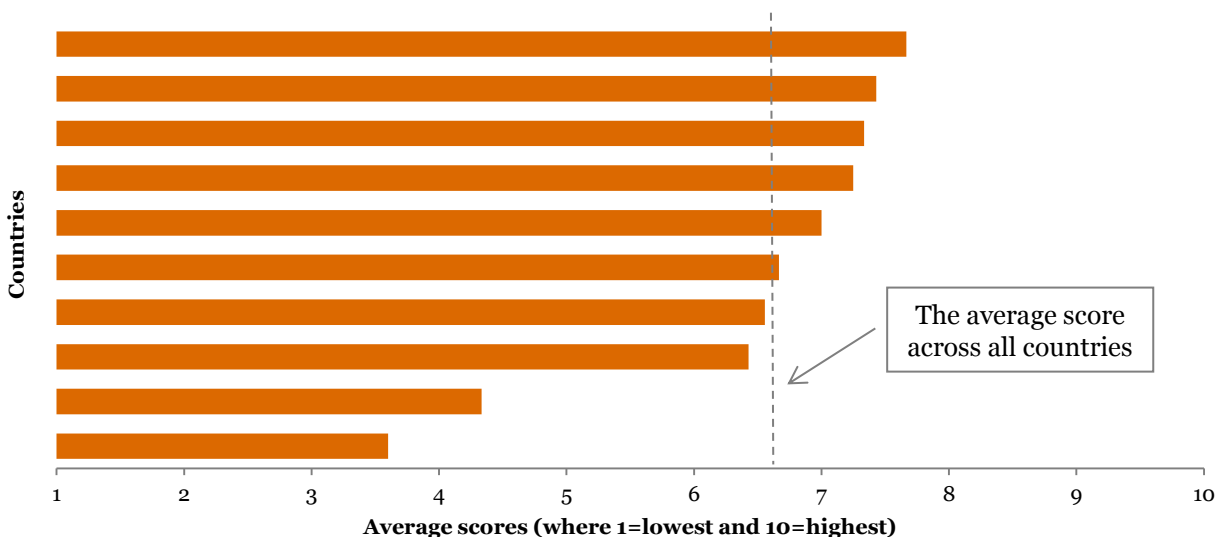
**Figure 3.4: Distribution of the overall score**



Source: PwC analysis

The average scores per regulator vary considerably across countries (from the lowest score of 3.6 to the highest score of 8). It should be noted that there was a limited number of respondents per country (with an average of three respondents), a comparison of country performance rating is not statistically sensible.

**Figure 3.5: Average score per country with three or more responses**



Source: PwC analysis

<sup>3</sup> A very high score (i.e. close to 10) would not necessarily be good, as it could indicate regulatory capture.

It is worthwhile noting that the regulators in Spain and the Czech Republic are rated relatively poorly by their grid operators. The main arguments for the poor score for the Spanish regulator NCMC, as mentioned by the Spanish grid operators, are limited competence and independence (only responsible for assessment and monitoring, but decisions are made by ministries), lack of transparency and consistency, and poorly designed regulation framework for renewable energy sector. The reasons for a low rate cited by the Czech grid companies are a lack of long-term vision, reactive attitude, lack of skills, accountability and transparency. We emphasize that the relatively poor ratings of Spain and of Czech Republic are only based on a limited number of responses, and are therefore not necessarily representative of other grid companies in these countries.

We examine whether there are any statistically significant differences in the overall score between different groups of regulators and grid companies. As shown in the table below, a significant difference is found in the overall score for single- versus multi-sector regulators. Single-sector regulators are statistically higher rated by their grid companies than multi-sector regulators.

**Table 3.6: Segmentation of the average scores for overall performance**

	Regulator characteristics						Company characteristics								
	Single	Multi	95%	Large	Small	95%	TSO	DSO	95%	Public	Priv.	95%	Large	Small	95%
Overall score	6.9	6.0	Y	6.5	6.7		6.9	6.4		6.8	6.4		6.6	6.6	

Source: PwC analysis

## Specific performance

Besides the rating of the overall performance, each regulator is also rated for specific individual performance indicators (between 1=worst and 5=best). These indicators are grouped into four main categories: capability, management & governance, effectiveness and social benefits. We examine the average score per performance indicator and assess whether these are positively (>3), centrally (=3) or negatively (<3) rated. We also asked the respondents to rank the importance of each performance indicator. In the tables below, we use the symbols ++, +/- and - to indicate 'critically important', 'neutral' and 'not important', respectively.

As the average scores of each indicator are estimated from a sample, we need to do a statistical test to see whether the sample averages (as shown in table 3.7) are statistically significantly different from the central rate of 3. Please refer to Appendix G for the calculation of the weighted average score and significant differences.

Our results suggest that all indicators; capability, management & governance, effectiveness and social benefits are positively rated from a statistical point of view (i.e. above 3). Please refer to table 3.7 for the results.

In line with the poor rating for the overall performance, the regulator in Spain is negatively rated (i.e. below 3) almost for all performance indicators, which is however based on limited number of observations.

**Table 3.7: The weighted average score per key performance indicator**

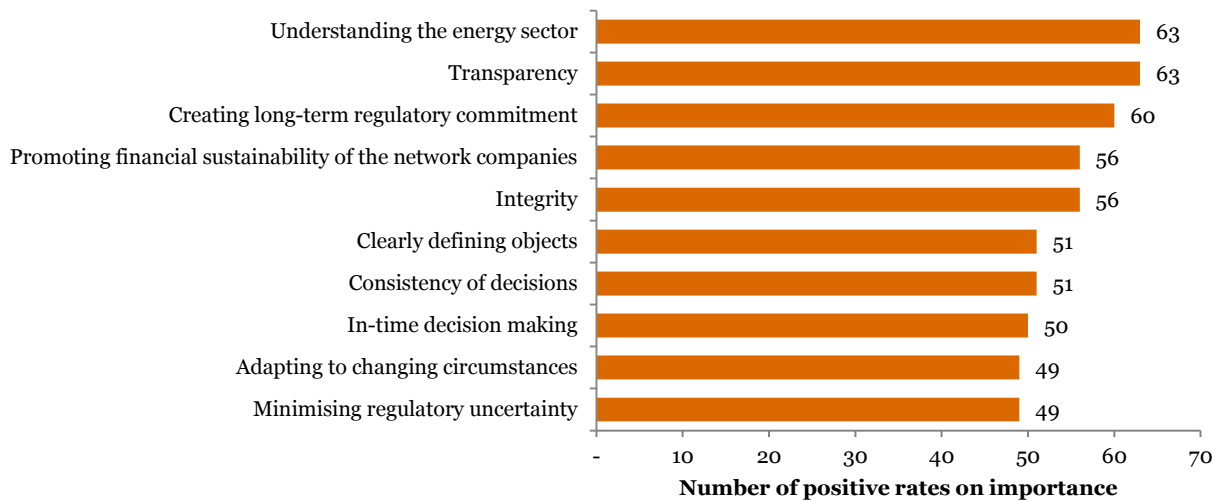
Main performance indicators	No. of sub-indicators	Weighted average score (min. 1 and max. 5)	Significantly different (from central rate of 3)	Importance		
				++	+/-	--
Capability	12	3.20	Y (above)	58	7	1
Management & governance	7	3.45	Y (above)	57	9	-
Effectiveness	5	3.41	Y (above)	58	8	-
Social benefits	4	3.35	Y (above)	36	25	5

Source: PwC analysis

A majority of the responses (more than 80%) considered capability, management & governance and effectiveness very important for the performance of the regulators. In particular, the survey shows that sector knowledge, transparency, creating long-term regulatory commitment, promoting financial sustainability of the

network companies and integrity are the top five most important performance indicators of a regulator (please see figure 3.8 on the next page). Below we discuss the scores of specific individual performance indicators.

**Figure 3.8: The top 10 indicators based on importance ratings**



Source: PwC analysis

### Capabilities

In the table below, we summarise scores for the capability sub-indicators. The table reports the distribution of the scores, the sample average and the column next to this indicates whether the average score is statistically significantly different from the central expected average (score of 3). In the final three columns, a distribution of the importance assigned by the respondents is shown. In the last row of the table, the weighted average score for capability is calculated, where the average is weighted by the importance score.

**Table 3.9: Scores and importance of capabilities**

	Lowest					Central	Highest		Average	Sig. (95%)	Importance		
	1	2	3	4	5	3	4	5			++	+/-	--
1 Understanding the energy sector	-	7	12	32	15				3.83	Y (above)	63	3	-
2 Clearly defining objectives	2	8	29	24	3				3.27	Y (above)	51	15	-
3 Adapting to changing circumstances	1	12	27	24	2				3.21	Y (above)	49	17	-
4 Incentivising cost efficiency	3	9	19	22	13				3.50	Y (above)	42	24	-
5 Promoting financial sustainability	5	14	21	24	2				3.06		56	10	-
6 Incentivising optimal quality of service	4	14	23	19	6				3.14		29	33	4
7 Influencing environmental policies	5	21	32	8	-				2.65	Y (below)	11	36	19
8 Promoting timely investment	6	10	24	24	2				3.09		45	21	-
9 Promoting technological innovation	8	14	31	12	1				2.76	Y (below)	32	25	9
10 Creating long-term regulatory commitment	5	8	25	24	4				3.21	Y (above)	60	6	-
11 In-time decision making	3	11	37	13	2				3.00		50	16	-
12 Quality of information services and communication	1	7	27	28	3				3.38	Y (above)	27	37	2
Weighted total capability score									3.20	Y (above)	58	7	1

Source: PwC analysis

Respondents gave the highest average grade to ‘understanding the energy sector’ (3.8), whereas the lowest score is given to ‘influencing environmental policies’ (2.6). Most important indicator is ‘understanding the energy sector’ and least important indicator is ‘influencing environmental policies’.

The capabilities of the regulator that have been rated significantly better than the expected average (i.e. higher than 3), are: (1) understanding the energy sector, (2) clearly defining objects, (3) adapting to changing circumstances (4) incentivising cost efficiency, (10) creating long-term regulatory commitment and (12) quality of information services and communication. The indicators of capabilities of the regulator that are significantly rated below the expected average (i.e. lower than 3) are: (7) influencing environmental policies and (9) promoting technological innovation.

The main reason for the low score on influencing environmental policies is the low priority for stimulating renewables and environmental policies for regulators.<sup>4</sup>

The low score on promoting technological innovation is explained by the respondents as the regulator not having a focus on technological innovation. They also state that there is lack of incentives to innovate, since the payback of investments in new technologies is uncertain. There is ‘no budget allowance for innovation’ and ‘technologies such as smart meters are excluded from the cost-based price structure’.

The overall weighted score for capability of regulators is 3.2, which is significantly higher than the central score of 3.

Due to the limited sample size per individual country, no meaningful statistical comparison between countries can be made. However, when simply looking at the average indicator ratings per country with 3 or more respondents, we see some countries received relatively low ratings (i.e. below 3). The regulator of Spain for instance, was on average rated below 3 on all capability indicators except ‘quality of information services and communication’. The Finnish regulator was the only regulator with a positive rating for influencing environmental policies.

### *Management & governance*

The findings for the indicators relating to management & governance are presented in the table below.

**Table 3.10: Scores and importance of management & governance**

	Lowest					Average	Sig. 95%	Importance		
	1	2	3	4	5			++	+/-	--
1 Transparency	2	7	24	28	5	3.41	Y(above)	63	3	-
2 Consistency of decisions	1	13	22	29	1	3.24	Y(above)	51	15	-
3 Minimising regulatory uncertainty	4	10	29	21	2	3.11		49	17	-
4 Independence	5	3	18	26	14	3.62	Y(above)	41	25	-
5 Integrity	-	2	15	35	14	3.92	Y(above)	56	10	-
6 Accountability of their own actions	-	8	25	28	5	3.45	Y(above)	29	33	4
7 Fairness	1	9	20	34	2	3.41	Y(above)	11	36	19
Weighted total management & governance score						3.45	Y (above)	47	9	-

Source: PwC analysis

Respondents gave the highest average grade to ‘integrity’ (3.9), whereas the lowest score was given to ‘minimising regulatory uncertainty’ (3.0). None of the indicators have on average been rated below the central rate of 3.

<sup>4</sup> The Ministry will generally be responsible for setting policies to stimulate renewables. But, the regulator will play an important role in stimulating investments in infrastructure needed for the energy transition.



All indicators of management & governance have been rated significantly higher than the central rate, except the indicator ‘minimising regulatory uncertainty’.

The total weighted average score for management & governance is a 3.5, and this is significantly higher than the expected average of 3. Thus the management & governance of regulators is overall rated positively.

When analysing average scores per country with 3 or more respondents; the regulator from Spain scores below 3 on all indicators, except the indicator ‘integrity’. Also the Czech regulator is negatively rated on management & governance except for the indicators ‘Independence’, ‘integrity’ and ‘accountability of their own actions’. None of the regulators were negatively rated on ‘integrity’.

### Effectiveness

The findings for the indicators relating to effectiveness are presented in the table below.

**Table 3.11: Scores and importance of effectiveness**

	Lowest		Central		Highest		Average	Sig. 95%	Importance		
	1	2	3	4	5	++			+/-	--	
1 Powers to undertake enforcement action	-	3	18	36	9	3.77	Y (above)	37	29	-	
2 Powers of information acquisition and investigation	-	3	10	35	18	4.03	Y (above)	34	31	1	
3 Meeting policy objectives for the industry	1	5	34	23	3	3.33	Y (above)	37	26	3	
4 Balancing interests of stakeholders	1	9	33	21	2	3.21	Y (above)	43	22	1	
5 Reducing the regulatory and administrative burden imposed on the regulated entities	5	18	35	7	1	2.71	Y (below)	46	20	-	
Weighted total effectiveness score						3.41	Y (above)	58	8	-	

Source: PwC analysis

The weighted average score of effectiveness is significantly higher than the expected average (i.e. above 3) with a rating of 3.4. This implies that effectiveness is overall positively rated.

Respondents gave the highest average grade to ‘powers of information acquisition and investigation’ (4.0), whereas the lowest score is given to ‘reducing the regulatory and administrative burden imposed on the regulated entities’ (2.7).

The regulators have been rated significantly better than the central rate (i.e. higher than 3) on the indicators of: (1) powers to undertake enforcement action, (2) powers of information acquisition and investigation, (3) meeting policy objectives for the industry and (4) balancing interests of stakeholders.

The effectiveness of the regulator in terms of reducing the regulatory and administrative burden imposed on the regulated entities was scored lower than the expected average (i.e. below 3). In general, the respondents see a growing demand for information. Besides, they see a larger effort by the companies themselves than by the regulator to reduce the administrative burden.

When analysing the indicator ratings of countries with a response of 3 or more, we notice that the regulator of Spain is the only regulator that is negatively rated on the weighted total effectiveness score. None of the regulators was rated negatively on powers of information acquisition and investigation. Only the Danish regulator received a positive rating for reducing the regulatory and administrative burden.

### Social benefit achievements

In the table below, we summarise the performance ratings for social benefits.

**Table 3.12: Scores and importance of social benefits achievements**

	Lowest					Average	Sig. 95%	Importance		
	1	2	3	4	5			++	+/-	--
1 Delivering lower tariffs for customers	4	4	18	28	12	3.61	Y (above)	33	29	4
2 Ensuring security of supply	2	7	29	22	6	3.35	Y (above)	46	19	1
3 Increasing overall efficiency in the sector	3	7	21	31	4	3.39	Y (above)	43	20	3
4 Contributing to the energy transition (towards renewables)	5	12	31	18	-	2.94		20	42	4
Weighted total social benefit achievements score						3.35	Y (above)	36	25	5

Source: PwC analysis

Respondents give the highest average grade to ‘delivering lower tariffs for customers’ (3.6), whereas the lowest score is given to ‘contributing to the energy transition (towards renewables)’ (2.9). None of the indicators regarding social benefit achievement of regulators was scored significantly lower than the expected average (i.e. below 3). The most important indicator is ‘increasing overall efficiency in the sector’ and the least important indicator is ‘contributing to the energy transition (towards renewables)’.

Three of the four indicators regarding social benefit achievement were scored significantly higher than the expected average (i.e. above 3).

The weighted average score of social benefits achievements is significantly higher than the expected average (i.e. above 3) with a rating of 3.4.

When looking at the average indicator scores per country with 3 or more responses, we notice that the regulator of Spain is overall unfavourably rated by their grid operators. The regulators of the Netherlands, Denmark, Portugal and Finland are negatively rated by their grid operators on ‘contributing to the energy transition (towards renewables)’. The Portuguese regulator was rated negatively on all social benefits indicators, except ‘delivering lower tariffs for customers’.

## Segmentation analyses per performance indicator

In addition to the analysis of the average score per indicator of the total sample, we also perform some segmentation analyses (i.e. for a specific group of regulators or grid companies) to assess

1. The difference in performance scores between regulators with specific characteristics (single- vs multi-sector; small vs large organisation)
2. The difference in the scores given by specific group of grid operators (TSO vs DSO; public- and private-owned; small and large company size)

Below, we explain different characteristics of regulators and grid operators, used for our segmentation analysis.

- **Single- versus multi-sector regulator.** Regulators from six countries (i.e. Germany, Italy, the Netherlands, Norway, Slovakia and Spain) are multi-sector (i.e. not only responsible for gas and electricity), whereas the rest of the countries have a single-sector regulator.
- **Small regulator versus large regulator.** Regulators’ size is based on the total number of FTEs working for the regulator.<sup>5</sup> We define a regulator as large if it has more than 100 FTEs. Large regulators are the regulators from Austria, the Czech Republic, Germany, Italy, Poland, Spain, and the United Kingdom.

<sup>5</sup> The total number of FTEs includes all employees regardless of their specific sectors, in the case of multi-sector regulators.

- **TSOs versus DSOs.** 40 companies have indicated that they are solely DSOs and 13 companies have indicated that they are solely TSOs and 2 companies are both TSOs and DSOs.
- **Public versus private or semi-private companies.** 25 companies in our data set turned out to be public companies whereas 20 are private or listed and 10 are both public and private (semi-private).
- **Small companies versus larges companies.** Company size is based on the total number of FTEs working for the company. We define a company as large if it has more than 500 FTEs. 33 companies in our data set are defined as large whereas 22 are defined as small.

In table 3.13 the outcomes of the segmentation analyses are shown. Only the statistically significantly differences are mentioned in this table. Please refer to appendix F for an overview of the average scores per indicator per segmentation.

**Table 3.13: Outcome of the segmentation analysis**

	Regulator characteristics	Grid company characteristics
<b>Capability</b>	<ul style="list-style-type: none"> <li>• Single-sector regulators score statistically significantly higher on <i>understanding the energy sector, creating long-term regulatory commitment and in-time decision making</i> than multi-sector regulators.</li> <li>• Large regulators score statistically significantly higher on <i>incentivising cost efficiency</i> than multi-sector regulators.</li> </ul>	<ul style="list-style-type: none"> <li>• TSOs give significantly higher scores for <i>quality of information services</i> than DSOs.</li> <li>• Public companies give significantly higher scores for <i>creating long-term regulatory commitment</i> than private or semi-private companies.</li> <li>• Large companies give significantly higher scores for <i>promoting timely investments</i> than small companies.</li> </ul>
<b>Management &amp; governance</b>	<ul style="list-style-type: none"> <li>• Single-sector regulators score statistically significantly higher on <i>minimising regulatory uncertainty and fairness</i> than multi-sector regulators.</li> </ul>	<ul style="list-style-type: none"> <li>• Public companies give significantly higher scores for <i>transparency, consistency of decisions and accountability for their own actions</i> than private or semi-private companies.</li> </ul>
<b>Effectiveness</b>	<ul style="list-style-type: none"> <li>• Single-sector regulators score statistically significantly higher on <i>balancing interests of stakeholders</i> than multi-sector regulators.</li> <li>• Large regulators score statistically significantly higher on <i>powers of information acquisition and investigation</i> than small regulators.</li> </ul>	<ul style="list-style-type: none"> <li>• No difference between grid companies.</li> </ul>
<b>Social benefits</b>	<ul style="list-style-type: none"> <li>• Single-sector regulators score statistically significantly higher on <i>delivering lower tariffs for customers</i> than multi-sector regulators.</li> <li>• Large regulators score statistically significantly higher on <i>contributing to the energy transition (towards renewables)</i> than small regulators.</li> </ul>	<ul style="list-style-type: none"> <li>• No difference between grid companies.</li> </ul>

Source: PwC analysis

## Comparison with Nillesen (2008)

We compare the indicators in this survey with the overlapping indicators of Nillesen (2008). In total, we compare the ratings of 16 performance indicators and the score for the overall performance. Please note that Nillesen's study from 2008 included non-European countries, including the US, India and Australia. Our comparison is restricted to European countries.

In the table on the next page, we show the average EU scores of Nillesen (2008) and the comparable indicator with the average score. Finally, in the column on the right, we show whether there is a statistically significant difference between the scores.

**Table 3.14: Comparison of indicators and overall score**

	<b>Indicator Nillesen (2008)</b>	<b>Inverse EU score<sup>6</sup></b>	<b>Indicator survey</b>	<b>Average score</b>	<b>Sig. diff.</b>
I	Sector knowledge	3.63	Understanding the energy sector	3.83	Y
II	Transparency	3.19	Transparency	3.41	Y
III	Consistency of decisions	3.21	Consistency of decisions	3.24	
IV	Incentivising cost control	3.35	Incentivising cost efficiency	3.50	
V	Incentivising optimal quality of service	2.98	Incentivising optimal quality of service	3.14	
VI	Minimising regulatory uncertainty	2.63	Minimising regulatory uncertainty	3.11	Y
VII	Promoting timely investment	2.74	Promoting timely investment	3.09	Y
VIII	Promoting innovation	2.58	Promoting technological innovation	2.76	
IX	Independence	3.49	Independence	3.62	
X	Long-term regulatory commitment	2.98	Creating long-term regulatory commitment	3.21	Y
XI	Powers to enforce	3.58	Powers to undertake enforcement action	3.77	Y
XII	Powers to get information	3.60	Powers of information acquisition and investigation	4.03	Y
XIII	Lower tariffs	3.37	Delivering lower tariffs for customers	3.61	Y
XIV	Increasing overall efficiency	3.14	Increasing overall efficiency in the sector	3.39	Y
XV	Meeting policy objectives	2.79	Meeting policy objectives for the industry	3.21	Y
XVI	Balancing interests of stakeholders	2.84	Balancing interests of stakeholders	2.71	
XVII	Overall score	6.11	Overall score	6.58	Y

Source: Nillesen (2008); PwC analysis

Statistically significant higher scores are found for the following indicators when comparing to Nillesen (2008): sector knowledge, transparency, minimising regulatory uncertainty, promoting timely investment, long-term regulatory commitment, powers to enforce, powers to get information, lower tariffs, increasing overall efficiency and meeting policy objectives. This could indicate an improvement over time in the quality of regulation across EU countries.

Please refer to Appendix E for an overview of the total response and the response per country of Nillesen (2008).

<sup>6</sup> Nillesen (2008) rated on a scale of 1 to 5 where 1 is the highest and 5 is the lowest. An inverse score is calculated as (6-average EU score) to compare results with our survey.

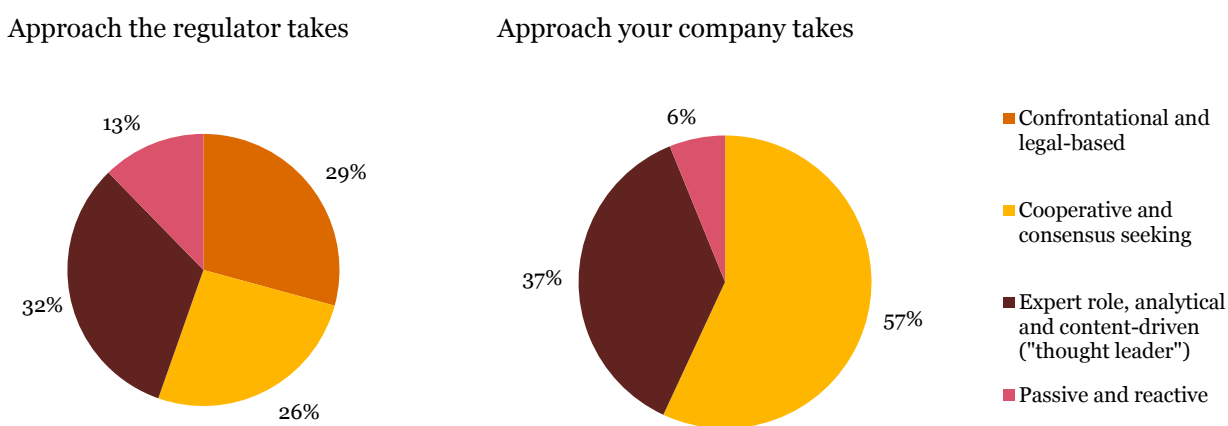
## Other performance-related questions

### Approach

Our results show that the perceived approach of the regulator seems to be quite divided (please refer to figure 3.15). Nillesen (2008) reported the perceived approach of the regulator to be mainly confrontational and legalistic or cooperative and consensus-seeking. So it seems that the content-driven approach of regulators has become more established.

The approach of the companies was identified by more than half of the companies (ca. 60%) as being cooperative and consensus seeking, by 37% as being an expert role, analytical and content-driven and by only 6% of all respondents as passive and reactive. The approach of the grid companies was not deemed to be confrontational and legal-based. These results agree with the findings of Nillesen (2008), who reported most of the companies to see their approach as either cooperative and consensus-driven or content-driven.

**Figure 3.15: The regulator's approach**

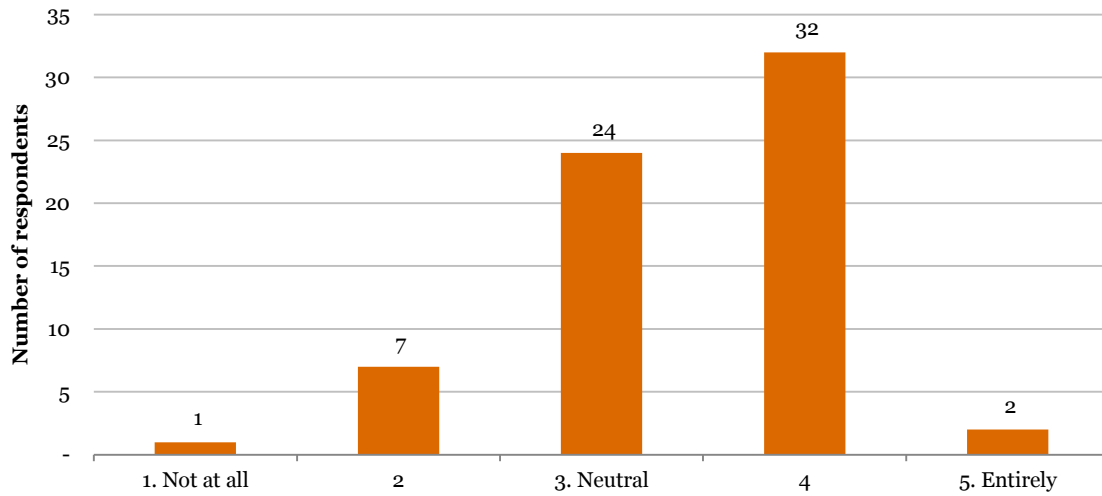


Source: PwC analysis

### Economic rationale

In the view of most respondents, regulation is driven by an economic rationale. The extent to which regulation is driven by economic rationale is significantly higher rated than the central rate, with an average score of 3.4. Only 2 respondents rate the regulation to be entirely driven by an economic rationale, which means that most of the respondents think that at least part of the regulation is not driven by an economic rationale. Only 12% of the respondents negatively rated the economic rationality of regulators. It is worthwhile to note that a positive view on economic rationality supports the relative high rate for the independence of regulators (please refer to figure 3.5) and reflects the fact that the regulators were established as 'economic' regulators.

**Figure 3.16: To what extent is regulation of your regulator driven by economic rationale?**

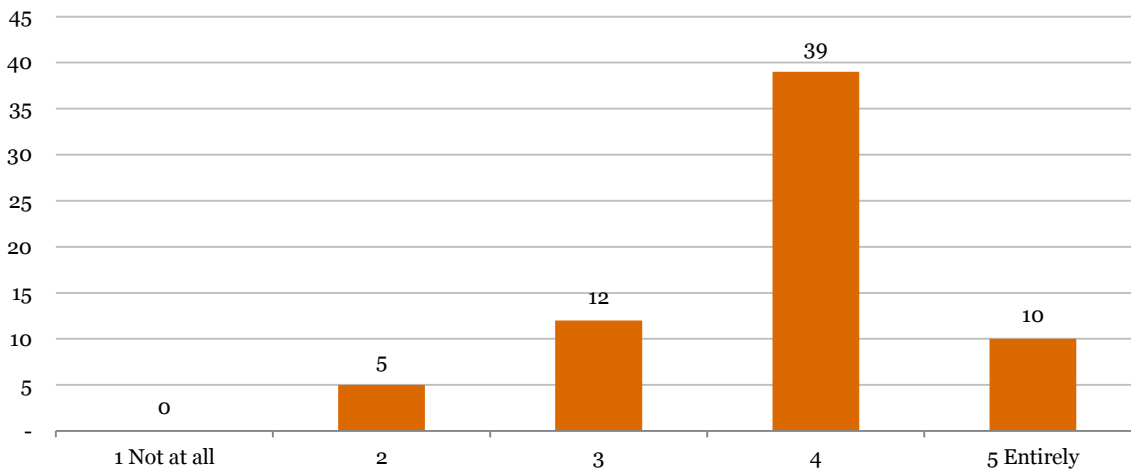


Source: PwC analysis

### *Company's strategy driven by regulation*

Although the extent to which the strategy of companies is driven by regulation is not a direct performance indicator of the regulatory system, it does say something about the importance that companies give to the regulation. Most respondents (ca. 75%) rated the extent to which their strategy is driven by regulation above 3, with an average of 3.8. Less than 10% of the respondents gave a negative rate.

**Figure 3.17: To what extent is your company's strategy driven by regulation?**



Source: PwC analysis

Nillesen (2008) asked about the position of regulation on the agenda of the board of the company. Most respondents also stated that regulation had a prominent position on the agenda. Although this does not say anything of the extent to which the strategy of the company is driven by regulation, it indicates that regulation was important to the company.

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### 3.3.2. Specific open questions

In total, 65 respondents took part in the specific open question part of the survey<sup>7</sup>. Respondents were asked three open questions:

1. What top 3 changes do you expect to be imposed on your company from a regulation perspective in the near future?
2. What top 3 changes from a regulation perspective do you think should happen in the near future?
3. Which 3 countries or regulatory authorities would you consider as best-practice?

We discuss each question in this paragraph.

### Expected changes in regulation

The changes expected to be imposed on the company of the respondents are of different kinds. Some of the respondents expect the burden on their companies to increase by: increased unbundling guidelines, growing demand for information from the regulator, tougher quality regulation and increased pressure for cost efficiency. Other respondents mention likely greater efforts of the regulator in incentivising integration of renewables, integration of innovative technologies like smart meters, energy efficiency and the implementation of unbundling. Finally, respondents also expect that the regulation periods will be lengthened.

### Desired changes in regulation

Several changes were mentioned as desired by the respondents. One of the main desired changes was the realisation of stable regulatory systems by implementing longer regulatory periods and increased transparency of the regulator. Other changes that are wanted are better integration of renewables into grids and increased incentives for innovation (i.e. smart meters and self-generation). These desired incentives for innovation mainly focus on the need for investment in new technology. Other desired changes cited by respondents relate to the management of stakeholders. The respondents mention a desire for better integration of the sector requirements and a better engagement towards the stakeholders of the regulators. Further, they would like to see fair sharing mechanisms applied to the tariffs and revenues.

It is interesting to see that part of the desired changes — like longer regulatory periods, better integration of renewables and integration of innovative technologies like smart meters — is also expected to be imposed on the companies.

### Best practice regulator

The regulators that have been indicated as best practice are those of the UK and Germany. As can be seen in the graph below (i.e. figure 3.18), there is a fairly large gap between the regulator of the UK and the other regulators in terms of the number of favourable votes.

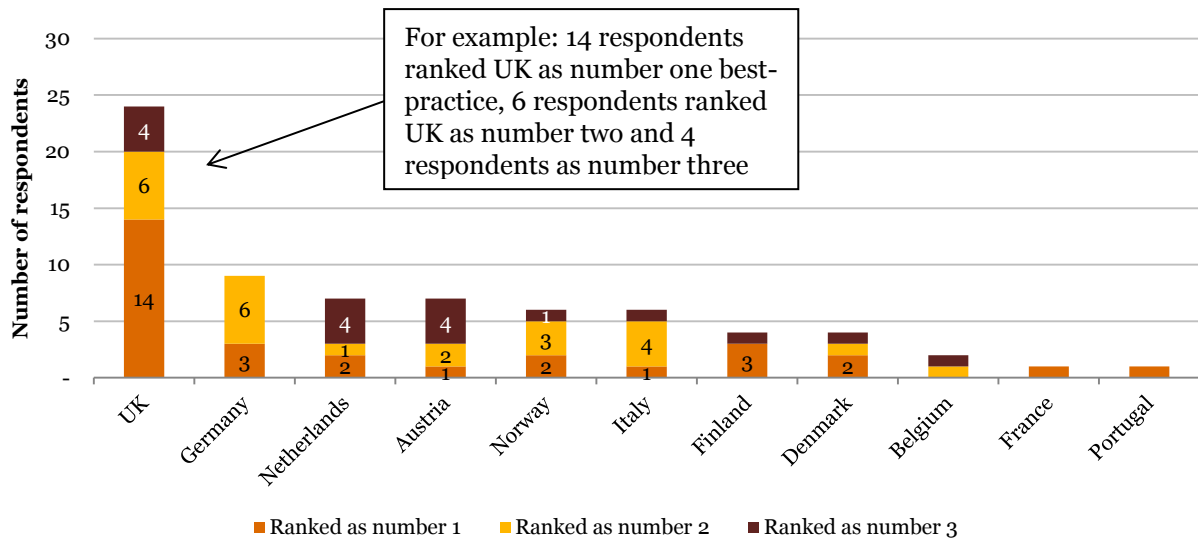
The regulator that was identified most often as best-practice is the regulator of the UK: the Office of Gas and Electricity Markets (Ofgem). More than 20% of the respondents (all outside the UK) chose the Ofgem as the number one regulator. The arguments for this choice were: 'high transparency', 'good knowledge of the sector', 'taking responsibility for the market', 'good stakeholder management', 'pioneer in regulation', 'long-term views' and 'thorough review of own regulation. In Nillesen (2008) the Ofgem was also identified as best-practice.

The second regulator that was often mentioned was the German regulator, the Bundesnetzagentur, but with only 3 votes as number one (of which 1 outside Germany). The reasons of the respondents provided included 'good cooperation with the market', 'consensus-driven approach' 'good stakeholder management', 'good transparency' and 'high stability and predictability'. The best-practices of Nillesen (2008) did not mention the German regulator. This could indicate that the regulator of Germany has greatly improved its performance and the recognition by the market over the last years, since its late introduction in 2005.

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<sup>7</sup> There was 1 respondent (out of 66), who has not completed this part of the survey.

**Figure 3.18: Best-practice regulator indication \***



Source: PwC analysis

\*Please note that for the best-practice 30 observations found useful, for the second best-practice 26 observations found useful and for the third best-practice 22 observations found useful.



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## 4. *Performance from an international perspective*

In 2007, the European Commission (EC) proposed the third legislative package to create a competitive internal electricity and gas markets in the EU. This third package came into force in September 2009. The Electricity and Gas Directives of this package have introduced a number of new rules with respect to the national regulatory authorities (NRA), and particularly required that all NRAs should act impartially, independently and in a transparent manner.<sup>8</sup> Also, these directives prescribe close international cooperation and coordination among NRAs across Europe.

In this section we address the international performance of NRAs as perceived by relevant European stakeholders, by considering the NRAs' international role in promoting and facilitating the creation of the EU's internal energy market, and NRAs' impartiality, independence and transparency.

For this purpose, we have interviewed eight European organisations that represent a broad range of stakeholders, including energy producers, traders, grid operators, suppliers, (industrial) consumers and the EC.

In the first subsection we describe the interview set-up. In the second subsection, we address the main results aggregated from the answers of the stakeholders.

### 4.1. *The set-up of interviews*

The interviews are intended to provide insights into the European stakeholders' views on the regulators' performance from an international perspective. Motivated by the directives of the third package, our interview questions address the following elements: (1) international cooperation; (2) promotion of the internal energy market (IEM); (3) achievements and accomplishments of the IEM; (4) independence; (5) impartiality and transparency; (6) competence; and (7) vision on the EU gas and electricity market.

- (1) With respect to international cooperation, respondents were asked what role, in their view, NRAs should play; which initiatives have been proposed or taken by NRAs and which NRA is most active in the EU arena;
- (2) With regard to promotion of IEM, stakeholders were asked to provide their views on the importance of promoting the IEM, and who is driving the IEM;
- (3) Regarding achievements and accomplishments of the IEM, stakeholders were asked to confirm whether national regulators sufficiently ensure compliance of TSOs with the legislation with respect to cross-border issues;
- (4) Independence is assessed by considering the independence of NRAs from market interests and from political bodies;
- (5) Impartiality and transparency are addressed by the question of how NRAs consult national/international stakeholders;
- (6) Stakeholders were asked to name the top 3 most competent NRAs across Europe
- (7) Stakeholders were asked to identify NRAs with a strong vision on the EU gas and electricity market.

Please refer to Appendix H for the full questionnaire of the in-depth interviews.

The interviews have been taken in August 2014. Representatives from the following EU bodies are interviewed; (i) EC; (ii) EFET ; (iii) ENTSO-E, (iv) ENTSO-G, (v) EURELECTRIC; (vi) EUROGAS; (vii) GIE; and (viii) IFIECGIE. The representatives of these organisations, who were interviewed by us, have a good knowledge about the internal energy market, and most of them are in regular contact with different national regulators.

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<sup>8</sup> Please refer to *Commission staff working paper*, 2010.

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## 4.2. Main outcomes

All interviewees unanimously indicated that NRAs should play a proactive role in the implementation of the third package for an internal gas and electricity market in the EU. In particular, NRAs should ensure that all market players are following the same rules as prescribed by the Electricity and Gas Directives. NRAs should promote the cross-border cooperation among TSOs and among themselves. NRAs from Austria, France, Germany, the Scandinavian countries and UK are generally considered most active in the EU arena. But, some interviewees also pointed out that an active role of NRAs in some cases is mainly driven by the personal involvement of their representatives in an EU regulatory body such as ACER.

All stakeholders interviewed by us recognised that NRAs are critically important for promoting and facilitating the creation of an internal energy market. Generally, they believe that the internal energy market stands or falls by the cooperation and agreement between NRAs, since NRAs have to remove the barriers between the national markets. As an example, some stakeholders pointed it out that NRAs played a very important role in the realisation of interconnections in the past.

A majority of the interviewees was of the opinion that NRAs could do more to ensure the compliance of TSOs with the directives of the third package with regard to cross-border issues. For instance, NRAs have not imposed any fines and sanctions on TSOs that are still not fully compliant with the newly implemented network code and the transparency platform. Some stakeholders believe that NRAs focus too much on developing the regulatory rules but do not pay enough attention to actively monitoring compliance and to enforcement.

With respect to the independence, an absolute majority of the interviewees agrees that NRAs are, in general, independent from market interests. But, a majority of the stakeholders think that still many NRAs, in particular some NRAs from Eastern and Southern Europe like Bulgaria, Hungary and Spain, are still not independent from political interference. In general, the NRAs from the Scandinavian countries are considered to be the most independent from their governments. Austria, Belgium, Germany and UK are also mentioned as good examples of independent regulators.

Most interviewees agree that NRAs generally make an effort to ask opinions from relevant stakeholders before taking decisions, although the degree of consultation may vary between NRAs. But, many interviewees pointed out that it was not always transparent to what extent the stakeholders' opinions provided during the consultation rounds have been reflected in their final decisions.

NRAs from Austria, Germany, the Netherlands, the Scandinavian countries and the UK have been mentioned by different interviewees as the most competent regulators in the European energy arena. The main reasons, they mentioned, were that these NRAs have good in-house sector and technical experts, a well-established organisational structure and close involvement in drafting and implementing the third package.

When asked about the NRAs' vision of an internal EU gas and electricity market, a majority indicated that NRAs from Austria, France and Italy have developed a strong European vision towards an internal EU gas market, probably inspired by their own national gas markets. The Austrian NRA E-Control is, for instance, driving the Gas Target Model very actively.

## 5. Conclusions and considerations

The online survey was conducted among 66 grid companies from 18 different countries in Europe and provides interesting and valuable insights into the way grid companies think about the performance of their regulator. This national perspective could help regulators to increase their performance by focusing on those issues that regulated companies identify as below average. Also, by identifying the best practice regulators, companies can argue for changes or propose alternative regulatory processes or structures.

At the same time, having interviews with relevant European stakeholders would provide valuable insights into the way international stakeholders look at the performance of national regulators.

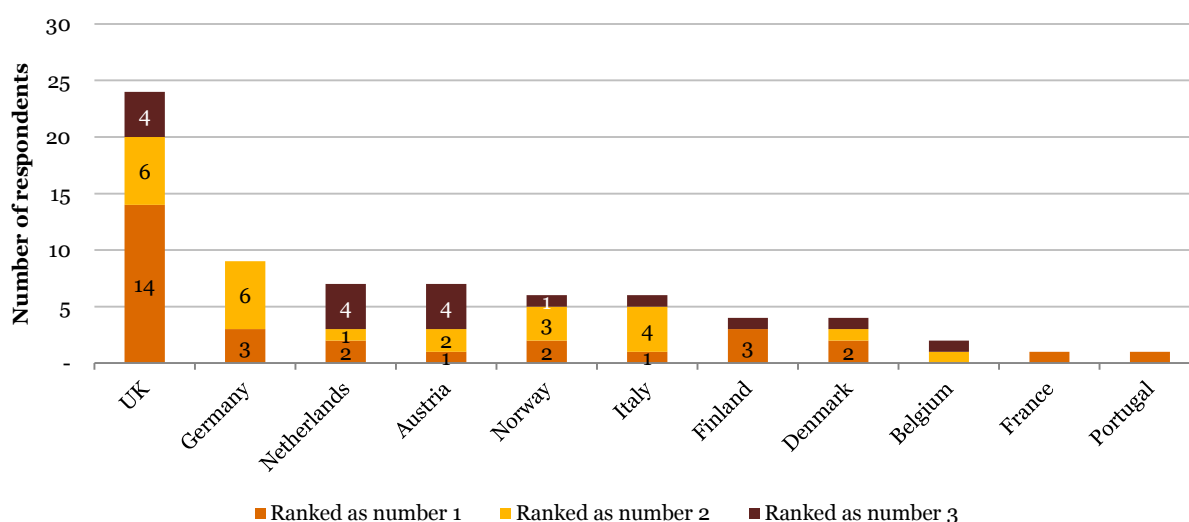
### 5.1. Overall performance

The responses from the online survey show that the national regulators from Austria, Denmark, Finland, Germany, Italy, the Netherlands, Norway and the UK (listed alphabetically) are the best-performance regulators in Europe. In addition, the regulators from Austria, France, Germany, the Netherlands, the Scandinavian countries and the UK (listed alphabetically) are mentioned as most active and competent regulators in the European energy arena by some of the representatives of the eight European organisations we have interviewed.

The main reasons for best practice regulators include knowledge of the sector, a good stakeholder management, high transparency and stable regulation due to long regulatory periods.

In particular, the UK regulator (i.e. the Ofgem) was ranked as best practice by most respondents. *Please refer to figure 5.1 for best-practice national regulators as ranked by grid companies.* The UK regulator was also mentioned as best practice in Nillesen (2008) but the German regulator was not ranked as such. Further analysis and assessment of the UK regulator could help improve the quality of other regulators. Further, it could indicate that the German regulator has improved its performance. Analysing its efforts of performance improvement since 2008 could provide useful insights into how to improve the performance of regulators.

**Figure 5.1: Best practice regulators, indicated by grid operators**



Source: PwC analysis

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## 5.2. Performance from a national perspective

In our survey, we asked grid operators to rate the overall performance of their national regulators by giving a score between 1 (worst) and 10 (best). With an average score of 6.6 for the overall performance, the European regulators are favourably rated (i.e. above 3) by their regulated grid companies.

This positive view of utility companies towards their regulators is in line with the outcome of the earlier study of Nillesen in 2008 (with an average score of 6.1).

The average scores vary considerably across countries (from the lowest score of 3.6 to the highest score of 8.0). Since there was a very limited number of respondents per country (with an average of around three respondents per country), a statistical comparison of the performance rating between countries may not be sensible.

We found a significant difference in the overall score for single versus multi-sector regulators. Single-sector regulators are statistically higher rated by their grid companies than multi-sector regulators.

### Specific performance of regulators

Besides the rating of the overall performance, each regulator is also rated on different performance indicators. These indicators are grouped into four main categories: capability, management & governance, effectiveness and social benefits. Our survey shows that the key performance indicators management & governance, effectiveness and social benefits are on average rated favourably (i.e. above the central rate), whereas the rate for capability does not significantly differ from the central rate of 3.

In line with the poor rating for the overall performance, the regulator in Spain is negatively rated (i.e. below 3) for almost all performance sub-indicators.

- **Capability:** Grid companies have on average a ‘neutral’ view on the capability of regulators from our sample. But our study shows that the sector knowledge of regulators, the ability to incentivise cost efficiency and the quality of information and communication are rated above average by respondents. On the other hand, the results indicate that influencing environmental policies and promoting innovation are rated below average. So regulators should ask for more influencing power on environmental policies and should more actively promote innovation<sup>9</sup>. A positive view of grid operators on sector knowledge and the ability to incentivise cost efficiency is in line with our expectation, since these fundamentals of regulators should be recognised by the market.

The regulator from Spain is negatively rated for their overall capability, whereas the UK regulator Ofgem received the highest score.

- **Management & governance:** Our results show that regulators are positively rated for this performance indicator. In particular, they received favourable rates for transparency, independence, integrity, accountability and fairness by their grid operators. It is noteworthy that the integrity of regulators is most highly valued.

Based on the responses, the Danish regulator received the highest rate from its grid companies, whereas the Spanish regulator forms an exception with the lowest rating for management & governance. In particular, Spain had a low score with respect to independence and providing regulatory stability. The poor score for these sub-indicators can be explained by: (1) the regulator in Spain is not considered to be completely independent legally; and (2) the Spanish government has made a number of retroactive changes to the renewable energy sector in the past few years, increasing regulatory uncertainty.

- **Effectiveness:** The results of our survey suggest that regulators in Europe are considered to have effective instruments. In the view of grid companies, regulators have strong powers to undertake

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<sup>9</sup> It should focus on the regulation of network infrastructure to facilitate the integration of locally generated renewable energy resources. See also Anaya and Pollitt (2014).

enforcement action, to acquire information and to investigate. Meeting the policy objectives for the industry is positively valued as well. Respondents are less positive about reducing the regulatory and administrative burden imposed on their regulated entities. So regulators should put more effort to reduce the administrative burden. But, regulators need to have an optimal balance between decreasing administrative burden and the power of information acquisition and investigation.

Regulators from all countries, except Spain, received a favourable rating (i.e. above 3) from their grid operators.

- **Social benefits:** The survey outcomes show that regulators stimulate social benefits. In particular, the tariff reductions, ensuring security and increasing overall efficiency of the sector are perceived positively by the regulated companies. This positive view is in our opinion sensible, since most of the grid companies have experienced tariff cuts driven by regulation. To maintain a reasonable income margin, some grid companies have been forced to reduce the cost base, improving the efficiency of the sector.

The Spanish regulator received the lowest overall rate for social benefits from its grid operators. The regulators of the Netherlands, Denmark, Portugal and Finland are negatively rated by their grid operators on ‘contributing to the energy transition (towards renewables)’.

## Difference in performance between specific regulator segments

We investigated the potential difference in the performance rating between small ( $\leq 100$  FTEs) and large ( $> 100$  FTEs) regulators and between single- and multi-sector regulators.

First of all, grid companies did not rate single- and multi-sector regulators differently.

But our analysis shows that small regulators are on average better rated for transparency and consistency of decisions (part of the performance indicator management & governance) than large regulators. This outcome is expected, since smaller organisations are usually considered more transparent and more focused.

Large regulators are more favourably rated for powers of information acquisition and investigation, and for contributing to the energy transition than smaller regulators. This is in line with the general perception that larger regulators commonly have more political power and more resources to facilitate energy transition.

## Different views of specific grid company segments

We investigated the possible difference in views on the performance of regulators between specific grid companies. For this, we distinguish between (1) TSOs and DSOs, (2) publicly and private owned, and (3) small ( $\leq 500$  FTEs) and large ( $> 500$  FTEs) operators.

It seems that TSOs rated regulators more positively than DSOs, with regard to in-time decision making, quality of information services and communication.

Publicly owned companies gave significantly higher scores for creating long-term regulatory commitment, transparency, consistency of decisions and accountability than privately owned companies.

Large utility companies rated regulators more favourably for promoting timely investments, powers for information acquisitions and investigation than small grid companies.

## Comparison with past results

If we compare the indicators in this survey with the overlapping indicators in Nillesen (2008), looking at the EU average scores, we observe that the indicators rated above the expected average in Nillesen (2008) have also received an above average rating in this survey. Minimising regulatory uncertainty and promoting timely investment were rated below the expected average in Nillesen (2008) but are rated as the expected average in this survey. Promoting innovation was rated below the expected average in Nillesen (2008) and is still below the expected average in this survey.

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Respondents indicated that their strategy is, to a large extent, driven by regulation. Nillesen (2008) already reported that regulation was high on the board's agenda. These are clear indicators of the high importance of regulation for these companies. Respondents also indicated that the regulation of their regulator was mostly driven by an economic rationale.

Our results show that the perceived approach of the regulator seems to be quite divided. Nillesen (2008) reported the perceived approach of the regulator to be mainly confrontational and legalistic or cooperative and consensus-seeking. So it seems that the content-driven approach of regulators has become more established.

The identified approach of the companies is in agreement with the findings of Nillesen (2008) as most of the respondents answered it as being cooperative and consensus seeking and as being an expert role, analytical and content-driven. A legalistic approach by the regulator is usually justified as regulatory decisions are challenged in court. The confrontational role is sometimes necessary to force implementation of changes or new regulatory regimes. It is likely that a more consensus-seeking approach will deliver greater benefits in the longer term.

### ***5.3. Performance from an international perspective***

All stakeholders interviewed by us recognised the critically important role of NRAs in promoting and facilitating the creation of an internal energy market. They believe that that internal energy market stands or falls by the cooperation and agreement between NRAs, since NRAs are responsible for removing the barriers between the national markets. But, a majority thinks that NRAs currently do not act sufficiently to ensure that TSOs are fully compliant with the directives of the third package with respect to cross-border issues.

An absolute majority of the interviewees agrees that NRAs are in general independent from market interests. But, a majority of the stakeholders thinks that still many NRAs, in particular some NRAs from Eastern and Southern Europe like Bulgaria, Hungary and Spain, are still not independent from political powers.

Based on our interviews with stakeholders from eight different European energy organisations, we found that NRAs from Austria, France, Germany, the Netherlands, the Scandinavian countries and the UK are perceived as most active and competent regulators in the European energy arena. The main reasons, they mentioned, for a good competence qualification, are that these NRAs have good sector and technical experts, a well-established organisational structure and close involvement in drafting and implementing the third package.

### ***5.4. Considerations***

Our study suggests that regulators' performance could be improved by considering the following:

- Regulators need to balance between decreasing administrative burden and the power of information acquisition and investigation.
- Regulators should implement regulatory best practice. Further analysis of the practices the UK regulator and the recent improvements of the German regulator could help improve the performance of regulators.
- Regulators should consider implementing longer regulatory periods to create a more stable regulation.
- Regulators should ask for a more active role to facilitate the integration of renewable energy sources and to incentivise investment in innovative technologies.
- A stronger focus of the regulator on stakeholder management and stakeholder engagement would be positively perceived by grid operators.
- Regulators should not only focus on the national impact and interest but should also consider EU-wide regulation to successfully complete cross-border initiatives.
- Regulator should not only focus on developing rules but also on actively monitoring the compliance.

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## B. Data quality

The quality of the given answers is important for our research. We can measure the quality of the response of our survey by the following indicators:

- Total elapsed time;
- Page time;
- Consistency;
- Respondent characteristics.

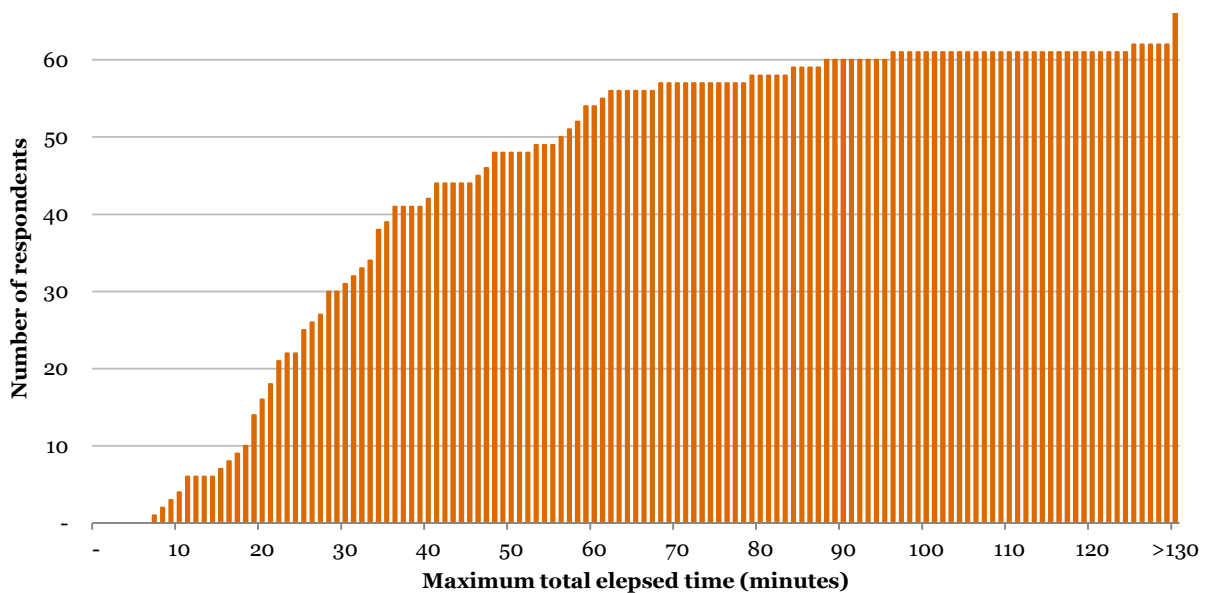
The quality indicators are described in the next section, and in the last section a score is given to each of the quality indicators. High quality scores of the indicators guarantee the quality of this research.

### Quality indicators

#### Total elapsed time

With the quality indicator 'total elapsed time' the total time to fill out the survey is measured. Total elapsed time of less than 10 minutes can be an indication of bad quality. On average, it takes respondents 56 minutes to fill out the questionnaire. The figure below shows the elapsed time per respondent.

**Figure B.1: Cumulative distribution of total elapsed time**



Source: PwC analysis

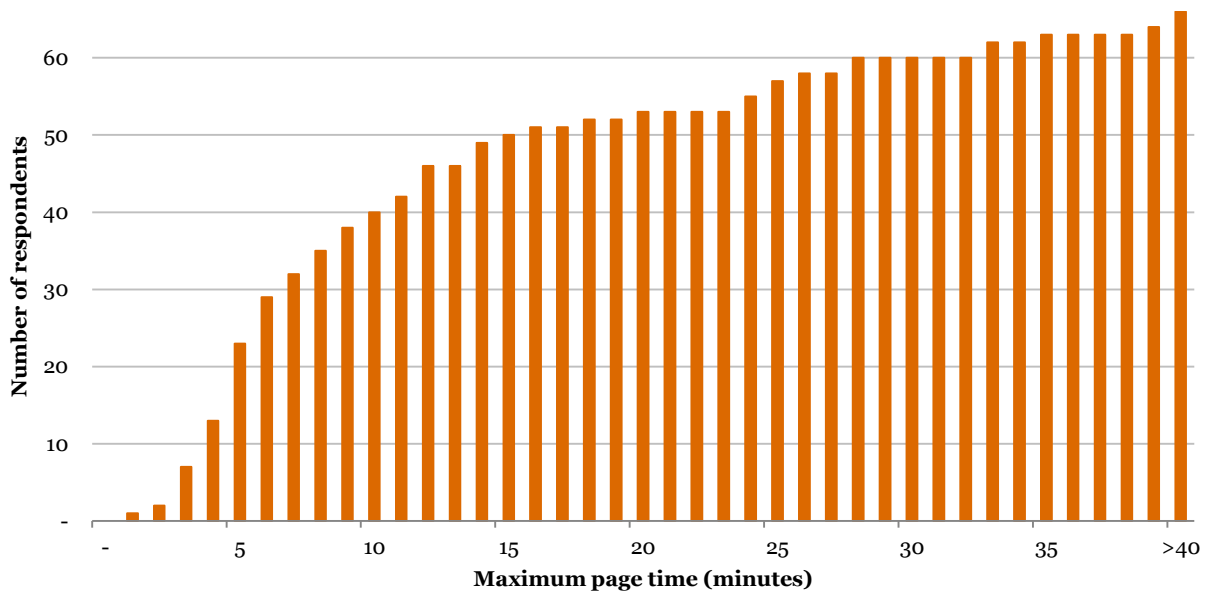
We observe that 3 respondents filled out the questionnaire within 10 minutes. For most respondents, it took between 10 and 40 minutes.

#### Page time

With this quality indicator, we measure the time to answer the performance-related indicator questions. The performance indicator question that we consider is capability, which consists out of 12 sub-indicators.

On average, it takes respondents 17 minutes to fill out this performance indicator question. The figure on the next page shows the page time per respondent.

**Figure B.2: Cumulative distribution of page time capability indicators**



Source: PwC analysis

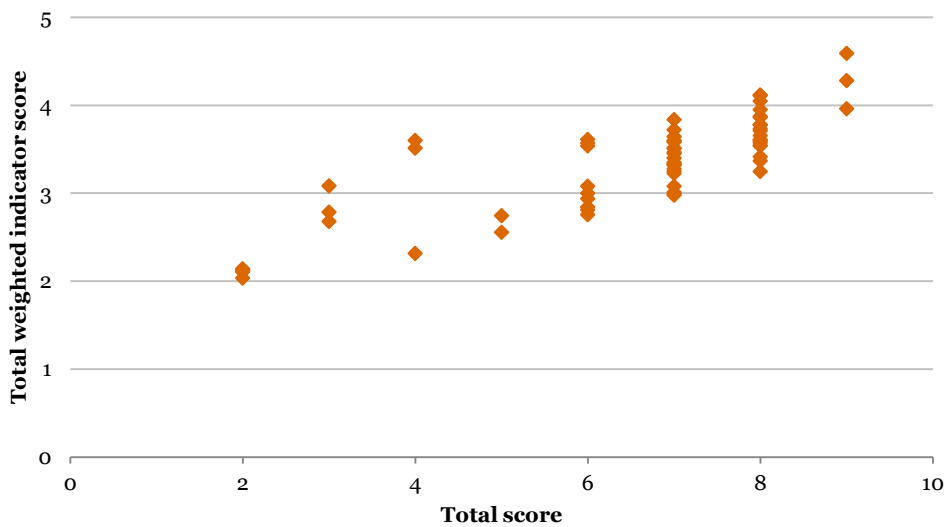
We observe that one respondent filled out the capability indicator question within 1 minute. For most respondents, it took between 1 and 15 minutes to fill out this performance-related question.

### Consistency

With this assessment, we check the consistency of the respondent's answers. We assess outliers and check whether the outcome of the survey is in line with the respondent's opinion (e.g. the respondent might have misinterpreted the scale).

The figure below shows the relation between the overall score and the weighted average score of the indicators. The indicator score is weighted by the importance.

**Figure B.3: Scatterplot of overall score versus weighted indicator score**



Source: PwC analysis

High positive relation is shown between the indicators and the overall score. Overall, scores are in line with the scores given for the sub-indicators.

We also explicitly calculate the correlation between these scores. The results are shown in Table B.4. It shows once again that the overall scores are positively correlated with the scores per performance indicator. It seems that the overall scores are most correlated with the scores for capability and for management and government.

**Table B.4: Correlation of the four areas with the overall score**

	Capability	Man & Gov	Effectiveness	Social benefits	Overall score
Capability	1	0.80	0.67	0.73	0.78
Management & governance		1	0.67	0.52	0.80
Effectiveness			1	0.61	0.60
Social benefits				1	0.58
<b>Overall score</b>					<b>1</b>

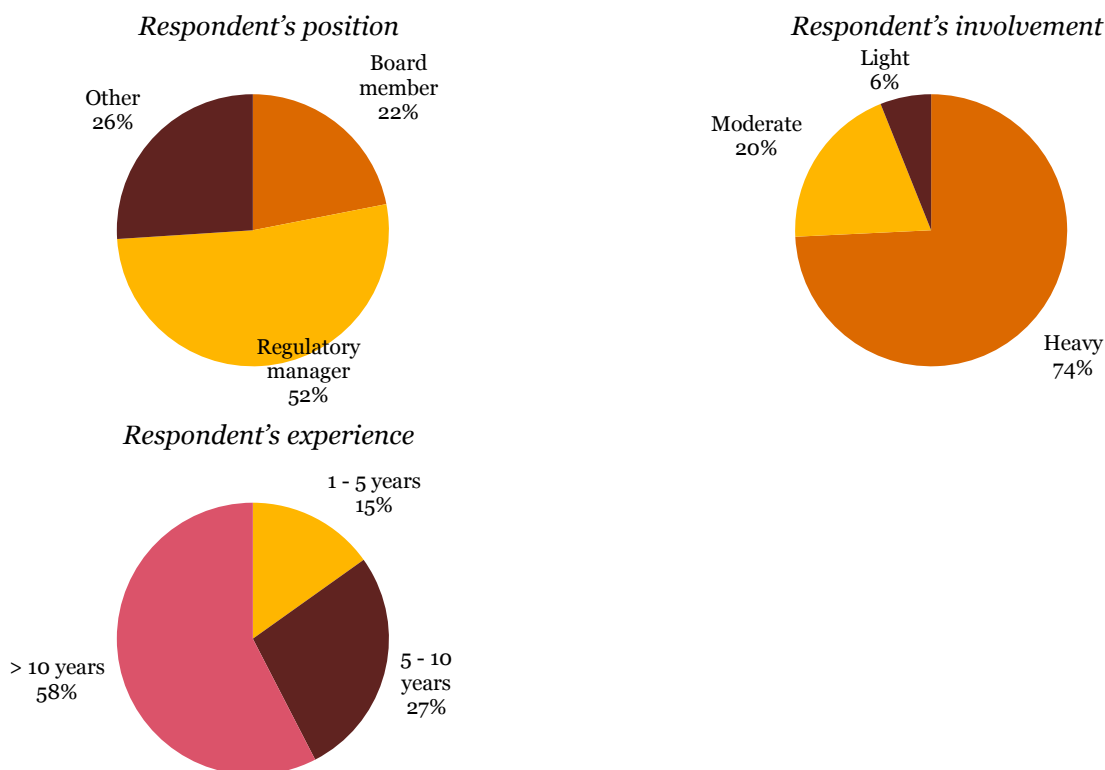
Source: PwC analysis

### Respondent characteristics

This indicator shows the characteristics of the respondent. Respondent's position, involvement with regulation issues and experience with regulation are taken into account to consider respondent's quality.

Respondent's position, involvement and experience are shown in the figure below.

**Figure B.5: Respondent characteristics**



Source: PwC analysis

Respondents have at least 1 year experience and over 50% have over 10 years of experience with energy regulation. Over 80% of respondents have moderate to heavy involvement with regulation issues. Most of the respondents are regulation managers. Examples of other positions are regulatory expert or finance manager.

## Quality score

Respondents have much experience and a function that is connected to the regulatory aspect and deal with regulatory issues often. Three respondents filled out the questionnaire very quickly, though quality can be guaranteed because of the high level of experience of the respondent. We found no evidence of misinterpretation of the scale questions. Overall, we observe that the quality of the responses is good. In the table B.6 we assign a quality score to each of the quality indicators.

**Table B.6: Quality indicators and scores**

Quality indicators	Description	Hypothesis	Outcome	Quality score
<b>Total elapsed time</b>	<i>Assessment of the overall time taken to complete the online survey.</i>	<i>Respondents need to have a minimal time slot of 10 minutes to ensure the quality of the data.</i>	Three respondents in the data set have a total elapsed time of less than 10 minutes, though quality can be guaranteed because of the high level of experience of the respondent.	●●○
<b>Page time</b>	<i>Time per question taken to answer (e.g. discard too short completion times per question). The performance-related questions are examined.</i>	<i>Respondents need to have a minimal time slot of 2 minutes to preserve the quality of the data for the performance-related questions.</i>	One respondent in the data set has a total elapsed time of less than 10 minutes, though quality can be guaranteed because of the high level of experience of the respondent.	●●○
<b>Outlier assessment</b>	<i>Assessment of outliers in the data set to check whether the outcome of the survey is in line with the respondent's opinion (e.g. the respondent might have misinterpreted the scale). Comparison of the overall score with the scores on the performance-related scale questions.</i>	<i>An outlier is detected if overall score &gt;7 and average score of scale is &lt;2</i>  <i>An outlier is detected if overall score &lt; 3 and average score of scale is &gt;4</i>	We have found no evidence of misinterpretation of the scale. The weighted overall indicator score is in line with the overall score.	●●●
<b>Respondent characteristics</b>				
<i>Function</i>	<i>Describes the function of the respondent. It can be a board member, regulator manager or other</i>	<i>Respondents need to have a function that is connected with regulation process to preserve the quality of the data.</i>	All respondents are board members, regulation member or have a finance or regulation-related function.	●●●
<i>Personal involvement</i>	<i>Describes the involvement with regulatory issues. This can be high-level, moderate or heavy involvement</i>	<i>Respondents need to high-level or moderate involvement to preserve the quality of the data.</i>	Three-quarter of respondents have heavy involvement, only 6% has light involvement.	●●○
<i>Experience</i>	<i>Respondents should have regulatory experience to give their judgement of the performance of the regulator</i>	<i>Respondents need a minimum of one-year experience to preserve the quality of the data.</i>	All respondents have a minimum of one-year experience.	●●●

Source: PwC analysis

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# C. Questionnaire

## Introduction

PricewaterhouseCoopers Advisory N.V. ('PwC') has been mandated by the Florence School of Regulation to assess the relative performance of regulators for the energy sector (gas and electricity) in Europe.

The study focuses on the following performance areas of the regulators: capabilities, governance, effectiveness and social benefits.

For this, we would like to invite European TSOs/DSOs of gas and electricity to participate in our online survey.

In this survey you will find questions consisting of:

1. General background questions about your role, your company and the relevant regulatory jurisdiction
2. Specific questions about the performance of your regulator
3. Additional open questions

Please note that none of individual answers of this survey will be disclosed or made available to any third party, without the written permission of the individual respondent. Only the aggregated outcomes of the survey will be reported.

We would highly appreciate your participation in this online survey which should take no more than 15 to 20 minutes of your time. All participants are provided with the opportunity to receive a copy of the final results of this research.

## General background information

### 1. Please specify the profile of your company (multiple answers possible)

- Transmission of electricity (TSO)
- Transportation of gas (TSO)
- Distribution of electricity (DSO)
- Distribution of gas (DSO)

### 2. Please provide the name of your company (as a single regulatory entity)

- [...]

*Note: If your company consists of more than one regulatory entity (i.e. different parts of the whole network company are regulated by different regulators and/or active in different countries), please only specify one single entity with one regulator, which you are responsible for.*

### 3. Please indicate the majority ultimate ownership structure of your network entity

- Public entity owned (e.g. municipality, government)
- Investor owned (e.g. private equity, listed on a stock exchange)
- Both (i.e. 50% public entity owned and 50% investor owned)

*Note: It is about the ownership of the ultimate parent company of the regulatory entity with more than 50% shares.*

- 
4. **Please indicate the FTE size of your company (as a single regulatory entity)**
    - Less than 100 FTEs
    - Between 100 and 500 FTEs
    - Between 500 and 1,000 FTEs
    - More than 1,000 FTEs
  5. **Please indicate the size of your company (as a single regulatory entity) in terms of the regulated revenue per annum**
    - Less than €100 million
    - Between €100 million and €500 million
    - Between €500 million and €1 billion
    - More than €1 billion
  6. **Please specify the regulator of your company (as a single regulatory entity)**
    - Select the regulator of your TSO/DSO from drop-down overview
  7. **To what extent is your company's strategy driven by regulation?**
    - *(Score between 1 and 5, where 1 is 'not at all' and 5 is 'entirely')*
  8. **Please provide your position within your company (multiple answers possible)**
    - Board member
    - Regulatory manager
    - Other (please specify your function)
  9. **Please indicate the average frequency of your involvement with regulation issues of your network company**
    - High-level involvement (once or less per month)
    - Moderate involvement (more than once per month, but less than once per week)
    - Heavy involvement (more than once per week)
  10. **Please state the number of years you have experience with the energy regulation (total of current position and previous positions)**
    - Less than 1 year
    - Between 1 year and 5 years
    - Between 5 and 10 years
    - More than 10 years

## Specific performance-related questions

11. **How would you describe the current capabilities of the regulator in terms of:**

*(Score between 1 and 5, where 1 is the lowest and 5 is the highest)*

- Understanding the energy sector

- 
- Clearly defining objectives
  - Adapting to changing circumstances
  - Incentivising cost efficiency
  - Promoting financial sustainability of the network companies
  - Incentivising optimal quality of service
  - Influencing environmental policies
  - Promoting timely investment
  - Promoting technological innovation
  - Creating long-term regulatory commitment
  - Timeliness of decisions
  - Quality of information services and communication

**12. How would you rank the capability indicators as indicated in question 11 by importance (Important, Neutral, Not important):**

**13. How would you rank management and governance of the regulator in terms of:**

*(Score between 1 and 5, where 1 is the lowest and 5 is the highest)*

- Transparency
- Consistency of decisions
- Minimising regulatory uncertainty
- Independence
- Integrity
- Accountability of their own actions
- Fairness

**14. How would you rank the management and governance indicators as indicated in question 13 by importance (Important, Neutral, Not important)**

**15. How would you rank the effectiveness of the regulator?**

*(Score between 1 and 5, where 1 is the lowest and 5 is the highest)*

- Powers to undertake enforcement action
- Powers of information acquisition and investigation
- Meeting policy objectives for the industry
- Balancing interests of stakeholders
- Reducing the regulatory and administrative burden imposed on the regulated entities

**16. How would you rank the effectiveness-indicators as indicated in question 15 by importance (Important, Neutral, Not important)**

**17. How would you rank the achievements of the regulator in the field of social benefits?**

*(Score between 1 and 5, where 1 is the lowest and 5 is the highest)*

- Delivering lower tariffs for customers

- 
- Ensuring security of supply
  - Increasing overall efficiency in the sector
  - Contributing to the energy transition (towards renewables)

**18. How would you rank the achievement indicators as indicated in question 17 by importance (Important, Neutral, Not important)**

**19. Please indicate the relative importance of the four areas as mentioned above (i.e. capabilities, governance and management, effectiveness and social benefits) for a strong performing regulator**

*(Ranking score: 1. not so important, 2. slightly important, 3. important, 4. very important, 5. critically important)*

- Capabilities
- Governance and management
- Effectiveness
- Social benefits

**20. Which of the following options best describes the approach the regulator takes?**

- Confrontational and legal-based
- Cooperative and consensus-seeking
- Expert role, analytical and content-driven ('thought leader')
- Passive and reactive

**21. Which of the following options best describes the approach your company takes?**

- Confrontational and legal-based
- Cooperative and consensus-seeking
- Expert role, analytical and content-driven ('thought leader')
- Passive and reactive

**22. To what extent is regulation in your country driven by economic rationale?**

*(Where 1 is not at all and 5 is entirely driven by economic rationale)*

**23. What overall score would you give your regulator with respect its performance?**

*(Between 1 lowest, and 10 highest)*

## Additional open questions

**24. What top 3 changes do you expect to be imposed on your company from a regulation perspective in the near future?**

*(Open question)*

**25. What top 3 changes from a regulation perspective do you think should happen in the future?**

*(Open questions)*



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**26. Which 3 countries or regulatory authorities would you consider best-practice (please provide a reason)?**

*(Select country from drop-down list of countries and provide a reason)*

**27. If you would like to receive a copy of the end report, please provide your name and email address**

- Name:
- Email address:

**28. Furthermore, we would like to have some in-depth interviews with some of the respondents about the outcomes of the survey. When we can contact you for such an interview, please also fill in the contact details below (telephone number).**

*(If you do not want to provide this info, you can leave it blank)*

*Note: Since we are only going to approach a sample of the respondents for an in-depth interview, providing us with your contact details does not imply that we will automatically conduct an interview.*

## D. Regulator characteristics

For the segmentation analysis of regulators, the characteristics have been used as presented in the table below.

**Table D.1: Overview of characteristics of each regulator**

Country	Regulator	Single or multi-sector	FTE	Budget (mil €)
Austria	Energie Control Austria (E-Control)	Single	109	16
Belgium	Commissie voor de Regulering van de Elektriciteit en het Gas/ Commission de Régulation de l'Électricité et du Gaz (CREG)	Single	72	15
Czech Republic	Energetický Regulační Úřad (ERÚ)/Energy Regulatory Office (ERO)	Single	102	4
Denmark	Energitilsynet - Danish Energy Regulatory Authority (DERA)	Single	50	5
Finland	Energiavirasto	Single	45	5
Germany	Federal Network Agency for Electricity, Gas, Telecommunications, Posts and Railway (Bundesnetzagentur - BNetzA)	Multi	185	18
Greece	Ρυθμιστική Αρχή Ενέργειας/Regulatory Authority for Energy (PAE / RAE)	Single	88	8
Italy	Autorità per l'Energia Elettrica e il Gas (AEEG)	Multi	168	39
Netherlands	Autoriteit Consument en Markt (ACM)	Multi	80	12
Norway	Norges vassdrags- og energidirektorat/Norwegian Water Resources and Energy Directorate (NVE)	Multi	-	-
Poland	Urząd Regulacji Energetyki/The Energy Regulatory Office of Poland (URE/ERO)	Single	300	9
Portugal	Entidade Reguladora dos Serviços Energéticos/Energy Services Regulatory Authority (ERSE)	Single	80	11
Slovakia	Úrad pre reguláciu sieťových odvetví (URSO)/Regulatory Office for Network Industries (RONI)	Multi	93	3
Slovenia	Javna Agencija Republike Slovenije za energijo/Energy Agency of the Republic of Slovenia	Single	43	3
Spain	National Commission for Markets and Competition (NCMC)	Multi	213	30
Sweden	Energimarknadsinspektionen/Energy Markets Inspectorate (EI)	Single	95	11
Switzerland	Federal Electricity Commission (ElCom)	Single	-	-
United Kingdom	Office of Gas and Electricity Markets (Ofgem)	Single	441	91

Source: PwC analysis

The figures regarding the budget and FTE of national regulators are based on the 2011 country reports of the European Commission<sup>10</sup>. Where available, these figures have been checked with more recent figures. No major changes in these figures were identified since 2011 onwards.

Since 2011, both the energy regulators of the Netherlands and Spain have been integrated into a multi-sector regulator. We assume that the amount of FTE and budget of this multi-sector regulator that are allocated to the regulation of the energy sector, are in line with that of the previous single-sector regulator.

<sup>10</sup> These reports can be found at: [http://ec.europa.eu/energy/gas\\_electricity/internal\\_market\\_en.htm](http://ec.europa.eu/energy/gas_electricity/internal_market_en.htm)

## E. Response comparison of studies

In order to get a sense of the sufficiency of the sample size of this study, the number of responses is compared to that of other previous studies, as shown in the table below.

**Table E.1: Overview of response of other studies**

Study	Type of respondents	Number of sent out surveys	Number of respondents	Number of European respondents
Brophy Haney & Pollitt (2009)	Regulators	-	43	24
Brophy Haney & Pollitt (2013)	Regulators	48	25	16
Jamasb & Pollitt (2000)	Regulators and academics	-	25	14
Johanssen (2003)	Regulators	16	8	8
Nillesen (2008)	Utilities	-	75	43
Our study (2014)	Utilities	196	66	66

Source: PwC analysis

Nillesen (2008) has the highest number of responses of the described studies. In order to further compare our study to that of Nillesen, a country by country comparison of the response has been made, as presented in the table below. Nillesen (2008) has received more response in some countries (Finland, Norway, Sweden and the United Kingdom). For most of the countries however, we received a higher response. Based on the response of other surveys, we conclude that the amount of response of our study is sufficient.

**Table E.2: Country-wise response comparison with Nillesen (2008)**

Country	Nillesen (2008)	This study
Austria	-	14
Belgium	1	1
Czech Republic	-	3
Denmark	2	3
Finland	9	3
Germany	8	9
Greece	-	1
Italy	1	2
Netherlands	5	7
Norway	5	2
Poland	-	3
Portugal	-	3
Slovakia	1	2
Slovenia	-	1
Spain	1	5
Sweden	2	1
Switzerland	-	2
United Kingdom	8	4
Total	43	66

Source: Nillesen (2008); PwC analysis

# F. Segmentation outcomes

**Table F.1: Average indicator scores for different characteristics and the statistically significant difference<sup>11</sup>**

	Regulator characteristics				Company characteristics						
	Single	Multi	95% Significant	Large	Small	95% Significant	Large	Small	95% Significant		
<b>Amount of regulators/companies</b>	12	6	7	11	15	48	31	35	28	38	
<b>Capabilities</b>											
Understanding the energy sector	4,03	3,56	Y	4,00	3,58	3,87	3,79	3,84	3,83	3,89	3,75
Clearly defining objects	3,33	3,19		3,28	3,27	3,27	3,25	3,32	3,23	3,42	3,07
Adapting to changing circumstances	3,28	3,11		3,28	3,12	3,40	3,13	3,26	3,17	3,18	3,25
Incentivising cost efficiency	3,54	3,44		3,73	3,15	3,60	3,48	3,42	3,57	3,61	3,36
Promoting financial sustainability of the network companies	3,05	3,07		3,18	2,88	3,07	3,02	3,10	3,03	3,00	3,14
Incentivising optimal quality of service	3,23	3,00		3,15	3,12	3,07	3,13	2,97	3,29	3,24	3,00
Influencing environmental policies	2,67	2,63		2,75	2,50	2,93	2,56	2,68	2,63	2,55	2,79
Promoting timely investment	3,13	3,04		3,08	3,12	3,27	3,00	3,19	3,00	2,82	3,46
Promoting technological innovation	2,77	2,74		2,83	2,65	2,80	2,71	2,81	2,71	2,76	2,75
Creating long-term regulatory commitment	3,44	2,89	Y	3,30	3,08	3,33	3,15	3,52	2,94	3,21	3,21
In-time decision making	3,18	2,74	Y	3,03	2,96	3,13	2,94	3,16	2,86	2,97	3,04
Quality of information and communication	3,51	3,19		3,45	3,27	3,73	3,27	Y	3,23	3,39	3,36
<b>Management and governance</b>											
Transparency	3,56	3,19		3,25	3,65	3,60	3,35	3,71	3,14	3,39	3,43
Consistency of decisions	3,36	3,07		3,18	3,35	3,20	3,25	3,52	3,00	3,18	3,32
Minimising regulatory uncertainty	3,33	2,78	Y	3,10	3,12	3,33	2,98	3,26	2,97	3,08	3,14
Independence	3,82	3,33		3,63	3,62	3,87	3,52	3,84	3,43	3,58	3,68
Integrity	3,95	3,89		3,83	4,08	4,00	3,88	4,03	3,83	3,89	3,96
Accountability of their own actions	3,51	3,37		3,43	3,50	3,67	3,38	3,68	3,26	3,47	3,43
Fairness	3,59	3,15	Y	3,45	3,35	3,53	3,35	3,48	3,34	3,45	3,36
<b>Effectiveness</b>											
Powers to undertake enforcement action	3,77	3,78		3,83	3,69	3,93	3,67	3,65	3,89	3,84	3,68
Powers of information acquisition and investigation	3,95	4,15		4,23	3,73	4,27	3,92	3,87	4,17	4,16	3,86
Meeting policy objectives for the industry	3,33	3,33		3,30	3,38	3,20	3,35	3,35	3,31	3,26	3,43
Balancing interests of stakeholders	3,38	2,96	Y	3,30	3,08	3,27	3,17	3,29	3,14	3,24	3,18
Reducing the regulatory and administrative burden imposed on the regulated entities	2,87	2,48		2,73	2,69	2,87	2,58	2,81	2,63	2,71	2,71
<b>Social benefits</b>											
Delivering lower tariffs for customers	3,92	3,15	Y	3,78	3,35	3,40	3,65	3,52	3,69	3,66	3,54
Ensuring security of supply	3,26	3,48		3,38	3,31	3,53	3,25	3,39	3,31	3,26	3,46
Increasing overall efficiency in the sector	3,49	3,26		3,45	3,31	3,67	3,27	3,52	3,29	3,37	3,43
Contributing to the energy transition (towards renewables)	3,03	2,81		3,28	2,42	3,27	2,79	2,84	3,03	2,95	2,93

Source: PtC analysis

<sup>11</sup> Please refer to Appendix G for more explanation about the statistical tests.

# G. Calculation methodologies

## Weighted average of the performance scores

The regulators were assessed along four key performance indicators: capability, management and government, effectiveness and social benefits. Each of these indicators covers a number of sub indicators. The respondents were asked to provide a rate for each of these sub indicators.

To calculate the weighted average of the key performance indicators, weights are used that correspond to the importance respondents give to each individual indicator in order to calculate the average of the four main indicators. Per respondent a weighted score is calculated.

The average weighted score of the four areas is calculated as follows:

$$\text{average weighted score} = \frac{1}{N} \sum_{n=1}^N \frac{\sum_{i=1}^I x_i \cdot w_i}{\sum_{i=1}^I w_i}$$

Where;

- $x_i$  is the rating of individual indicator  $i$
- $w_i$  is the importance of individual indicator  $i$ , where important = 3, neutral = 2 and not important = 1
- $n = 1, \dots, N$ , where  $N$  is the total number of respondents
- $i = 1, \dots, I$ , where  $I$  is the total number of individual indicators per key performance indicator

## Student's t-test

### One sample t-test

To test whether the scores are statistically significantly different from the central score (i.e. 3) a one sample t-test is used. The Student's t-test tests a statistical hypothesis in which the test statistic follows a Student's t distribution if the null hypothesis is supported. The scores are assumed to follow a Student's t distribution.

The calculation is as follows:

$$t = \frac{\bar{X} - x}{\frac{s}{\sqrt{n}}}$$

Where;

- $\bar{X}$  is the sample mean
- $x$  is the expected average (i.e. 3 in our study)
- $s$  is the sample standard deviation
- $n$  is the sample size
- $t$  follows a student's t distribution with  $(n - 1)$  degrees of freedom  $\sim T_{n-1}$

---

To test the statistically significantly difference on a 95% confidence interval, we test whether the absolute value of  $T(t, (n - 1)) < (1 - 0.95)$ . This is the one-sided Student's t test.

This test is used whether the performance indicators are statistically significantly positively (>3) or negatively (<3) rated.

### **Two sample t-test**

To test whether two sets of data are statistically significantly different a two sample t-test is used. The calculation is as follows:

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

Where;

- $\bar{X}_1, \bar{X}_2$  are the sample mean of respectively group 1 and group 2
- $s_1, s_2$  are the sample standard deviation of respectively group 1 and group 2
- $n_1, n_2$  are the sample size of respectively group 1 and group 2
- $t$  follows a student's t distribution with  $(n_1 - 1 + n_2 - 1)$  degrees of freedom  $\sim T_{n_1-1+n_2-1}$

To test the statistically significantly difference on a 95% confidence interval, we test whether  $T(t, (n - 1)) < (1 - 0.975)$  and whether  $T(t, (n - 1)) > (0.975)$ . This is the two-sided Student's t test.

This test is used whether different company or regulator characteristics have a statistically significantly different view on the performance related indicators.

### **Regression analyses**

Overall score can be explained by the weighted average sub-indicator scores as:

$$y = \alpha + \beta X + \varepsilon$$

Where;

- $y$  is the overall score
- $X = [x_1, x_2, x_3, x_3]$  are weighted scores of the four area's
- $\alpha$  is the intercept
- $\beta$  is the coefficient for the slope
- $\varepsilon$  is the residual error

If we regress the weighted score of the four areas on the overall score we get the following outcomes that are showed in table G.1.

**Table G.1: Cumulative distribution of total elapsed time**

			Observations	54
			R-squared	61%
	Coefficient	Std. Error	T	P >  t
<i>b<sub>capability</sub></i>	0.8	0.5	1.6	11%
<i>b<sub>man &amp; gov</sub></i>	1.4	0.4	3.6	0%
<i>b<sub>effectiveness</sub></i>	0	0.5	0	93%
<i>b<sub>social benefits</sub></i>	0.3	0.3	1.0	34%
<i>a</i>	-1.7	1.2	-1.4	18%

The weighted score of management & governance shows the strongest relation with the overall score. This weighted score is significant at a 95% confidence interval. Overall, we can explain 60% of the overall score with the weighted average scores of the main indicators.

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# H. Interview questionnaire

## Introduction

PricewaterhouseCoopers Advisory N.V. ('PwC') has been mandated by the Florence School of Regulation to assess the relative performance of regulators for the energy sector (gas and electricity) in Europe.

The study consists of:

- 1 An online survey among grid operators (gas and electricity) in different EU countries to assess capabilities, governance, effectiveness and social benefits of the national regulators.
- 2 Interviews with stakeholders from relevant EU institutions to assess the international performance of the national regulators.

For the second part of the study, we have invited you as an important European stakeholder to answer a number of questions about the international role of national regulators.

In this questionnaire, you will find questions addressing the international cooperation and the performance of the national regulator from an international perspective.

Please note that none of individual answers of this questionnaire will be disclosed or made available to any third party, without the written permission of the individual respondent. Only the aggregated outcomes will be reported.

We highly appreciate your participation for this interview which will take about 30 minutes.

In the next section, we outline our questions.

## Questionnaire

1. The 3<sup>rd</sup> package for the first time prescribes **international cooperation** as one of its rules for the national regulatory authorities (NRA).

**1.1 What role, in your view, should the NRAs play in the EU arena in implementing the 3rd legislative package?**

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**1.2 Which EU (good) initiatives have been taken/are taking by NRAs in the light of the 3rd package?**

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**1.3 Which of the EU regulators do you consider to be most active in the EU arena? Could you please provide specific examples of their activities (e.g. initiate/organize workshops, propose new ideas)?**

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2. How important in your view are NRAs for the **promotion of the internal energy market (IEM)** for Electricity and Gas in your point of view?

- A. Not important
- B. Important, but not critical
- C. Critically important

**2.1 Could you please motivate your answer?**



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**2.2 In the case of B (Important, but not critical) or C (Critically important), which NRA/ NRAs, if any, in your point of view is a “motor of the EU Internal Energy Market”?**

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**3. Achievement and accomplishment** of the IEM and the 3rd package.

**3.1 Do you think that NRAs sufficiently ensure the compliance of TSOs and electricity and gas companies with Directives (legislation) with respect to cross-border issues?**

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**3.2 Could you please explain why?**

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*Note: According to the requirements of the 3rd package, the NRAs must ensure that the TSOs according to the legislation, means that the NRAs can impose e.g. fines in case a TSO do not comply with the Directive or Regulation or any relevant legally binding decisions of the NRA or the Agency (ACER). The penalties have to be effective, proportionate and dissuasive. The ruling quoted" the power to impose or propose the imposition of penalties of up to 10% of the annual turnover of the TSO on the TSO (...) for non-compliance with their obligations pursuant to this Directive". [Electricity Directive and very similar wording in Gas Directive].*

**4. Independence** of the NRAs in Europe

**4.1 Which NRAs in your judgment act independently from any market interests? (please provide the top 3)**

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**4.2 Could you please explain why?**

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**4.3 Which NRAs in your judgment act independently from a political body? (please provide the top 3)**

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**4.4 Could you please explain why?**

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*Note: The independence requirements of the regulators have been strengthened in the 3rd package (electricity and gas): the regulator must be independent now, not only from the industry but also from any political influence.*

- 
- 5. Impartiality and transparency** of the NRA.  
(Decision taken impartially and consult stakeholders before take decisions).

**5.1 As far as reported by your members /as far as you can judge, do the NRAs in your point of view sufficiently consult national / international stakeholders and consider it in their reasoning and decisions?**

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**5.2 Could you please explain why?**

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- 6. Competence** of the NRA.

**6.1 If you could mention the top 3 most competent NRAs in the EU, which ones would these be?**

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**6.2 Could you please explain why?**

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**6.3 Which of the European NRAs do you know personally (on any level)?**

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*Note: The 3rd package foresees a NRA to be adequately staffed and financially resourced. So it indirectly targets the expertise of the staff of the NRA.*

- 7. Vision** of the NRA.

**7.1 Which of the NRAs, in your opinion, has a strong vision of an European Internal Energy Market of Gas?**

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**7.2 Could you please explain?**

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**7.3 Which of the NRAs, in your opinion, has a strong vision of an European Internal Energy Market of Electricity?**

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**7.4 Could you please explain?**

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