THE ICER CHRONICLE

A FOCUS ON INTERNATIONAL ENERGY REGULATION

EDITION 1, DECEMBER 2013

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I. FOREWORD

This is the inaugural edition of the ICER Chronicle. Our purpose in producing this periodical is to bring to electricity and gas regulators around the world, on a regular basis, information which will help them to undertake their difficult tasks more effectively. We know of no similar publication addressed principally to the world's energy regulators, and we believe that the ICER Chronicle will help to fill that gap.

The information the ICER Chronicle provides in the current and future editions should be judged against the simple criteria of relevance and interest. Beyond that benchmark, the scope of the issues the ICER Chronicle will cover is broad and extensive. It draws from regulators, academics, consultants, lawyers, and industry. The substance of each topic may be new thinking, new approaches, good practice examples, new technologies, or discussions of issues that are anticipated not yet facing us.

The Chronicle is the latest initiative of the International Confederation of Energy Regulators (ICER), which was launched in Athens in 2009 at the fourth World Forum on Energy Regulation (WFER). ICER aims to enhance collaboration between energy regulators on issues affecting energy regulation globally. It also seeks to enhance the understanding of policy makers in governments on the role of energy regulation in respect of broader energy policy. ICER is a truly international organisation and depends on the commitment and contributions of energy regulators internationally, and on a number of other bodies where the public interest issues of energy policy play a significant role. The ICER Chronicle, for example, is produced by Working Group 4: Regulatory Best Practices led by NARUC, the U.S. state-level regulatory association.

ICER is organised with a very light operational structure. It has four working groups which operate virtually – using electronic communication tools to organise and deliver a three yearly work programme which provides a link between each World Forum on Energy Regulation.

- Working Group 1: Opening & Integration of Regional Markets
- Working Group 2: Technology Change
- Working Group 3: Consumers
- Working Group 4: Regulatory Best Practices

WFER VI will take place in Istanbul in May 2015 (www.wfer2015.org) and ICER will present the outcome of its current work programme there. Critical deliverables include reports in regional market integration; regulation and investments in new technologies; and consumer protection and empowerment. Two ICER Distinguished Scholar Awards will be made in Istanbul at WFER VI to those candidates (including at least one from developing markets) who demonstrate leading thinking in a key area of interest for regulators. In this and other ways ICER works to foster new approaches and to develop good practices from which all regulators (and ultimately energy consumers) can benefit. A further example is the ICER Women in Energy (WIE) initiative which aims to unlock the full potential of women in energy regulation.

I am pleased to see how ICER has developed in just four years. The ICER Chronicle is an important mechanism to enhance our communication with, and between, regulators. If you have any feedback on this first edition of the ICER Chronicle, or suggestions on how future edition might be improved, please send your comments to chronicle@icer-regulators.net.

Lord Mogg
ICER Chairman

II. Welcome from the Editorial Board Chair

On behalf of ICER Working Group 4: Regulatory Best Practices, I am delighted to launch the ICER Chronicle as a means to further promote our goals of enhanced exchange of regulatory research and expertise. The Chronicle builds upon the ICER Distinguished Scholar Awards, established in 2010, which contributes to an increased reflection on energy regulation policy issues. These Awards acknowledge important contributions made to enhance electricity and gas regulation around the world. The ICER Distinguished Scholar Award has been issued twice, in accordance with the following themes:

- 2010: The Impact of Renewables on Energy Regulation
- 2012: Integrating New Technologies into the Grid

Going forward, the ICER Distinguished Scholar Award will be given every three years, in conjunction with the World Forum on Energy Regulation. The theme for the 2015 Awards is Creating and Managing Regional Energy Markets. The public Call for Papers is available here: http://bit.ly/1dKx58q

The Chronicle features shorter articles and will be published biannually in order to share information among international energy regulatory agencies and beyond. If you haven't received this subscription directly, you can join our list-serve by emailing chronicle@icer-regulators.net.

The ICER Chronicle is open to submissions from regulators, academia, industry, consultants and others (such as consumer groups). This ensures a variety of perspectives and increases the exchange of information and messages among the various groups. Submissions will be collected on a rolling basis, in addition to formal Calls for Articles. You are invited to send your article to chronicle@icer-regulators.net. The deadline for consideration for inclusion in the second edition of the Chronicle is March 14, 2014.

Finally, I would like to thank the dedicated members of our Editorial Board. They thoughtfully reviewed all submissions and assessed those that are particularly interesting and timely to the global regulatory community.

Sincerely,

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Chair, ICER Virtual Working Group 4: Regulatory Best Practices

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Mr. Charles Gray, Executive Director
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Many thanks to the following support staff who contributed to the design and development of the Chronicle:

Mr. Jerome M. McLennon, Manger, Internet & Information Technology, NARUC

Mr. Robert J. Thormeyer, Director of Communications, NARUC

Ms. Una Shortall, Deputy Secretary General, CEER

Ms. Francesca Pia Vantaggiato, ICER Secretariat

III. Forward to the Women in Energy Story-telling

Interested in joining Women in Energy – the ICER International Network?

Free to join, the ICER WIE network is open to all staff (men and women) of ICER's energy regulatory authorities. To join, visit here: http://bit.ly/ICERWomenInEnergy
The WIE section of the ICER website contains more inspiring stories (including video interviews), infographics and information on how to submit a story to the ICER Chronicle.

Welcome to the Women in Energy story-telling section of the Chronicle!

Energy, like many other sectors, has a significant under-representation of women, particularly at senior level. This points to a significant under utilization of talent. This women story-telling section of the ICER Chronicle shines a light on some inspiring stories by high achieving, but not necessarily high profile, women in energy.

Before turning to the selected stories, first a brief word on ICER's Women in Energy initiative. In October 2013, ICER launched a global initiative to help the career advancement of women, through practical tools and by seeking to change culture and attitudes. We have set up Women in Energy – the ICER International Network, a collaborative network for the benefit of women (at all levels). This new and growing global network helps women in energy regulatory authorities to forge personal contacts with their peers worldwide. It celebrates the diversity of cultures and professional experiences of the ICER global network as a means of sharing experiences and learning from each other.

Members of the ICER Women in Energy (ICER WIE) network also benefit from having access to (free) training webinars, networking events and ICER's pilot mentoring program for staff of energy regulatory authorities. We are seeking more mentors (male and female) and female mentees.

Our series of training webinars and mentoring program are practical ways of empowering women and helping them develop in their careers, providing them with access to learning and advice by experts across the ICER global network. The dedicated women's story-telling section of the ICER Chronicle is part of our efforts to give greater visibility to women in energy, allowing women to share their stories and hopefully inspire others by their actions and experiences.

We are delighted with the response by women regulators to our call for stories for this first edition of the ICER Chronicle. What rings through in all the submission received is the value of international contacts in enhancing knowledge and bringing fresh perspectives to improve work practices. We feature two stories, one from Gulefsan Demirbas, EMRA, Turkey and the other from Laura Steerman, a young energy lawyer working for the Irish energy regulator, CER. Their stories illustrate the challenges faced by many ordinary women within our ranks. We hope their trials and triumphs, their doggedness to do their very best and their tips on juggling competing interests will inspire more women to join the ICER WIE network, and more success stories for women globally.

Una Shortall
Chair of the ICER Women in Energy Steering Group

Women in Energy
The ICER International Network

Women in Energy Story Telling: Gulefsan Demirbas, Turkey

Gulefsan Demirbas received her B.S. and M.Sc. degrees Environmental Engineering from the Middle East Technical University of Ankara. She is continuing her Ph.D. studies in the field of social dimension of environmental policy.

She started her career as an expert in the Privatization Administration (PA) in 1998. She moved to Energy Market Regulatory Authority in 2008, and served as advisor to the president till she was appointed as Head of the Strategy Development in 2009, where she still serves.

Gulefsan Demirbas is author or co-authors of several papers on environmental engineering and, energy and climate policy.

Following my career in the Privatization Administration, where I worked in the privatization processes of several projects some of which were in the energy sector, I moved to the Energy Market Regulatory Authority (EMRA). I was worried when I started my new career at EMRA almost six years ago, because I was entering a world which I did not know much about. Despite having a Master of Science degree in environmental engineering and elementary knowledge of the energy sector, energy regulation was a new area for me. Moreover, I was beginning my new career with the newly appointed EMRA president, and thus I was considered by the existing staff as the president's man (woman). So I had to overcome the challenges arising not only from lack of my knowledge on energy regulation but also being a newcomer.

Challenges

My first appointment within EMRA was in the position of advisor to the president. The president, with whom I had worked together at the Privatization Administration, knew my capacity and competency in problem solving. Hence he assigned me to report on the proposals and recommendations submitted by the service units. I must confess that working in such a position was an invaluable opportunity for rapid learning. So I decided to use this opportunity. I believed in myself, my dedication to work, mathematical background and my experience within the public sector which I already had. However, I knew I had to strengthen my knowledge and to build bridges with my new colleagues. And so, I assessed the conditions and drew a roadmap.

I really worked very hard. I read the fundamentals of energy regulation and every report I received. I participated in every meeting and took extensive notes to further educate myself. I gave great importance to building up good relations with my new colleagues. I did not hesitate to ask even easy questions either to my colleagues or our stakeholders. In other words, I used every useful tool and followed every wise path, and gradually improved myself, my capacity and as a result my situation both among my colleagues and within EMRA. Meanwhile, I learnt that energy regulation is like juggling. You have to manage too many different, even opposite, interests and have to satisfy needs of all relevant stakeholders.

Hard Work Leads to New Opportunities

My dedicated work was acknowledged by the board and I was appointed as acting head of newly established Strategy Development Department within a year. The Strategy Development Department was created to carry out a wide range of activities spanning from strategic planning to conducting market analysis and reporting, from coordinating international activities to management of IT services. Its scope covers almost all activities of EMRA.

First of all I had to build up a new team and develop working procedures.

Building up a new team is not easy, especially in an organization with pre-existing structures. While building up my team, I talked to key staff for transferring to my department and convinced some of them.

While doing this, I acted not too aggressive in order not to ignite resistance of other department heads. Although I could not build up the team in my mind, I succeeded to establish a team that I can walk together.

Meanwhile, the biggest project that EMRA had developed so far for increasing the corporate capacity within the frame of market monitoring and supervision, the Energy Markets Information Systems Development Project, was also given to the responsibility of my department. The project covers development of Project Management System, Regulatory Information System, Process Management Infrastructure, Electronic Document Management System and Information Security Systems, improvement of Web and Content Management Systems, upgrade of Servers Systems Software and Hardware. The goal of this project was to develop necessary infrastructure for conducting all processes of EMRA on IT systems for better monitoring and understanding of market activities and, fast reacting to developments within the market.

EMRA had introduced several similar smaller scale projects in the past but these not succeeded. The new project was bigger in scope than previous failed ones and thus required continuous patience and close attention to detail. Since the previous projects failed, almost all of the staff within EMRA has lost their confidences to similar projects. I started the project with a couple of dedicated colleagues of mine. We drew up our roadmap, and divided the project into modules and stages. We started to implement the project gradually in order to regain confidence of the staff. Four years following the kick-off of the project, I can say that we did a lot and achieved results not to be underestimated. As an example Electronic Document Management System and Energy Markets Data Management System were successfully launched. Now, I can proudly say that almost all of the activities of EMRA are being conducted through e-services. As this projects goes on, I was appointed principally as department head.

Work Life Balance

When I began at EMRA, my sons were 8 and 3 years old. I was excited to bring fresh perspectives but also realized that I need to balance work and family life. But I must admit that during early stages of my new work, I spent almost 10 hours a day for reading and trying to understand the scope of work and ways of doing, to convince my new colleagues that I was neither obtuse nor a spoilt and temperamental president's man (woman). I was determined to be successful, and to prove that I deserved my position. I have to thank to my sons and my family for their understanding and support, which allowed me to do that.

My Success

At the end, I can say that I succeeded. The success I achieved was not easy. The success was the result of my dedicated work, understanding of my family and support of my colleagues. Meanwhile, I have to add inspirations I received from my friends working in energy regulation field in different countries whom I met in activities of regional regulatory agencies. When I look at the energy regulators worldwide, I see that energy regulation is a male-dominated world, especially at the governing level. For instance, when I started my career within EMRA, female staff accounted for 48.3% of total employees, which has now dropped to 46.6%.

Meanwhile, the share of women in the administrative level has increased to 12.5% from 9.7% within 5 years time, illustrating that even while overall female staff decreased, they increased disproportionately at the junior level. I have to add that I am the only women assigned as a department head within my organization.

My last words are those: The essence of energy regulation is creating a level playing field for all. Why not cooperate for achieving an equal footing in energy regulation for women as well? We have to keep in mind that a woman's touch creates differences in the workplace, and, in my opinion, make it better. Hence, for smarter and better energy regulation, the number of women in this sector needs to be increased.

Women in Energy
The ICER International Network

Women in Energy Story Telling: Laura Steerman, Ireland

When a friend asks me "what do I do?" I inevitably stumble. Energy regulation is a complex business but when I drive by a field of wind farms and my daughter bellows excitedly, "Look, there's Mummy's office!" I have to laugh. Rather than go into the intricacies of the sector, I relate my work to peoples' own energy experiences illustrating my work with a topical example in the media, or explaining the Commission for Energy Regulation (CER) of Ireland regulates their electricity/ gas suppliers to protect the interests of final customers.

Laura Steerman is the in-house Legal Advisor to the Commission for Energy Regulation, the national energy regulator in Ireland. Having studied Business & Law at University College Dublin Ireland, she completed a Master of Laws at Northwestern University School of Law in Chicago, USA before qualifying a solicitor in New York and Ireland. Laura was a founding member of Energy Law Ireland - a national networking and knowledge sharing forum for lawyers and persons interested in energy law, policy and regulation. Laura is 31 years old and lives with her husband and young family in Dublin. She is a member of the ICER Women in Energy network.

Challenges

The biggest challenge as a young energy lawyer working at the energy regulator is getting on top and ahead of the learning curve. The energy sector is a complex, dynamic, multifaceted industry which encompasses a range of economic, policy, technical, legal and engineering challenges and issues. Additionally, as a lawyer, I need to invest time staying abreast with legal developments including case law and legislation.

There is a saying - "Before you make up your mind – open it" and I find putting it into practice contributes to a more effective decision than I would otherwise have made. By keeping informed, considering alternative ideas and testing my views with colleagues, I bolster my legal advices and keep my thoughts grounded.

Work-Life Balance

Like many, I'm guilty of living one of those 'too-many-things-to-juggle' lives. Fortunately, I am not re-inventing any sort of wheel striving to strike the perfect balance between the competing demands of motherhood, my professional commitments and work load.

Some years ago when I worked in, this balance got way out of kilter because I was too busy making a living - neglecting to make a life. The corporate culture of private legal practice skewed my incentives and I worked 12-15 hour days. Quality time, family, friends or hobbies suffered.

Needless to say, when the time was right, I sought out more facilitative employment where achieving the elusive work/family equilibrium was valued and supported. I moved in-house to the CER, and I have never looked back. I am currently on maternity leave with my second daughter who was born in October. Without an employer being flexible in accommodating parental leave, I may have had to exit the workforce. Unlike previous decades, degrees in engineering, law and economics are not the exclusive purview of men. With more women qualifying in energy related areas, if more employers developed and valued aflexible attitude to working time arrangements it would attract more women to work and continue their practice long term in the energy sector. Offering supportive and facilitative employment arrangements is inevitably reciprocated with dedicated hard work from women in the workplace.

The Value of Mentors

Mentoring has assisted to no end and I fully expect that it will continue to do so long into the future. The CER Director of Safety and mother of three, Sheenagh Rooney, is to me, an exemplary proponent of the view that

by working more efficiently you can achieve as effective a result. I was inspired at her time management, prioritisation and organisational skills and have adopted this approach to manage the often competing demands of my own family and career.

I trained with solicitor Diane Balding in private practice and we have since co-founded Energy Law Ireland together with colleagues. Diane was a senior associate when I was a trainee solicitor working together in a busy law firm, who invested much time in me. This is something I was, and still am extremely grateful for. Over and above the call of duty, Diane helped me to improve my skills as a lawyer, nurtured my interest in energy and promoted a determined work ethic. Her incisive and thorough approach to her work is something I still try to emulate today.

This mentoring has meant I can now perform my work more effectively, meet objectives and leave the office on time (well, most of the time!), able to dedicate my spare time fully to family and friends. Women in particular can be ruthlessly self-critical and if, like me, you stumble tip-toeing along the tightrope of a challenging career and personal life, you need to go easy on yourself if every now and again if you fall off!

My Success

At this nascent stage of my career in energy, I consider "success" to be relative to the satisfaction I get out of my work, rather than measuring achievements by salary or rank on the corporate ladder. If I didn't enjoy my work as much as I do, I could not do it. I wholeheartedly attribute my ambition and creativity to my family who are supportive, inspiring and generous with their time and ideas. An entrepreneur and teacher, my parents instilled me with a positive attitude towards hard work, emphasising the importance of creativity and being passionate about whatever you do.

The mantra 'Jack of All Trades, Master of None' has helped me keep focus on my goals. As a trainee solicitor, a respected corporate law Partner with a wealth of legal expertise and experience approached me – a novice – for advice on an energy matter. I was flabbergasted and asked why me? He explained that though he worked in corporate law for over 20 years, this law had by and large remained relatively static. In contrast, he admitted the energy sector has evolved so rapidly in the last few years, in effect when it came to energy matters I was more up to speed than he was. Imagine my shock realising the crucial difference between us at that moment was that I was garnering a sought after specialisation which he did not have. I had found my niche.

The energy sector runs the gamut of economic, policy, technical, legal and engineering issues and I have relished the challenge applying traditional legal tools and concepts to the dynamic issues and complex issues that arise.

The Importance of Networking

Co-founding Energy Law Ireland (ELI), as not for profit Irish networking forum for energy lawyers, regulatory officers and all persons interested in energy law, policy and regulation, was a project I am particularly proud of. ELI launched in 2009, when a colleague and I realised there were no opportunities locally for young professionals to network and break into the energy industry.

The collaboration and sharing of knowledge and experience with others in the industry is invaluable. As a young woman in energy, I support the global ICER Women in Energy initiative and see it as an opportunity to increase my professional network of other talented women globally.

Membership of a dedicated worldwide forum such as ICER's WIE network will expose me to global professionals, experiences, knowledge and support. This will mean I bring fresh perspectives and practices back to the CER to inspire my colleagues and improve my work practices.

Best Advice

The best advice I could give to young women early in their careers are nuggets of wisdom I have collected from my family, friends and colleagues.

Love what you do – Why bother pursuing any career if you do not truly enjoy dedicating half of your waking hours doing it?

Embrace the learning curve – No one is born an expert or the best. At the outset there is no substitute for putting in the hard work to excel.

Stay objective – always keep an open mind. Often there is no panacea or right answer, and the most valued contribution is a well-reasoned response.

Cultivating a creative curiosity - I've found you can gain respect not from being right, but from addressing problems with creative solutions.

It's good to know what you don't know: If I don't know an answer, mindful of my own strengths and weaknesses, I admit this and delegate the query to an expert who does. You must be aware of what an employer values in you to determine where your hours best spent.

Find and exploit your niche – having explored the energy sector thoroughly discover where you can make your mark by specialising in a sought after area.

No man is an island – meet a mentor: Self-confidence is not built in isolation, so I draw on the support, encouragement and inspiration from mentors. Seek out those you admire in your field, emulate and learn from them.

Bossy Pants by Tina Fey is a must read for Women working in the Energy Sector. This witty autobiography details how the successful comedy producer copes with a professional responsibilities and young family and offers candid advice for women on how to make it in a male-dominated industry.

I would caution a son or indeed any boys and men of the world to never under-estimate the woman standing or sitting across from them. Without a doubt, the women who pursue careers in the energy sector are a formidable force – intellectually, socially and professionally.

The Spanish Regulatory Energy Body's Experience in Monitoring the Automotive Fuel Distribution Market

By Milagros Avedillo Carretero[1]

Abstract

After a quick price rise and suspicion of market power abuse in the fuel distribution market, in the summer of 2012, the Government asked the Spanish Regulatory Body to reinforce the fuel sector supervision. Modern statistical techniques and new information systems were implemented. Broad statistical information on fuel data was displayed in order to encourage and give tools to other institutions to supervise and keep close at-tention to the sector. As a result, in the summer of 2013 quantitative evidence of market power abuse was proved and denounced to the Antitrust Agency who initiated further actions against the oil companies' anticompetitive behavior. Furthermore, a new Law has introduced the Regulatory body recommendations to improve competition in the fuel sector. Media has welcomed exceptionally well this program and Universities and other organizations have turned out to be regular costumers of the statistical information. New companies are starting to pay close attention to the automotive fuel distribution market opportunities in Spain. Finally, oil companies behave now more carefully and try to keep margins on fuel under control.

Tensions in the Spanish fuel market were particularly tough in summer 2012: Between June and September, the average fuel prices increased over 9% and suspicion of mar-ket abuse in the Spanish automotive fuel distribution market became a serious concern. This evolution damaged the inflation and other macroeconomic variables and caused the anger amongst citizens. The Economical Authorities got alarmed and asked the Regulatory Body to carry out a monitoring program on fuel distribution market per-formance and confirm suspicion on low competitiveness.

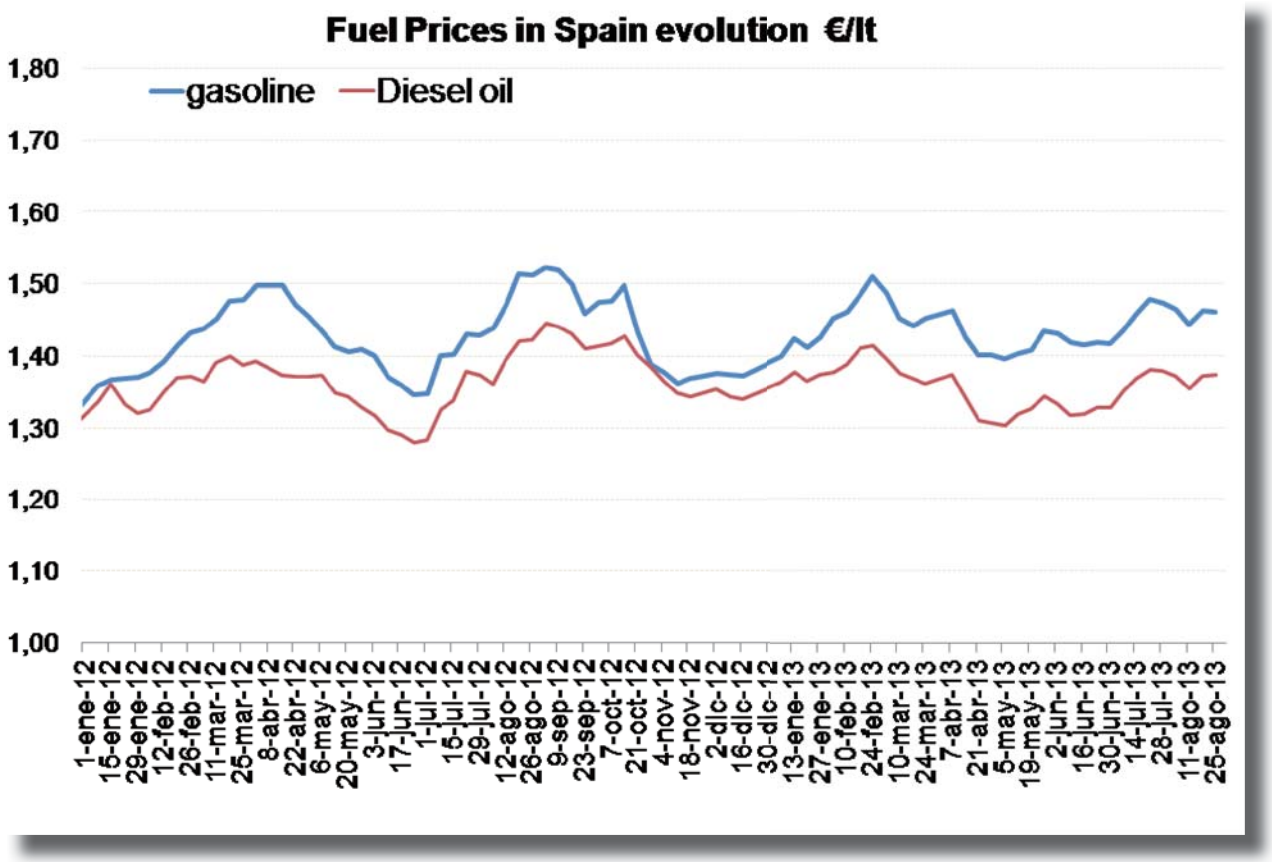

Figure 1: Evolution automotive fuel prices in Spain. Source: CNE

The Spanish oil industry is supposed to be a complete open market. In the year 1998, legislation ruled out most of the regulated prices; the former monopoly company was completely privatized; foreign capital corporations acquired relevant domestic infrastructures; and, quite a lot of companies of all sizes, either large and global companies or small domestic firms, started doing business in retailing and storage activities.

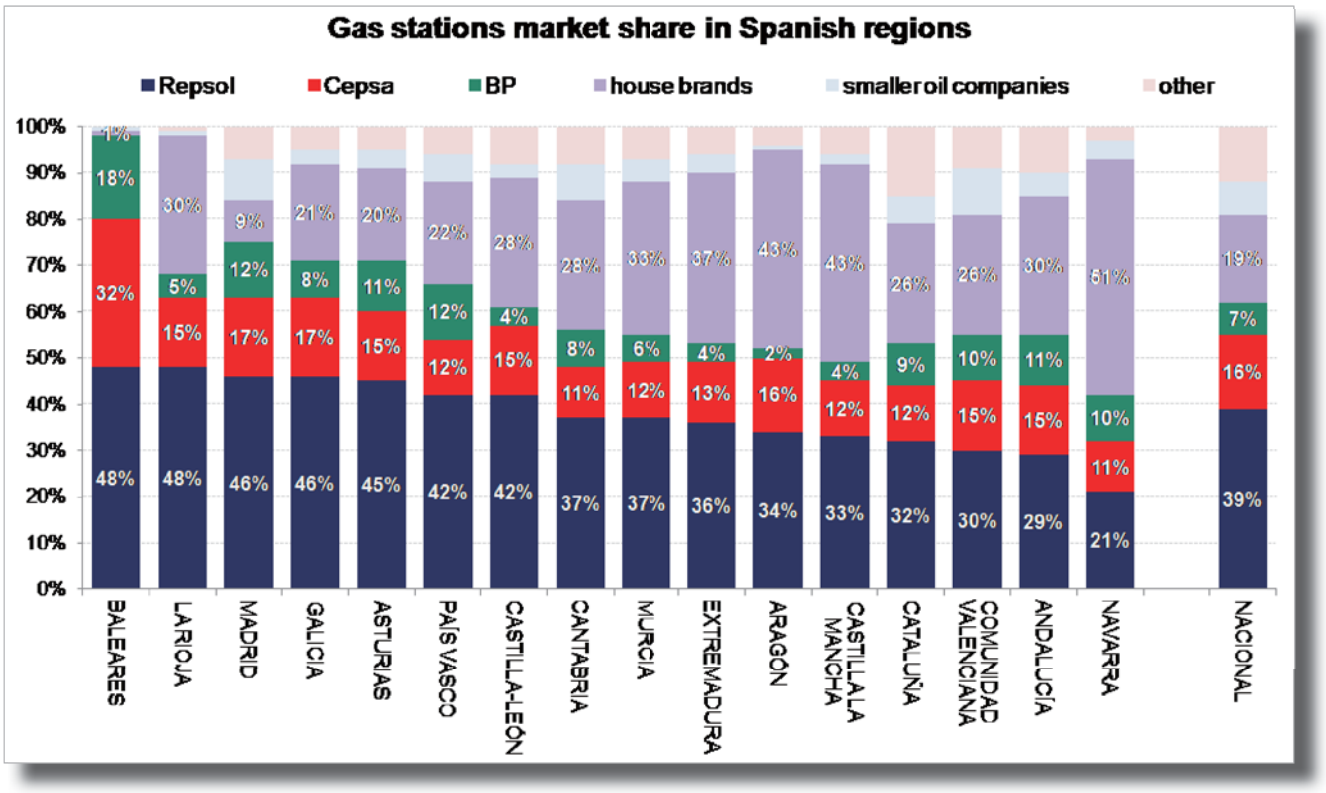

Figure 2: Regional market share in Spain on gas station. Source: CNE

Only a few regions show a healthier degree of participation of other fuel retailers. Furthermore, shopping malls and “carry and trade” retailers have a very low share of fuel sales compared to other European countries.

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[1] The opinion and the ideas expressed in this paper by the author do not commit the institution where she works. Yet, twenty years later, the liberalization experience, particularly in the automotive fuel market, is still far from being a fully competitive market and did not fulfill consumers’ expectations. Both, the Antitrust Agency and the Regulatory Body still need to pay attention to fuel prices and they recurrently claim further regulation to reduce market power from the former monopoly.

Indeed, companies originated from the former monopoly, enjoy a large market share in most local fuel markets. On average, Repsol together with Cepsa and BP, the three traditional oil companies present in the early stages of the liberalization, control over 60% of the petrol station network. Furthermore, the share of traditional oil companies reaches 90% in several towns and small local markets.

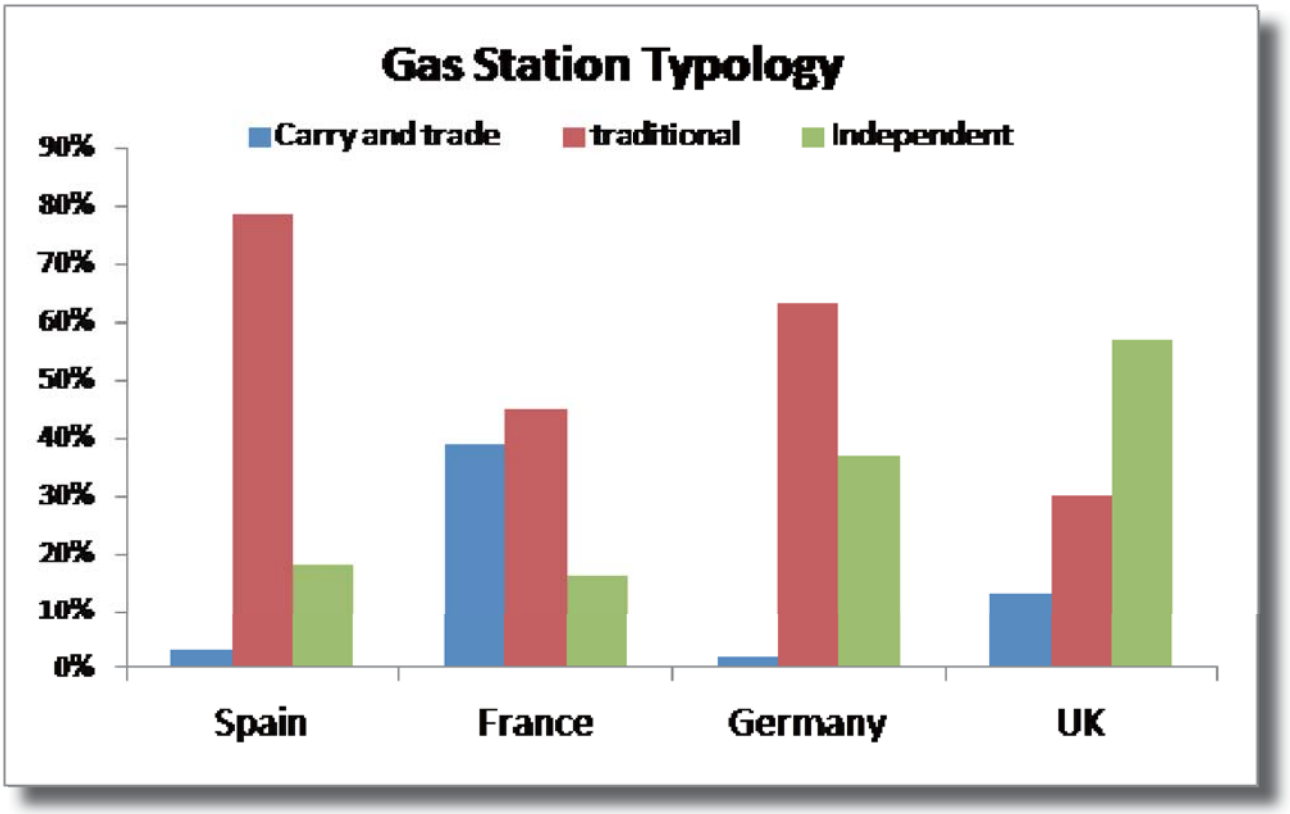

Figure: 3: Fuel gas station by type. Percentage on total gas stations. Source: CNE

Over the last years, traditional oil companies have gained a poor reputation because fuel price manipulation. Whenever fuel prices steeply rise, as they did in August 2012, mass media attack intensifies. It is not surprising: the yearly fuel bill per vehicle rose from 2,600 to 3,150 Euros in 2012. On the contrary, sincethe beginning of the crisis in 2007, the average Spanish real household income has dramatically fallen by around 3,000 Euros a year. Obviously, in such environment, consumer's anger intensifies and society claims severe institutional action to ensure competitive prices of essential goods such as energy.

There is a common agreement that automotive fuel distribution in Spain still requires specific supervision, regulation and close attention from the authorities. Its relevance for the economy, the political and social impact justifies, even under normal conditions, a specific monitoring. Moreover, the current scenario of crisis and the structural reforms process put in place by the Spanish Government impose new actions.

Nevertheless, caution must be taken against temptation of fuel prices contention. Expe-rience on artificially price control has proved to be ineffective, inefficient and the origin of macroeconomic imbalances. Measures have to be taken to deter abuse of market power and excess of business benefits, but authorities should never interfere in intena-tional quotations passage to final fuel prices. To this aim, all agents need to uderstand the fuel price formation process so they can distinguish whether price movements re-spond to international quotations fairly passage and other sources of costs, such as taxes, or whether they are actually revealing a market power abuse.

Indeed, more than 70% of the final price in Europe depends on international quotations and special taxes, but the cost of retailing has a quite smaller impact. Companies should not be blamed when international quotation rise or the government increases taxation on fuels, but they are definitely responsible for an increase of gross margins, by either delaying international quotation drops to final prices reductions, by pressing costs of the attached activities of retailing or by interfering in competitive wholesale markets, among others.

To distinguish both matters, transparency on fuel price formation is vital, especially in the Spanish case, with hundreds of local markets attended by more than 10.000 as stations. In such scenario, consumers become an important competition watchdog as they assist regulatory bodies to monitor the market. In exchange the regulatory authori-ties must provide the necessary tools to society -media researchers, local authorities, consumer organizations - to carry out this work. Transparency benefits both the con-sumers and the companies themselves, as it prevents false speculations accusations about price manipulation and prosecution based on wrong references.

In response to this concern, over the last year, the Spanish Regulatory Body has carried out an enormous job to improve the transparency of the oil market. It has displayed broad statistical information on fuel prices, demand, imports, exports, and other quanti-tative data. Also, it has implemented periodical reports with a full overview of the fuel market and the oil companies' behavior.

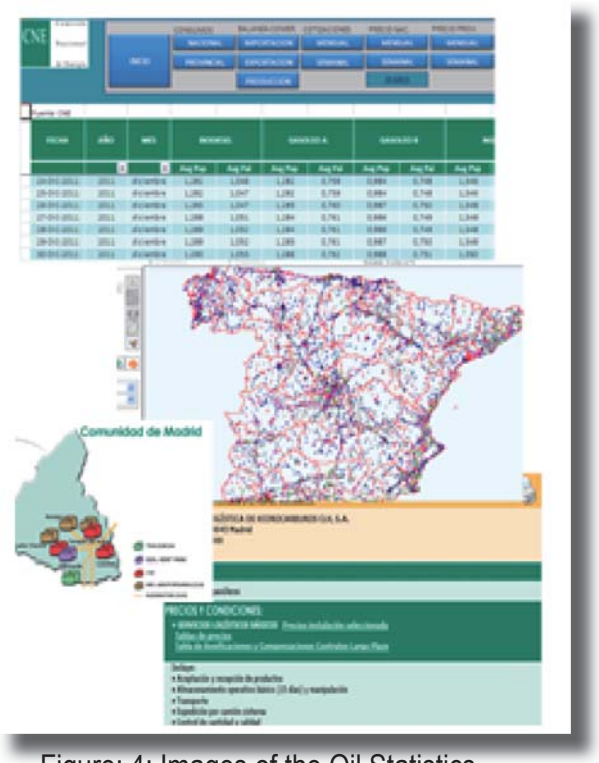

Figure: 4: Images of the Oil Statistics Regulatory Body website. Source: CNE

In a nutshell, the Regulatory Body monitoring program of the automotive fuel distribution market focuses on transparency and new competitiveness methods for comparisons. As novelty, the oil department of the Regulatory Body introduced modern statistical techniques to ensure robust and unarguably data, along with very detailed monthly statistical information on fuel prices and demand.

Some of these reports have become a handbook to follow up the fuel market competi-tiveness. What follows, describes the most interesting conclusions drawn from those surveys and the techniques to achieve them.

Spain's competitiveness gap in automotive fuel distribution markets

Spanish final prices of fuel are among the lowest of the EU, but among the higher ones before taxes. This has been so since the liberalization of prices took place in year 1998. The reason lies in taxation which is quite different across European countries and especially low in Spain. Even if the Government has recently increased taxes over the last two years to meet the budget deficit commitments, fuel taxation in Spain is still lower than the European average.

During some years, lower taxation in Spain was enough to keep consumers happy. They felt that, aside competition questions, fuel prices were relatively lower than their European neighbors and they were enjoying a greater competitiveness. However, when the level of prices rose sharply in 2012, and so did the taxes, the lack of competi-tiveness became an important issue. If the prices before taxes had not risen there would have been scope to increase taxes with no final price effects.

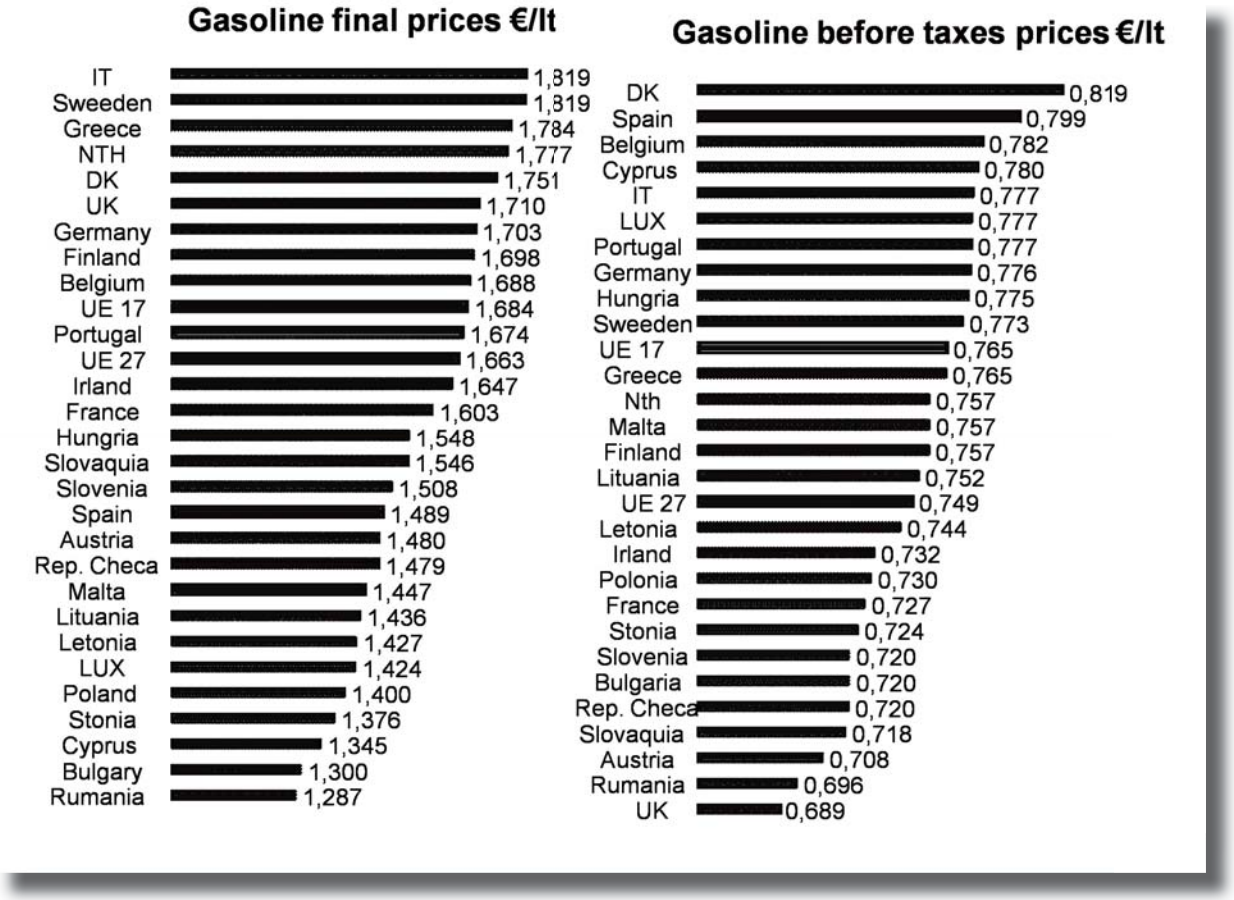

Figure 5: European ranking on fuel prices after taxes and before in August 2012.

The European fuel prices before taxes benchmark became, then, a real source of con-cern for the Spanish oil companies, as they were seen as the bad guys among con-sumers, the media and the Government.

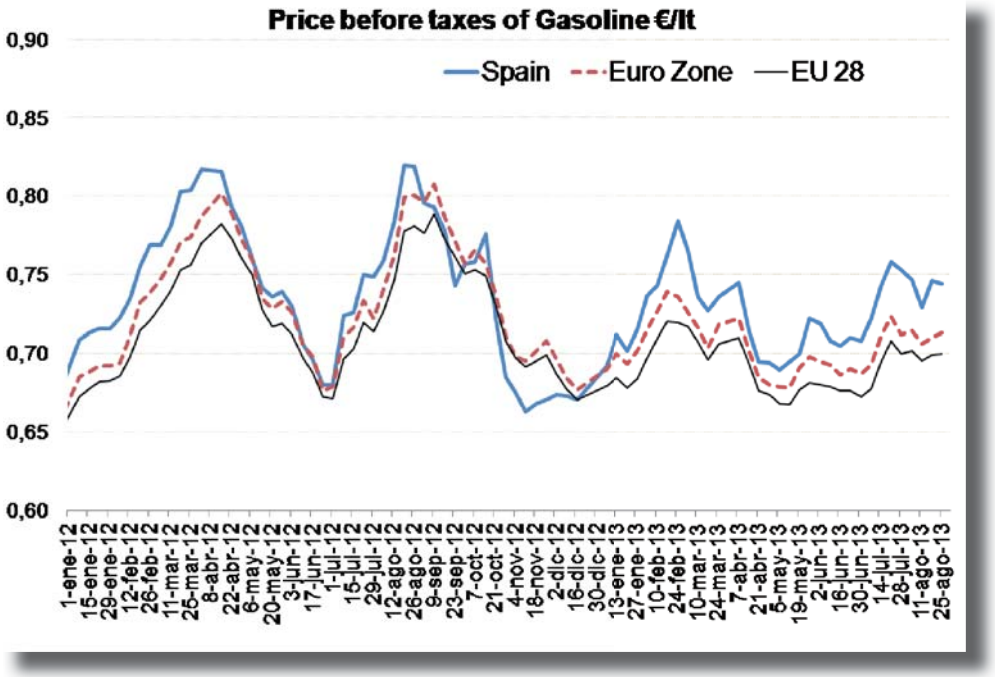

Figure 6: Pre tax prices of gasoline in Spain vs. European Union. Source: CNE

In response to this concern, oil companies claimed that the “Oil bulletin Pétrolier,” the European statistics on weekly average fuel prices and fuel taxes across the EU, was inaccurate and was not taking into account some peculiarities of the Spanish industry. Companies justified the gap calling at larger costs of retailing, such as specific local taxes, extra cost of building land, higher wages.

Furthermore, they claimed that the “Oil Bulletin Pétrolier” did not use homogenous methodologies across countries and the results of comparisons were not solid. They argued that the Spanish report on Monday fuel prices, as it was requested by the Oil Bulletin, was positively biased. That is, Spanish average fuel price reported by the Min-istry of Industry every Monday was artificially higher. Therefore, according to the Spanish oil companies, the European ranking on fuel prices was wrong and the Spanish position mistaken.

To overcome the comparison issue, the Regulatory Body did several revisions and checked the Oil Bulletin price collection. In the Spanish case the found it accurate and reflecting the average prices on Monday. The same exercise was done in the French case with similar results. Moreover, price series of the Oil Bulletin were consistent and time series methods could be used to find more concluding evidence about competi-tiveness.

In the first place, time series showed that pre-tax fuel prices differences between Spain and France were positive and non-stationary. The gap was not only positive but also increasing, meaning that over the last years, Spanish fuel retailers have pressed fuel prices above other European countries. Thus, there was evidence of an increasing efficiency loss in the Spanish fuel distribution market. Such evolution responds to a lack of competitive pressure and higher costs due to X-inefficiency.

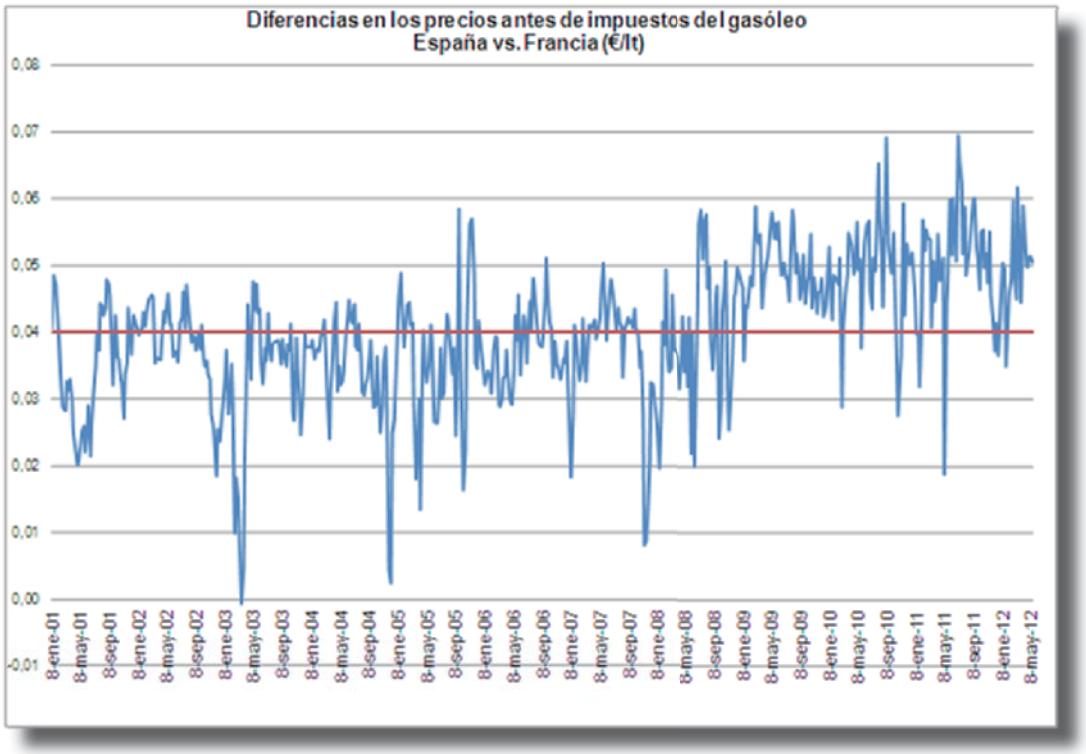

Figure 7: Pre tax prices on diesel fuel in Spain vs France (€/lt). Source: CNE

In the second place, statistical analysis showed that fuel price in Spain reflects higher seasonal variation compared to France, meaning that when fuel demand is higher, Spanish gas stations press fuel prices above the level of other more competitive fuel markets. Hence, Spanish retailers might be using market power in periods when de-mand rises, such as holiday journeys.

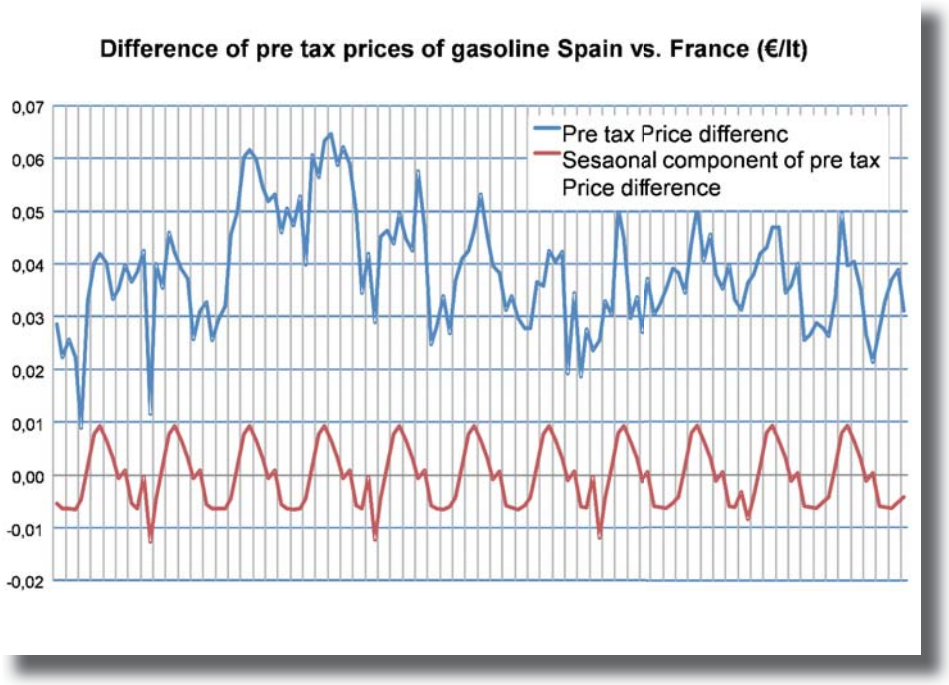

Figure 8: Seasonal component of Pre tax prices of gasoline differences Spain vs France (€/lt). Source: CNE

Third, when using the Oil Bulletin Petrolier to obtain gross margin on fuel, conclusions on competitiveness were remarkable as well. Gross margin on fuel is the result of sub-tracting the unit cost of fuel supply from the reported price before taxes. International quotations are the common references for the oil supply prices.

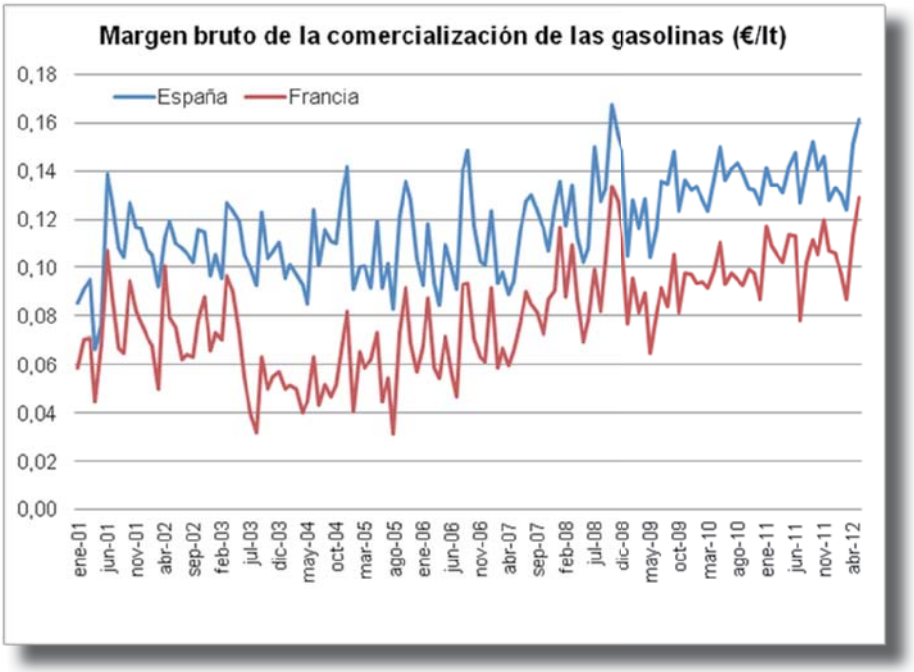

Figure 9: Gross fuel margin on gasoline in Spain and France. Source: CNE

Due to its geographical location, the cost of supply for the Spanish fuel market is 30% based on the North West Europe market and 70% on Mediterranean market quotations. The cost of supply for the French fuel market is for based on 50% North West Europe market and for 50% on Mediterranean market quotations.

In addition to the international prices of gasoline and diesel, biofuels are also an im-portant share of the supply. On average, volumes of conventional gasoline and gasoil contain up to 10% of ethanol and up

to 7% of biodiesel, respectively. Biofuels also have their own international quotations. For the Spanish market case, Ethanol T2 FOB ROTTERDAM and FAME 0C CFPP NWE FOB Barges Argus for biodiesel are the most relevant. Nevertheless, most bio products supplies follow the fossil fuel cost, so gasoline and gasoil international quotations are still the references of motor fuel supply.

The Regulatory Body shows that using the specific cost of supply of each country, the Spanish gross margin on fuel is, again, statistically larger. Time series analyses showed, in coherence with pre tax prices, that Spanish gross margin have been increasing over time. Thus, retailers have been increasing benefits, even in periods where demand was falling. The statistical results also concluded that international quotation fluctuation passages were delayed and fuel prices did not reflect those movements as quick as the French market did.

	Gross Margin on gasoline €/lt		Gross margin on motor diesel €/lt	
	Spain	France	Spain	France
Mean	0,11791	0,07916	0,11703	0,07743
Standard deviation	0,01963	0,02208	0,02056	0,01630
Variance	0,00039	0,00049	0,00042	0,00027
Rank	0,10130	0,10240	0,09849	0,07561

Figure 10: Gross margin on fuel statistics (January 2001 to April 2012). Spain vs France

In competitive fuel markets, prices are expected to follow very closely the supply costs. The competitive dynamics require so. If not, if retailers delay the price reductions when quotation drops, they will lose sales, because costumers will find cheaper gas stations. On the contrary, if the gas station keeps prices below quotations, it will sell fuel at a loss. Therefore the delay in international quotations passages is another evidence of price market power.

The Regulatory Body publishes daily data on fuel prices and its international quotations on a regularly basis, so this statistical analysis can be done and improved by consumers organizations or academic institutions. Actually, during the last months, the website to download fuel prices Statistics has enormously increased the number of users and has become a reference source of information for the sector.

The quantitative results described above, were solid enough to go ahead with motor fuel distribution market survey and new and much more concluding evidence of market power abuse was found.

Domestic competition in retailing fuel market reports across different regions

Since 2007, gas stations in Spain have been sending daily information on final prices of gasoline and gasoil to the Ministry of Industry. Final prices, location and brand of each gas station are published in the website of the Ministry, so consumers can check out prices before refueling. The data base of fuel final prices is an excellent source of in-formation for monitoring, because oil companies behaviors are accurately recorded so they can be studied.

To support fuel prices analysis, the Regulatory Body implemented a new information system. It is important to note that fuel price data base is very large as it records around 300.000 registers per day. Some limits to work with such a big volume of information exist and the IS took some months to be implemented and is still being improved.

First monitoring reports started in summer 2012 and obtained outstanding conclusions on fuel prices evolutions and companies behaviors. Since August 2012, fuel prices showed an anomalous evolution:

Prices increased on Sundays, sharply fell on Monday and bounced back on Tuesday. Media name this pattern the “Monday effect”. The Regulatory Body certified that fuel prices evolution on Monday was not a random be-havior and was not justified in any case by international fluctuation of fuel. Furthermore, being Monday the reference day to report prices to the “Oil Bulletin Pétrolier,” the Eu-ropean weekly fuel prices statistic, evidence pointed at price manipulation. Were the companies trying to distort the Spanish position in the European ranking of fuel prices? Indeed, the statistical research proved quantitative evidence of anticompetitive behav-iors, and its results were sent to the Antitrust Agency.

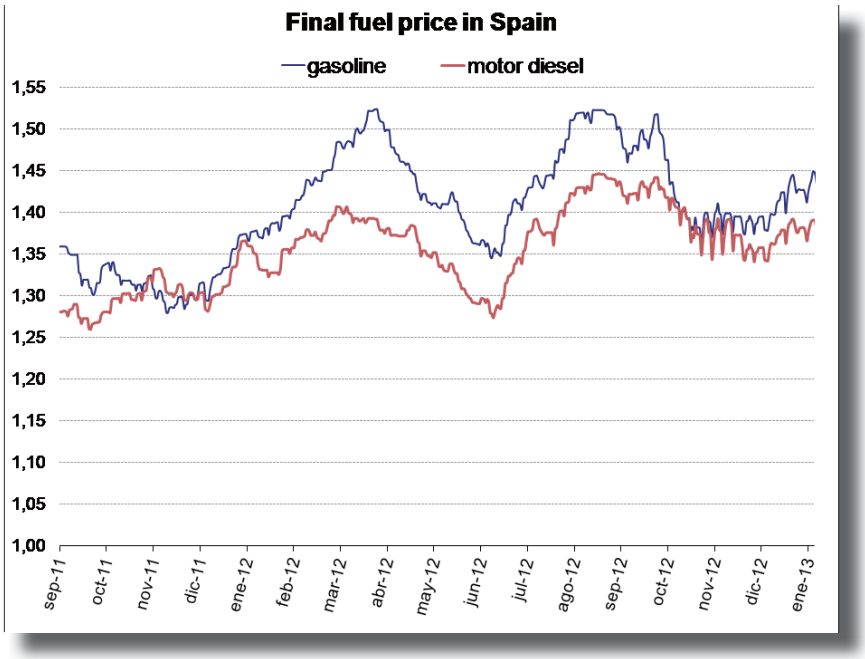

Figure 11: Gasoline and diesel daily price evolution. Source: CNE

The figure above shows the final price evolution of gasoline and diesel. As can be seen, from August 2012, fuel prices movements show weekly bottom peaks. If we zoom on that period such as in November 2012, see Figure below, we see evidence of a quite strange pattern. Monday prices drop about 1% and increase next Tuesday with more than 1%. So prices show a clear week seasonality on Mondays, which cannot ob-viously be explained by immediate international quotations, since oil international markets are closed during the weekends.

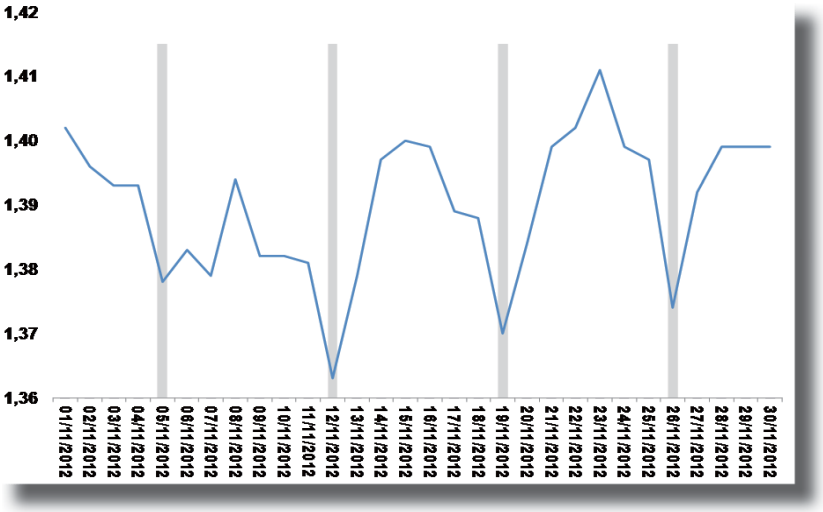

Figure 12: Gasoline daily price in November 2012. Source: CNE

The intensity of the “Monday effect”, that is, the order of magnitude on fuel prices drop every Monday, was very revealing. The higher the market concentration the greater the price drop in a region. On the other hand, regions where market share was diluted, the “Monday effect” was smoother. Moreover, the “Monday effect” intensity and relative higher average prices on other week days, showed a positive relationship. Therefore, the intensity of the “Monday effect” could evidence a price manipulation. Eventually, the leading group of companies could be exercising market power abuse.

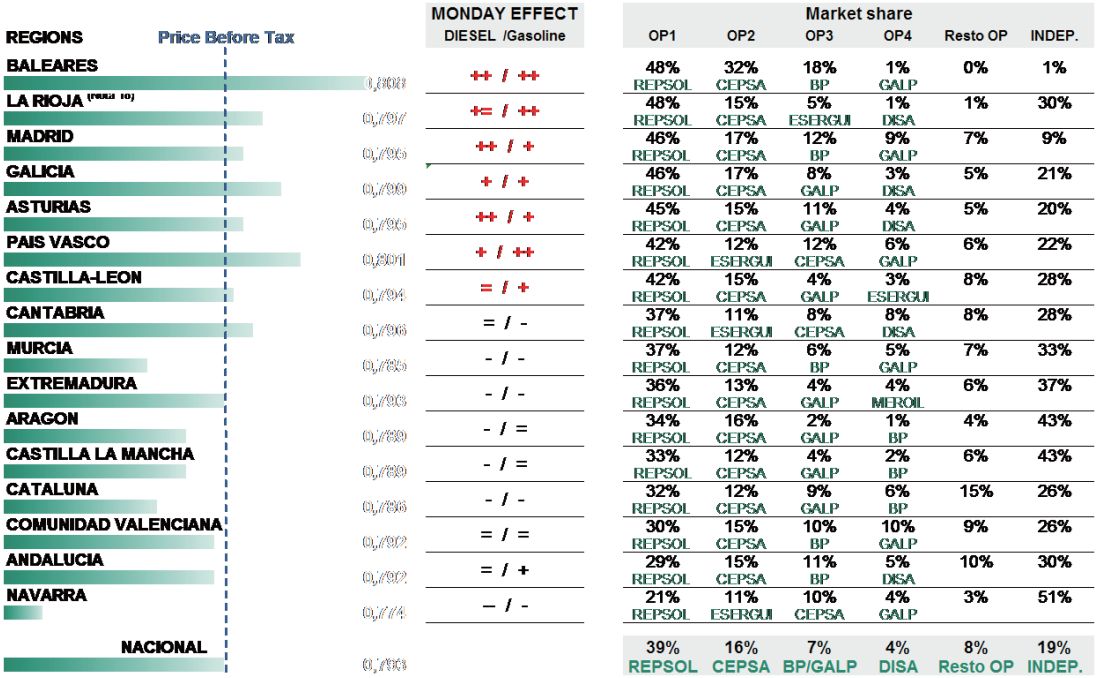

Figure 13: Monday fuel price strategies by region and market shares. Source: CNE

Looking at individual strategies fuel price setting explained these results. Repsol, the incumbent oil company with the largest market share, set prices on the “Monday effect” basis. The rest of traditional oil companies admitted that they were following Repsol’s strategy. Thus, being those the companies with the biggest market, the average price was fully determined by Repsol’s strategy. Moreover, statistical research showed that the prices fluctuations were totally the same in a group of companies, indicating, at least, tacit collusive behaviors agreements.

On the contrary, Maverick firms did otherwise. They set prices according to internation-al quotation fluctuation. Their commercial strategy was not closely correlated with Repsol’s, so in local markets where those companies had a larger market share, the “Monday effect” was very smooth o just did not exist.

Conclusions

Repsol replied that the Monday fuel price strategy was addressed to consumers and in no case the company was attempting to manipulate the European Oil Statistics. Alt-hough they did an im-portant job to explain themselves in the media, its arguments did not convince. In Summer 2013, one year later the Regulatory Body started the fuel distribution market survey, the Antitrust agency started proceedings against Repsol, Cepsa, BP , DISA and Meroil. During the last months, Span-ish oil companies have not complaint about the European fuel prices ranking, or the Oil Bulletin Petrolier Statistics. They have focused on con-taining gross margin on fuel and price before taxes in order to stop new critics and re-build their damaged reputation.

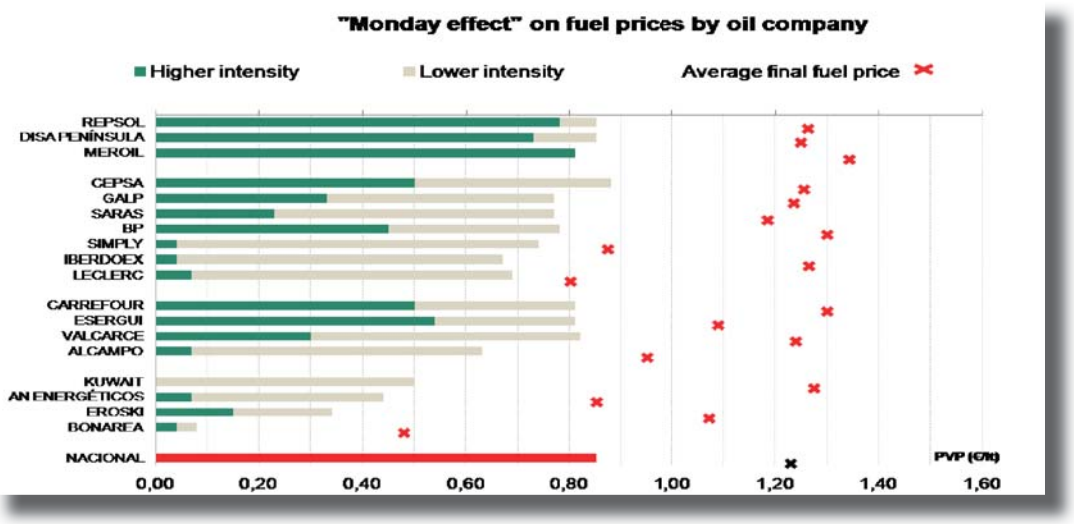

Figure 14: Fuel price strategies on Monday grouped by company's likeness. Source: CNE

owever, in July 2013, the Government approved a new law to limit market share in the distribution fuel market and restrict agency contracts and exclusive supply contracts between oil companies and gas stations. New powers were given to the Regulatory Body in order to supervise wholesale markets and ensure fair competition in retailing.

Over the year 2013, several academic studies, have published new papers on the fuel market competition using the Statistical information . The monthly reports of the Regu-latory Body on fuel distribution are now front-page news. Most importantly, new legisla-tion and business opportunities have started to attract new investors for projects on more efficient gas stations.

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Milagros Avedillo is economist specialized in industrial policy. Since 2009, she is the Oil Market Deputy Director at the Spanish Regulatory Body. Formerly she has served as senior advisor at the Spanish Minis-try of Economy and Finance and at the Prime Minister's Economic Bureau. She is a regular guest speaker at several Universities.

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Independence, Accountability and Perceived Quality of National Regulatory Authorities [1]

By Prof. Pierre Larouche, Dr Chris Hanretty, Prof. Andreas Reindl and Thierry Denuit

Abstract

In this report, we investigate three key features of regulatory agencies: their independence, their accountability, and their perceived quality. We investigate these three factors for regulators drawn from four sectors (telecoms, energy, competition, and rail) and five countries (Belgium, France, Germany, the Netherlands, and the UK). Measurements of accountability and independence are developed, based on the political science literature and legal documents. Regulators' quality is measured through pairwise peer evaluations, correcting for various possible respondents' biases. Concerning the links between independence, accountability, and quality, we find that there is both (1) a statistically significant and positive link between independence and perceived quality, and (2) a statistically significant and positive link between accountability and perceived quality. What is more, independence and accountability are themselves positively related. This suggests that robust independence and accountability measures can effectively co-exist and contribute to better outcomes. Accordingly, our study provides empirical support for the EU approach to the design of regulatory agencies, which combines independence and accountability and seeks to find the optimal balance between them.

1. Introduction

Historically, the establishment of independent national regulatory agencies (NRAs) was justified on the basis that regulation carried out by independent agencies would deliver better outcomes. This claim was based on the idea that political principals have time-inconsistent preferences, which lead them to prioritise low consumer prices over investment in infrastructure, and which generally 'spook' investors (Kydland and Prescott, 1977; Majone, 1996), and on the idea that sectoral regulation often requires a degree of technical complexity which cannot be met by an organisation headed by a politician (Majone, 1994). Furthermore, even though the independence of regulators is accepted as an essential feature of the regulatory framework, an expectation of political responsibility and control from the executive branch remains. This is why a specific European model of NRAs has emerged, which combines independence with accountability. Yet, demonstrating the link between independence, accountability and performance empirically has been difficult, not least because a "legal" concept of independence and accountability with uniformly applicable legal requirements is lacking.

Finally, as already mentioned, much of the literature on independence and accountability suffers from one of two following problems: 1) Poor measurement of independence (many articles use a simple dichotomy of whether an independent regulator has been set up or not, which is, however, unhelpful in the present context, where the presence of independent regulatory agencies is almost uniform, but where degrees of independence differ considerably); 2) Poor choice of outcome (many outcomes cited in the literature, such as financial leverage and interconnection rates, do not tap broader aspects of the work of regulatory agencies). These problems are addressed here by using a sophisticated measure of independence and tying it to more direct measures of regulators' quality. Furthermore, even though much has been written on accountability, few attempts have been made to develop an empirical measurement for the accountability of NRAs. We use the existing literature on accountability, which has identified various instrumental and structural mechanisms for enhancing accountability ex ante or ex post (Maggetti, 2010; Hood, 1995), in order to develop our own set of accountability criteria.

In the present study, we consider sixteen regulators, covering 4 sectors (telecommunications, energy, railways and competition) in 5 different countries (Belgium, France, the Netherlands, the UK and Germany).

These regulators are listed by country and sector in Table 1. Some of these regulators cover multiple sectors. We do not, however, explicitly consider the dual character of such regulators, but instead give each regulator a single score on independence, accountability, and perceived quality.

Table 1 – List of regulators by country and sector

	Competition	Energy	Rail	Telecommunications
Belgium	Conseil de la concurrence	Commission de régulation de l'électricité et du Gaz	Service de régulation du transport ferroviaire	Institut belge des services postaux et des telecommunications
France	Autorité de la concurrence	Commission de régulation de l'énergie	Autorité de régulation des activités ferroviaires	Autorité de regulation des communications électroniques et des postes
Germany	Bundeskartellamt	Bundesnetzagentur		
Netherlands	Nederlandse Mededingingsautoriteit			Onafhankelijke Post en Telecommunicatie Autoriteit
United Kingdom	Office of Fair Trading	Office of gas and electricity markets	Office of rail regulation	Office of communications

2. Measuring independence

A number of difficulties arise when measuring independence. The first issue we must deal with lies in specifying what kind of independence. It is common to distinguish between de jure and de facto independence, or the independence that an organisation has according to the law from the one enjoyed in practice. Here, we concentrate on de jure independence, because it is less ambiguous to measure and because studies have shown that de jure and de facto independence are correlated (Hanretty and Koop, 2010). Three other issues which arise when computing a measure of independence is to decide on what items to include, how to weigh those items, and how to account for the fact that some items might have more than 2 possibilities, necessitating to compute the appropriate spacing between the different levels.

In developing our list of independence criteria, we built upon a list of criteria commonly used in the political science literature, which we then cross-checked against those criteria that most commonly appear in European legislation, case law, and legal literature on independence. We hereby created a list of what we saw as 'core' independence criteria. Our approach is at once simple and sophisticated.

It is simple in that we allow the data to answer many of the issues we posed in terms of inclusion, exclusion, weighting, and spacing. Institutional features that are commonly found together are taken to be independence-promoting; institutional features that are commonly absent together are taken to be independence-weakening. If we have enough data available, we can calculate numbers which reflect the weighting of each item. Items that cluster with other independence-promoting items receive a high weight. Items which sometimes cluster with other independence-promoting items, but which sometimes are found alongside independence-weakening features, are given a lower weight, because they are noisier signals of the level of an agency's de jure independence. Figure 1 below shows the different criteria comprised in the independence index (including their thresholds). [2]

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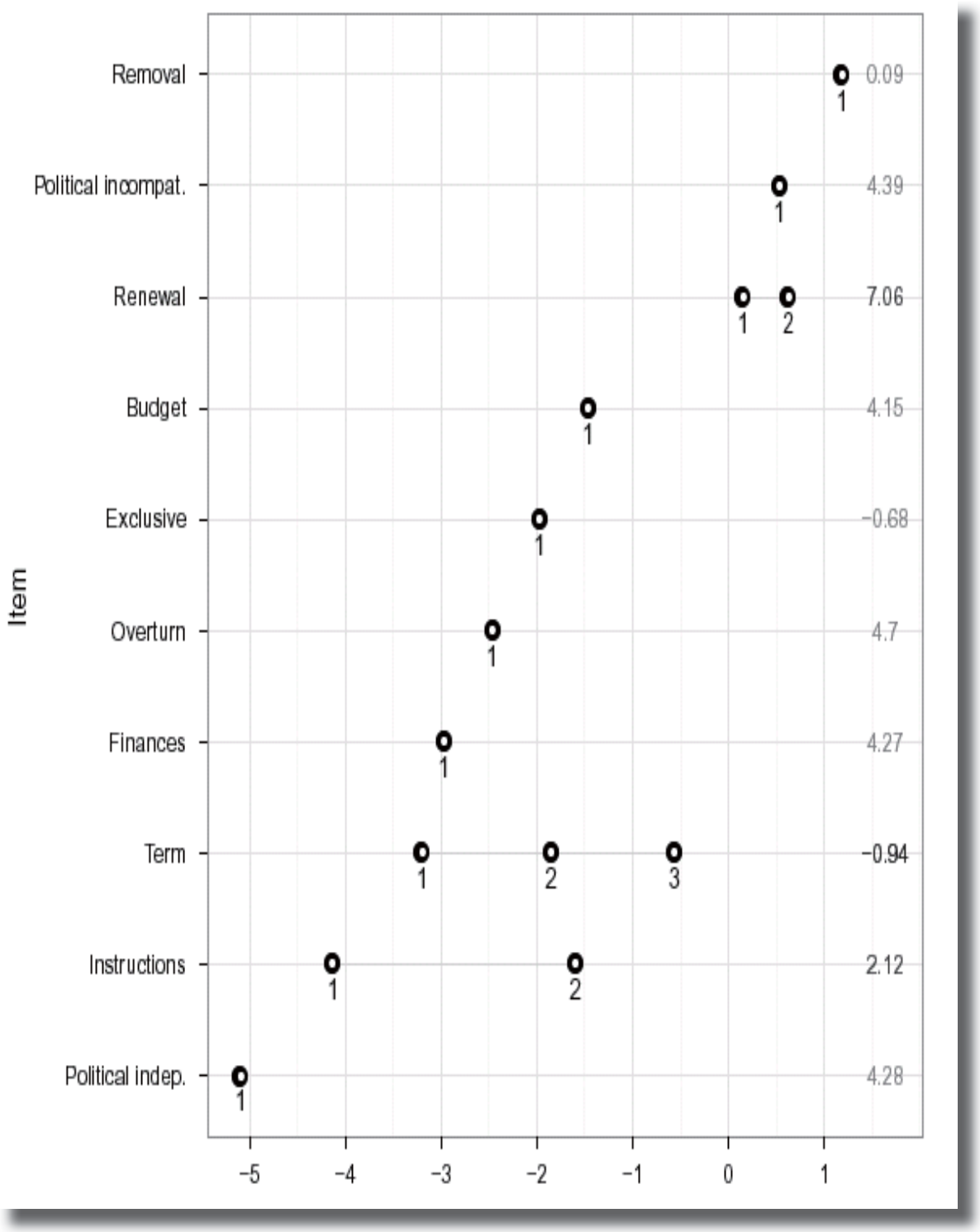
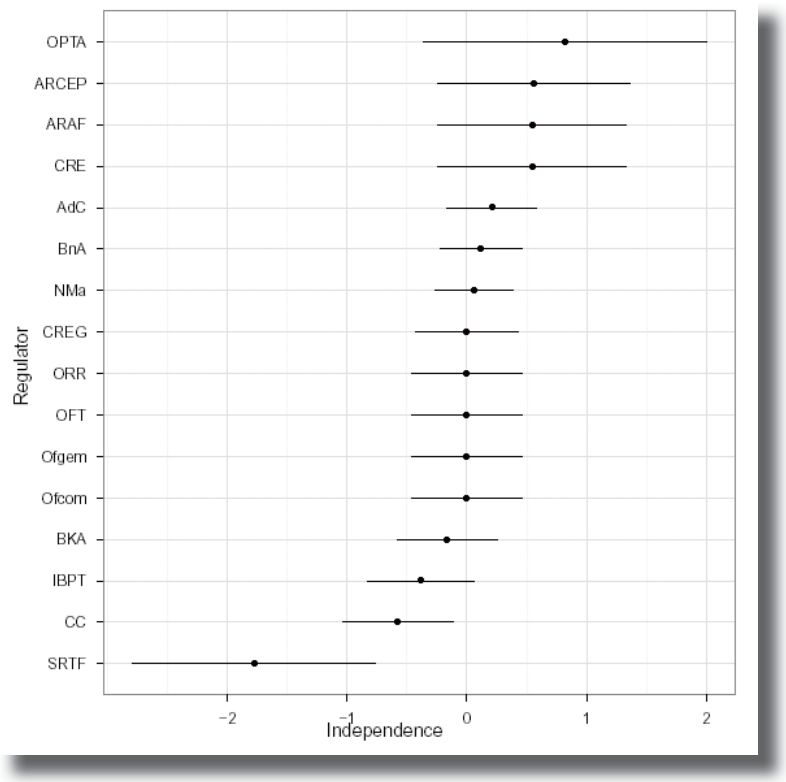
[1] This article is based on a more extensive study conducted by Prof. Pierre Larouche, Dr Chris Hanretty and Andreas Reindl on behalf of the Centre on Regulation in Europe (CERRE) and published by the latter in 2012. We would like to thank the authors of this study, without which the current article would not have been possible. Furthermore, we would like to extend our gratitude to Prof. Bruno Liebhaberg, Director General of CERRE, for his useful comments and support. Due to editorial constraints, more technical aspects of the analysis have voluntarily been omitted from the text. These are referenced extensively in the above-mentioned CERRE study, which can be downloaded on www.cerre.eu.



Once the different weights have been computed, they are used to estimate the overall independence of each NRA. These estimates are plotted in Figure 2. [3]

[2] A more detailed description of these criteria is provided in the above-mentioned CERRE paper.
[3] The estimates are presented with their associated 95% confidence intervals.



We note that the disparities in independence between sectors are less marked than the disparities between countries. More specifically, whilst there is a statistically significant difference between the perceived quality of regulators according to country (F-value of 3.94 on 4 degrees of freedom, p = 0.03), the same cannot be said of quality by sector (F-value of 0.84 on 3 degrees of freedom, p = 0.5).

3. Measuring accountability

Just as with the independence of regulators, the accountability of regulators needs to be clarified conceptually. Following Philp (2009), we first distinguish a number of different accountability relationships: accountability to politicians, accountability to the market, accountability to the judiciary, and accountability towards relevant peer groups such as networks of sectoral regulators, or the European Commission.

Second, accountability is a relationship which involves “giving account”: that is, informing, explaining, and justifying conduct. Because of this, many of the items in our index of accountability relate to the provision of information.

Third, accountability need not, as a matter of definition, involve sanctioning behaviour. Philp (2009) explains the distinction as follows: The intuition behind the desire to make sanctioning analytically part of the definition of accountability is that, without any sanctions, accountability could be an entirely paper exercise. The intuition behind resisting this move is that a regulator is accountable if he or she can be required to give an account, irrespective of whether certain consequences may follow from doing so. The latter option is ultimately born out by our empirical analysis. Although we begin by including an index item which relates to sanctioning, we find that this item is unrelated to the other items which measure accountability. We consequently remove it from our index. This conceptual point also matters when we consider the relationship between accountability and independence.

These are sometimes taken to be inimical to each other, based on the view that accountability requires sanctioning, and that sanctioning might compromise independence. If, however, accountability can be achieved by transparency and publication requirements alone, then the two concepts will be easier to reconcile in practice.

Table 2 – Accountability criteria

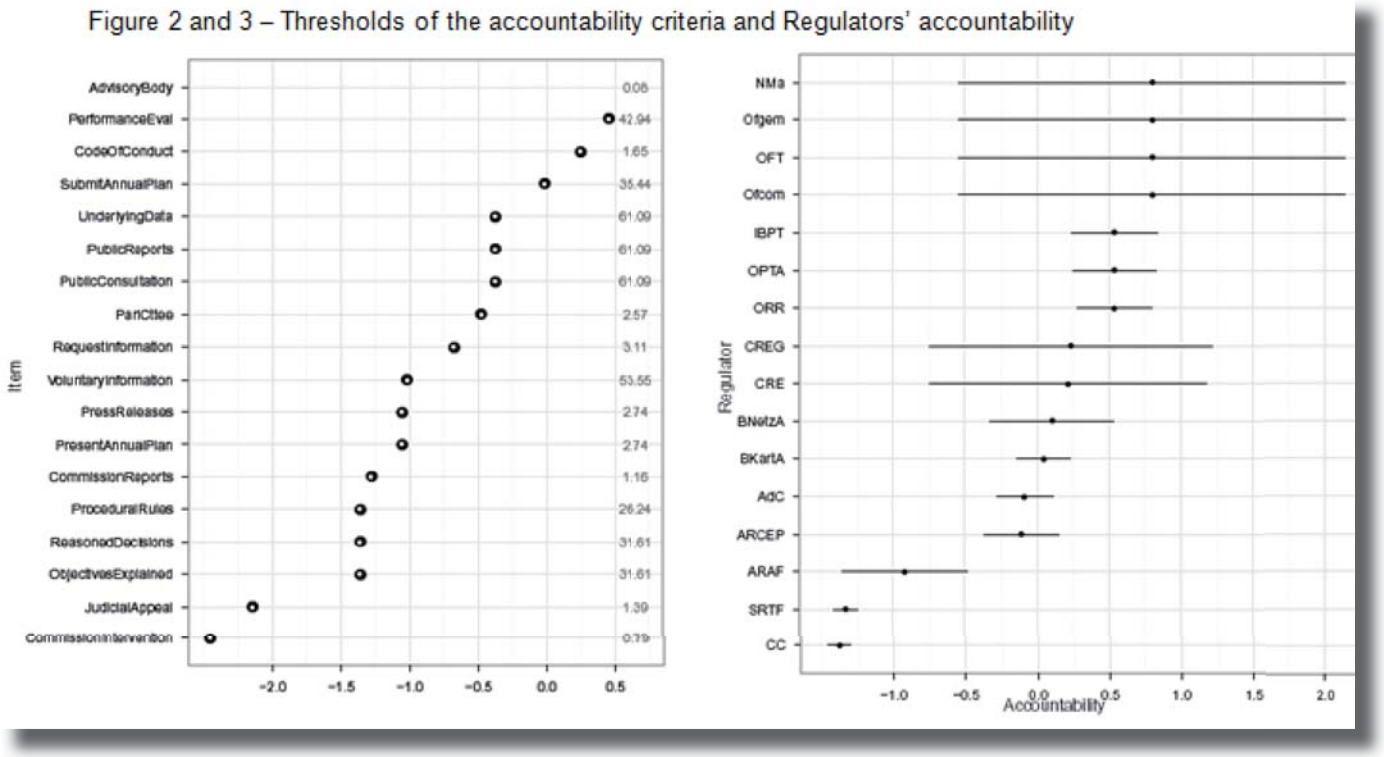
Principal	Executive	Legislature	Commission	National public	Regulated firms	Other regulators (peers)	Judiciary
Accountability criterion							
Procedural stage							
Presence of defined regulatory objectives	X	X	X	X	X		X
Objectives explained to stakeholders	X	X	X	X	X		X
Reasoned decisions	X	X	X	X	X		X
Procedural rules in place				X	X		X
*Advisory body with stakeholder participation				X	X		
Information stage							
Report to Commission	X						
Retrospective annual report	X	X	X	X	X		
Press releases	X	X	X	X	X		
Voluntary information provision	X	X					
Discovery stage							
Compulsory/compelled information provision	X	X					
Appearance before parliamentary Committee		X					
Public consultations				X	X		
Annual reports publicly available				X	X		
Data underlying decisions publicly available				X	X		
Evaluation stage							
Prospective annual plan	X	X					
Code of conduct				X	X		
Periodic performance evaluation	X	X					
Possibility of Commission intervention			X				
Appeal before judiciary					X		X
Membership in peer network						X	
**Prior ministerial approval for annual plan	X						
**Minister can issue guidelines to regulator	X						
**Minister can dismiss head of regulator	X						

* Not used in the assessment, since all regulators score the same.

** Not used in the assessment, because of high threshold value.

*** Not used in the assessment, because of low discrimination parameter (low influence on accountability score).

Figure 2 and 3 – Thresholds of the accountability criteria and Regulators' accountability



4. Perceived quality

From a conceptual standpoint, even though regulatory quality is much discussed in the literature, it is not well-defined. As Radaelli notes, "quality is associated with a variety of characteristics. 'High quality' regulatory work is, variously, work that is efficient (both in its own production and in its consequences for regulated markets), proportionate, legitimate, consistent, not unduly prescriptive, and enforceable." Therefore, instead of aiming at specifying the various components of regulatory quality, we rely on a notion of perceived quality. Specifically, regulator X has greater perceived quality than regulator Y if competent experts choose X over Y when asked which regulator does better work.

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[4] As the technique used in this section (and similar to the technique used earlier to measure independence) exploits variation between responses of different regulators, it is unable to 'score' items where all regulators in the sample have the same response. Three items in our index do not have any variation, and therefore had to be removed. However, the fact that we cannot 'score' these items does not mean that they are not important for accountability. Indeed, it may be that these items are fundamental for accountability. Having defined regulatory objectives might be such a basic element of accountability that it is a characteristic of all regulators in our sample, even those which score poorly on other characteristics. For the remaining items, we estimated thresholds for each item, and a number of discrimination parameters. These thresholds and discrimination parameters can be interpreted as follows: a threshold for a given item is the point on the scale at which the regulator is as likely to respond in a given high-accountability category as it is to respond in the low-accountability category; a discrimination parameter measures roughly how important having this item is to the regulator's overall score for accountability. High discrimination parameters indicate items that are particularly important for accountability. When we conducted this preliminary analysis, we found that three items had very small or negative discrimination parameters. Negative discrimination parameters may mean either that the item is unrelated to the latent trait we are trying to measure, or that although the item is related to the latent trait we are trying to measure, it is related in precisely the opposite direction to that which we predicted. Given that there are no strong reasons for suspecting that items are related in the opposite way to that predicted, we view the former possibility as more likely. Furthermore, we also leave aside one item because its threshold was extremely high. The high threshold associated with this item is related to the extremely low discrimination parameter, suggesting that whilst this item is an indicator of high accountability, it is a very unreliable one.

The measure of perceived quality used in this study results from a peer benchmarking exercise of regulatory quality carried out at workshops organised by the Centre for Regulation in Europe (CERRE). Respondents were asked to take an electronic survey, indicating their country, their sector, their role (regulator, regulatee, or academic), and were then asked to compare every pairwise combination of regulators in their country, and in their sector. In terms of the composition of respondents, the most popular sectors were Rail (11 respondents), Telecoms (10 respondents), and Energy (7 respondents). The most represented countries were Belgium (15 respondents), United Kingdom (9 respondents), and France (6 respondents).

Consistency and reliability are two key issues when eliciting judgements from multiple participants in an evaluative exercise such as this. By consistency, we mean the ability of respondents to rank regulators such that, if they prefer A to B, and B to C, then they also prefer A to C. By reliability, we mean the ability of respondents to give similar judgements when presented with the same comparison. If respondents are inconsistent and/or unreliable, and if this inconsistency or lack of reliability is not the result of systematic factors which can be accounted for, then our overall results concerning perceived regulatory quality may be called into question.

In order to quantify the degree of (in)consistency, we use Kendall's coefficient of consistence ζ (Kendall and Smith, 1940). The average value of $\zeta = 0.57$, indicates moderate to high consistency in the answers in our sample. Consequently, there are no good grounds for excluding respondents on the basis of inconsistency.

Regarding reliability, we calculated values of Cohen's κ statistic (Cohen, 1960) for each pair of respondents, and then calculate the average reliability level across all respondents. The average κ for our sample is 0.22, indicating fair agreement between raters. In order to further improve the overall reliability, we eliminated the most unreliable respondents until $\kappa = 0.4$, which is equivalent to requiring moderate agreement of our respondents.

Furthermore, we identified a number of potential biases: 1) Regulator-boosting (respondents working for regulators might be more likely to choose their employer); 2) Regulatee bashing (regulatees will be more likely to choose any other organisation over 'their' regulator); 3) Nationalism (respondents will be more likely to choose organisations from their country). After empirical verifications, it appears that only regulator-boosting was significantly present in the data and needed to be corrected.

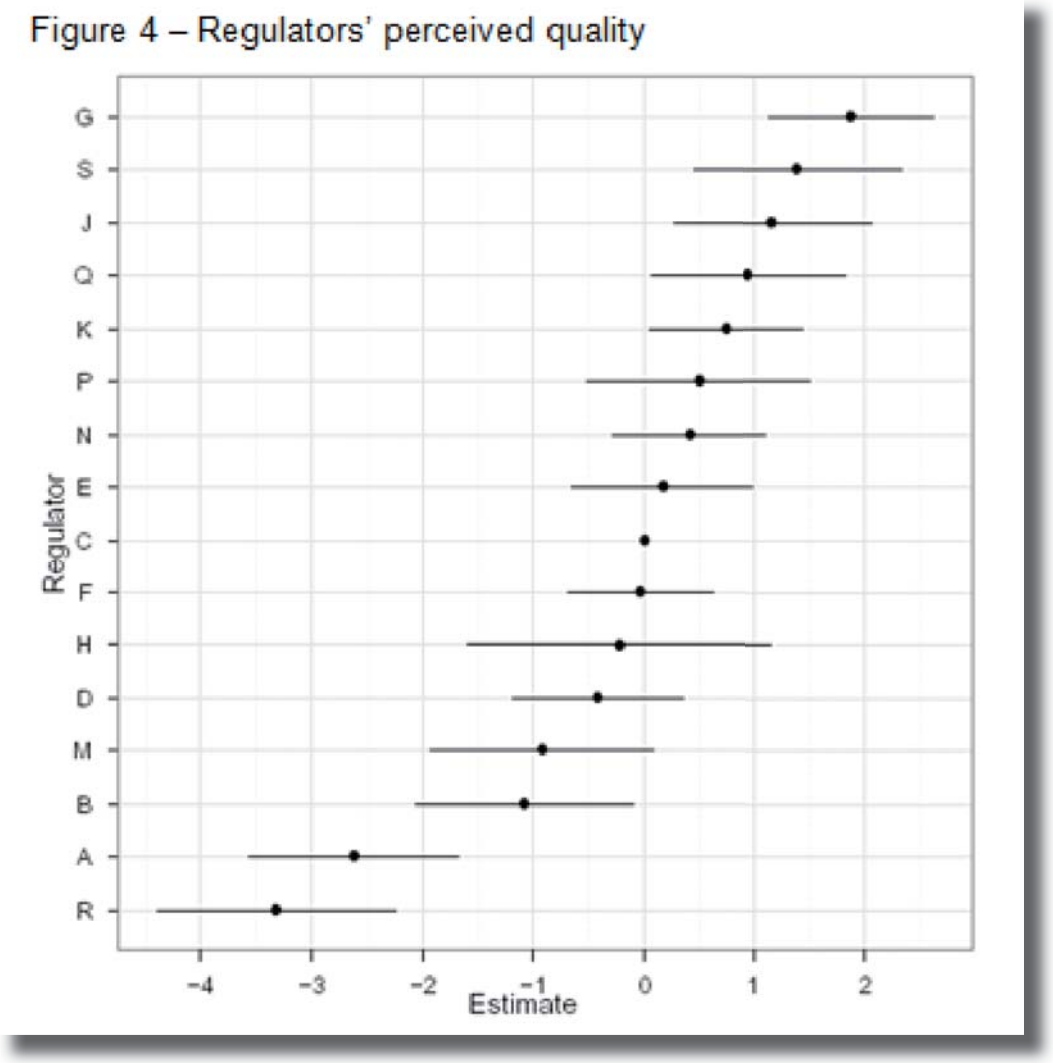
the regulators we consider here have very large budgets in absolute terms, whereas some have rather small budgets. It is possible that these differences are driving differences in perceived quality, either because funding really does matter for quality, or because those comparing regulators opt for the larger, better-funded, or more visible, regulator. Regarding reliability, we calculated values of Cohen's κ statistic (Cohen, 1960) for each pair of respondents, and then calculate the average reliability level across all respondents. The average κ for our sample is 0.22, indicating fair agreement between raters. In order to further improve the overall reliability, we eliminated the most unreliable respondents until $\kappa = 0.4$, which is equivalent to requiring moderate agreement of our respondents.

To measure and make comparable the resources available to each regulator, we collected information on the size of the budget, expressed in millions of euros, for each regulator, and on the number of full-time equivalent staff for each regulator. These figures were generally taken from the annual reports of each regulator, and typically refer to the financial year 2010/11.

To test the overall link between our three inputs (independence, accountability and resources) on the output variable (perceived quality), it would be natural to use a linear regression. Unfortunately, because of the limited number of regulators in our sample (16), it is both difficult to achieve results that are statistically significant, and undesirable to include all three predictors. Most rules of thumb usually suggest between ten

Figure 4 below provides an overview of regulators' perceived quality. [5]

Figure 4 – Regulators' perceived quality



5. Empirical links between independence, accountability and perceived quality

In order to assess the empirical link between independence, accountability and perceived quality, we included a potential confounder of quality in the set of explanatory variables, namely regulator resources. Some of

[5] As it is not the objective of this paper to name and shame given regulators, the perceived quality measures have been anonymised.

and twelve cases per predictor, a rule of thumb which would permit only bivariate tests of the relationship between inputs and quality. Nevertheless, the models shown suggest that, across the three different pairwise combinations of these three inputs, there is a significant relationship between at least one variable in each model. Resources have a significant positive impact on quality in the first model, alongside independence. Resources also have a significant positive impact when considered alongside accountability, although here the relationship is only significant at the 10% level. Finally, accountability has a significant positive impact when considered alongside independence. None of these models is likely to be the 'correct' model of quality, but the three models taken together do suggest that there are positive relationships between these three inputs and quality which are not epiphenomenal. The results of the regressions are provided in the table below.

Table 3 – Regression models of quality

	(1)	(2)	(3)
(Intercept)	−0.256	−0.277	−0.184
	(0.258)	(0.264)	(0.282)
Resources	1.608*	1.594†	
	(0.543)	(0.865)	
Independence	0.455		0.573
	(0.491)		(0.545)
Accountability		0.221	0.972*
		(0.642)	(0.448)
R-squared	0.541	0.515	0.436
adj. R-squared	0.470	0.440	0.350
sigma	1.006	1.034	1.115
F	7.660	6.904	5.031
p	0.006	0.009	0.024
Log-likelihood	−21.144	−21.583	−22.787
Deviance	13.167	13.910	16.169
AIC	50.289	51.167	53.574
BIC	53.379	54.257	56.664
N	16	16	16

Note: * = results statistically significant at the 0.05 level of significance; † = results significant at the 0.1 level.

6. Policy recommendations

Our research provides empirical support for the basic approach chosen in the EU for the design of regulatory agencies, namely a combination of independence on the one hand, and accountability on the other hand. Our research shows that a sustainable and fruitful trade-off between independence and accountability is possible and it leads us to formulate the following policy recommendations.

Our first broad recommendation is that regulators should ask to be granted greater independence and offer more accountability. In making this recommendation, we recognize that we are, in a certain sense, pushing at an open door: regulators are unlikely to advocate for greater and more demanding restraints on their actions. Yet we believe that this recommendation now has added force in the light of our findings regarding the link between independence and perceived quality, but especially regarding the compatibility of independence and accountability. Armed with this finding, regulators can now make the case for greater independence without conceding that this necessarily damages accountability – or, what is perhaps more useful, can now freely accept requests for greater accountability without worrying that this will damage independence.

Our second broad recommendation is that regulators should pursue increases in independence and accountability as part of balanced packages of changes to their governance. From an analysis of the correlations between the variables, it might seem that, since the link between quality and accountability is stronger than the link between quality and independence, regulators should devote all their effort to becoming more accountable, rather than more independent, since more accountability will deliver greater increases in perceived quality. This would be the wrong conclusion to draw, and does not take account of the positive relationship between independence and accountability. Independence, accountability and quality therefore form a virtuous triangle, which is the basis of the European model of regulatory agencies.

Our third and final broad recommendation is that regulators, in arguing for greater independence and accountability, should focus on 'low-hanging fruit'. By this we mean that regulators who wish to increase their levels of independence should start from the items as mapped in the previous sections, identify which pro-independence (or pro-accountability) provisions they lack, and lobby for the 'missing items' in the order in which they appear in our map. Thus, focusing on 'missing' low-independence items (such as an explicit statement of independence, or a ban on ministerial instructions) will not only fill in any gaps in the regulator's governance, but will also be easier for ministers or legislators.

Prof. Pierre Larouche is Joint Academic Director of the Centre on Regulation in Europe (CERRE) and Professor of Competition Law at Tilburg University, as well as Professor at the College of Europe (Bruges) and the Institut d'Etudes Politiques (Paris). He also co-founded the Tilburg Law and Economics Center (TILEC). Before starting his academic career in 1996 at the University of Maastricht, he clerked at the Supreme Court of Canada in 1991-1992 and practised law for three years in Brussels. His teaching and research interests include competition law, telecommunications law, media law, basic Community law and the common European law of torts.

Dr. Chris Hanretty is Lecturer in Politics at the University of East Anglia, and member of the Centre for Competition Policy. After graduating from Oxford with a first-class degree in Politics, Philosophy & Economics, he worked for the United Nations Human Settlement Programme, and completed a PhD at the European University Institute in Florence. His research interests include institutional design and the independence of non-majoritarian institutions such as regulators, courts, and public broadcasters. He has published in the British Journal of Political Science, the European Journal of Political Research, and the Journal of European Public Policy.

Prof. Andreas Reindl is currently Visiting Professor at Leuphana University, Lüneberg, Germany. He previously served as the Executive Director of the Fordham Competition Law Institute, and as Principal Administrator at the OECD where he worked on competition law enforcement issues, international cooperation, and technical assistance. Prof. Reindl has also practiced U.S. and European antitrust law with the Washington, D.C. and Brussels Offices of Skadden, Arps, Slate, Meagher & Flom. Prof. Reindl has taught U.S. antitrust, European and international antitrust, and antitrust and intellectual property at Fordham Law School, the University of Michigan Law School and the American University Washington College of Law. He has published widely in the areas of antitrust and intellectual property law.

Thierry Denuit has been a researcher at CERRE from 2010 to September 2013. He holds a MA in Management Sciences (Ingénieur de Gestion) from the Solvay Brussels School of Economics and Management (SBS-EM) - Université Libre de Bruxelles.

Strengthening Strategic and Sustainability Considerations in Regulatory Decision-making: A Case Study from the GB Regulator

By Jennifer Mills
Contributing Author: Professor Michael Grubb

Abstract

"The short to medium term future of the energy sector in the UK is characterised by a growing dependence on energy imports, potentially higher energy prices and the need for continuing action to reduce greenhouse gas emissions whilst ensuring that energy and heating costs remain affordable to all" (Ofgem, 2012).

In common with many energy regulators worldwide, the range of factors the Office of Gas and Electricity Markets (Ofgem) is required to take into account has grown in complexity and scope over recent years, with regulatory decision-making often having to balance the type of 'trilemma' issues described above – in effect, balancing long term benefits against short term gains. This requirement is further highlighted in Ofgem's statutory powers and principal objective, which requires the regulator to protect the interests of both existing and future consumers.

Although the organisation has always considered these issues within its decision-making process, in order to fully meet both the present and future components of its principal objective Ofgem has developed a Strategic and Sustainability Assessment to provide a systematic and transparent framework in which to evaluate the mid-term stress and security and long-run natural asset and sustainability implications of its decisions.

Context

Historically, the main role of the energy regulator in Great Britain (GB) was to deliver consumer protection, optimise markets, maximise the benefits of competition and drive out inefficiency. However, the nature of decision making in the energy sector is becoming increasingly complex and long-term in outlook.

Ofgem's duty to have regard to the need to contribute to the achievement of sustainable development was first introduced in the Energy Act 2004. The Energy Act 2008 promoted this duty, placing it on an equal footing with the organisation's duties to meet reasonable demand and financing authorised activities, and clarified that Ofgem's principal objective is to protect the interests of future as well as existing consumers.

Under the Energy Act 2010, Ofgem's principal objective was further amended to make it clear that the interests of consumers include their interests in the reduction of emissions of greenhouse gases and their interests in security of supply. These changes underline Ofgem's important and developing role in shaping the future of gas and electricity industries in a sustainable manner.

Looking beyond Ofgem's statutory duties, in 2009 the Government Economics Service (GES) undertook a review of the Economics of Sustainable Development. It concluded that, whilst social cost benefit analysis was appropriate in most cases, certain circumstances required other specific tools in order to assess whether policy proposals were consistent with sustainability. These circumstances arise when policy options have "large, non-marginal or irreversible impacts; on taking social impacts into account more systematically; on dealing more transparently with the consequences for future generations; and on improving the way Ofgem values externalities (such as damage to environmental assets)"[1].

Ofgem's Deliberations

The natural desire of regulatory economists is for a framework in which costs and benefits are monetised and aggregated to inform consistent and efficient tradeoffs. Ofgem's existing decision-making process laid stress on this, supplemented by other factors. In practice, through a two-year process of deliberation and consultation, we concluded that a viable and transparent process in fact needs to comprise three elements: a monetised CBA, distributional analysis, and explicit consideration of strategic and sustainability factors.

In common with the Government Economic Service review, we concluded that it was ultimately not helpful to rely principally on monetising key factors around longer term impacts. This is partly because of numerous uncertainties that cascade over time, to an extent that makes monetisation largely subjective: security and climate change are obvious cases.

Ultimately, the organisation concluded that Ofgem would be better served by a set of discrete indicators about such longer term implications of decisions. The potential trade-off between these and the potential costs to present consumers ultimately involves political judgements that can be obscured rather than illuminated by over-reliance on monetisation techniques (like discounting over the very long term).

The question then was what information does Ofgem most need about the strategic and sustainability implications of decisions in order to fulfil the organisation's dual duties to protect the interests of both present and future consumers.

The GES Review highlighted a number of critical assets and social impacts to be considered in this context. The recent Organisation for Economic Co-operation and Development's (OECD) Environmental Outlook to 2050 also underlines the growing strains and risks associated with a number of strategic trends, and the difficulty that countries have in handling these appropriately with traditional analytic tools [2].

The OECD also published a report in 2012 stating that NRAs should "assess economic, social and environmental impacts (where possible in quantitative and monetised terms), taking into account possible long term and spatial effects"[3].

Furthermore, planning for a future energy system with high levels of uncertainty (over emissions reductions targets, for example), and increasing proportions of intermittent renewable generation alongside the need to integrate the interests of future consumers often raises issues with long term, enduring sustainability consequences.

In view of this wider context and the organisation's newer duties, in 2011 Ofgem took the view that it was necessary to develop a systematic approach to assessing strategic and sustainability issues in its decision making. A number of tools for this purpose exist, and have informed Ofgem's work; however, as different sectors face different issues, the organisation deemed it appropriate to develop a tailored framework specific to its specific responsibilities and the characteristics of the energy system.

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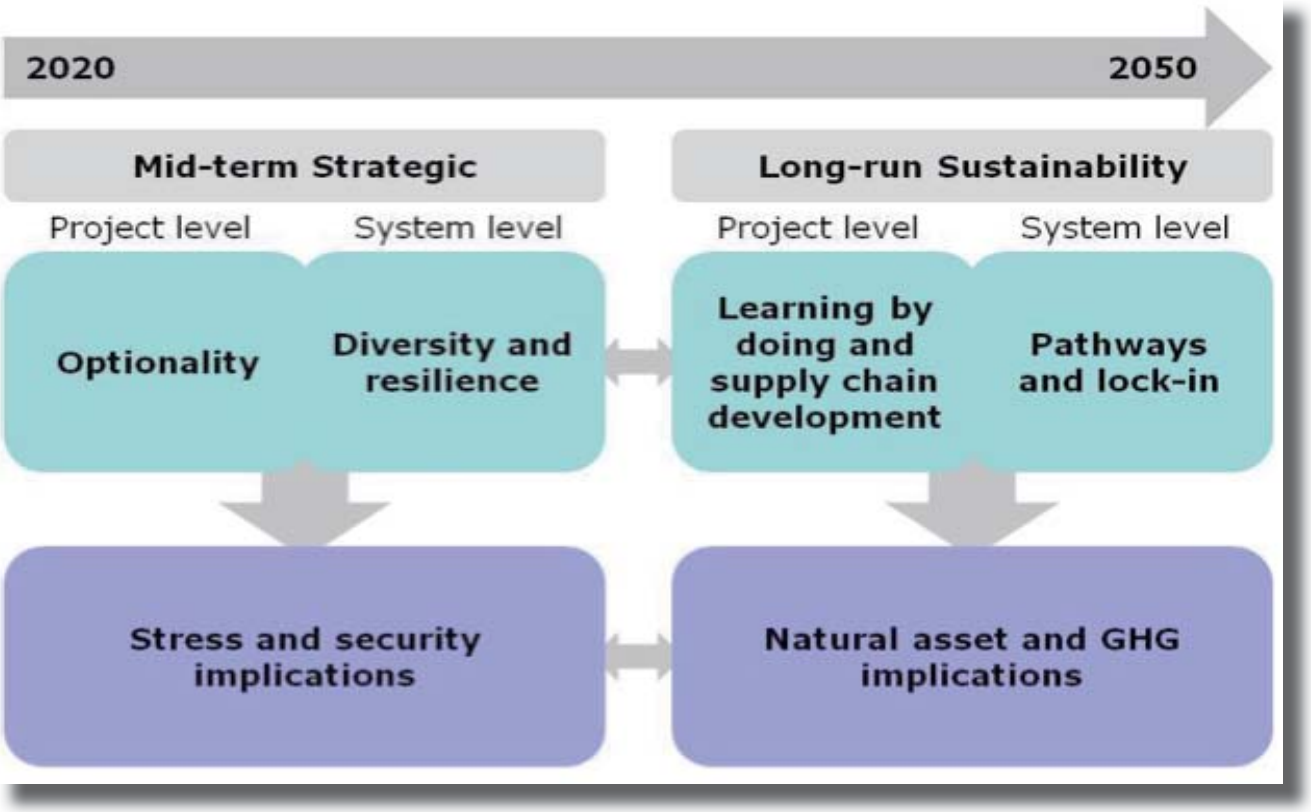
[1] GES Economics of Sustainable Development Review, 2009.
[2] OECD Environmental Outlook to 2050: the consequence of inaction, 2012
[3] OECD Recommendation of the Council on Regulatory Policy and Governance, 2012

The Strategic and Sustainability Assessment

In developing this approach, Ofgem took the view that a balance needed to be struck between complexity and transparency. This allows the organisation to be confident that it fully understands the breadth of issues involved and enables stakeholders to make informed representations on the proposals.



The topics addressed by the Strategic and Sustainability Assessment (SSA) require attention to extended timescales, broadly the period 2020-2050, and beyond where relevant. This ensures that Ofgem considers the interests of future as well as existing consumers. The SSA's extended time horizon makes the assessment largely qualitative, due to the increased uncertainty and ranges of variables which make detailed modelling less practical or robust. The approach is structured around two conceptual 'legs': assessment of mid-term strategic effects, and assessment of long-run

sustainability effects.

Optionality is a consideration of specific, realistic options that may be enabled or precluded by a decision. Consideration of optionality helps to ensure that a decision retains as much flexibility as possible to help accommodate future uncertainty .

In the context of the energy system, considerations of diversity and resilience are significant because a diverse system is more likely to foster innovation and be less vulnerable should one part of the system fail. However, diversity may also have less beneficial effects and involve trade-offs, so other influences on resilience should also be considered.

Although numeric methods of calculating diversity and optionality exist, and are encouraged within the framework, a quantified assessment is not always possible, so the considerations noted below can also be addressed qualitatively. Furthermore, the nature of Ofgem's decisions means that their relative impact, or influence on a trend, is often as useful to consider as an absolute measure.

Mid-term strategic effects	
Analysis of optionality considers the impact of a decision on:	Analysis of diversity and resilience considers the impact of a decision on:
• **Significant subsequent options created or facilitated** by the decision • **Significant options precluded** by the decision • **Optionality in timing:** risks and benefits of deferring a decision.	• **Diversity** of fuels, technologies, types of players, business models and/or services, including influence of a decision on the trend of diversity, highlighting critical stages of low diversity / substitutability • Other characteristics influencing the **resilience** of the system including capacity to absorb disruptions, and investor confidence.
Stress and Security Implications These component analyses can help to inform assessment of the 'stress and security implications', for which the organisation proposes the following specific tests: • Security of supply failure in electricity and gas supplies, and consideration of the interactions between the two fuel sources • Potential risk of extreme energy prices and volatility to a degree which might affect personal security (eg winter deaths), even when the likelihood of these events arising may be very small • UK's legally-binding energy targets – to ensure that Ofgem's decisions do not impede the UK's achievement of its legally-binding national targets, and to assess potential contributions of those decisions to these targets, taking account of the organisation's legal duties and objectives under both UK and European law.	

Long-run sustainability implications

The second leg applies systematic tests to help determine the long-run sustainability implications related to Ofgem's responsibilities. Optionality and diversity and resilience, as discussed above, can have long-run as well as mid-term implications. Additional input components include consideration of learning by doing and supply chain development, and pathways and lock in, to the extent that these have longer-term, sustainability-related implications.

Learning by doing and supply chain development reflect assessments of the cost reductions and other learning and capacity related benefits that may occur in the future, related to a decision. Unit costs typically decline with experience, which may lower future costs to GB consumers of developments that incur costs today. The extent to which this occurs may also depend upon the likely extent of GB versus international learning (the latter implying both investment costs and benefits accruing elsewhere). As with the diversity and optionality assessments,

where data are available a quantified estimation of the impact of learning rates can be developed to complement the qualitative assessment. This may give a sense of whether benefits associated with future cost reductions are likely to outweigh any additional short-term costs.

Pathway and lock-in analysis is an evaluation of what a decision may imply for the future direction of travel of the GB energy system and, in particular, whether it may 'lock in' or 'lock out' certain alternatives. This

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[4] This is in a similar field to the Real Options approach, but is also relevant where a full application of Real Options is impractical or disproportionate.

assessment involves an awareness of the intended destination and incorporates consideration of the effects of system inertia. It is particularly relevant to the energy system due to the lifetime of generation and network infrastructure. Pathway lock in can therefore be extremely difficult to avoid, but is not always negative; it only becomes a problem when it may conflict with longer-term goals or lock out potentially superior future options.

<table>
<tr><th colspan="2">Long-run sustainability effects</th></tr>
<tr><td>Analysis of learning by doing and supply chain development considers the impact of a decision on:</td><td>Analysis of pathways and lock-in considers the impact of a decision on:</td></tr>
<tr><td>• Potential to gain UK experience which can benefit future projects, including risk reduction, learning and skills base etc
• Avoiding supply chain bottlenecks - the pace of development can be constrained by the capacity/capability of the supply chain
• Learning rates to inform cost projections in quantified scenarios.</td><td>• Implications for the direction of travel of the energy system, taking account of the interplay between generation and transmission
• Relationship of this trend with the ability to adapt to long-run sustainability constraints and wider environmental impacts.</td></tr>
<tr><td colspan="2">Natural Asset and Sustainability Implications
The natural asset and sustainability implication test focuses on the most relevant natural assets for the energy system context, and whether decisions may improve or degrade their condition. The assessments above include consideration of depletable assets, natural / renewable assets and waste (CO2, nuclear). Conceptually this could be considered to be the ‘safe carbon space’, but could also include reference to spent nuclear wastes, and pollutants associated with shale gas.
Importantly, the criticality of natural assets needs to be viewed from both a domestic and international perspective. For example, biodiversity assets can have both location specific and global importance, whereas carbon and methane emissions are globally significant in their effects. Additionally, the nature of energy system and natural asset interactions may change over time (adaptation to a changing climate).
The specific tests Ofgem proposes for understanding the natural asset and sustainability implications include consideration of:</td></tr>
<tr><td colspan="2">• Consistency with the UK’s 2050 greenhouse gas (GHG) target (interpreted as a 90% reduction in GHG emissions from the electricity and gas sectors) and complementary assessments of:
• Cumulative GHG emission and other finite resource implications, as this is the most fundamental driver of atmospheric impacts and such assessment also helps to protect against unrealistic degrees of ‘backloading’ trajectories towards 2050 and reveal optionality and timing implications
• Interactions of the energy system with environmental assets (such as biodiversity, landscape, land use, water, air quality and soils) and wider ecosystem functioning as appropriate, factoring in consideration of how the energy system will need to respond and adapt to a changing climate</td></tr>
</table>

Next steps

Although Ofgem has always considered strategic and sustainability issues within its decisions, the SSA framework provides a systematic and transparent process for these considerations. In order to operationalise the framework, the organisation intends to embed it within its regulatory impact assessment (IA) processes by late 2013.

The approach will supplement and enhance the monetised cost benefit analysis and distributional impact components of the IA, and ensure that the interests of future consumers are fully considered. Ofgem intends that there should be iteration between the SSA components, and between the other elements of the IA, to ensure that the analysis reveals any relevant interactions and avoids 'double-counting'.

In that context, it should be noted that the SSA represents a neutral framework and does not prioritise one consideration over another, eg future consumers over current consumers. Ultimately, the SSA forms one of a number of pieces of evidence Ofgem considers when reaching a regulatory decision.

The organisation is also developing a supporting evidence base[6] which will enable Ofgem to scope and justify the SSA analysis. This will ensure that the qualitative considerations are as reliable and consistent as the monetised aspects of the IA.

The SSA framework has been extensively reviewed by GB government officials, other GB regulators, academics, campaigning groups and industry via a series of workshops, as well as the general public via an open consultation. Improvements have been made as a result of that process, and the organisation believes that it represents a robust and consistent method of considering strategic and sustainability considerations in the context of Ofgem's role. Feedback also suggests that other parties find this approach to impact assessment valuable, and may consider adopting either the framework's approach or those aspects which are also relevant to their particular sectors.

Jennifer Mills is a Policy Advisor at Ofgem working within the Sustainable Energy Policy team. She works internationally on coordinating sustainable development efforts with other European regulators, and with a domestic focus on the development of flexible licensing arrangements in support of low carbon energy. She also leads on updating Ofgem's approach to regulatory Impact Assessment.

[5] Consideration of climate risk and adaptation measures helps to ensure flexibility in policy design, identification of independency risks with other sectors and avoidance of 'mal-adaptation' and the costly 'lock-in' of infrastructure.

[6] Such as a scenarios tool which brings together multiple low carbon future projections, and a comprehensive review of regulated energy system interactions with the natural environment.

Grid Regulation Incentives for Network Loss Reduction

By Sebastiaan Hers, Christian Redl, Martijn Duvoort

Abstract

Environmental concerns remain a driving force for European energy policy, as exemplified by last years' directive on energy efficiency. The directive sets the legislative framework to achieve energy efficiency targets. Since electricity network losses comprise a significant component of electricity demand, regulatory incentives to facilitate loss reduction in electricity networks should be in place. This paper evaluates the incentives for investments in low-loss equipment in differing regulatory settings and outlines pathways to assure the proper embedding of these incentives.

1. Introduction

The EU has set ambitious energy policy targets for 2020: a 20% greenhouse gas emission reduction, meeting 20% of energy needs by renewables and a 20% increase in energy efficiency. With regard to energy efficiency, a directive of the European Parliament and of the Council on energy efficiency sets the legislative framework. Article 15 of the directive requests that national energy regulators take into account energy efficiency in their decisions regarding network infrastructure operations. Through grid tariff design and regulations, incentives for the grid operators should be provided allowing them to implement energy efficiency improvements (Directive 2012/27/EU).

Technical losses in European transmission grids vary between 1 and 2.6% whereas losses in the distribution grids can be as high as 11.7% (Targosz et al., 2012). Technical losses are caused by the network infrastructure´s electrical resistance and correspond to the power that is dissipated when delivering power through the grid from electricity generation to end-use. Options for grid operators to increase energy efficiency in networks comprise both cables and overhead lines, the installation of energy-efficient transformers and measures related to the network topology, network architecture, voltage levels and operational procedures[2].

Given the efficiency targets and the associated costs that losses impose on society, the reduction of network losses seems a logical instrument to increase the sector´s energy efficiency. However, these costs are currently not always relevant for grid operators. In such cases, reduction of grid losses may prove to be a low priority to network operators. To exemplify this, in a study on 41 European transmission and distribution system operators (TSOs and DSOs), only 7 treat network losses as a separate cost line item in their annual financial accounts (ECI, 2013).

The main aim of this paper is to outline regulatory approaches that can facilitate energy-efficient grid investments. First the main approaches to grid regulation are summarized in section 2. In section 3 several approaches to the incentivisation of (energy) efficiency are compared and, finally, we will derive conclusions in section 4.

2. Summary Of European Grid Regulation

Operators of electricity transmission and distribution grids are regulated as their business constitutes a natural monopoly. Regulation shall ensure that grid operators charge reasonable prices for their services and operate efficiently at adequate quality standards.

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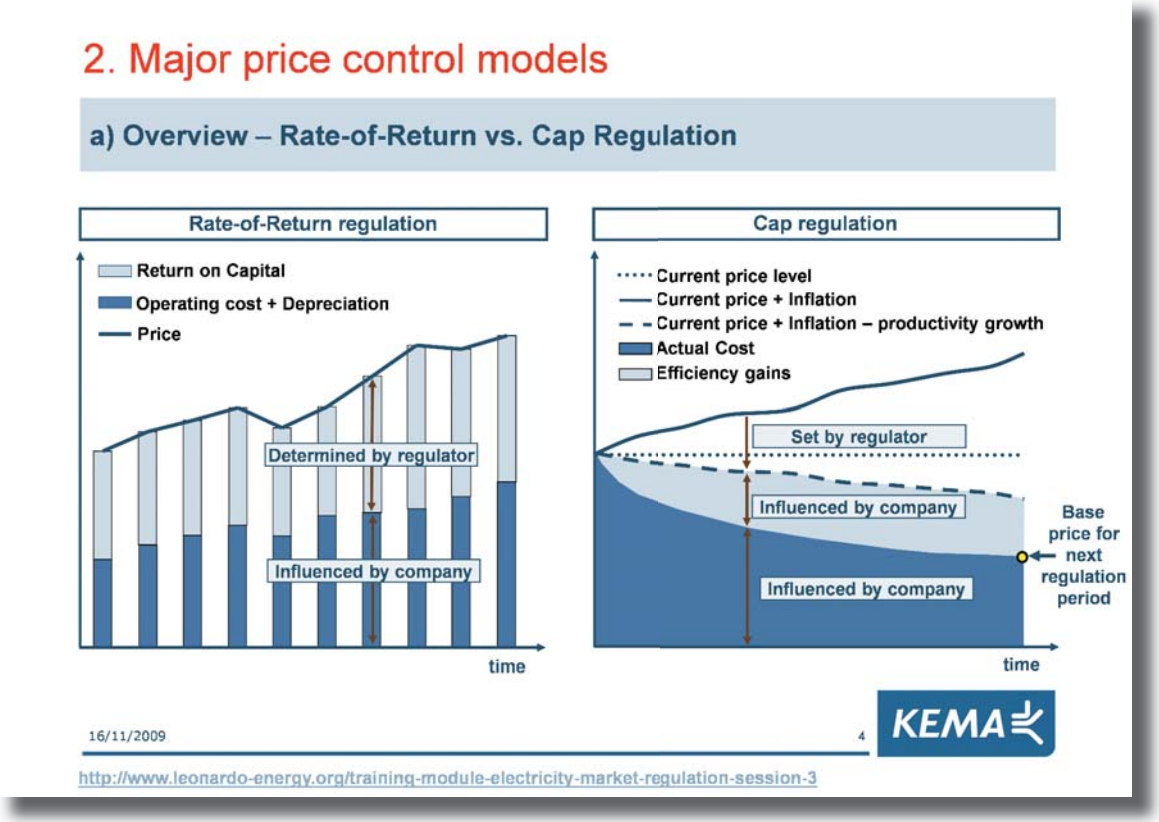
[1] Directive 2012/27/EU

[2] See Papaefthymiou et al. (2013) for a detailed description.



With regards to price regulation, two main principles can be distinguished: Rate of return regulation (a form of cost-based regulation) and incentive regulation. The former sets prices on the basis of operating costs plus a return on capital and thus facilitates cost recovery and avoids pricing above costs. Yet, as all costs are covered, incentives for grid operators to increase their efficiency in service provision are limited. Thus, incentive regulation is implemented within the EU.

The most prominent forms of incentive regulation are price cap and revenue cap regulation where an upper limit on the price or the revenue of the grid operator is placed. Prices – or revenues – are set in advance for each regulation period whereas annual prices or revenues are adjusted subject to an X-factor which captures the cost changes the regulator assumes as a reasonable productivity growth. Besides this direct incentive to increase its productivity, the grid operator faces an incentive to cut costs below the set price as it is allowed to retain associated profits. Only at the end of the regulation period is the base price for the next period reset to the actual cost level of the grid operator. Typically this regulation period covers some 3-5 years. Figure 1 illustrates the two main price control methods.

To avoid cost-cutting at the expense of service quality, regulators typically foresee additional quality incentives which, depending on the performance of the grid operator, allow for additional financial rewards or penalties. For example, a formula for determining the revenue cap by means of a building blocks approach with performance target may look as follows:

[3] See section 3.

Revt=CAPEXt + OPEXt-1*(1+RPI-X) + Inc*(PerfTarget,t - PerfActual,t)
where
CAPEXt = RABt*(1+RoR) + Dept

Rev	Allowed revenue
CAPEX	Capital expenditures
RoR	Rate of return
OPEX	Operational expenditures
RPI	Retail price index
X	Productivity growth factor
Inc	Financial incentive
PerfTarget	Targeted performance (e.g. losses in kWh)
PerfActual	Actual performance (e.g. losses in kWh)
t	Time index
RAB	Regulatory asset base
Dep	Depreciation

The formula outlines the options or restrictions a grid operator is faced regarding the reduction of network losses: The treatment of CAPEX (and hence investments) in the regulation directly affects the recovery of investment costs. This is also linked with the OPEX term. If OPEX savings (following from investments in energy efficient equipment) can be retained, then the investments may be induced. Especially if supply companies are responsible for loss procurement, an explicit incentive term can embrace an energy-efficient operation of the grid. These potential options are restricted by the overall cost minimisation targets as governed by the regulation. Section 3 will discuss these options in detail whereas in the following we summarise the main principles with respect to network loss treatment in European regulations.

Treatment of Network Losses in European Incentive Regulation

Three main options regarding the regulatory treatment of losses can be distinguished in the current practice.

The first option relates to the responsibility for loss procurement. In some countries (e.g. the Netherlands, Norway) network operators are responsible for procurement. The associated costs are typically included in the allowed revenue whereas they can be considered as controllable or non-controllable items. In other countries the suppliers have to procure the losses (e.g. Portugal, Spain) and thus the associated costs are not considered in the price control of the grid operators and the associated grid tariffs.

The second option to consider losses in the regulation is to include explicit loss reduction incentive schemes in the price/revenue cap in case the grid operators are not responsible for loss procurement. This should nonetheless encourage loss reduction by the grid operators and is applied in, e.g., Portugal and Spain. These incentives link the allowed revenue with the grid operator's performance with respect to losses (see third term in above equation). As such, the revenue is increased or decreased by the difference between the actual and the target network losses, valued at a specific price (Petrov and Nunes, 2012).

A third distinction relates to the actual treatment of costs related to losses in the price control (see the first and second term in the equation above). For OPEX related expenditures, they can either be treated as non-controllable (e.g. in Germany), which effectively makes them a cost-pass through item directly increasing or decreasing the allowed revenue, or as controllable (e.g. in Denmark) which makes them subject to the X-factor. For CAPEX related expenditures, costs with respect to investments in energy efficient equipment can be part of the allowed cost (e.g. for UK DSOs) which allows earning a return on capital.

[4] This taxonomy is not free from ambiguity. For (part of the) network losses to be subject to regulation, and reduction thereof to be incentivized, the associated costs should therefore be considered as controllable costs.

3. Incentivizing Network Efficiency

From a project perspective, the investment in loss-reducing efficiency improvements in networks typically involves a balance between increased capital expenditures and the resulting reduction in operational expenditures. In other words, the project-based assessment would involve an evaluation of the minimum lifecycle costs (LCC). For TSO/DSOs in regulated environment such trade-offs between capital and operating costs should be considered when taking investment decisions as well. In order to provide the regulated entity with incentives to make an efficient decision, the regulatory framework should embed the structure that promotes decision-making on the basis of LCC.

This section focuses on different avenues to assure that LCC are appropriately accommodated in regulatory frameworks. We first take a closer look at the financial incentives as encountered in the European cap regulation context, while alternative incentivising schemes will be briefly discussed in the latter part.

a. Financial Incentives in Cap Regulation Regimes

The objective of cap regulation is to incentivise the regulated entity to reduce controllable costs, while non-controllable costs are allowed to be passed through to consumers. Here, one may distinguish between costs associated with OPEX and those associated with CAPEX. The latter covers costs related to investments and consist of depreciation and a rate of return on the non-depreciated portion of the investment based on an assessment of the firm's costs of capital. Under cap regulation, the regulator faces the challenge to determine the efficient levels of allowable OPEX and CAPEX. Two basic approaches to this challenge can be identified, as discussed in the following.

Building Blocks Approach

Under the building blocks approach the regulator separately assesses OPEX and CAPEX, and establishes an allowance for each of these components or building blocks. Generally, efficient OPEX is based on a benchmarking analysis (though often there is some room for regulatory discretion), while the allowed level of investments is based on the investment projections of the regulated grid operator. With regards to the allowable investments, the regulator may take position on what investments to include in the RAB. The investments included in the RAB are then depreciated and a rate of return is allowed on the non-depreciated portion of the investment. These investments are therefore essentially passed through to the consumers.

This creates adverse incentives for the regulated entity to overstate investment projections. The more investments are included in the RAB, the higher the capital base of the regulated entity and associated returns. Further, prices are set on the basis of the RAB and projected capital expenditures. The regulated entities are therewith rewarded for making savings against their CAPEX budgets through their RAB. These mechanisms could compromise the incentive to invest in energy efficient equipment by network companies.

However, in case a regulated entity is faced with the trade-off between CAPEX and OPEX, one should note that incentives to achieve efficiencies in CAPEX are weaker than incentives to do so in OPEX, as the benefits retained only involve depreciation and rate of return on the non-depreciated portion of the investment. With regard to investments in energy efficient equipment, both the investments in such equipment should be allowed to enter the RAB and the cost savings should be allowed to be retained by assuring these are considered to be controllable costs. The retention of cost savings should be allowed for a sufficient period of time in order to reflect the LCC. Given that regulation periods are generally somewhat short in comparison to reasonable payback periods for regulated environments (i.e. environments that impose limited price risk), a gradual adjustment of the allowable costs of losses could be based on a long-term average.

Thus we conclude LCC can be embedded in this framework which will encourage regulated grid operators to invest in - more expensive - loss reduction equipment in case the regulator considers network losses to be part of controllable costs.

TOTEX Approach

Under the TOTEX approach, the regulator does not differentiate between OPEX and CAPEX but sets the price cap on the basis of total costs (TOTEX). The potential for efficiency increases in the TOTEX is determined entirely from a benchmarking exercise. Under the TOTEX approach efficiency is incentivized by the fact that in each regulatory period, the X-factor is set on the basis of performance achieved in previous years. In case of a productivity increase, efficiency will be higher in future periods.

Under the TOTEX approach, the investment assessment required for the building blocks approach is effectively bypassed, since the regulator does not need to take position on whether a given investment proposal should be allowed or not. Rather, the regulator considers the actual total costs (including investments) incurred by the utility and sets the X-factor based on a benchmarking analysis of these costs. In order to harness LCC as a guiding principle for investments in efficient components, the regulatory arrangements should include appropriate cost allowance on losses as is the case for the building blocks approach. If not, adverse incentives arise, incentivizing the reduction of CAPEX by investment in conventional equipment as the X-factor directly applies to CAPEX and savings on CAPEX offer the same retention factor as savings on OPEX do.

Loss Reduction Incentive Scheme

Though the building blocks and TOTEX approaches presented above allow facilitating LCC as a guiding principle for investments related to network losses, this will only be the case if network operators are accountable for the costs of network losses. In some regulatory frameworks however, suppliers are held to procure network losses. In this case neither these costs nor any retention of costs savings will emerge in the network operators accounting. Therefore, explicit loss reduction incentive schemes to incentivize network operators to consider losses may be implemented in the network regulation. Here, regulators may resort to include explicit adjustment factors in price control, incorporating targets on network losses. In this approach, explicit benchmarking of (avoided) network losses imposes a challenge however.

Internalizing Network Efficiency in Cap Regulation

Incentivising schemes addressing network efficiency explicitly should induce LCC driven decision making by the regulated entities. Depending on the regulatory framework, such embedding of LCC can be accomplished through various pathways. In case of cap regulation with both the building blocks and TOTEX approach, the scheme should allow investments in efficient equipment, while it should also allow retention of cost savings related to reduction of costs of losses. Allowance for financially less attractive investment in such equipment could be considered, reflecting the social benefits associated with such investments and compensating for the payback time associated with the duration of the regulation period. Here, a gradual adjustment of the allowable losses should be considered in order to induce a reasonable payback period for the investment beyond the limits of the regulation period. Otherwise, regulatory arrangements should include appropriate cost allowance on losses for a sufficient period of time. Finally, incentive schemes that are based on a recorded reduction in network losses relative to a target may be introduced in case the costs of network losses are procured by suppliers rather than network operators.

b. Non-financial Incentives

Apart from the financial incentives that could be established to stimulate investments in loss reducing equipment, regulation may also resort to non-financial incentives. Here, one may think of technical standards, obligation – or certificate schemes, voluntary agreements, labeling schemes, information campaigns or for example R&D support. Each of these categories of incentives has its own merits and drawbacks. One of the more effective schemes among those listed, is the development of minimum technical standards (see Papaefthymiou et al. (2013)). A minimum technical standards scheme places minimum requirements on equipment to be installed, while the cost of meeting these standards would need to be allowed for in the allowed revenue. The scheme therefore bears similarities with eventual incentives in building blocks and TOTEX approaches. Since the scheme comprises a minimum technical standard, it does of course not necessarily incentivize the installment of the most appropriate equipment and as such is likely to be less effective.

4. Conclusions

Strong energy efficiency measures in the electricity sector are expected to support reaching medium- and long-term energy and environmental policies. As electricity network losses are the single biggest source of power “demand” they should be treated prominently.

Network losses clearly represent a cost to society and the environment. However, these costs are not necessarily relevant for the various grid operators which results in a low priority to reduce losses. This paper has outlined regulatory options which can facilitate energy-efficient grid investments.

Incentivising schemes addressing network efficiency explicitly should induce LCC driven decision making by the regulated entities. Embedding of LCC can be accomplished through various pathways. In case of cap regulation with both the building blocks and TOTEX approach, the scheme should allow investments in efficient equipment, while it should also allow retention of OPEX cost savings related to network loss reduction. To facilitate a reasonable payback period a gradual adjustment of the allowable losses should be considered. This induces a reasonable payback time beyond the regulation period length. To reflect the social benefits associated with energy efficient equipment, allowances for financially less attractive -investment could be considered to compensate for the payback time associated with the regulation period duration. Otherwise, regulatory arrangements should include appropriate allowance on costs of losses for a sufficient time period.

Incentive schemes that are based on a recorded reduction in network losses relative to a target may be introduced in case the costs of network losses are procured by suppliers rather than network operators.

Apart from financial incentives regulation may resort to non-financial incentives as well to stimulate investments in energy efficient equipment. Such non-financial incentives may comprise technical standards, certificate schemes, voluntary agreements, labeling schemes, information campaigns or R&D support.

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Sebastiaan Hers is a consultant with the Markets & Regulation team at DNV KEMA. He has broad experience in energy economics, with a strong focus on asset management and valuation in relation to market design and regulation. Project experience includes assessments of market design like congestion management and support schemes, operational challenges in power system scheduling and risk management challenges like procurement of grid losses.

Christian Redl is an energy economist within DNV KEMA's Markets & Regulation team. He performs analyses regarding the design of electricity markets focusing on grid regulation (price controls, investment incentives and energy efficiency), balancing markets and renewables integration.

Dr. Martijn Duvoort is team manager of the Markets and Regulation team. As such, he is responsible for studies regarding the regulation and functioning of energy markets. Studies involve both short and long-term power markets, as well as gas markets. Of special attention is how industrial players can optimize their operations in changing market environments. Dr. Duvoort has managed a wide range of projects, ranging from electric mobility to nuclear, but particularly in the area of power balancing and ancillary services.

The Value of Solar Tariff: Net Metering 2.0*

By Karl R. Rábago**

Introduction

Increasing numbers of customers are installing solar photovoltaic systems on their homes and businesses. As module and system costs decline, customer demand grows, and more businesses organize around the solar opportunity, it is time to revisit the tariff structure under which these systems integrate with and operate on the electric grid. This article details a novel approach to a distributed solar tariff, called the "Value of Solar" tariff ("VOST"), that addresses important utility and customer issues, and offers some significant improvements over traditional net metering approaches.

There is a saying in the venture capital world to the effect that, "It is not enough to design a better mousetrap. You really, really must want to kill mice." Sound execution inspired by a clear vision of an end result is essential for business success. So, too, in the quest to increase markets for distributed solar generation—you really, really must want to get more solar installed.

Elements of an "Ideal" Distributed Solar Tariff[1]

In thinking about distributed solar tariff design, it is useful to pretend for a moment that we have not had traditional net metering in the United States for almost thirty years, nor feed-in tariffs or other schemes. Instead, a good place to start might be with clean slate, asking what features would accompany an "ideal" distributed solar tariff.

First, and foremost, a distributed solar tariff should be fair to the utility and to non-solar customers. The tariff should ensure that the utility has the opportunity to collect its cost of service to the solar customer, including a reasonable opportunity to earn a rate of return. And other customers should not be unfairly required to pay costs created by the solar customer, nor be unfairly subsidized by solar customers.

Second, the ideal solar tariff should fairly compensate the solar customer, through a credit, for the value that their solar generation brings to the utility system.

Third, the tariff should recover costs and give compensation credit for value independently from an incentive designed to overcome market failures. Incentives are a legitimate public policy tool, widely used in the electricity and other industries, to encourage certain kinds of market behavior. One justification

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** Karl R. Rábago has 20+ years experience in electricity policy and regulation, and energy markets and technology development. He runs Rábago Energy LLC, a clean energy consulting practice. Karl sits on boards at the Center for Resource Solutions, and the Interstate Renewable Energy Council. He has been a Texas PUC Commissioner, U.S. DOE Deputy Assistant Secretary, and utility executive. http//www.rabagoenergy.com

[1] This paper addresses a tariff design for "distributed" solar electric or photovoltaic systems. Distributed solar systems are embedded in the distribution grid, on or near the customer's home or other building, and are typically connected at the electric distribution feeder level, generating electricity primarily for consumption at the customer premises.

for solar incentives is that they help overcome certain market failures such as lack of information and practical experience with the relatively new technology among homeowners, lenders, and others. Another justification for solar incentives is that existing tariffs under-compensate for the value of distributed solar. So adequate compensation for distributed solar energy should relieve pressure on incentive systems. And these incentives will be less necessary as the distributed solar market matures. For efficiency of administration and to communicate clear signals to the market, incentive levels and compensation levels should not be conflated.

Fourth, an ideal distributed solar tariff would operate as a complement to other electricity policy goals, including, especially, a goal of more efficient use of energy. Other goals that a solar tariff should complement include payment or credit for performance, rather than just investment; encouragement of long-term performance of solar systems; reduction of long-term risks or generational cost shifting; and strong alignment with market signals.

Finally, an ideal distributed solar tariff should be intuitively sound and administratively simple to implement and manage. Analytical inputs should be rationally related to the character of solar systems and the quantity and character of energy output associated with the technology. Inputs should also be simply calculated from information the utility already routinely produces.

Traditional Net Metering Benefits and Problems

The most commonly adopted rate treatment for distributed solar systems connected to the grid in the U.S. is net metering, sometimes called net energy metering. The first net metering tariff was adopted in 1983, and the approach is part of utility policy in over 40 states in the United States.

The structure of the net metering approach is simple--customers are allowed to “net” their production of solar energy against their household energy consumption. This has often been described as “spinning the meter backwards”—a nod to the phenomena that local generation can actually cause mechanical meters to spin backwards when generation exceeds consumption. In the event that the customer produces excess energy during the netting period, most net metering systems provide a credit related to the utility’s avoided cost, the applicable retail rate, or in some cases, the current fuel charge value. Those involved in utility regulation recognize net metering as a derivative of the United States’ PURPA regime for utility rate treatment of energy from cogenerators and other “qualified facilities.”

In practice, net metering systems in the various states also include other components, such as limits on the total capacity allowed under the tariff, size limits on individual systems, differences in the netting periods, and variations in the calculation of payments for net excess generation.

Net metering was a major step forward for the distributed solar markets because the policy behind it recognizes that energy generated at the point of consumption by the customer is worth at least as much as a unit of energy delivered by the utility to that customer. And that energy is worth more than the traditionally calculated avoided cost of generating the next marginal unit of energy at a remote power plant.

Net metering offers the additional benefit of administrative simplicity. A single meter, capable of sensing energy flow in both directions can be used. No separate calculation is used for the cost or value of the solar generation.

Traditional net metering also creates some problems. First, simple netting of energy assigns a retail value to local solar energy, but that value is not necessarily representative of the true value of solar.

There is no “cost of service” calculation underlying this assigned value. Second, the approach makes no provision for ensuring that the utility recovers the full cost of serving the solar customer. A solar customer willing to invest in a very large system or dramatically reduce their consumption could, in theory, eliminate any utility charges, even though they continue to receive service at night and on an as-needed basis, over a electric distribution network.

Third, the significantly reduced payment for excess generation at the “avoided cost” rate in many jurisdictions sends a very clear signal to customers that they should size their solar system roughly equivalent to their baseline energy demand. This is because the relatively low payment for excess generation isn't enough return to justify the added investment in capacity to generate that excess energy. As a result, traditional net metering creates an opportunity cost to all customers—a customer willing to invest in a system that could generate valuable excess on-peak or near-peak energy for the system is dissuaded from making that investment by lower payments or credits for that energy. And the utility still has to generate or procure that energy for other customers, almost certainly at a higher-than-average cost.

Finally, traditional net metering couples solar energy value to the level of a customer's energy consumption, with the effect that it discourages energy efficiency and actually encourages on-peak consumption. Since a unit of energy offset by solar generation is worth more to a customer than a unit of excess generation in many jurisdictions, the approach sends a powerful economic signal to customers that is out of sync with other policy and economic objectives.

The Austin Energy "Value of Solar" Tariff

When I served as vice president of Distributed Energy Services at Austin Energy, I took the initiative to fundamentally redesign the way net metering was structured, working with my staff to create a new "Value of Solar" distributed solar rate, applicable to residential customers. The tariff design has two basic components. First, the tariff relies on an annually-updated value of solar calculation designed to reveal the value to the utility of a unit of generated solar energy. Like an avoided cost methodology, this is essentially the “indifference price” at which the utility is neutral to the solar energy, and is conservatively calculated. Second, the tariff reconfigures the netting process to ensure that the utility recovers its full cost of serving the solar customer before any credit for solar generation is applied. These two steps result in a distributed solar rate that is more fair to the solar customer, the utility, and other utility customers. The Value of Solar Tariff is administratively simple, aligns with other policy objectives, and decouples solar energy compensation from both consumption and incentives.

Austin Energy had adopted a value of solar calculation methodology several years before applying the calculation to distributed rates. Previously, the calculation had been used to generate a reference or

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[3] Traditional avoided cost calculations assign a single value to all forms of non-utility generation. The avoided cost is defined as the incremental cost to an electric utility of electric energy or capacity which, but for the purchase from the QF, such utility would generate itself or purchase from another source (see 18 C.F.R. § 292.101(b)(6). The U.S. Federal Energy Regulatory Commission has clarified that a regulatory authority may establish technology-specific avoided cost values under certain conditions. See California Public Utilities Commission, Order Granting Clarification and Dismissing Rehearing, 133 FERC ¶ 61,059 at pp. 26, 31 (2010).

[4] Some net metering schemes limit a customer’s ability to offset some charges.

[5] A comparison table of U.S. net metering schemes is available at http://bit.ly/1fkhHAL

benchmark value against which to evaluate purchased power proposals, calibrate rebate and incentive levels, and evaluate resource plan components. As used by Austin Energy, the Value of Solar calculation generates a long term levelized value of solar in cents per kilowatt/hour, based on five components.

These value components are energy, capacity, transmission capacity, transmission and distribution losses, and environmental value. Energy and capacity value are heavily influenced by natural gas prices (the marginal generating fuel in Texas) and these values make up the bulk of the value. Environmental value is derived from the price premium for Austin Energy's highly successful GreenChoice® renewable energy product offering—a market-based, willingness to pay indicator. Prior to adapting the calculation as a foundation for the distributed solar rate, Austin Energy also added a value derived from nodal market prices, matching 15-minute nodal price data with the average daily output levels of solar energy. In the end, the value of solar today is about three U.S. cents higher than the average distributed energy rate.

The goal of the calculation process is to estimate the total value of a unit of solar energy generated in the distribution grid, at or very near the point of consumption. Put another way, it is the conservative estimate of the cost that the utility would face in seeking to fill an order for a unit of energy with the same character as that generated from a local solar facility. That is, the utility would have to buy some energy, which would include some capacity value. The energy would have to be transmitted, with losses, over a delivery system, and pay transmission costs as well. Finally, the energy's environmental impacts would have to be offset or "greened" with some kind of renewable energy credit or certificate.

The calculation is conservative for several reasons. It does not include so-called externality values related to local economic benefits, local environmental benefits or other valuable attributes of distributed solar. The levelized value is recalculated annually, so as to reflect current utility costs and prevent overpayments when system prices fall.

The concept behind applying the value of solar calculation to a distributed rate stemmed from recognition of the limitations of traditional net metering, discussed above. The calculation confirms the common sense perception that locally generated clean energy, produced at or very near the point of use has "above average" value.

Once the Austin Energy team decided that the value of solar rate was an appropriate foundation for a distributed solar rate, the question that remained was how to incorporate it in a tariff. This rate design stage was the point at which the "ideal" characteristics for a solar rate came into play. First, it was determined that the value would be recalculated and reset on an annual basis, in conjunction with the annual fuel factor or charge calculation. Second, Austin Energy decided that the netting process would be reconfigured, even while it remained on the customer-side of the service relationship. In order to account for utility fixed and variable cost recovery requirements that remain with solar customers, the billing process charges every customer for total energy consumption (whether offset by solar production or not) at their premises using the applicable existing distributed service rates. Then, a credit is applied for every unit of solar energy produced, at the value of solar rate. Excess credit is carried forward each month until the end of the year, when any remaining balance is erased. While little or no balance is anticipated, the use of a credit, rather than payment and annual zeroing out of excess balances helps preserve the status of the net metering calculation as "non-refundable credit" for tax purposes.

While the impact of the new Value of Solar Tariff has yet to be fully understood and will vary from customer to customer, the design team estimated that the new rate would reduce the payback period for an average distributed solar system to something fewer than ten years. Under the new rate, customers have a strong incentive to use energy efficiently, in order to maximize the economic value they receive, and making more on-peak energy available to the utility. Because the value is recalculated frequently, both the customer and

the utility are treated fairly as solar and general system costs change. In the event that the system fails to generate as expected, the netting methodology ensures that the utility always recovers its costs of serving the customer. The calculation and netting approach eliminate the argument that other customers subsidize solar, and the Value of Solar credit ensures that solar customers are not unfairly asked to subsidize the utility or other ratepayers. In the months following adoption of the Value of Solar Tariff, Austin Energy reports continued strong growth in distributed solar installations and the opportunity to reduce capacity-denominated incentive rebates by more than 30%.

Next Steps

The Austin Energy Value of Solar rate was implemented with new rates adopted in June 2012. It has earned recognition and interest from utilities and solar industry experts alike. The Value of Solar Tariff was cited by SEPA in its decision to recognize Austin Energy as "Public Power Utility of the Year" in 2012.

More can be done with the value of solar approach. The rate has been adopted in state law in Minnesota, and is under consideration in several other jurisdictions.[6] With more broadly available public data, the concept could see even wider application. As experience grows, the various approaches should consolidate around common methodologies, even as values differ from location to location.[7] Though Austin implemented the concept with residential customers, it can be applied to commercial solar rates as well. And it merits further study in conjunction with other valuation approaches for distributed solar. Finally, the concept of distributed solar valuation as a foundation for setting an economically efficient compensation rate has potential application for use in setting rates for storage, energy efficiency and demand response, smart grid-enabled services, and other distributed energy resources.

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[6] The regulatory process for developing the Value of Solar methodology in Minnesota is chronicled at http://mn.gov/commerce/energy/topics/resources/energy-legislation-initiatives/value-of-solar-tariff-methodology%20.jsp

[7] The author and Jason Keyes recently published a paper setting forth generic recommendations for regulators relating to distributed solar valuation. See A Regulator's Guidebook: Calculating the Benefits and Costs of Distributed Solar Generation, Interstate Renewable Energy Council, Oct. 2013, available at http://www.irecusa.org/wp-content/uploads/2013/10/IREC_Rabago_Regulators-Guidebook-to-Assessing-Benefits-and-Costs-of-DSG.pdf

Karl R. Rábago has 20+ years experience in electricity policy and regulation, and energy markets and technology development. He runs Rábago Energy LLC, a clean energy consulting practice. Karl sits on boards at the Center for Resource Solutions, and the Interstate Renewable Energy Council. He has been a Texas PUC Commissioner, U.S. DOE Deputy Assistant Secretary, and utility executive. http//www.rabagoenergy.com

Evolving Australia's Energy Network Regulation: Consumers in Focus

By Andrew Reeves

Consumers are at the centre of the evolving economic regulation of electricity and gas networks in Australia. The Australian Energy Regulator (AER) is implementing changes to involve consumers more closely in the process of economic regulation, while at the same time improving how it regulates network businesses. These reforms will promote efficient investment in energy network services that are valued by the community.

The AER's Better Regulation reform program sees it consulting on a range of improvements to the regulatory regime focused on promoting the long term interests of consumers. The multi-faceted Better Regulation program covers:

- development of a better consumer engagement framework—encouraging greater consumer involvement and communication between electricity and gas network businesses and the communities they serve
- stronger incentives on electricity network businesses to spend efficiently
- new tools for assessing electricity network businesses' expenditure forecasts and a new annual benchmarking report comparing the efficiency of electricity network businesses
- improved methods of determining the rate of return that electricity and gas network businesses can earn on their investments, drawing on a broader range of information.

The Australian Energy Market

The AER is an independent body established in 2005 responsible for energy network regulation, wholesale electricity market surveillance and non-price retail market regulation. The AER is also responsible for enforcing the national gas and electricity laws as set by the member state and territory governments. Under these laws, another independent industry body, the Australian Energy Market Commission, is responsible for administering the electricity and gas rules, which the AER must then enforce. In undertaking its roles, the AER is guided by objectives set out in the electricity and gas laws:
The objective of the National Electricity and Gas Laws is to promote efficient investment in, and efficient operation and use of, energy services for the long term interests of consumers of energy with respect to—
(a) price, quality, safety, reliability and security of supply of energy; and
(b) the reliability, safety and security of the national energy systems.

The AER regulates around 40 electricity and gas network businesses whose combined total asset base is approximately $94 billion dollars. Network businesses are vertically separated from their wholesale and retail market counterparts, with a mixture of private and government ownership models.

Australia operates an ex-ante incentive based regulatory framework, where revenue or price determinations are made for each energy network business prior to the commencement of their regulatory control period. The length of the regulatory control period can vary for different businesses, but most are five years. The network business proposes the revenue it requires to meet its obligations over the next period. The AER then publishes the proposal for public scrutiny and conducts its own analysis to determine whether the proposal is efficient.

Between 2011 and 2012 there was a re-examination of network regulation by Government, policy bodies and regulators. This was aimed at mitigating energy network cost pressures as residential electricity prices markets in an uncertain environment.

had risen nationally by 91 per cent in five years, and gas prices by 61 per cent. The main driver of higher prices was rising network charges which account for almost half a residential electricity bill. Thus the efficiency of spending by network businesses was a major focus of significant reforms. These reforms provided the AER with new tools and processes for the challenging task of regulating dynamic energy

The AER's Better Regulation program draws together its work on developing its regulatory processes and systems with these important network regulation reforms. The program encompasses several streams of the AER's work which together form an integrated package of changes to the way it approaches network regulation under the new regulatory framework.

The AER began the Better Regulation program in December 2012 and recently published a suite of draft guidelines for consultation that give effect to the network regulation reforms. After an extensive consultation process, the AER will publish final guidelines by the end of 2013. The new processes will apply for the next round of regulatory determinations commencing in 2014.

Renewed Focus on Consumers
Greater Consumer Consultation

A key element of the AER's Better Regulation program is increasing the extent of consumer involvement throughout the regulatory process. Before a network business submits is proposal, the AER now expects extensive and genuine community consultation to have taken place. The AER is developing a consumer engagement guideline to provide best practice principles and a framework for electricity and gas network businesses to better engage with their consumers. This will guide businesses in developing consumer engagement strategies and approaches, and assist them in preparing spending proposals that reflect the long term interests of their consumers.

The five key principles that underpin this framework are accessibility, transparency, communication, inclusivity and measurability. The guideline places the onus on network businesses to develop consumer engagement strategies as they are in the best position to understand their consumer base and its issues. For this reason, the guideline is not prescriptive and does not mandate any particular engagement strategy.

When the AER assesses an expenditure proposal from a network business during a determination, it will take into account how the business engaged with its consumers. This links how well network companies conduct their consultation directly to the expenditure proposal assessment process.

Better Informed Consumers

Other important aspects of the Better Regulation program are designed to improve the regulatory process and the access for all stakeholders to timely information.

The time allowed for a regulatory determination process has been extended to allow stakeholders more time to prepare submissions and put their views forward. This additional time will allow the AER to publish a new issues paper at the start of each process. This paper should help consumers' understanding and engagement with network businesses' spending proposals.

There are new arrangements for dealing with confidentiality claims over the information network businesses put forward. Prior to submitting a regulatory proposal, the AER will hold pre-lodgement discussions with the business, aiming to agree on what information is confidential and why. To achieve a transparent regulatory process all information that can possibly be published will be, while protecting genuinely confidential

information. The aim is to protect genuinely confidential information, while publishing for public scrutiny as much information as possible to allow for an open and transparent process. Another measure to provide high quality information to stakeholders is the AER's Regulatory Investment Test for Distribution. This is part of a new distribution planning framework aiming to promote non-network alternatives where these are more efficient. The RIT-D provides an open and transparent planning and consultation process for network businesses to publicly assess all credible options, including embedded generation demand management, before committing to network upgrades.

These measures build on the AER's existing role in promoting well informed and active consumers at the retail end of the market. For example, the AER's Energy Made Easy website helps residential and small business energy consumers navigate the often complex electricity and gas retail markets to find a suitable energy offer.

Stronger Consumer Representation

In developing the Better Regulation reforms, the AER established a consumer reference group to make it easier for consumer representatives to input into the reform process without necessarily writing formal submissions. Consumer reference group members have been able to distil key issues and information to constituents for consideration, consult and report back to the AER. This has provided a mechanism for coordinated and informed input from a cross-section of consumer groups.

To bolster consumer input beyond the Better Regulation program the AER established a Consumer Challenge Panel. The objective of the Panel is to advise the AER on issues that are important to consumers in the regulatory process. This will enhance consumer input into some of the more complex, technical issues that are considered during determinations. The Panel will provide advice to the AER:

- challenging network businesses' proposals in terms of the services to be delivered to consumers; whether those services are acceptable to, valued by, and in the long term interests of consumers
- challenging the effectiveness of network businesses' consumer engagement activities and how this engagement has informed, and been reflected in, the development of their proposals.

Better Network Regulation Outcomes
Stronger Incentives on Efficient Network Spending

The AER is strengthening the incentives on electricity network businesses to only spend what is prudent and efficient to meet service and reliability obligations. This centres on efficiency sharing schemes for capital and operating expenditure combined with ex-post efficiency reviews of capital expenditure. Together, these provide better incentives for electricity network businesses to spend efficiently and to share the benefits of efficiencies with consumers.

A new sharing mechanism for capital expenditure provides a 30 per cent reward to businesses for becoming more efficient (underspending) and a 30 per cent penalty for becoming less efficient (overspending). In addition, if the business spends more than its allowed forecast the AER can examine the overspend ex-post and disallow inefficient capital from the business' regulatory asset base so consumers do not fund inefficient overspending on capital. Taken together, these capital expenditure incentives mean electricity network businesses stand to lose between 30 and 100 per cent of any capital overspend. This sharing scheme compliments one already in place for operating expenditure.

The AER's preference is for incentive-based regulation. But, where the AER considers incentives are not effective, an improved approach to forecasting expenditure should promote efficient outcomes for consumers.

Improved Approach to Expenditure Forecasting and Assessment

The AER prefers to use an electricity network business' past spending as a starting point to set its future expenditure. But this should only apply where previous expenditure was efficient. Where the AER is not satisfied past expenditure was efficient, it can now draw on enhanced benchmarking and other assessment techniques to form a view on efficient costs. If an electricity network business' total proposed operating or capital expenditure forecast is greater than estimates the AER develops using its new assessment techniques and there is no satisfactory explanation for the difference, the AER can amend the forecast or substitute its own estimate.

The AER will complement its existing assessment techniques with two new benchmarking techniques—economic benchmarking and category analysis—to help it form a view about efficient expenditure levels. Economic benchmarking techniques measure a business' efficiency overall, while category analysis analyses expenditure drivers and the costs of conducting similar activities across businesses. The AER is also developing a new model to better forecast the expenditure needed to build, upgrade or replace electricity network assets to address changes in demand. This complements an existing model examining the expenditure needed to replace aging assets.

The AER will publish new annual benchmarking reports allowing ongoing comparison of electricity network businesses against each other. Consumers will benefit from the practices of the most efficient electricity network businesses that set the benchmark other businesses should aim for. The AER will also take the benchmarking reports into account when determining expenditure allowances for each electricity network business.

Sufficient but not Excessive Return on Investments

The AER is improving the way it determines the return that electricity and gas network businesses can earn on their investments. The allowed rate of return is an estimate of the appropriate cost of capital expenditure for the network business. Returns can account for 40–70 per cent of network businesses' revenues in this capital intensive industry. The rate of return must be calculated as a weighted average of the return on equity and the return on debt.

The AER is proposing to draw on a broad range of information to set rates of return that reflect efficient financing practices. The revised approach is also expected to lead to a more stable rate of return estimate over time, decreasing the volatility in prices that consumers previously experienced.

To estimate the return on equity component, the AER is proposing a model that would allow it to take account of a broad range of information, rather than being limited to the output of one particular financing model. Under the previous approach, the Sharpe-Lintner Capital Asset Pricing Model (CAPM) was used exclusively to determine the return on equity. The AER's proposal would use the Sharpe-Lintner CAPM (the 'foundation model') to set a range and point estimate on the final return on equity. Other financial models and other information would be used to either set the range of inputs into the foundation model, or assist in determining the point estimate within the final range. Additional information would then be used to estimate the final return on equity. This includes estimates from valuation reports, brokers, other regulators and alternative financial models. This flexible approach would allow the AER to determine an equity estimate consistent with the new rate of return objective that has recently been added to the energy rules—for the overall rate of return to correspond to the efficient financing costs of a benchmark efficient business.

For the return on debt, the AER proposes to move to a trailing average model that would align the allowed cost of debt with the cost of a hypothetical portfolio of seven year bonds, with one-seventh of the portfolio refinanced each year. This will better reflect efficient debt financing practices of regulated businesses and

provide a less volatile price profile over time. The previous approach used a once-every-five-year estimation of the cost of debt by measuring the return on 10 year bonds issued by Australian companies. After the global financial crisis, there was a very small or no pool of bonds to observe in this class. This led to an estimation method that did not reflect actual debt financing practices and overcompensated network businesses. The AER proposes adopting a seven year benchmark term to estimate the allowed cost of debt at the start of the next round of regulatory determinations. A gradual transition is proposed from using prevailing rates to the trailing average approach. The transition will occur over a period of seven years and will apply to all businesses.

The Big Picture—Reforms Delivering for all Consumers

Through the Better Regulation program the AER is improving how energy network businesses are regulated. Central to these reforms is greater consumer involvement in the regulatory process. Ultimately, consumers should only pay network prices that are based on the efficient costs of providing reliable energy services. Consumer involvement is critical if the regulatory regime is to be focused on promoting their long term interests and if spending proposals are to be based on the priorities of the Australian community.

Andrew Reeves was appointed as the Chair of the Australian Energy Regulator in July 2010, following his appointment as a board member in July 2008. Before his appointment, Andrew was commissioner of the Tasmanian Government Prices Oversight Commission and regulator of the Tasmanian electricity supply industry. His first professional discipline was engineering, with postgraduate qualifications in economics.

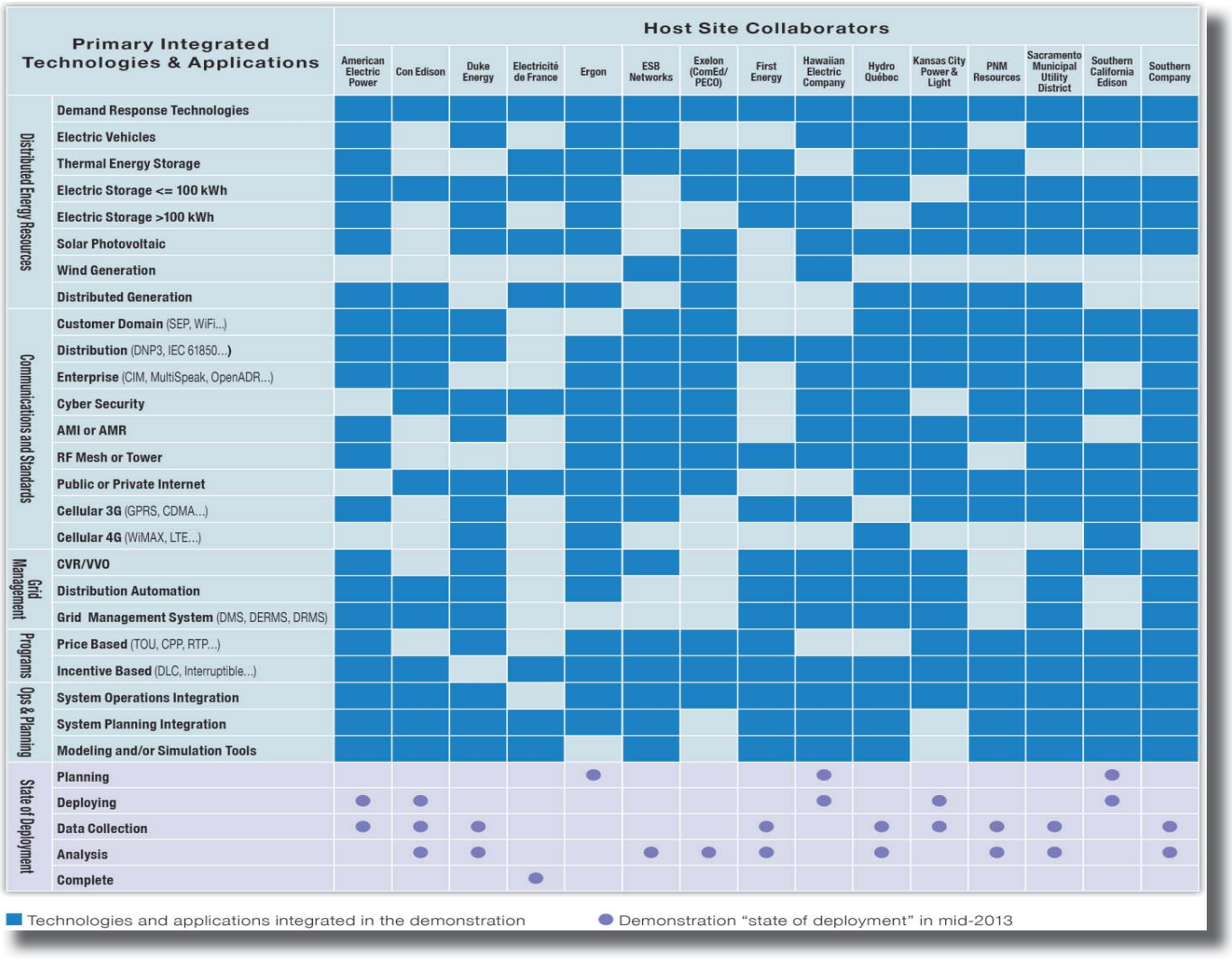
Electric Power Research Institute Reports Progress in Seven-Year Smart Grid Demonstration Initiative

Progress Highlights Include Grid Technologies, Customer Research, and New Tools for System Operators

By Matt Wakefield

EPRI's Smart Grid Demonstration Initiative is a seven-year collaborative research effort to design, deploy, and evaluate how to integrate distributed energy resources into utility grid and market operations. Twenty-four utilities from Australia, Canada, France, Ireland, Japan and the United States are investing millions of dollars and sharing information and research results on a range of technologies and applications.

Now in its fifth year, the initiative summarizes key accomplishments and results each year. Also published yearly are complete case study results, which are available to collaborating member utilities. At the discretion of member utilities, selected case studies are made available to the public. This article highlights results from 2012 and 2013. To appreciate the scope and scale of the initiative, this table summarizes the utilities that have hosted research on site and the technologies and applications being researched and developed. By collaborating across multiple projects, collective knowledge can be built, enhancing the ability of participating utilities to create the Smart Grid.



The research for EPRI has been conducted primarily by host utilities. Other collaborators that are not hosting projects also may conduct targeted research in "mini-demos" that relate to at least one of the research goals of the smart grid demonstration initiative.

These results highlight the breadth of the initiative in addressing technology, grid operations, and customer options.

EDF Case Study Tests Simultaneous Control of Distributed Energy Resources

This Electricité de France project focused on PREMIO (Production Répartie, Enr et MDE, Intégrées et Optimisées), an open architecture system designed to optimize the simultaneous control of distributed energy resources, such as thermal storage and electric batteries, that can serve as a virtual power plant when aggregated. The project examined peak shaving in southeast France, where the power system faces increasing constraints. It explored reducing loads in response to operator requests via:

- A central control unit and infrastructure located at customer facilities; and
- A communication and information system that enables operation, planning, and maintenance tasks

The control unit simulates an upstream operator by sending an offer for a variable length "critical period" as either a day-ahead request or an intraday request.

The Tests

The study period was the "cold" season of October 2011 through April 2012. A key goal was to measure response precision of 231 tests, which were initiated every two days. The control unit aggregated three different types of distributed energy resources to achieve the load reductions:

- A "smart box" that controls electric space heaters and water heaters (10 included);
- A heat pump coupled to a hot water tank that delivers hot water to the heating circuit when the heat pump is turned off (6 included); and
- Lead-acid batteries that inject power into the grid (21 included) Control settings for each type of DER included the minimum delay between consecutive load shedding periods and the maximum duration allowed for a load shedding.

Results and Lessons Learned

The analysis of results included the following observations:

- The system responded very reliably and on time, resulting in a good load reduction profile although the precision of the response profile was irregular.
- The response velocity can reach 60 kW/hour.
- Load curve is sensitive to consumer behavior and outside temperature.
- Technical issues, such as communications losses, may impact availability of each DER.
- The smart boxes may shed only a part of the load due to optimized device control settings.
- Due to open-loop design, control requests cannot be modified once issued.
- Only four customer overrides of smart box control occurred.

Sacramento Municipal Utility District (SMUD) Case Study Examines Residential Energy Savings, Peak Reduction

The SMUD Summer Solutions project was conducted in the summers of 2011 and 2012 to test how different information and load control treatments affect energy savings and peak demand reduction. Contractor Herter

Energy conducted the work for SMUD, working with a self-selected sample of more than 300 residential customers. The study investigated the effects of dynamic pricing, customer-programmed thermostat automation, utility-controlled thermostat automation, and various levels of real-time energy and cost information.

The Sample and the Treatments

In 2011, the project comprised 265 study participants as well as a "recruit and delay" control group of 137. In 2012, control group members participated fully for a total of 313 participants and no control group. Participants received a communicating thermostat that notified occupants of an impending event and enabled automation of air-conditioning response, either by the customer or by SMUD.

Information Services

Participants were randomly assigned to three different information treatments:

1. Standard billing information, including SMUD's MyEnergyOnline web portal, which is available to all customers. Here, line and bar charts display historical household energy use data in monthly, daily, and hourly intervals.
2. Home level energy data was provided using a submeter on the residence's main electricity supply line. The submeter transmitted real-time energy data for customer viewing at the thermostat or computer.
3. Appliance-level data on HVAC systems, electric water heaters, electric dryers, pool pumps and customer-selected plug loads was provided via the thermostat and gateway-assisted computer portal. This data was provided in addition to the home-level data.

Rates

Participants could sign up for the standard rate or the Summer Solutions rate. The standard rate is a default, two-tiered rate with Tier 1 at 10.45¢/kWh and Tier 2 (when usage exceeds 700 kWh per billing cycle) at 18.59¢/kWh. The Summer Solutions rate (SS rate) was an experimental rate that combined SMUD's tiers with time-of-use and critical peak pricing. This rate had four different prices: 7.21¢/kWh during the Tier 1 off-peak period, 14.11¢/kWh during the Tier 2 off-peak period, 27¢/kWh during the weekday peak period from 4-7 pm, and 75¢/kWh during critical peak events, which were called from 4-7 pm 12 times each year.

Automated Load Control

Participants could choose to control the automated event temperature settings on their thermostat or have the utility control it for them. The two options were:

1. Customer programmed temperature settings, which enabled customers to program an automatic response to events, from 0 to +9 degrees, with overrides and modifications allowed at any time.
2. Utility controlled temperature settings, or Automatic Temperature Control (ATC), which increased temperature settings by 4 degrees during events and allowed one override per season. With this option, customers received a $4.00 per event incentive.

Results

Of participants offered both the Time of Use/Critical Peak Pricing rate and the Automatic Temperature Control options, 49% chose both, 25% chose the TOU/CPP rate only (no ATC), 13% chose the ATC option only (with the standard rate), and 13% chose neither option (standard rate with no ATC, i.e. information and event notification only).

Both home-level and appliance-level energy information resulted in greater peak demand savings on non-event weekdays, but had very little effect on event savings. Home information improved overall energy savings throughout the day, but this effect was not evident for participants that received appliance information in addition to home information. An analysis of loads for just the second-year participants, however, showed that home-level and appliance-level information resulted in similar overall savings throughout the day, implying a one-year learning curve for the customers that received the more detailed appliance-level data.

Those with the experimental Time of Use/Critical Peak Pricing rate who controlled their own response to events exhibited a 10% overall energy savings, dropped 33% of their load during non-event weekday peak periods, and dropped 58% of their load during peak events – 70% more than those on direct load control alone – as shown in Figure 2. The results for those on the TOU/CPP rate with Automatic Temperature Control were nearly identical.

The higher peak savings for those on the TOU/CPP rate can be explained by the Time of Use peak price on non-event days, and by the price incentive to shift or reduce all loads, not just the air conditioning load targeted by the direct load control Automatic Temperature Control program. Higher overall savings for those on the TOU/CPP rate is likely a result of peak reduction measures that also contributed to overall energy savings, for example air-conditioning tune-ups or replacement.

Lessons Learned/Recommendations:

This study led the research team to recommend the following:

- Offer a voluntary Time of Use/Critical Peak Pricing rate for energy savings, daily weekday peak reduction, and occasional summer peak load reduction;
- Offer rebates or recommendations for user-friendly thermostats that can automate pre-cooling and peak load drop for TOU peak periods and/or CPP events. As an option, also consider thermostats that display the real-time electricity rate, event status, and/ or real-time energy data;
- Do not offer a financial incentive for direct load control where TOU/CPP is offered; and
- Do not offer appliance level information at this point in time, because of its high cost, limited energy savings, and lower customer ratings

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ESB Networks Case Study on a Smart-Meter Customer Behavior Trial

ESB Networks conducted a customer behavior trial to gauge the potential for smart-meter enabled treatments, including time-of use (TOU) prices and energy information services, to change customer energy consumption and peak demand usage.

The sample of 3,800 residential customers was provided some combination of treatments; more than 1,100 customers were monitored as a control group. All participants had smart meters.
For six months prior to the trial, electricity usage profiles of participants were recorded to provide baseline data.

Among residential customers, four different TOU rates were tested during a one-year trial, along with several different energy-use information services: monthly or bi-monthly bills with a detailed energy usage statement, and an electricity monitor (in-home display). Also offered was a load reduction incentive, which financially rewarded customers that reduced electricity usage by a certain percent compared to the same period in the previous year. Pre- and post-trial surveys provided insight on customer perceptions and motivations.

Among small to medium businesses 650 customers participated in the trial. Two TOU tariffs were tested, along with an electricity monitor and a web account targeted specifically to businesses. Delivery of these

services and treatments relied on advanced metering infrastructure featuring three different communications technologies: power line carrier (PLC), a 2.4GHz wireless mesh network, and point-to-point wireless (general packet radio service, or GPRS).

Residential Sector Findings Included:

- As shown in the table, the TOU rates, energy information services, and financial incentives were found to reduce overall electricity usage by 2.5% and peak usage by 8.8% for the one year period of the trial.

  Results are statistically significant at the 90% confidence level.
- The treatment that had the greatest effect on reducing peak usage, with a peak shift of 11.3%, was the combination of in-home display with the bi-monthly bill that features a detailed energy statement.
- No single type of TOU tariff offered in combination with information services stood out as being more effective than another.
- There is no evidence that there is a threshold point at which the price of electricity will significantly change usage. The demand for peak usage is highly inelastic to price.
- Ninety-one percent of survey respondents deemed that the in-home display was a support in achieving peak reduction and 87% considered it an important tool for shifting to night rates.

Businesses Sector Findings Included:

- On average, no statistically significant reductions in overall electricity use or peak demand were exhibited by business customers.
- No specific tariff, information service, or combination of tariff and information service reduced overall usage or peak usage by a statistically significant amount.
- Only 15% of business customers reported logging onto the web account for energy use information.
- Among participants who did reduce usage or cut peak, 93% reported that the electricity monitor was an effective information resource and 85% who reduced peak demand said it was an important tool.

Communications Technology Findings:

- The power line carrier (PLC) communications system has major issues to overcome to deliver reliable daily profile data from every meter. Problems are also experienced with performance of on-demand tasks.
- A point-to-point wireless communication system generally worked well, but its long-term availability in a large number of meters is a concern. This technology seems most appropriate if there is a required roll-out of a limited number of meters in the near- to mid-term.
- The 2.4 GHz mesh network was a good fit in urban environments where meters are relatively close together. However, performance in rural areas, where wireless is most needed, was disappointing. Scaling of the system to large numbers may also be an issue.

Results of the customer behavior trial generally indicate that treatments designed to encourage changes in customer energy usage can assist customers in being more efficient in their use of electricity.

Ameren Illinois Case Study on Conservation Voltage Reduction

Beginning in April 2012, Ameren Illinois conducted tests to determine the effects of conservation voltage reduction (CVR) on two distribution circuits: a highly loaded urban circuit and a combination urban/rural circuit.

CVR reduces voltage along the distribution feeder for the purpose of reducing electric power demand and energy. This research tested the hypothesis that reducing voltage 2-4 percent while keeping it adequate for customer use at 114-126 volts, also reduces demand and energy.

Results

Analysis of testing results demonstrated that different CVR capabilities are attainable during different periods. This is expressed using the Conservation Voltage Reduction Factor, or CVRf, which is the percent load reduction obtained per percent of voltage reduction. For example, if load is reduced 2% from a voltage reduction of 3%, then the CVRf is 2%/3%, or .67.

Lesson Learned

- Understanding the feeder load characteristics is critical for CVRf analysis. For the urban feeder test additional load was added to the comparable circuit. Seasonal grain elevator loads on both of the rural/urban circuits (test circuit and comparative circuit) created data analysis issues until the seasonal load was identified and addressed.
- Additional testing is necessary to understand the effects of CVR throughout all seasonal conditions.
- Statistical comparison of a CVR feeder with a similar non-CVR feeder can change in effectiveness from month to month:
    - Load shapes may be similar in hot weather peak months, but may differ in other periods.
    - If the comparable feeder approach fails, then weather data may be useful for use in the regression analysis.

AEP Project Assesses Distributed Energy Resources' Ability to Function Collectively to Meet Demand or Shift Loads

The AEP Smart Grid Demonstration Project is assessing distributed energy resources and technologies that can serve collectively in a manner similar to a physical power plant. These resources include a mix of distributed generation, energy storage, and demand response systems that make it possible to meet demand or shift loads.

AEP Case Study on Multiple Technology Aggregate Response

The AEP/EPRI project team developed a process to determine and manage the impact of concurrent operation of several technologies, including electric vehicles (EVs), community energy storage, and photovoltaic (PV) generation systems.

Part of the study is assessing data from each technology that can be used to help inform decisions about managing the system as a whole. For example, if an EV and community energy storage system are active at the same time, what data from the EV configuration and dynamic data on EV operation will be helpful in managing the storage technology? Also addressed is the impact of one technology on the other, such as how one technology can enhance or extend the value of another, or the potential of a combination of technologies to negate or reduce the benefit of another.

Researchers confirmed that operation of two or more systems on the same circuit, such as community energy storage, volt-var control systems, PV, or EV, will necessitate a change in dispatch or control system algorithms. They also confirmed that technologies can be identified that, when operated concurrently, provide

value beyond what can be achieved by either individual technology. They did this by testing interactions between the volt-var optimization system and the community energy storage used for peak shaving and load reduction.

Matt Wakefield is Director of the Information and Communications Technology group at the Electric Power Research Institute (EPRI), managing Smart Grid, IntelliGrid and Cyber Security Programs. He has over 25 years of energy industry experience with a strong emphasis on applying information and communication technologies for real-time information transfer between control centers, generators, markets, and consumers. He earned his Bachelor of Science in Technology Management from the University of Maryland University College.


ICER PUBLICATIONS

Reports
ICER's Virtual Working Groups draft reports on an on-going basis and in accordance with three year work plan cycles. The following reports were prepared during the 2009-2012 period:

Role of Energy Regulators in Guaranteeing Reliability and Security of Supply: The National, Regional and Global Dimensions (March 2012) http://bit.ly/1bY3aLg

Experiences on the Regulatory Approaches to the Implementation of Smart Meters (April 2012) http://bit.ly/18Uc4bz

Renewable Energy and Distributed Generation: International Case Studies on Technical and Economic Considerations (February 2012) http://bit.ly/18x7XUT
Examples of Methodologies Utilized to Manage Competitiveness and Affordability Issues Related to the Introduction of Renewable Forms of Electricity Generation and New Technologies: An Overview Report of a Compilation of Four Case Studies (April 2012) http://bit.ly/19aWbQs

A Description of Current Regulatory Practices for the Promotion of Energy Efficiency (June 2010) http://bit.ly/1bNctsR

Response to the European Commission Public Consultation on the External Dimension of the EU Energy Policy (February 2011) http://bit.ly/18UcvCC

Distinguished Scholar Award http://bit.ly/1dKx58q

ICER established its Distinguished Scholar Awards with a view to contributing to an increased reflection on energy regulation policy issues. These Awards acknowledge important contributions made to enhance electricity and gas regulation around the world. Two recipients are selected each cycle, in the categories of Impact on Developing Countries and Next Practices. The Awards are now held every three years in conjunction with the World Forum on Energy Regulation (WFER).

2015 Theme: Creating and Managing Regional Energy Markets (deadline April 1, 2014)
http://bit.ly/1dkDGG6

2012 Theme: Integrating New Technologies into the Grid

2012 Winners

Category: Impact on Developing Countries

Development of New Infrastructure and Integration of New Technologies in Guatemala's Electricity Sector: Practical Lessons Learned by a Regulator in a Developing Country, prepared by Carlos Colom, President, Comisión Nacional de Energia Eléctrica (CNEE), Guatemala http://bit.ly/1dKzFeI

Category: Next Practices

Changing The Regulation for Regulating the Change: innovation-driven Regulatory Developments in Italy: Smart Grids, Smart Metering and E-mobility, prepared by Luca Lo Schiavo, Maurizio Delfanti, Elena Fumagalli and Valeria Olivieri, Italy http://bit.ly/ISUfQI

2010 Theme: The Impact of Renewables on Energy Regulation

2010 Winners

Category: Impact on Developing Countries

Effects of the Introduction of Successful Mechanisms to Promote Energy Efficiency in Non-EU Countries prepared by the MEDREG Ad Hoc Group on Environment, RES and Energy Efficiency http://bit.ly/1emp3XT

Category: Next Practices

Pricing of Ancillary Services and the Impact of Wind Generation on the Capability of the Transmission Network prepared by Mr. Darryl Biggar (Economist, Australian Energy Regulator (AER) and the Australian Competition and Consumer Commission (ACCC)) http://bit.ly/1bcpz35

You are invited to learn more about ICER by viewing its Brochures http://bit.ly/1cP360t **and Press Releases!** http://bit.ly/1dkE3Ao

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