The future of TSOs – electricity and gas highways
The roundtable

More than 51 senior executives and experts from 16 different countries gathered in September 2013 in Brussels, Belgium, for PwC’s roundtable on the challenges facing modern transmission service operator (TSO) companies. Participants were drawn from industry bodies, regulators and companies involved in TSO activity in different parts of the world as well as from PwC. The moderators and speakers were:

- **Hans ten Berge**  
  Secretary General, Eurelectric
- **Dennis Eboreime**  
  Head of Finance, Niger Delta Power Holding Company Limited
- **David Etheridge**  
  PwC Global Power & Utilities Advisory Leader
- **Jeroen van Hoof**  
  PwC Global Power & Utilities Assurance Leader
- **Jacob Machinjike**  
  General Manager, Eskom
- **Paul Nillesen**  
  Partner, PwC Netherlands
- **Günther Oettinger**  
  European Commissioner for Energy
- **Christophe Poillion**  
  EVP European Affairs, GRTgaz
- **Juan Pons**  
  Strategy & Regulation General Manager, Enagas
- **Denis Reeves**  
  Executive Director Finance, Transmission Company of Nigeria
- **Jukka Ruusunen**  
  President and CEO, Fingrid
- **Nancy Saracino**  
  Vice President, General Counsel and Chief Administrative Officer, California ISO
- **Norbert Schwieters**  
  PwC Global Power & Utilities Leader
- **Graeme Steele**  
  Head of the Brussels Office, National Grid
- **Matti Supponen**  
  Policy Coordinator, European Commission
- **Fabio Tambone**  
  Head of International Affairs, Italian Regulatory Authority

* to view a full video of Mr Oettinger’s speech please visit www.pwc.com/utilities
Introduction

Transmission service operators (TSOs) have always played a vital, central part of modern power systems but now their role and the challenges they face are changing fast as the generation and flow mix become more volatile and more complex. Welcoming participants to the roundtable, Norbert Schwieters, PwC Global Power & Utilities Leader, observed: “Safety and reliability have been always critical issues for TSOs. Network planning, development, natural hazards, generation/consumption imbalances, grid instability and failure are just a few of the things a modern TSO is dealing with. Add in the need to integrate renewable energy sources, the wider development of decentralised generation and the strengthening of interconnections at European level and you begin to see the full extent of the challenges.”

The roundtable enabled participants to talk in depth about the issues facing electricity and gas transmission networks. In Europe, there is considerable impetus behind trans-national network development and interconnection in addition to what is happening at a national level. But there is considerable tension between the scale of investment that is needed and the current market and regulatory context for investment.

The roundtable focus was not confined to Europe. It was also informed by perspectives from the United States, Nigeria and South Africa. Participants were able to discuss the very contrasting situations of a mature Californian network that is facing the challenge of managing large volumes of distributed generation and the network challenges in Africa, where infrastructure is underdeveloped and often a long way short of what is needed to meet power demand.

This publication reports on the many insights that flowed from a very wide-ranging roundtable discussion. We focus on:
- European electricity networks p4
- European gas infrastructure planning p7
- Global contrasts: California, Nigeria and South Africa p10
- Balancing the regulatory challenges p14

“The questions facing TSOs today are more complex, more uncertain than ever before. ‘Should we look at the big picture or the small picture? Do we have a European, national or a local perspective? Are we cooperating or competing? Will we get state support or private sector funding? Do we rely on French nuclear energy or on Azeri gas? Is the future in smart grids or ‘more of the same’?”
Opening our roundtable discussion, National Grid’s Graeme Steele identified what he called an “investment conundrum” in Europe. He observed: “the policy makers want it to happen; TSOs and other developers are ready to make the investments; there is support from the finance community and the manufacturers tell us that they are up and ready to go. So why, given all of the support we’ve got behind network expansion, isn’t it happening?”

The need for clarity

Steele argued that issues such as permitting and public acceptance, while significant, are no different to any infrastructure investments and are not “major blocks”. He felt there were market issues to be addressed, notably whether the so-called ‘target model’ for the development of the single market in Europe remains best given the changing generation mix. But he pointed to ‘regulatory regimes’ and ‘regulatory complexity’ as being “the biggest challenges for crossborder network expansion.”

“Regulatory stability is easy to say but difficult to achieve,” said Steele, particularly in the context of crossborder interconnections: “Very quickly you could be talking about three, five or even a dozen countries. Doing something with two regulatory regimes is difficult enough. Doing it with more than that is even more challenging.”

What can be done to deliver more clarity?

“We need a clear line of sight to a revenue stream for these investments. We also then need to think about how capacity mechanisms might fit into this space. I think we should look at some sort of review of the target model. We’re now dealing with a different world than when it was first envisaged. There is significant intermittent generation and flexible traditional generation plant is being closed every day across the EU in some quite frightening numbers. That situation is only going to get worse before it gets better.”

A fast-changing world

Fingrid’s President and CEO Jukka Ruusunen followed up, highlighting the challenges for companies and how unexpected events can alter longer term horizons: “Like all TSOs in Europe, we are in the middle of an electricity revolution. It is a very peaceful revolution which will take us up to around 2050 but a lot is happening right now. Sudden events can totally change the picture. The ‘black swan’ of Fukushima is one example. The full extent of the current changes in Europe would have been difficult to foresee four or five years ago.”

Europe’s network vision

The goal is a single optimised European energy network. The scope of the European Commission’s guidelines on trans-European energy networks (TEN-E) is being widened to accommodate 12 strategic trans-European energy infrastructure corridors and areas, including new energy infrastructure, such as gas and electricity networks and storage, oil transport pipelines, smart grids and CO2 networks.

The talk is of a “no regrets option” with infrastructure investment playing a key role. A process of identification of ‘projects of common interest’ (PCIs) is underway with such projects being considered as essential for European energy goals and, as such, entitled to preferential treatment, including faster and more efficient permitting procedures. The investment requirement is substantial. And, as the roundtable discussion shows, there are considerable obstacles that lie in the way.
As well as managing long-term planning, companies have to balance many shorter term and immediate, day-to-day, pressures: “We face a lot of volatility. We’re running a real-time process all the time,” said Ruusunen. “There is a lot of pressure balancing reliability and the market. If we do more capacity, take more for reliability, we give less to the market. What is the right balance? There is also more crossborder cooperation and more volatility, so you have real time connections to your neighbours because things happen very fast. Then, of course, there is the need to deliver shareholder value, efficiency and lower tariffs.”

**Strategy**

What does this balance mean for companies? Ruusunen stressed the need for focus: “You have to have a very disciplined, clear, focused strategy because you cannot do everything. As TSOs, we want to save the world and we want to do everything at the same time. But it is impossible. If you want to be the best in your activities, you have to focus yourself.” He outlined how Fingrid puts customers and stakeholders at the head of its strategy but sought a balanced vision (figure 1) and ways of measuring its performance in all its key strategy areas.

Some of the main strategic metrics that the company uses also form part of the bonus system for everybody working in the company. These measures are the value of undelivered electricity (reflecting electricity reliability), congestion hours between Finland and Sweden (functioning electricity market) and tariff affordability (cost efficiency).

Outsourcing is another important part of Fingrid’s approach. The company employed just 275 people at the end of 2012: “We keep the core competencies in the company but then we do maximum outsourcing. So we rely on the service provider market and that is why the amount of people working in Fingrid is so small,” observed Ruusunen.

**Figure 1: Fingrid’s balanced vision**

![Diagram showing Fingrid's balanced vision]

**An exciting TSO future**

The roundtable heard from Günther Oettinger, European Commissioner for Energy, whose presentation included a look ahead at the future challenges and role that TSOs will play in a modern energy system:

“Looking to the future, we will need TSOs to dig deep, to show creativity, innovation. You will benefit from a European perspective, a long-term vision, and an ability to work with other sectors, such as telecoms and cyber security specialists, transport or urban planners, in scenario building and network planning. International cooperation will become more important, with other countries, in technology platforms, international negotiations. Managing the network is just the start! The future role of TSO’s will be, frankly, far more interesting!

“We are investing, not in a replication of the 20th century energy network, but in a network for the 21st century. Everyone will need to adapt, and this includes TSOs. The days of one large coal power station using local coal and serving one specific city are well and truly over! In the longer term, high-voltage, long-distance, and new electricity storage technologies must be developed to accommodate ever-increasing shares of renewable energy, from the Union and from its neighbourhood. Offshore wind and decentralised solar energy call for a new type of network, not just in terms of supply balancing, but also in terms of physical security – linking up offshore wind farms safely to the mainland grids, for example.

“TSOs will need to work even more closely with technology developers to resolve the grid issues around these changes. The implementation of smart grids, smart networks, intelligent cities and communities all have practical implications for TSOs. TSOs will need to build up a new dialogue, not just with energy experts, but with innovators in many different fields – information technology, electric transportation, agriculturalists, economic modellers, and many more besides.”
Who in your view should hold responsibility for establishing new grids and interconnecting markets?

Graeme Steele, Head of the Brussels Office, National Grid: It depends which member state you are in. For the vast majority of member states, but not every state, this is seen as a responsibility of the domestic or national TSO. In turn, under the third package, they have an obligation to coordinate with each other in an EU context so the crossborder element is brought in. We’ve got a different approach in the UK with the responsibility sitting outside the domestic TSO. But there’s no obligation with regard to interconnection. There’s a project looking at this issue in the UK at the moment. I think it’s easier if it sits with a national TSO. It doesn’t solve the problem totally but it helps in having some clarity about where the obligation does lie.

We’ve seen increasing local subsidies and regulations popping up everywhere across Europe. How does this fit with the challenges of working towards a single European workable model?

Graeme Steele: I think it is a big challenge. Who would have predicted a few years ago that the German system would have 60GW of capacity equally divided between solar and wind power. It means that for significant periods you could have the entire German demand being met by those renewable sources. But they can slip off the system very quickly and you need the ability to access a lot of flexible generation in the background. It does get back to market interventions like capacity mechanisms offering support to ‘anytime generation’. Leaping to an answer that says you need to try and harmonise those things across the whole of the EU could probably make you take several steps back before you can start moving forward again. I think we need to see how can we try and incorporate what we’ve got but we have to think about what’s the ultimate aim of where we have to get to.

You mentioned using options for planning investment projects, can you give an example?

Jukka Ruusunen, President and CEO, Fingrid: We try to do as much as possible in advance and reduce uncertainty from projects. For example, Finland is planning to have new nuclear power plants after 2020 and we need a lot of lines to connect them and to improve the existing grid. We don’t know whether or when those nuclear investments will be made. But still we have planned what lines are needed, we have carried out most of the environmental impact analysis and have the permits. So when the new generators announce that they are ready to go, we are ready to go.

Are European network codes killing innovation? How do you strike a balance between rules and flexibility?

Jukka Ruusunen: In the Nordic countries we developed a very advanced electricity market via innovation, not via laws. Now Europe is moving towards a future electricity system that is changing very fast and is uncertain but, at the same time, fixing a lot of rules. This is a risk. We have lost a lot of flexibility actually by writing such detailed codes.

What’s your vision of the future as between TSOs and DSOs?

Jukka Ruusunen: The distribution system operators have to manage a lot of uncertainty. The new meters are creating huge amounts of data. In Denmark, there is already a hub built by a TSO which gets the data from the DSOs. We don’t know how much PV there will be in Finland that will be in the distribution grid. But it’s important to develop things cooperatively because we see that this is a win/win. If we do it in the right way we can increase the cake and then it’s easy to share.

1 Integrated Transmission Planning and Regulation (ITPR) Project, Ofgem.
Investment in gas network transportation and interconnector capacity is an important part of the development of Europe’s energy market. It is necessary for market integration, competition between different sources of gas and overall security of supply. Infrastructure development has enabled significant progress in north-west Europe towards the achievement of the gas target model of liquid hubs, free gas flows and functioning markets. But major obstacles remain and the role of TSOs in infrastructure investment is central.

Southern France and the Iberian Peninsula are among the regions where lack of capacity is hindering market integration. Sustained price differences between these regions and the European gas hubs further north are the product of insufficient interconnection. The roundtable had the benefit of hearing from Juan Pons, Strategy & Regulation General Manager for Spanish TSO Enagas, and Christophe Poillion, EVP European Affairs at GRTgaz in France, on factors affecting infrastructure investment.

**The role of gas**

An important overriding factor for new gas infrastructure is the place of gas in a future decarbonised world. Poillion observed: “In the context of the 2050 roadmap, is it still useful to develop pipelines for transporting gas which is a fossil fuel when the commission would like to have less fossil fuels in the long run. Even if the commission says it (gas infrastructure) is a ‘no regrets’ option, it still needs careful thought.” In the long run, Poillion says GRTgaz is moving towards a greener gas network which would allow the infrastructure to have a long-term use in a decarbonised context, for example using the network for transporting bio methane and for power to gas solutions.

Perversely, the immediate challenge to gas comes not from cleaner energy but a move to coal as cheap coal imports, the collapse of the EU carbon trading market and the impact of renewable generation has led to a massive displacement of gas-fired generation. Together with the effect of the economic downturn, this has led to a consumption downturn in Europe.

But the case for gas as a flexible and complementary source of power generation alongside intermittent and uncertain renewable generation is a strong one. Juan Pons illustrated this by pointing to two contrasting recent days in Spain: “On one day (a peak wind day), wind was providing 66.5% of electricity generation and gas could almost disappear from the mix but on another day there was no wind and gas had to fill the gap. There is complete complementarity between gas and renewables. We have to be ready to have the necessary flexibility to provide this fluctuating demand.”

**Expanding competition in gas**

Investment in gas infrastructure is delivering greater supply competition into parts of Europe. Poillion outlined the arbitrage effect of more pipeline gas coming into France from Norway and Russia in 2012 to offset higher liquefied natural gas (LNG) prices and reduced LNG flows: “Thanks to the flexibility of the gas transmission network shippers can switch from one source to another. But a lack of capacity between the north and the south part of France and between Spain and France leaves these regions very dependent on LNG imports.”
The need for increased capacity to achieve the single market is clear. Much progress is already being made with north-south capacity between France and Spain roughly doubling since 2007 alongside completely new south-north capacity. More is needed and Franco-Spanish interconnections are on the EU list of projects of common interest (PCIs). But said Pons: “Those projects would be subject to cost benefit analysis. The traders and suppliers tend to go more towards short term contracts. For a cost benefit analysis it is necessary to assure the financing on long term contracts. So I think there it will be difficult for PCIs to be financed by the market.”

Pons went on to cite the example of the open season consultation on the proposed linking of Catalonia with the French grid via the Midi-Pyrénées: “There was huge demand but when it moved to 20 year commitments the demand was much lower. It demonstrated that we have to look for other ways of financing the PCIs that will be necessary to really achieve an integrated European market.”

Poillion continued: “The network codes which have been developed at EU level are trying to promote liquidity of markets and short-term capacity booking. This is ok for short-term competition but is blocking long-term investment decisions.” Nevertheless companies like GRTgaz are still investing: “In the past we were investing around €400m a year. It is about €600–800m for the coming years. It could have been €1.2bn on an optimistic basis but this is no longer the case.”

Both Poillion and Pons expressed concern about the current gas storage situation in Europe. Pons observed: “Gas storage is experiencing difficult times. Market conditions mean it is not worthwhile contracting storage capacity. Many countries are starting to think whether remuneration of storage should be reconsidered.” Poillion added: “There is a definite worry in several countries. If winter is usual then no problem but if it is cold then there could definitely be difficulties. There is a need to ensure security of supply by using adequately existing infrastructures.”

Poillion backed up Pons’s concerns: “We no longer have any long term signals for supporting long term investments. There are significant investments at stake. Not many years ago, we were looking ahead to a golden age of gas but right now we have something completely different. The lack of long term visibility on energy policies is hampering the development of the network.”

He gave the example of Obergailbach (the France-German interconnector) and the consequences of the application of framework guidelines to highlight the reduction in long term price signals: “The result is you are booking only 35% of capacity on a long term basis. As a TSO, I would not invest anymore because I am not sure the pipeline will be used on a long term basis.”

“Not many years ago, we were looking ahead to a golden age of gas but right now we have something completely different. The lack of long term visibility on energy policies is hampering the development of the network.”
In electricity markets the hot topic is capacity mechanisms. Is there a need for something similar in gas storage?

Juan Pons, Strategy & Regulation General Manager, Enagas: I think some countries will try to go to some kind of capacity mechanism. If the market does not provide the storage, and it is a risk for security of supply, I think that perhaps should be compulsory in some countries. The cost would need to be financed by the state or integrated into the tariff as a cost of operating the system. In Spain there is an obligation on traders and suppliers to keep 20 days of supply (based on their sales in the previous year) stored in the system.

What’s your view on the rise of spot markets and more market-based pricing versus oil-indexed longer term contracts? How you see that developing?

Juan Pons: It’s a trend. As gas is more interconnected and there are hubs, there will be more spot trading. But I think it will take some years to be implemented. It could be a threat to LNG infrastructure development. Projects are expensive and if they don’t get the assurance of a fair return for investment they will be delayed or stopped I think there will always be a need for long term contracts with a price that allows project financing otherwise there will be no supply.

As well as the interconnector capacity between countries, there is also the need to expand internal domestic networks. How is this expenditure covered?

Christophe Poillion, EVP European Affairs, GRTgaz: There is a regular process of consultation to see when the market will be ready for additional capacity. There are wider security of supply and other benefits and an assumption is made about what costs can be ‘socialised’. In a recent example, the expectation was that 30% would be socialised.

What I am not hearing is that financing is an issue. Is that right?

Christophe Poillion: I’ve not mentioned financing at all. In the past, we were asking for a stable and high enough rate of return on investments. That is still needed for PCIs. We invest in new capacity if there is enough demand with long-term commitments from the market, if the regulatory office approve it, if there is enough profitability and, of course, if we have the money from our shareholders.

Am I right in thinking there is not yet price transparency and gas hubs in Spain? When will this be able to be changed?

Juan Pons: It is a real issue. One of the reason the price is so high in Spain is the lack of a real hub. There are a lot of exchanges but most of it is over the counter so the price is not known. At Enagas we are promoting an Iberian gas hub and we are working for this. The government has announced an intention for gas reform by the end of the year or the start of next year. I think one of the things it has to create is a framework for a hub. We really feel the lack of this and it would help bring the Spanish prices closer to other European prices.

What I am not hearing is that financing is an issue. Is that right?
Global contrasts: California, Nigeria and South Africa

The contrasts in electricity networks around the world were illustrated vividly at the roundtable with perspectives from California, Nigeria and South Africa. In Nigeria, there is a population of nearly 170 million having to get by with 5,000MW compared with 30 million people and 60,000MW in California. “It’s the difference between not having enough to drink and worrying that the red wine isn’t being served at the right temperature”, commented Nancy Saracino, Vice President, General Counsel and Chief Administrative Officer, California ISO.

But if the nature of the challenge is different, it is no less significant. The California ISO conducts 27,589 market transactions each day, managing 26,024 circuit-miles of transmission lines and delivers 246 million megawatt-hours of electricity annually. California consumes much more power than it produces and has an import capacity of 16,000MW from neighbouring territories. It is also at the forefront of handling considerable volumes of intermittent renewable generation in the system.

Global contrasts: California, Nigeria and South Africa

Californian renewables ramp-up

“Right now quite a substantial amount of renewable production comes from wind and we’re about to head into a significant amount of solar growth. By 2020, a much greater proportion of California’s renewable generation will come from solar,” said Saracino. Currently renewables account for just under a fifth (18.3%) of power generation in California. The state’s renewables portfolio standard requires the utilities to procure renewable resources to meet 33% of retail sales by 2020 and policy makers are considering requiring even higher percentages of renewables, in the range of 40–50%.

“We call this our ‘duck chart,’” said Saracino, introducing a chart showing the challenge of meeting demand while handling daytime solar and intermittent wind alongside other conventional baseload resources that can’t easily be turned off, such as nuclear and some gas-fired plant (figure 2).

California ISO market enhancements to help the integration of higher levels of variable energy resources

- Active flexible capacity procurement.
- Dynamic transfers.
- Lower bid floor to incentivise economic curtailment.
- Pay-for-performance regulation.
- 15-minute intra-hour scheduling.
- Resource adequacy enhancements.
- New energy imbalance market and better regional coordination.
“It’s useful in talking to policy makers and regulators to let them understand the dispatch and potential over-generation issues that arise from non-flexible supply.” These include: “A very steep climb up to the evening peak which by 2020 will be about a 13,000MW climb in two hours. Right now we do not have the capability to manage that kind of flexibility, but we know this ahead of time so we’re working on developing the right tools and resources.” The chart uses the example of an early Spring day – a time of year when solar intensity is relatively high but the summer air conditioning demand hasn’t built up.

Managing volatility

“As you can see, we have more generation during the day than we can use. So, this is the challenge that we’re looking to manage within the next seven years,” said Saracino. She stressed the importance of accurate forecasting and good operator tools as well as market enhancements, including incentives for load shifting, demand response and resource adequacy (see panel).

There are plans to use an energy imbalance market as a platform to optimise real-time dispatch: “The economic value of this is quite profound. It also allows for a diversification with respect to the geographies. So, among other things, you take advantage of wind in different places and the sun shining across a larger span of the country.”

Nigerian power reform accelerates

Dennis Eboreime is Head of Finance, Niger Delta Power Holding Company (NDPHC), and is part of a team leading the National Integrated Power Projects (NIPP) at the heart of the country’s power system reform process. Introducing an overview of Nigeria’s power system challenges he commented: “We are trying to get to where most of the speakers are already. We’re obviously in a far deeper and lower level of the power curve than everybody else, but the challenges are nonetheless extremely interesting.”

Electricity demand in Nigeria far exceeds supply. Capacity is about 10,300MW of which less than half is currently available and about half the population is off the grid. Eboreime outlined: “The transformation and reform process hopes to reach about 20,000MW although, optimistically, our vision 2020 looked at 40,000MW. But from where we stand today, that is a big challenge. In its first phase, the NIPP will contribute 5,000MW.”
Rehabilitating transmission

To get a closer insight into the transmission challenges in Nigeria, the roundtable heard from Denis Reeves, Executive Director Finance at the Transmission Company of Nigeria (TCN), and part of the MHI team that has been put in place to manage and to rehabilitate the electricity transmission system of Nigeria. “It’s very difficult to put it into words what it entails,” said Reeves. “But imagine process re-engineering a nationwide company that is primarily paper-based in its systems. Trying to establish opening balance sheet positions and determining steady state funding requirements just for the soon to be separately regulated entities is one of the challenges.”

“Right now we are on target on all the activities that we are running,” said Eboreime. “We intend to use the proceeds for another phase of power investments. It is obvious what we have done so far has not even scratched the surface, so we need to do more.” Among the challenges facing the reinvestment strategy, transmission infrastructure cannot evacuate all of NIPP generated output and there is also the problem of grid instability. More investment is required just to meet current generation, as well as for expected growth.

Reeves estimates US$4–7bn investment is needed in the transmission company over the next 10 years to enable it to get closer to steady state transmission against generation and against end-user requirements. But despite the scale of the challenge, he is optimistic: “I’ve been watching the power sector in Nigeria for about ten years and more has happened in the last 18 months or so than has happened in the previous eight years in my opinion. If that momentum is kept up, I think you’ll see some very significant things happening in Nigeria in the not too distant future.”

Transmission in South Africa

Jacob Machinjike, General Manager, Eskom, completed the input to the roundtable from Africa. Unlike the unbundling in Nigeria, Eskom remains the monopoly power utility in South Africa with business units within the company that deliver the TSO, generation, distribution and customer retailing functions. The possibility of unbundling the TSO function has long been discussed by the government but without any definite conclusion.

Machinjike reminded participants of the scale of Eskom’s operations: “It provides 95% of South Africa’s electricity and close to 67% of Africa’s electricity. If you lift Eskom’s infrastructure and you superimpose on parts of Europe, it will cover Spain, Germany, France and Belgium.” Renewable generation makes only a marginal contribution to a largely fossil-fuel generation mix with some nuclear.

Active demand-side management has been an important part of Eskom’s strategy in recent years and DSM annual savings are estimated at around 360MW. Machinjike added: “The challenges are around peaking. We have gas power stations largely for peaking because our profile for demand in energy is very peaky in the morning around 9–10am and in the late afternoon all the way to 9pm.” Electricity theft is also an issue with combined transmission and distribution operations’ losses totalling 8–9%. High levels of theft of copper and pylons persist, which are affecting plant performance and increasing costs.
In California, how do manage the extra costs to the system of adding renewable generation? Are they borne by the renewable developers, for example, or socialised within the tariffs?

Nancy Saracino, Vice President, General Counsel and Chief Administrative Officer, California ISO: It’s a great question and the answer is complex. Development has been in part funded by the federal government with respect to incentives and tax breaks. Right now the load-serving entities are entering into contracts with the solar developers largely for solar expansion. But the price point for development has actually been going down and so you see the utilities starting to try to renegotiate the contracts to keep up with this evolution in technology.

Certainly rates are going to increase for rate payers. But some of the estimates for added costs for consumers are much lower now than they were a couple of years ago when we were first estimating it. To meet the costs of transmission system expansion we’re trying to optimise on a regional basis.

**But the cost is high, isn’t there a danger of a rate shock?**

Nancy Saracino: We are concerned that ultimately there could be a rate shock. In our view, this notion of regional expansion of the grid, so that you’re co-optimising and saving everybody money, is absolutely essential. So, throughout the entire west of the US, using the resources that are already available and underutilised in other states and then co-optimising the peaks and the efficiencies you get from a broader geographic area. Otherwise, I think we will hit a point where the rate impact could be quite significant.

**Is the proposed supergrid the right development for Nigeria at the current time as opposed to a conventional grid?**

Denis Reeves, Executive Director Finance, Transmission Company of Nigeria: I wouldn’t say ‘no’ but it’s a ‘very cautious yes’. We’re healthily sceptical about it. We’ve taken a fairly pragmatic view and budgeted for the necessary co-funded feasibility studies that will need to take place.

*Given the scale of challenges ahead, are there any role models or other entities around the world that you look to emulate?*

Jacob Machinjike, General Manager, Eskom: We benchmark ourselves with the best in the world. So, with the models that are there, we have been testing them in-house and in some cases we have gone to the stage where we can say we can break things up and start moving on in line with other players. Our direction is linked to government policy. So, it has been a waiting game from our side and it has worked well up to now.

Dennis Eboreime, Head of Finance, Niger Delta Power Holding Company: Nigeria and South Africa are the two biggest economies in Africa and, if South Africa can do 46,000MW, we should be able to do so. So we put that as a bar. If we can reform power, that will have a significant transforming influence on everything. Recently, some three years ago, we did the same for telecoms and it’s a massive success, so we think we are heading in the same direction here.

**In California, how do manage the extra costs to the system of adding renewable generation? Are they borne by the renewable developers, for example, or socialised within the tariffs?**

Denis Reeves: If you were to look at what we’re doing, I think it would frighten the life out of you. However, if you look at what Manitoba Hydro International in particular has done in the past in different countries and if you look at individuals within the team, we all have experience of implementing the required transformational components elsewhere. What we are doing in Nigeria is only different in the sense of being bigger in scale and bigger in complexity.

**We are starting some market trials in a few weeks in Nigeria. Of course, California had a bumpy road starting the market. What recommendation do you have for us starting from scratch?**

Nancy Saracino: It’s a very important question. I recommend you come and talk to our market monitor about how to put in place really effective mechanisms for observing market behaviour. It still happens in California’s market today, but we’re much better at catching it, so you look for trends, you look for anomalies and then you start figuring out what’s causing them. You absolutely need a regulator with a very strong enforcement regime behind it, including penalties, and the potential for criminal sanctions. Our market is much more well-developed than the one that was manipulated to such disastrous effect in 2000/2001, but it is a whole framework that I think is really part of any well-designed and operating market. It must be highly regulated due to the nature of what we’re serving, which is a product that has no substitute.
At the heart of the market

The pivotal part played by TSOs is not always widely appreciated: “It is my conviction that the attitude and position of the TSO determines to a much larger extent than we commonly think the success of a market,” remarked Oettinger. “New investments in interconnections and crossborder trade rules mean that suppliers can sell beyond their home markets and ever fewer Member States will be completely dependent on a single gas supplier.” TSOs are also important in the context of energy efficiency: “We energy users want to think more carefully about our consumption habits, if we want to control expenses and take some of the strain off our systems. To do that, we need smart grids and smart networks, as well as some consumer education.”

But there are also important questions: “How can you take advantage of the new opportunities, while fulfilling the very urgent demands and expectations of both consumers and suppliers? How can TSOs cooperate in a market where, in practice, they are also competing?” He also stressed that the many developments in renewable and decentralised generation “can only happen with investments in a new kind of power network. A network which can integrate intermittent power, a smart network and a network that can accommodate reserves and storage to back up increasing shares of renewables.”

Oettinger also highlighted the importance of gas networks: “Our economy is increasingly dependent on gas, while we are producing less and less. We need billions of euros of investments in new pipelines, such as the OPAL project, import routes, such as the Southern Corridor, pipeline maintenance, reverse flow projects, links for LNG terminals, such as in Poland, or possible future shale gas production sites. Tomorrow’s security of gas supply is today’s infrastructure project.”

Planning and investment

But again this raises many questions. As Oettinger remarked this is all “easily said but in practice, who will pay for these new networks? Governments? Consumers? Suppliers? TSOs? We need a clear answer to this question.” Given the scale of investment needed, policies need to be designed to support investment. Oettinger said: “The economic situation is not on our side. So we have to make sure our policies make up for this as far as possible. The financial instruments will be designed in a way to best support long-term infrastructure projects inter alia by making direct market financing and risk sharing easier.”

He also stressed the importance of speeding up planning approvals: “Changes in the planning laws, which the Infrastructure Regulation create, give a new opportunity for TSO’s to become more involved in local community decision making, speeding up planning authorisations, getting more public acceptance. This is an opportunity not to be lost.”

Oettinger outlined some of the initiatives that are taking place as a result of the Europe-wide planning and operations roles assigned to ENTSOs in the Third Energy Package. These include the drafting of network codes – “this is very much work in progress, but it is very simple: without the TSOs no network codes and without network codes no functioning wholesale markets” – and the ten year network development plan which he said “is a stepping stone towards more TSO cooperation and better management of network investments.” He also pointed out: “ENTSO-G’s work on the Winter Outlook and ENTSO-E’s work on generation adequacy give policy makers valuable insights on the security of supply situation in gas and electricity.”

Balancing the regulatory challenges

The EU’s view on the changing transmission landscape

European Commissioner for Energy Günther Oettinger outlined the fundamental role TSOs play in Europe’s internal energy market and the way in which this role is fast changing as the nature of the market and the energy system change. “What TSOs do is crucial to the security of supply, to competition, to sustainability and ultimately to our whole economy,” he stressed. “TSOs have adapted very well to the challenges that have come their way. They are and have to be the true market facilitators. With their fundamental role, they have the power to make or break the functioning of a market.”
The need for an integrated approach

Oettinger does not underestimate the challenge of incorporating large volumes of intermittent renewable generation: “Tackling the challenges of increasingly variable low-carbon generation while maintaining a high standard of security of supply is not going to get easier,” he said. “And it will come at a cost, in terms of the need for new infrastructure. It will be far cheaper if done at European level through integrated markets. Adequate, efficient, and reliable crossborder infrastructure must become the norm.”

The role of TSOs in the development of integrated markets won’t just be an administrative one. According to Oettinger: “It will also be very political. Cooperation and ‘Europeanisation’ must intensify at all levels of energy policy, and this includes network management. Whether we look at maintaining networks or maintaining security of supply, the issues are increasingly cross-regional. We need a change in mentality in Member States away from the traditional focus on internal networks, towards a more European perspective.”

The introduction of infrastructure regulation is giving this shift some momentum. Oettinger observed: “For the first time, Member States have agreed on the importance of discussing the infrastructural needs of their territories with their neighbours. They have a common multi-lateral und multi-national approach on the infrastructural needs inside and beyond their borders. National borders are still the reference for actions, but they will not be the ‘natural bottleneck’ anymore. For TSOs, this means a decisive shift towards more cooperation and integrated actions when it comes to network planning and development.”

The first EU-wide list of projects of common interest (PCIs) is an important step. Oettinger hoped “that this list will be adopted by mid-October 2013” and sees it as “just the first step within a longer-term infrastructure vision. In addition to the policy framework, we also need to increase the role of TSOs in investment planning and decision making.”

A changing TSO-DSO relationship

“All these changes call for a new relationship between TSOs and DSOs,” Oettinger stressed. “This relationship is the vital link in the chain between suppliers and consumers. Consumers are no longer the ‘end of the line’. In fact, the energy system needs them to become active. To help the system when it is stretched. If this link is weak, our whole system is weak.”

In conclusion Oettinger observed: “All players in the energy market have to adapt as we tackle the challenges to our energy system, find new ways to enhance security of supply and build up a competitive and fully interconnected energy market. In this new world, TSOs face unprecedented challenges. The responsibilities of TSOs are massive. The expectations that suppliers and consumers have of TSOs are phenomenal. The influence of TSOs in our energy changes is vital. We need adaptation. We need a more strategic approach. We need a more international outlook, beginning with full cooperation within the ENTSOs.”

“If we look at investments, around 200 billion euros are needed to upgrade Europe’s gas and electricity grids by 2020. The economic situation is not on our side. So we have to make sure our policies make up for this as far as possible.”
A look at some current challenges

Fabio Tambone, Head of International Affairs, Italian Regulatory Authority, updated roundtable participants on some of the important developments affecting transmission networks in Italy. Renewable generation has grown to a remarkable 42% share of the country’s electricity. This is posing the regulatory challenge of how best to strike a balance between security of supply and competition objectives, without additional costs for electricity tariffs.

As well as measures such as dispatching rules, Italy’s federal energy authority is planning a capacity market to subsidise fossil-fuelled back-up electricity generation to be in full operation by 2017. Transmission system operator Terna is expected to hold the first auctions to strike option contracts with electricity generators before the end of 2013, as the capacity mechanism proposal requires a four-year lead time between the auctions and the contracts coming into force.

Interconnector initiatives

Italy has developed a number of interconnector initiatives to boost connections with neighbouring countries. Tambone focused on two of the latest initiatives. Contracts have been assigned for the 1,000MW subsea connector with Montenegro and it is expected to be in operation from 2017. But the project needs to fit with the changed electricity demand and supply picture in Italy. Tambone said: “Things are going well but today our worry is that this 1000MW input could strongly affect our system. So now we are having discussions to examine future flows, to see if reverse flows could be feasible and to consider how to better allocate costs considering the impact of the project on the Balkan market which will be integrated very soon in the European region.”

The Trans Adriatic Pipeline (TAP) will bring Caspian gas to the EU through Greece, Albania and into Italy with capacity also for reverse flows. Tambone commented: “We have carried out for the first time the so-called ‘market test’ and that in principle was very positive.” But the economic crisis in Greece as well as reduced Italian demand, has changed the market context: “In Italy, I don’t know if we can afford the ten billion cubic metres import, so this is something that we put certain conditions on in order to make this project feasible both from the investor side and for the countries that have to receive this. A final investment decision will be declared hopefully by the end of 2013.”

Euro-Mediterranean integration

Finally, Tambone highlighted MEDREG (the Association of Mediterranean Energy Regulators): “MEDREG started in 2006 and brings together all the regulators for the south and north shore of the Mediterranean. There is a lot of interest for the future in this area of course and MEDREG is getting more and more relevant. We are signing a Cooperation Protocol concerning the development and integration of the Euro-Mediterranean energy sector with Med-TSO (Association of the Mediterranean Transmission System Operators). This is the first good step in possible cooperation and paving the way for future investment.”

The problem of loop flows

Matti Supponen, Policy Coordinator, European Commission focused the roundtable’s attention on the problem of loop flows. Vital electricity interconnector and other transmission capacity in parts of Europe is being reduced because of loop flows. These are caused when infrastructure bottlenecks cause electricity to take a longer loop to flow to where it is needed.

For example, bottlenecks in Germany are leading to significant loop flows through the networks of neighbouring countries. Similar flows occur around the major consumption region of northern Italy. The German loop flows have been reinforced by the sharp increase in power generation from renewable energy sources in Germany.

Neighbouring countries have complained that this is unfair. But the solution is not proving easy as Supponen observed: “One of the favourite options is to install phase shifters at this border, to alleviate the loop flows and to bring the physical flows and the commercial flows closer together. But this is not working very well. A key issue is that there is no agreement about who has the button to control these phase shifters.”
National vs European solutions

Another proposal, put forward by proponents in the Czech Republic and Poland, is to split Germany into price zones, or a north and south price zone, and to separate Austria from the common German/Austrian price zone. But Supponen pointed out it is a wider problem: “It is important to say that it is not only Germany who is causing loop flows. In fact the biggest loop flows are from France, a lot of which ends in Italy. There are loop flows between Norway and Sweden and the Baltic states are complaining of loop flows coming from close to St Petersburg and passing over the whole Baltic area, which they cannot easily control.”

The French loop flows are somewhat different from the north-south phenomenon in Germany and do not generate as much dissatisfaction. Supponen said: “One obvious solution is to increase the capacity of the transmission grid and this is exactly what is planned in Germany.” But, because this is seeking to solve “an international problem with a national solution,” Supponen suggested that “this is perhaps the second best solution. The best solution might be to have all these neighbours discussing and then agreeing on something that would look like an integrated grid in the centre of Europe.”

42%

is the remarkable share of the country’s electricity that renewable generation has grown to in Italy. This is posing the regulatory challenge of how best to strike a balance between security of supply and competition objectives, without additional costs for electricity tariffs.
1. How many TSOs are needed in the one European market?

Berge observed: “We still have more than 30 TSOs in Europe, regulating their own kingdom, their own national areas. I think it’s time that we start reflecting could we speed up cooperation to have them working as one TSO pan-European. Could we unbundle them from their national interest and get them working as a European entity? We are still working in national borders and have price areas and price zones by national areas. But how many TSOs do we really need?”

2. Is a national TSO model required?

“In an integrated European electricity market, why are prices set by national borders?” asked Berge. He continued: “Are the constraints by accident always on the border? I don’t believe it. We have this national playing field because TSOs, are related to national government, national exchanges and national regulators? Is this the way we should go in the future? I think they should be European, but there’s more needed for that. Regulation should be much more European. ENTSO-E and other moves are a good start. But we have to make further steps in that area. The biggest hurdle is probably the national governments. But generation adequacy is not a national issue anymore. A blackout in Germany has consequences in Rome and Paris. We are working crossborder and the denial of this is denying the factual situation.”

3. Considering the volume of the decentralised power generation and the growth of ‘prosumers’, is the role of balancing the grid shifting from the TSO to the DSO?

“How do we connect new renewables up to the grid? It is not at TSO level anymore. How are we going to cope with that?” asked Berge. “We’ve got areas in Germany where the production of households at times are seven times their consumption. That means on a sunny day that you have to export but the grid is not there to export this surplus. It is not worthwhile to put a second grid in. We will not stop this development. On the contrary, we should not be seeking to stop it but we have to have adequate tools and we don’t at the moment. I accept TSOs have a responsibility for making sure the grid is balanced across the whole country but you cannot afford to balance at the level of, say, the state of Bavaria or, even worse, a street level. Nonetheless, if we want to accommodate this new world, this question has to be on the table. It is a system issue. There is a huge challenge between the TSOs, the DSOs, the suppliers and even the generators, to resolve this. We have to cooperate.”

4. Are interconnectors created to compensate for different national non-compatible energy policies?

Berge observed that the role of interconnectors at present is often to accommodate the impact of different national energy subsidies. For example, the surplus from peak renewable generation in Germany gets exported: “So we have interconnectors in order to get the subsidies paid on these renewables exported to the neighbouring countries, while the populations in the neighbouring countries are enjoying the German subsidies paid by the retail customer. Do we need interconnectors for that? Are the differences in policy a basis for building interconnectors? I strongly question this. If we are not willing to develop a more harmonised policy, then I doubt the value of interconnectors.”

5. Is a capacity market needed and what is the role of TSOs in such a market?

Berge observed that today’s market arrangements for renewables fail to value capacity: “Renewable output is dumped on the market and gets priority access but, if it is not there, there is no obligation on the renewable generator. No capacity requirement is needed. It becomes someone else’s problem. That gives a very clear economic signal that the capacity is worthless. The solution is probably to value the capacity, which means that if the renewable producer withdraws because the wind is not there and the sun is not there, he has an obligation to ensure the capacity. He could buy that; there are gas plants enough – they are almost free of charge at this moment! Why don’t we have a solution where capacity is guaranteed? TSOs could play a very constructive role in that. Would it not be starting a capacity market by giving every supplier the obligation to have the capacity which he has sold also available? It is normal practice that if you sell something, you should have further stock of the product which you sold. This is not the case today. Nevertheless we are calling this a market. I don’t call it a market.”

Talking points

Hans ten Berge, Secretary General, Eurelectric rounded off the roundtable with five key questions and his own thought-provoking viewpoint for participants to consider.
How can we get national and European energies working better together so that their approaches are better harmonised?

Günter Oettinger: We have the ambition to Europeanise energy policies and to link energy policies to industrial policies and to climate change policies. National players are relevant but are often not coherent. To add together 28 or more national energy strategies is not a European picture. What we need are concrete projects – projects of common interest – and to view cooperation in bigger European regions – north-west, south-west, central Europe, Baltic region. We have some progress and my hope is that energy process for gas and electricity will support our strategy to Europeanise in the best manner. We need a European gas and power strategy and a common European infrastructure or energy prices in competition to the US, to the Middle East, will be at a bigger and bigger disadvantage for our industry. So the best driver is the too high energy prices as we have at the moment.

Do you think the impact of renewable energy on TSOs and the working of the market are adequately addressed on a European level?

Günter Oettinger, European Commissioner for Energy: Up to now we have 28 country support schemes in parallel. This was ok in the beginning when renewables had a small share. But now renewables have a bigger share. We need a more coordinated and coherent approach and, more and more, a European support scheme. This is what we are developing, with some guidance, with a clear comment which capacity mechanisms are acceptable and which are not acceptable. Twenty eight mechanisms in parallel means a fragmented market and is contrary to the functioning of an internal market and so we are just now in a window of opportunity to change this – coming from national levels and going to European levels…. Member states have to play a constructive role therefore or we all will fail.

How do you respond to the problem of a big growth of renewables in a market where demand is going down?

Günter Oettinger: We need a common target…. (By knowing) which renewable share will be generated in 2030, we have clarity for all investors and for our infrastructure as well. My idea is that target must also mean limit. And so we need a speed limit for next steps for more and more renewables, a smart speed limit… You need a clear priority – first grids, second storage capacities and afterwards new generation capacities, and not without a smart grid with new capacities and more storage facilities. So we need a real speed limit and more control before investments in renewable technologies.

If you want an integrated market, doesn’t that ultimately mean bringing everyone together and a unified price?

Hans ten Berge, Secretary General, Eurelectric: Let’s be clear, a unified market for me is not a market where we have one price. There are constraints in the system. There are benefits in certain areas where the electricity generation would be much cheaper than in other areas. A unified market is where the transport is possible from one to the other area and, if the transport is not there, we can benefit from the local advantages or pay for the disadvantages in order to create the incentives to compensate for them. I am concluding that that is not the case if you take the national borders as the things that determine the market. I would say let’s go for where the real constraints are and make sure that locational signals are the basis for the investments. We don’t have that now. We’ve got the highest concentration of solar panels in the Black Forest, not for the sun, for the subsidies!

For California, you talked about active flexible capacity procurement and dynamic transfers. What do you intend there? Is it an organised mandatory system, for example, or a wholesale market based system?

Nancy Saracino: It’s actually a combination. One of the dynamics in California and really across the country is the capacity markets that have been designed have started to create conflicts within the states where the states are trying to control the generation resources and are concerned with the interface between federal control and state control. So, in California, since we haven’t yet designed an organised capacity market, we’re working with our state regulator to create a combination of a bilateral capacity arrangement with certain percentages of procurement going forward three years which offers enough certainty to provide for new types of resources. Then the ISO is going to develop a backstop auction and that will be a market-based mechanism to backstop the percentages that have not been procured through the bilateral arrangements that are overseen by the local state public utilities commission. So, that’s the framework that we’re working on. It remains to be seen whether we’ll be successful and it’s still in the process of development and approval through the regulatory bodies.