

McKinsey on **Electric Power and Natural Gas**



Perspectives on electric power and natural gas

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International leaders from several high-profile companies discuss the future of the wind and solar industries.

Nuno Santos

On May 23, 2008, in Lausanne, Switzerland, McKinsey hosted a conference to discuss renewable power with prominent global leaders from this industry. In one of the plenary sessions, we held a roundtable discussion of the key strategic issues confronting the wind and solar industries and were fortunate to have the presence of six of the most relevant international leaders in these two sectors. What follows is a transcript of their discussion. In parallel, for each of the questions discussed, the audience—composed of 45 international managers from the renewables industry—used electronic voting to register their responses, which are included in the sidebars to this article.

Wind: Question 1

Which regulation/remuneration models will prevail in the future (2010–15)?

- a. Current diversity will prevail
55%
- b. “Feed-in tariff” model will be dominant
17%
- c. “Green certificates” model will be dominant
21%
- d. “No subsidies” model (free-market energy prices) will be dominant
7%

Wind

McKinsey on EPNG: *What will be the most effective way for governments to promote the development of wind power? Is it going to be through mandates and green certificates or, for example, through “feed-in tariffs,” and how much longer will that support be needed?*

Carlos Gascó: Onshore wind is competitive when power prices are at €70 per megawatt and yields a nice return at around 80. So given the potential of the technology, in the long term, I believe we’ll eventually move to a system where no subsidies are needed. Meanwhile, we will continue to witness very different regulatory models across Europe and in other regions of the world, though feed-in tariffs will probably continue

to be dominant for a while. Markets that adopted green certificates are clearly taking more time to develop and introduce more uncertainty to investors.

Luis Adão da Fonseca: In the shorter term if you want to grow a market, if you want a technology, then governments and regulators are beginning to understand the importance of having long-term stability, which is best served by incentive structures like the feed-in tariff, as they give greater certainty and encourage longer-term investments.

Italy is a good example of what happens when you try to move too quickly to mandates rather than subsidies. It went too fast into the green certificate system, which

Wind panelists



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Luis Adão da Fonseca is the chief business development officer for EDP Renovaveis, where he is also responsible for markets and regulation and international special projects and investments. He was formerly CFO of the Neo EnergiaGroup.



Michael Lewis is the managing director Europe of E.ON Climate and Renewables. He has worked in the energy industry for over 15 years and was formerly the UK strategy manager for Powergen.

Wind: Question 2

How will the turbine supply market evolve in the future (2010–15)?

- a. "Suppliers' market" (OEMs with a return on invested capital greater than their weighted average cost of capital) **49%**
- b. "Balanced market" (OEMs with a return on invested capital around their weighted average cost of capital) **39%**
- c. "Buyers' markets" (OEMs with a return on invested capital lower than their weighted average cost of capital) **12%**

produced volatility that significantly hurt the growth of the Italian market. Green certificates will be important in the future, they'll probably precede a model with "no subsidies," but if you want to grow a sector, it's extremely important in the short term to provide a feed-in tariff to give stability to investors. I also agree, though—and it's why we've been growing so aggressively—that we won't need subsidies in the long run.

Michael Lewis: There are examples of certain onshore wind farms in certain markets where it is possible to operate without subsidies. For example, in Texas, which has recently experienced high marginal natural-gas prices, large-scale wind farms can become broadly competitive with the marginal generation technology, in this case CCGT.¹ But this is not true in all markets. In addition, if you look at how the European

Union will meet its renewables target, it's probably going to require a large expansion of offshore wind, which is unlikely to come down to parity with other grid suppliers any time soon.

I don't see us moving to a fully unsupported market in the near future, but over time we will see convergence to a more market-based system. Meanwhile, I believe a system based on mandates and certificates will probably become dominant, as I think it is the most efficient way of reaching the renewables targets.

McKinsey on EPNG: *The development of the wind turbine supply market will be critical to the evolution of wind power generation. Today the market is quite tight, and is often characterised as a suppliers' market. How do you see this situation over the next few years?*

¹ Combined cycle gas turbine.

Solar panelists



Dr. José Luis Arroyo is the head of strategy and corporate development at Abengoa Solar, a subsidiary of the Spanish technology group Abengoa, and one of the world leaders in concentrating solar power (CSP).



Karl-Heinz Groß is the CEO of Würth Solar, a pioneer in copper-indium-diselenide (CIS) solar cells whose technology was developed in collaboration with the Centre for Solar Energy and Hydrogen Research in Germany.



Marko Schulz is the CEO of Q-Cells International, the world's largest solar cell manufacturer.

Wind: Question 3

What will be the winning business model in wind?

- a. "Pure" operator/generator (eg, FPL Energy, EDP Renováveis) **48%**
- b. Operator with privileged suppliers (eg, Iberdrola) **40%**
- c. Integrated player (eg, Acciona) **12%**

Luis Adão da Fonseca: This is a very capital-intensive industry, and as such—especially in a very high-growth phase—is a cyclical market, in which it's very difficult to match supply and demand. We are currently in a suppliers' market and are likely to be so for the next two or three years. But given the industry consolidation that is happening, I believe it will eventually evolve toward a more balanced market. The consolidation that will probably happen on the developers' side will also help to balance forces.

Michael Lewis: We've certainly been in a suppliers' market for the past few years, not just in terms of the turbines but also particularly in offshore turbines, vessels, foundations, and cables. Looking forward, we will see growth of several hundred megawatts of new capacity over the coming few years, compared to 90 gigawatts today. That's an

enormous challenge for any industry, so I see the industry remaining tight, with bottlenecks emerging in various places.

Carlos Gascó: I'd agree it's going to be tight for a while yet, but new competition coming from Asian suppliers, particularly from China, should slowly make a difference, if they prove that their machines are reliable and cost competitive.

Michael Lewis: Of course we expect the technology to improve over time and we expect the costs to improve, but this is still fundamentally about supply and demand. Even if the cost falls, we may still see prices rise if the supplier market remains tight.

McKinsey on EPNG: *How will relationships with the manufacturers affect the shape of a successful business model for wind?*

Solar: Question 1**How large will solar energy production be compared to wind in 2020?**

- a. Solar will remain a “niche” segment (eg, less than 100 gigawatts or 10% of wind capacity)
21%
- b. Solar will grow into a substantial renewable-energy source (eg, 100–300 gigawatts or 20–40% of wind capacity)
55%
- c. Solar will grow to become a leading renewable-energy source (eg, more than 300 gigawatts, or 50–100% of wind)
24%

Michael Lewis: I would say the pure operator/generator model² will mostly prevail, but it will be a different relationship from what we’ve had in the past. I don’t see any inherent advantage for an operator owning a manufacturer. E.ON isn’t a manufacturing company. Our skills are in developing, constructing, and operating assets. Having said that, as the industry consolidates and as a few major players emerge I think we will start to see longer-term strategic relationships with a smaller number of manufacturers, which will give us some certainty regarding when we can get turbines and the price at which we can get them.

Carlos Gascó: We believe it is very important to have privileged relationships with turbine manufacturers. This can take different shapes: equity positions, long-term relationships/agreements, etc. Iberdrola has decided to own an important minority stake in Gamesa. We’re happy with this and believe it is currently the right thing to do. We would not be where we are if it was not for this. Over time, we will see what happens—this relationship can evolve in different ways.

Luis Adão da Fonseca: There’s no doubt it will be important to have these strong relationships with a few key suppliers. It’s why having long-term agreements with them is something that we think is critical for the success of the business. These privileged relationships, as we have in Portugal with Enercon, are a particular advantage as we move into new countries or projects. Overall I also believe the pure operator/generator model will prevail, as it’s the most sustainable and aligned with our core skills.

Solar

McKinsey on EPNG: *Electricity generation from solar sources starts from a much lower base than wind, so how extensive could solar generation become?*

Marko Schulz: You’re right that solar generation is currently limited. The total installed capacity around the world is only equivalent to a couple of nuclear power plants, and it’s important to bear this in mind when we talk about growth rates.

That said, solar is becoming much more cost competitive; there are at least some areas in the world—such as Italy, California, and the Middle East—where solar will soon operate at commercial prices. It will definitely be at grid parity within five years, that is around 10 euro cents per kilowatt hour, and by 2020, these costs can still go down significantly versus the levels expected for 2012–15. If we start then to see some of the cost improvements we think are possible, we should see it expanding very rapidly.

Overall, I believe solar capacity will be more than 300 gigawatts in 2020 and, by that point, almost or as important as wind.

Karl-Heinz Groß: The driving force in making solar competitive will be the price of photovoltaics. Innovative PV such as advanced thin-film technologies should lead to significant cost reductions in the near future, so that by the end of the next decade the energy production costs of PV will be level or nearly level with wind. Before that, in five years or so, I finally believe solar will reach grid parity in the most attractive markets: Greece, Italy, Portugal, Spain, etc.

²Defined here as an operator without a position or stake in wind turbine manufacturers.

Solar: Question 2**Which model will predominate: decentralized, centralized, or both?**

- a. Decentralized (photovoltaic): +70–80% of total installed capacity
38%
- b. Centralized (thermal and photovoltaic): +70–80% of total installed capacity
22%
- c. Balanced mix of decentralized and centralized (eg, 40–60% of market share each)
40%

Solar: Question 3**What will be the role of utilities in solar?**

- a. Utilities will not be key players in solar
8%
- b. Utilities will be key players only in centralized solar
38%
- c. Utilities will be key players in centralized and decentralized solar, leveraging their customer relationships and brand, either alone or through joint ventures/acquisitions (eg, system integration)
54%

Longer term, I'd be bolder, as I think using energy where it's needed—a decentralized system—is going to become increasingly important, and because of that I expect to see greater growth in PV than in wind.

José Luis Arroyo: We believe solar energy has the biggest potential of the renewable-energy portfolio and will become the leading renewable-energy solution of the future for three main reasons.

First, one of the main criticisms of renewable energy is that it's not manageable energy; it isn't practical. This isn't a problem for solar power, as we have the technology to harness it efficiently and where it is needed. Second, electricity production using solar power fits very well with the demand picture that we see—you produce electricity during the day when the sun is shining and when demand is higher. Finally, it's reliable. You can predict solar radiation with more accuracy than for other renewable resources.

Marko Schulz: I would like to stress that the potential for cost reduction along the entire solar value chain is enormous: on the cell side, on the module side, and on the installation side. For example, the industry is using a grade of silicon that is of a much higher quality than needed. Also, the installation relies significantly on aluminium, which is very expensive. Finally, in addition to technology improvements, new supply capacity, especially on the silicon/polysilicon side, will be translated in important cost reductions in the near future.

McKinsey on EPNG: Will solar generation follow a decentralized or centralized model?

Karl-Heinz Groß: Over the next few years, the centralized PV will grow faster than the decentralized, but ultimately one of PV's most outstanding advantages is the possibility of economic energy production next to the demand. Smaller plants will also be a more manageable investment, as they don't require large-grid capacities as well as infrastructure.

So I see very good chances and market potential for decentralized systems and think we will start to see wide distribution of minigrids into rural areas and smaller cities. However, in the 2020 time horizon, I believe there will be an even balance of decentralized and centralized solar capacity.

José Luis Arroyo: I think we will see a balance between centralized and decentralized systems in the future. For centralized solutions, thermal power and possibly PV will be the key technologies. For decentralized applications, PV will clearly be dominant.

Marko Schulz: If you want to grow the industry fast, you probably do it initially with large-scale installations, both CSP³ and PV, as this allows you to drive costs out of this system, but we will clearly move towards a decentralized system over time. Decentralized plants are the sweet spot for solar and where it should be most competitive in the long run.

McKinsey on EPNG: Will utilities move into this field, and what role are they likely to play in shaping the industry?

José Luis Arroyo: Let's put this simply: when solar becomes an important part of the

³ Concentrating solar power.

energy mix, it will be the utilities' business. So I have no doubt about the role of utilities in centralized generation. I'm much less sure, though, about the role in decentralized generation. In this regard, the US utilities are more advanced than the European ones.

Marko Schulz: I believe utilities will play a role even in decentralized generation because that's where their customers are. Our industry isn't just a solar-energy provider—it's a power provider, and so from a customer's perspective we are in competition with the utilities. The question for customers in the future will be, where do I get my power from? During the daytime, is it cheaper to get it from the grid or from my own roof? Our competitive advantage is that we save on the distribution and transmission costs. Whether the utilities will be able to compete at that level will be a question of execution, but I'm sure they'll try.

Karl-Heinz Groß: The utilities' strength is that they have long-term, stable customer relationships, as well as strong brands. We shouldn't underestimate that. I could imagine a totally new and fascinating marketing proposition of utilities selling rooftop systems, in combination with long-term delivery contracts from the grid. I have no doubt utilities will sooner or later play a key role in solar.

McKinsey on EPNG: *What is the utilities' perspective on this?*

Michael Lewis: I can imagine a concentrated solar production—for example, 200 megawatts connected to a grid—as being within the scope of a utility business. The more decentralized model is less certain. Selling the technology to individual customers could come within the role of a utility, but I would say it's likely to be as a value-added reseller.

Carlos Gascó: The decentralized utility might appear to be a contradiction, but ultimately wind is decentralized, and while it was initially difficult for a utility to think about wind as a major source of power production, that's been forgotten. So I don't think it's out of the question for utilities to play in solar, even in decentralized models.

Luis Adão da Fonseca: As a utility, we are trying to find a way to become a leading solar player, but we and other utilities face two major challenges. The first is cultural. As we found with wind, it's very difficult for utilities to go into these new businesses. The second challenge is to understand exactly where the utility should play in the value chain. It's not in the manufacturing; it's not even in installation. My view is that in the long run, most of the value will be very close to the consumer. ●

