

GREEN TECH



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UNCLEAR NUCLEAR

Towards new cost/benefit for energy

Any stock/sector analysis of the impact of the Fukushima crisis make us feel distinctly uncomfortable given the extent of the suffering in Japan. Nevertheless, we believe we have a duty to attempt to understand the consequences for investors.

■ Time to ask: questions investors should pose

We endeavour to rationalise an approach for investors to assess the validity of the sell nuclear/buy renewables trade and challenge long-term investment views on nuclear, its related and opposed sectors. The shift in social acceptance, not least stemming from weak transparency in the Fukushima crisis, is our starting point. Following what we perceive as a global pause for reflection, we look at the main questions around energy as a background for nuclear. We then consider questions and follow the ramifications for utilities, industrials and renewables/clean energy that we think are most relevant for a comprehensive investment view. We also look at the most important topics on a country-by-country basis. We include a range of possible scenarios for nuclear and renewables and their likelihood and implications.

■ Renewables/clean energy: don't get carried away

We suggest looking very carefully at the renewables-over-nuclear trade that has occurred with a view to reducing those names with weak business models ahead of a disappointing Q1. We prefer segments with high barriers to entry and names with strong finances and differentiated business models, namely solar upstream and offshore wind. Our strongest preference is for energy efficiency.

■ Energy solutions to gain importance: big uplift now

The industrials sector is a net beneficiary in almost any nuclear-related scenario. Its geographic diversification mitigates risk from a slowdown of nuclear in Europe or the US. New revenues might make up for lost orders in bear scenarios, and higher-spec new reactors are a bullish scenario. As Japan has lost potentially 10-20GW of nuclear generation, it will focus much more on energy efficiency in order to plug the gap. Japan may become the world's biggest energy efficiency test lab. This could bring a step change in the adoption and rollout of regulation, technologies and infrastructures.

■ New challenges for utilities

Beyond the Green Tech segment, we see still higher regulatory risk adding to already elevated risk premiums and the risk of lost earnings from reactor shutdowns. On the positive side, tightening markets stemming from less nuclear in Germany could induce a power price recovery. The French and Italian names might benefit first and foremost.

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**Fukushima has put
some fundamental
questions back in
focus...**

**... but we think
nuclear will remain
part of the picture**

**We prefer
industrials....**

Summary

Time to ask: rationalising investment views

We have found that the market has reflected the events in Japan with a strong sentiment-driven reaction. In order to assess the validity of the sell nuclear/buy renewables trade we look at the fundamental questions that we think will help investors form a short- and long-term view when assessing nuclear and its related and opposed sectors.

The accident at Fukushima has led to global reconsideration of nuclear power. The key issues are lack of clarity and transparency on the final impact of the accident and uncertainty over the future of the nuclear industry. We find that many basic questions have regained high relevance, such as the benefits and costs of energy, and that priorities have shifted to varying degrees. One will be that the assessment of energy sources may shift. We expect that the cost per kWh and carbon criteria will remain highly relevant, but that others such, health & safety and global environmental and social risks will enter the equation to a greater degree and become more relevant for an analysis of the energy sector.

We look at the questions relating to the basics of nuclear under the broad categories of energy context, politics & regulation, financing & costs and societal topics. We analyse these questions and the follow the ramifications for utilities, industrials and renewables/clean energy. We further evaluate them on a country-by-country basis for the most important nuclear-exposed countries and look at a range of scenarios for potential energy outcomes from the nuclear crisis.

We have included a number of scenarios and their consequences in our questions and investment views, notably:

- a world with unscathed nuclear, more fossil and renewables/less nuclear, and the world going green;
- the impact of full, partial or no substitution of nuclear; and
- the likelihood of these scenarios.

It is our view that in the medium term nuclear will continue to be part of the picture if the world is going to meet growing energy demand and achieve a cost-competitive, reliable and lower-carbon energy mix. But there may be scaleback to both existing and new nuclear capacity at the expense of increased renewables and thermal buildout. The impact on climate change would almost certainly be negative.

Capital goods is our preferred sector, selective on utilities and renewables

We prefer the **capital goods** sector among those that are closely and broadly related to nuclear. We see the negative impact from potential scaleback as limited, while new business opportunities could more than make up.

The sector is closely connected to the nuclear revival despite a low current revenue exposure. But it has been driven by concept and momentum investing.

The large industrials are highly diversified geographically. We therefore believe that the impact of any potential slowdown of nuclear in Europe or the US will be mitigated by other regions.

Furthermore, we see potential for new revenue opportunities in all nuclear-related scenarios. These range from new equipment and services for shutdowns, safety requirements to higher-spec new reactors.

Lastly, the sector should benefit from a renewed push for energy efficiency under all scenarios.

... and adopt a cautious, selective approach to utilities

Power prices might benefit from the situation

We would take profits on the strength in renewables/clean energy

Our utilities team is cautiously selective on **utilities**. The immediate consequence for the heavily nuclear-exposed names is increased regulatory risk adding to already high risk premiums and the risk of lost earnings from potential shutdowns and a more expensive and/or delayed or scaled-back nuclear revival.

We can see one silver lining on the horizon, though. The improvement in power prices might lead to a sustainable recovery in Europe if markets tighten in the case of the pre-1980s reactors and maybe even Brunsbüttel shutting down for good. But we suggest exposure to France and Italy rather than Germany. The power markets of France and Germany are strongly correlated, regulatory risk is arguably lower and reactor shutdowns are much less likely. Italy should benefit from rising power prices without the nuclear shutdown risk.

We would use the recent strength across the board in **renewables/clean energy** to reduce those names with weak market positions and business models. There could be significant potential upside to volumes if markets were to double in some of the more optimistic scenarios. But this prospect is still far out. Over the near term, enthusiasm may be dampened once the sector moves into the Q1 earnings season. First anecdotal market evidence suggests Q1 might be disappointing. Over the longer term, we think that there should be no illusion over the fact that the downward trajectory of subsidies won't be reversed. Structural issues in the industry (oversupply, intense competition and little prospect for improved momentum in major markets such as the US) still leave plenty of scope for volatility in the European names in particular. We prefer the energy efficiency segment within clean energy (see above) where we see positive regulatory momentum and strong industrial and financial business models.

Key investment views: Siemens, Schneider, Wacker, Concerned over Q-Cells, Solarworld
Read across outside Green tech : Areva, EDF, Enel,

Wacker Chemie (WCH GR; 2/Outperform, TP EUR175) should benefit from strong pricing on the back of fears of supply disruptions and its unique position as one of the very few global suppliers that could benefit from increasing Chinese solar buildout.

We highlight **Siemens** (SIE GR; 1/Sel List, TP EUR116) and **Schneider** (SU FP; 2/Outperform, TP EUR132) as beneficiaries of a renewed push for energy efficiency.

We are concerned that sentiment on **Q-Cells** (QCE GR, Not Rated) and **Solarworld** (SWV; Not Rated) might become more negative as a weak Q1 might reverse recent strong momentum-driven share price performance.

Beyond our Green Tech universe :

Our utilities team rates **EDF** (EDF FP; 2/Outperform, TP EUR32) looks attractive despite low visibility following its recent underperformance. **Enel** (ENEL IM; 2/Outperform, TP EUR5.20) stands out with low nuclear exposure but positive leverage to rising power prices and renewables.

Our capital goods team rates **Areva** (CEI FP, 2/Outperform, TP EUR39.60) as outperform. We think that the share price reaction was too negative and that the company should benefit from broadly sustained Asian build. Potentially higher safety requirements should bring new revenues.

IMPACT OF THE FUNDAMENTAL NUCLEAR QUESTIONS ON RELATED SECTORS, BE

Sector	Questions	Impact
Utilities	Will the short nuclear/long renewables trade unwind?	↑
	What is a future energy mix and a path thereto?	?
	What are the shares of nuclear and renewables?	↓
	What is the impact on energy prices?	↑
	What is the future of regulation?	↓
	Can nuclear be financed?	↓
	What is the true cost of nuclear?	↓
	Will capex change?	↓
	What is the impact on credit ratings?	↓
	What is an appropriate age and life for nuclear reactors?	↓
	Will there be precipitated shutdowns and if so how fast?	↓
	Will there be new conditions and obligations on existing plant?	↓
	Will life extensions be cancelled or reversed?	↓
	Will there be profit share for existing nuclear and extended lives?	↓
	Will there be new nuclear?	= - ↓
	How will public acceptance levels change?	↓
	How much delay will there be to existing applications?	↓
	Will already-granted permits be revoked or amended?	↓
	Will new applications be considered?	↓
	Are there new criteria to be considered for new nuclear?	
	How would nuclear be replaced?	↑
	How would climate change be impacted?	↑
Capital goods	Will there be order cancellations or delays?	(↓)
	How would early shutdowns affect revenues?	↑
	What is the impact of increased safety?	↑
	What does the picture look like for new reactors?	↑
	Will warranty/provision risk increase?	↓
	Will R/D budgets rise?	↓
	Will there be new revenue streams?	↑
	What other new energy opportunities may arise?	↑
Renewables/cleantech	Will renewables replace nuclear?	↑
	What is an appropriate share of renewables?	↑
	Do renewables have externalities?	↓
	Will they move into a new regulatory sweet spot?	↓
	How are renewables to be financed?	↓
	What is the impact on competitiveness and mass adoption?	=
	Is there any impact on the industry structure?	=
	Where else could new opportunities lie?	↑

Source: CA Cheuvreux

POSITIVE AND NEGATIVE INVESTMENT POINTS BY SECTOR EXPOSED TO NUCLEAR

Sector	Positives	Negatives	Comment
Utilities	Tightening power markets in bear scenarios		To benefit French/Italian names, German names impacted by shutdowns that offset
	Offshore build		Positive for UK and German projects (Centrica, SSE, RWE, E.ON, Iberdrola).
		Less nuclear	Highest earnings hit in Germany
		Higher regulatory risk	Positive impact UK, negative Germany
		More capex	Hits German and UK names
Capital goods	New revenue streams		Positive across the sector
	Renewables build		Benefits Siemens, Alstom
	Energy efficiency to gain		Benefits Schneider, ABB
		Less new build	Will impact concept sentiment and orders that are far out
Renewables/cleantech	Beneficiary from reduced nuclear		Benefits major utilities with strong renewables businesses, namely offshore wind. Positive for solar upstream and Chinese downstream names.
	Political support restored		Will only have an impact if followed by action and funding
		No reversal of downward trajectory of subsidies	Will continue as a challenge, mainly for solar
		Industry structure	Intense competition and oversupplied market in a sector in transition pressure margins

Source: CA Cheuvreux

CHEUVREUX VIEWS ON KEY NAMES DIRECTLY EXPOSED TO NUCLEAR AND CLEAN ENERGY

Name	Ticker	Rating target price	Mkt cap (FX m)	Exposure to nuclear/renewables/clean energy	Positives	Negatives	Comment
ABB	ABB US	1/Selected List, USD28	56,911	Nuclear: minimal; Energy efficiency through T&D, industry, building, utilities	Beneficiary from renewed push for energy efficiency and infrastructure build		Strong demand recovery on the way
Areva	CEI FP	2/Outperform EUR39.60	11816	Leading reactor manufacturer and service provides	Potential for share price recovery after shock reaction Potential for new revenue streams	Uncertainty over future new reactor orders	The worst is over, even when toning down our nuclear revival scenario
Centrica	CNA LN	3/Underperform, 310p	17114	1.8GW of nuclear output from British Energy / over 1.5GW of offshore wind and looking for more	Beneficiary from renewables build, rising commodities, power prices and supply margins	Nuclear exposure	
EDF	EDF FP	2/Outperform, EUR40	54430	Nuclear 75% of power generation; new build in the UK and Asia; buyout of EDF EN	Increased renewables exposure from EEN deal	Risk to nuclear, low visibility	Opportunity following recent underperformance
EDF EN	EEN FP	3/Underperform, EUR36	2880	100% renewables developer	Beneficiary from improved outlook for renewables	Weak US wind market. French solar market opportunity much reduced	No longer relevant as buyout by EDF
E.ON	EOAN GR	3/Underperform, EUR24	43742	26% of power generation nuclear (22% in Germany), 10% renewables 6GW renewables pipeline	One of the strongest utility owned renewables portfolio. Exposure to power price strength	Nuclear and German risk	Risk over nuclear and German regulation prevails
Enel	ENEL IM	2/Outperform, EUR5.20	42560	14% of power generation nuclear. 70% stake in Enel Green Power; 7% of EBITDA	Power price and renewables exposure	Some French nuclear exposure. Strained balance sheet	Risk on Italian nuclear revival but largely sheltered
Exelon	EXC US	Not Rated	27242	Nuclear 93% of generation park, Renewables 1%	Operational track record, US commitment to nuclear	Risk to new projects	Under-performance less pronounced than European names reflects US commitment
GDFSuez	GSZ FP	3/Underperform, EUR30	60859	Nuclear 16% of power generation, renewables 4%	Low carbon generation, solid BS, strong growth profile	Belgian nuclear tax	Low visibility on French gas prices will weigh
Gamesa	GAM SM	Not Rated	1817	Second largest European wind turbine manufacturer	Benefits from renewed support for renewables and stronger global growth	Weak US and European markets	Near-term visibility is low

Source: CA Cheuvreux, Bloomberg

CHEUVREUX VIEWS ON KEY NAMES DIRECTLY EXPOSED TO NUCLEAR AND CLEAN ENERGY, CONT'D

Name	Ticker	Rating target price	Mkt cap (FX m)	Exposure to nuclear/renewables/clean energy	Positives	Negatives	Comment
GCL Poly	3800 HK	Not Rated	76154	100% renewables through solar	Benefits from poly market tightness and post Fukushima price strength	Tier 2 manufacturer.	Uncertainties remain from H2 11; contract position less strong than sector benchmarks.
Iberdrola/ Iberdrola Renovables	IBE SM/ IBR SM	2/OP, EUR8.04 / 2/OP, EUR3.40	36330 / 13027	Nuclear 37% of power generation, renewables 23% of power generation, >25GW pipeline	Benefits from renewed support from renewables. Limited nuclear exposure	Oversupplied domestic power market. Weak US wind market.	Expect little inspiration while the US wind market remains weak.
Meyer Burger	MBTN SW	3/UP, TP CHF 34	1911	100% renewables through solar	Roth & Rau deal materially strengthens market position	Market leadership reflected in premium rating	High quality name, but well understood
Q-Cells	QCE GR	Not Rated	545	Fourth largest global solar cell manufacturer	Solar market might see new uplifts	Commoditised segment of the value chain	Risk of weak Q1 and margin squeeze from H2
RWE	RWE GR	2/OP, EUR63	25,809	Nuclear 20% of power generation, renewables 4.2%. 2.6GW renewables pipeline	Positive power price leverage. Improving carbon footprint.	Nuclear and German regulatory risk. Still carbon heavy.	The most exposed to German nuclear risk
Schneider Electric	SU FP	2/OP, EUR132	33492	Nuclear minimal, Energy efficiency a major revenue driver (32%)	Beneficiary from new push for energy efficiency	Risk of value-destructive expansion/acquisitions	Long-term beneficiary from energy efficiency
SMA Solar	S92 GR	Not Rated	3070	100% renewables through solar	Market-leading product with IP. Supplier agnostic leverage on growth	Driven by sentiment on German solar market	Growing international exposure compensates for Germany. But little inspiration with margin compression in 2011
Solarworld	SWV GR	Not Rated	1282	100% renewables through solar	High end product with strong brand equity	Cost structure. Exposure to German solar market	A likely survivor, but performance may reverse when margins get squeezed again
Vestas	VWS DC	Not Rated	45751	100% renewables; largest global wind turbine manufacturer	Technology advantage and growing foothold in offshore	Lack of visibility on market and earnings recovery	Uninspiring in the absence of a turnaround of the US market
Wacker Chemie	WCH GR	2/OP, EUR175	8691	>60% of EBITDA. Global market leader polysilicon	Unrivalled position in a very strong market	Wafer, exposure leaves earnings volatility	A high-quality name in almost any scenario. Highly leveraged to poly prices
Yingli	YGE US	N/R	1922	100% renewables through solar	Competitive cost structure. Growing market share and brand equity	Exposure to Italian market	A likely outperformer in most scenarios due to its strong market and cost position

Source: CA Cheuvreux, Bloomberg

CURRENT UTILITIES AND RENEWABLES MULTIPLES

	P/E			EV/Sales			P/B		
	2011E	2012E	2013E	2011E	2012E	2013E	2011E	2012E	2013E
Nuclear power generators	11.9	11.6	11.6	1.3	1.3	1.3	1.4	1.3	1.3
Wind sector	23.0	18.2	17.3	1.2	4.1	3.9	1.4	1.3	1.2
Solar sector	13.0	12.6	11.3	1.1	1.0	0.9	1.5	1.3	1.1

Source: CA Cheuvreux, Bloomberg

Repercussions of the Japanese disaster have yet to play out

Share prices reflect the view that nuclear is dead and renewables will take over

I— Time to ask

We are looking at global questions to rationalise the short nuclear/long utilities trade and whether it is sustainable.

■ Introduction: global fallout on energy?

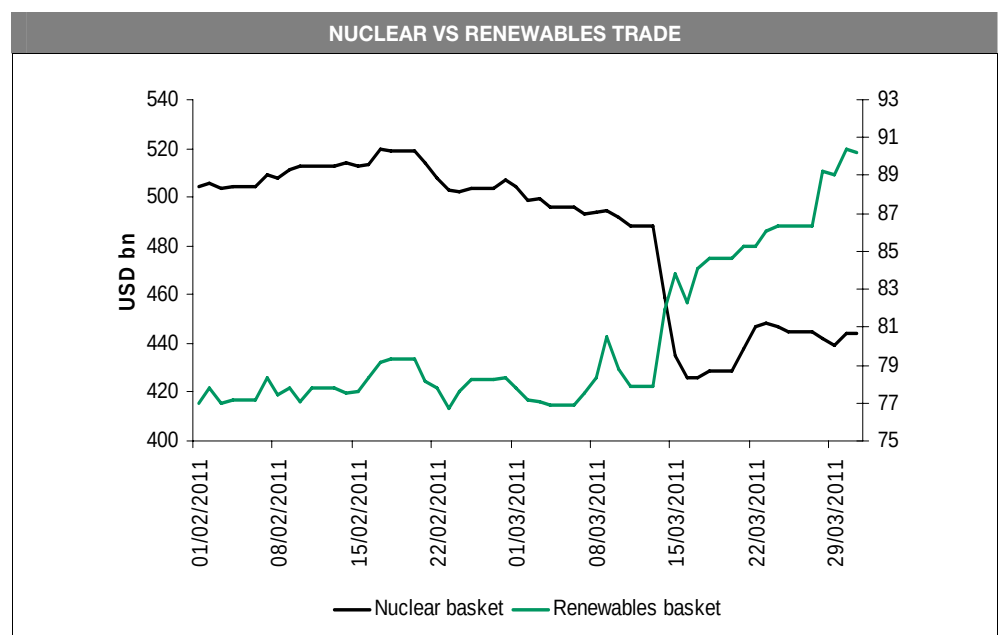
The Japanese earthquake, tsunami and nuclear incidents that have caused huge human suffering and the worst nuclear disaster since Chernobyl have led to fallout on nuclear and energy questions on a global scale. The end of this is not yet in sight and the final outcome not clear. Several weeks and months will go by during which energy will be the centre of thoughts. Policy needs to be clarified, energy mix reassessed and sustainability integrated. While all of this goes on, opinion leaders will seek to gain capital and media will bulk up the news flow. There is undoubtedly a global fallout on the energy sector. It might result in only minor tweaks, but the possibility of significant upheaval is real.

In this note we consider some of the main questions that we believe investors should ask themselves when looking at nuclear and its related sectors. Many of them are not new, but almost certainly most of them will be asked with new vigour over again and probably many more times. We will not be attempting to provide answers to all of these questions: to most of them there are no answers as yet and maybe even not for the long term. But we will be exposing the issues that will drive society's views, politics, company strategies and ultimately share prices.

We note that there is circularity between many of the topics, which is inevitable as the smaller pictures are all intertwined and form part of a very large puzzle.

■ Share price reactions send one message: is it the one and only?

Share price performance across the various sectors can be summed up as "nuclear is risky/dead" and "renewables will conquer the world". Around USD68bn has been wiped off the combined market cap of the most exposed nuclear stocks globally. Conversely, the renewables sector market cap has increased by the equivalent of USD7bn.



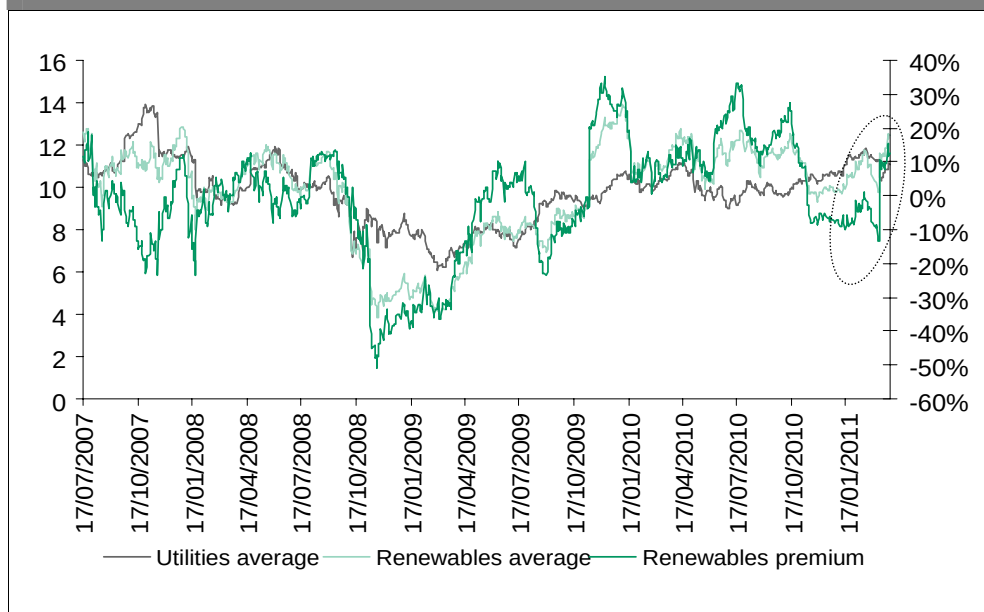
Source: Bloomberg and Cheuvreux

CURRENT UTILITIES AND RENEWABLES MULTIPLES

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Wind sector	23.0	18.2	17.3	1.2	4.1	3.9	1.4	1.3	1.2
Solar sector	13.0	12.6	11.3	1.1	1.0	0.9	1.5	1.3	1.1

Source: CA Cheuvreux and Bloomberg

RENEWABLES VS NUCLEAR UTILITIES P/E PREMIUM



Source: CA Cheuvreux and Bloomberg

We are as yet unsure of the correct stance on "sell nuclear/buy renewables"

We analyse a range of scenarios in an attempt to ascertain whether the reaction is reasonable

The renewable and clean energy sectors now trade broadly on a par with nuclear utilities or at much reduced premiums on or around 12x P/E 2012E. On average, the P/E premium of what we consider a representative renewables basket over integrated power generators has jumped 20%. With that, it has returned from a discount reflecting concerns over growth and visibility to a premium.

We are unsure at this stage whether the "sell nuclear/buy renewables" trade, the contrary or something in between will be the correct view. Hasty political statements have already been made and some decisions taken. But much more remains to be considered. There are many moving parts and major decisions that societies and policymakers will need to take. We consider the most important topics below.

What is very sure in our view is that both sectors will remain strongly momentum-driven and volatile. And news flow in both directions will certainly abound.

As a first stab though, we would suggest a scenario analysis in order to get closer to the fundamental question, which is: was this reaction reasonable?

In order to get somewhat closer to a view on this, we propose a series of questions below that we think can capture many topics that should be integrated into long- and near-term scenarios.

Societies need to ask themselves some very broad questions

How do we arrive a fair cost for energy?

II – Global questions

We are looking at global questions that govern the nuclear, renewables and broader energy sectors. For this we will consider overarching energy questions, costs and benefits, potential pathways to new energy and a range of scenarios.

■ Benefit and cost of energy

What is an appropriate cost/benefit relationship for energy?

For society as a whole, this is an overarching question which leads in more granularity to the topics that we will evoke later on. Societies must ask themselves about the benefits vs costs of energy in the broadest terms.

This means a – by no means exhaustive – list of benefit considerations such as: standard of living, economic growth, eradication of poverty, security. There is a value of energy as an enabler for all of those and other benefits that society may consider to stem from energy. We have looked at a picture of massive long-term energy demand growth into the future. The IEA currently estimates 50% growth in global energy demand between 2010 and 2035 in its reference scenario. This is where an analysis of the level required for benefit indicators and an assessment of resulting energy consumption and what level is sustainable come in.

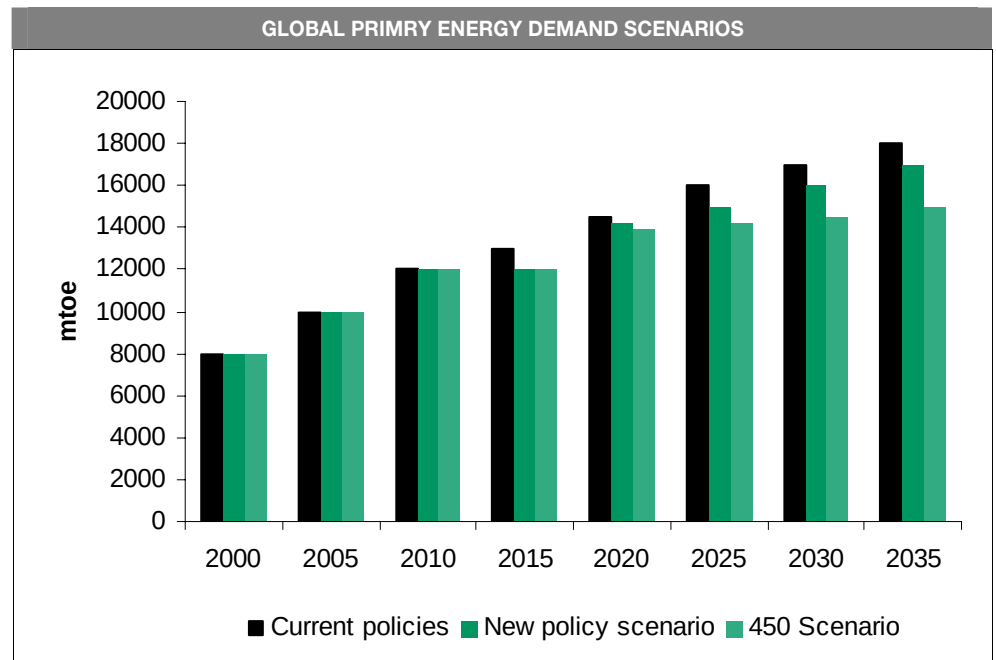
On the other side of the coin, what is an acceptable price for energy? Financial costs are the first and obvious ones. Externalities are now conceptually well understood, and the questions relating to them are cropping up. What are the relevant externalities? How will they be measured, and how reliable are those measures? How will they be put into monetary terms and through what mechanisms? Who will pay for them? What other measures will be adopted to remedy. What is the cost of energy security? The price has multiple forms: sustainability, environment, risk of other disasters, geopolitical dependency, financial cost. The trade-off between these and others will almost certainly be a constantly moving target.

We think that investors should investigate all these topics, but they might gain particular insight from considering any potential change in views and the likely speed of action from such change.

What is a pathway towards a new energy future? What is the desired one, and what is reality?

Whatever shape it may take, the future energy landscape will undoubtedly look different from the current one. Even taking that as given, there is much to reflect upon when it comes to the path to such a future. Will it be an orderly transition with prospects of great opportunity or one of lack of visibility where risk premiums in the sector will be high? Will there be externalities on the way, and if so, which ones will be accepted? How will declining sectors be offset by growing ones?

Below, we will look at more detailed questions at sector level. As with the global questions, there is a degree of circularity between all of these.



Source: IEA

Japan has dramatically highlighted of cost and risk externalities

Will the way in which energy sources are assessed change? Our view: marginally

The events in Japan have brought out the dimension of externalities of costs and risks in a renewed way, as has not been the case since Chernobyl. This could profoundly change the way in which all energy sources are looked at. In the current world, energy sources get selected primarily on the basis of their cost, contribution to supply, reliability, and forced measures such as government mandates, and regulatory targets (eg climate change). We note that many sources of energy are subsidised in direct or indirect form (pricing regulations and incentives, tax incentives, financing aids, primary resource subsidies and many more). These subsidies are driven by public views, and the allocation of them between the various sources of energy may change. This could visibly alter the global energy mix. Some sources may no longer be viable if such indirect subsidy structures change; for example, the cost of supporting nuclear may be considered too high compared with its benefits and risk.

We think that the cost criteria will continue as one of the most important as affordable, accessible and competitively priced energy is a social goal of most governments. But, we believe that a number of countries will take the approach of incorporating externalities to a greater degree in such a way that it will change their energy mix away from current baseline scenarios. But others will stick to their current way on the basis of overriding requirements for low-cost, high-volume, reliable and low-carbon energy. Globally, we see a marginal shift away from baseline towards higher renewables-content scenarios.

III – Nuclear questions

Even before the events in Japan, a raft of topics was hanging in the air. There is now more pressure to address them and complexity has certainly increased. We first look at very generic questions. We then consider those that concern the current state of nuclear and as well as its potential future development.

■ The very basics

Throughout, we attempt to structure our questions into the broad categories of:

- societal topics and public attitudes;
- politics and regulation;
- energy context and;
- financing and costs.

■ Societal topics and public acceptance

Societal issues have raised nuclear to the top of the energy agenda. We therefore treat them as a first point in our question series. We believe, however, that society eventually will consider the energy, political and regulator and financial topics with equal importance.

What is the impact and consequence on public acceptance? Our view: negative... but with potential for recovery

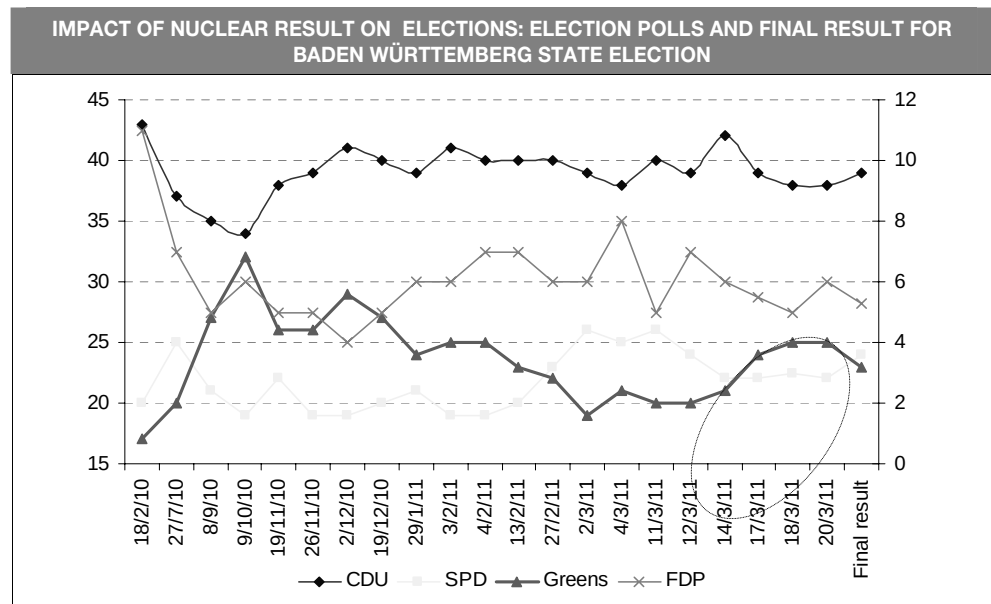
Even if nuclear were to be a part of any energy mix under all aspects of cost/benefit analyses and it could indeed be financed, kept and executed, that does not mean that public acceptance will indeed support nuclear. Often public opinion has deviated from a rational path. The Japanese events might have dented public acceptance to such a point that even if nuclear was a beneficial choice under rational criteria, those might still be overturned.

In Germany, Ms Merkel's State election debacle suggests that the green shoots of support for nuclear appear to have been killed off. Yet, a Stern poll shows that 71% of people consider nuclear necessary, but 52% want an exit from nuclear within five years. This is a 1000bp slip in support vs 2010. In France where nuclear has been seen as an asset from an energy, technology and industry standpoint, an EDF-sponsored opinion poll by TNS Sofres the week after Fukushima showed 55% of people supporting nuclear. But the Green Party claims another survey showed the opposite. In the US, support has slipped c.20-50%, but the majority of people still seem broadly supportive.

The bottom line is that the perception of nuclear has been tarnished, but at this point not to such a point as to put a complete end to it. We find that a thorough understanding of opinion leaders of all kinds and their respective strategies to influence opinions will greatly help understanding of potential dynamics.

**Public opinion is not
always rational**

Operational risk of nuclear accidents currently seen as unmanageable



Source: Forschungsgruppe Wahlen, Emnid, Infrast

What is an acceptable level of risk? Our view: accident risk is not

Nuclear is supposed to deliver reliable, cost-competitive and CO₂-free base load generation, and has an extensive track record; but that does come at the price of operational risk. The risk question is at centre stage and will in all likelihood dominate the debate all the way through. Within this context, there are follow-ons: i.e. which risks are manageable, which aren't. It seems that the consensus is that fuel and back-end risk is something that can be managed, but that the operational risk of accidents during the course of a reactor's life is seen by many as unmanageable. We take the Strasbourg city recent decision to require the closing of the Fessenheim reactor (see below, France) as indicative of such a view on a reactor where risk is certainly heightened.

What level of security will be required? How will it be enforced? Our view: tighter national regulations and stress tests

Besides some global understanding, security is down to individual countries. And the enforcement of security in particular will vary widely. Further on, rather than only asking what security will be required and where it will be most stringent, we think that share prices will inter alia move in relation to areas where the change in required security will be most important.

This may or may not answer the question of whether new security and enforcement will be the final straw, ie a deal-breaker for nuclear. Investors will then need to try to assess whether proposed levels of security will be acceptable to public opinion or whether the debate will continue to weigh on the industry even if a compromise is reached.

So far, we are seeing global safety reviews, but no formal requirements. The proposed EU stress tests are so far voluntary only but could become mandatory under EU Parliament or G-20 pressure. We think that they will look at exposure to geographic risk, and that operational risk will be captured through reactor age and reactor technology. We would expect that countries will increase safety requirements on cooling and electricity systems and become stricter on seismic and flooding exposure. We think enforcement will remain with national safety agencies.

Does the nuclear industry have an issue of perceived low transparency? Our view: yes

Reputation risk from incidents leads to minimisation

There is a constant risk that the announcement of an incident – even a minor one – may result in a huge (or even exaggerated) reaction by the media and society as a whole. This is challenging the entire industry. There are assertions that as a result private operators and authorities are driven to minimise or even conceal incidents altogether. A number of NGOs have stated for decades that the nuclear industry is covering up its real situation and denying any harmful effects that it might have. Without giving in to conspiracy theories, it is legitimate to question sector players' transparency on incidents and, given the fragility of their media credibility and the major financial, the energy and political issues that are at stake.

CONCERNS OVER NUCLEAR TRANSPARENCY

"The nuclear industry cannot afford to make any mistakes in terms of safety... It is disturbing to realise that the nuclear industry now seems to behave like any other industry, and is subject to the same defects, including non-compliance with procedures, various cuts in budgets and a lack of integrity," by Georges Charpak, recipient of the Nobel Prize in Physics.

Source: Nucleonics Weekly

The Fukushima crisis has highlighted the transparency issues

Communication around the events at Fukushima has been less than clear. Initially, it was stated that the impact was minimal. Similar communications happened after Chernobyl and Three Mile Island. However, on 12 April, the Japanese Government Commission on Nuclear Safety estimated that the amount of radioactive material released by the reactors at Fukushima at one moment reached 10,000 Tera-Bequerels per hour, de facto ranking the accident's gravity at level 7 on the international scale.

In the defence of public and communication bodies, we acknowledge that there is significant potential for underestimating and for situations to worsen as they develop. Also, level 7 on the INES international scale seems to include varying situations, not taking into account a potential difference in size or nature compared with the Chernobyl disaster.

However, the Japanese agency's communications have been more optimistic than those of other observers. It classified the accident at level 5 (the same as the Three Mile Island incident in 1979), while its French counterpart evaluated the Fukushima disaster at 6, corresponding to a "serious accident," and other observers such as Greenpeace said that it was already at level 7 in mid-March. French and American officials were concerned in March about explosion risk, decision-making between central and regional authorities and lack of restrictions on people returning to the zone.

One of the seven commissioners of the French Nuclear Safety Authority (ASN), who returned from a mission to Japan, stated in an interview with the press that technical information on the situation of the Fukushima Dai-ichi plant is not "homogeneous" according to the speaker. Commissioner Jamet also mentioned some frustration from seeing that the Japanese are so closed regarding collaboration on the management aspect of contaminated land and the radioactive risk to people. According to a newspaper article, he admitted that he had not really understood how decisions had been taken on this point, which is key to relations between central and regional authorities. He was also surprised to learn that afterwards people returned to the immediate vicinity to retrieve belongings, or pets, without there having been any restrictions in place.

Other independent nuclear scientists have publicly claimed that northern Japan (one-third of the country) is uninhabitable and should be evacuated, arguing that a number of figures provided by the Japanese administration were based on a purely theoretical analysis, and not actual tests. In addition, Japanese independent expert such as Shunichi Yama from the highly reputed Atomic Bomb Disease Institute, were refused from the government to send experts to the site

Public health liabilities

Public health issues are crucial in analysing the acceptability of nuclear technology and associated risks.

A central question about public health risks related to the Fukushima crisis concerns the potential impact of the water that has been contaminated after the operations, and the need to dispose of it at sea for it to be diluted, while continuing to water the plant. The ongoing arbitrage between the risk of fire causing hazardous and dangerous air emissions and those of the risk of marine pollution does not offer a clear explanation of the different impacts on human health and the environment related to these options.

Therefore, without necessarily sharing his view, we cite an independent expert, Dr Ilya Perlingieri, who claims that radioactive water tipped into the Japanese Pacific could reach the US West Coast.

In the absence of reliable information though, we should pay careful attention to the estimates that are circulating.

On the date this report was written, the only real piece of information available is limited to the steps taken to ban access to the most contaminated or irradiated area. In addition, there are restrictions on food, for example on green vegetables and milk from the surrounding area, which have been withdrawn from sale because of excessive radioactivity, while several foreign countries have taken steps to increase controls, or even ban Japanese food altogether. It is impossible to conclude whether this is the implementation of a precautionary procedure or a reflection of real risks.

A management problem?

A key finding that should emerge from the current investigation is that the Fukushima crisis is primarily a management problem rather than a technological one.

From this point of view, **we consider it useful and very instructive to insert the article below** that featured in Ann MacLachlan's magazine, "Nucleonics Week", and which Georges Charpak, recipient of the Nobel prize in physics, and one of the world's nuclear experts, published in the appendix to his book "From Chernobyl to Chernobyl" in 2005.

NUCLEAR ENERGY ACCORDING TO THE WARNINGS OF THE WORLD ASSOCIATION OF NUCLEAR OPERATORS

At the general biennial meeting of the World Association of Nuclear Operators (WANO) in 2004, a warning was issued: the world nuclear industry is in danger, threatened by negligence and complacency that have resulted in a number of "serious incidents" in nuclear power stations in Europe, the US and Japan over the past years.

This warning was issued by senior officials at the WANO, although the message has been further reinforced by members whose organisations had not yet made any similar comments and which, in many cases, are still suffering from the financial, social and political consequences of this state of affairs.

David Gilchrist, the CEO of British Energy (BE), Robert Saunders, the CEO of First Energy Nuclear Operating Co (Fenoc), operator of the Davis-Besse power station (State of Ohio), Hans-Josephe Zimmer, director of the Philippsburg nuclear power station (Germany), Istvan Hadnoti, safety director of the Paks nuclear power station (in Hungary), Ales John, chairman of WANO's Moscow centre, which inspected Paks and Tsunehisa Katsumata, chairman of the Tokyo Electric Power Co (Tepco), each took turns to take the floor. (...)

Amongst other things, the Wano inspection of 2001 noted "incredibly high cost pressures" while British Energy reported a negative cash flow, which began to "eclipse the management of safety".

Saunders confirmed that the good precedents in terms of operating quality at the Davis-Besse plant, coupled with the supremacy of engineers relative to other personnel at the power station had led to "arrogance and complacency...". Based on the glorious past of Davis-Besse, personnel rejected the deterioration of the plant's performance to level 2 of the IPNO scale of the American Institute of nuclear operators several years ago and "ignored" the significant operating performance from which the industry benefited. Management implemented programmes, but there was no monitoring and personnel responsible for quality control reported directly to site management, which "influenced its independence and objectivity"

Saunders and Graham Brown, CEO of Ontario Power Generation, confirmed that the plants' management had implemented the right strategies for safety, but there was no monitoring procedure. According to Brown, management now meets each week to examine the progress of Ontario Power Generation's rehabilitation plan for Darlington, and is making adjustments on the basis of "feedback from external independent experience, which is critical for routine operations".

Katsumata pointed out that Tepco's nuclear energy department had become "an homogenous and closed circle of engineers who were challenging the checks carried out by other departments, including those conducted by top management". Rules relating to maintaining equipment in service were "not clear", and did not take into account the faults that appeared as equipment aged, encouraging personnel to ignore its rules. Media attacks on problems in nuclear installations had put engineers "on the defensive" and encouraged personnel to dissimulate faults so long as they did not directly threaten safety – leading to 16 cases of falsification in inspection and repair reports on Tepco's boiling water reactors.

In addition to this, there was the behaviour of the engineers, who considered that "the stable electricity supply (was) the final purpose", which led them to take "personal decisions that were based on their own concept of safety", added Katsumata.

Apart from the initiatives that have been taken to re-write the rules, revising Tepco's code of conduct and reinforcing messages relating to safety culture, Tepco is in the process of taking different steps to regain the public's confidence, which includes organising open public information meetings. Nevertheless, several executives have recognised that this would not be easy, as many incidents, including the last episode at Tepco, have seriously eroded the Japanese public's confidence, and because the country's culture still discourages whistle blowers .

"Wasted". Nuclear power represents an important source of energy which is currently being "revitalised", even after the deregulation of the energy market in the US, pointed out Maeda. However, he warned that, "if safety is compromised due to cost cuts, or excessive pressures in terms of production, we have wasted the superiority of nuclear energy... Our safety culture, which has been compromised by pressures aimed at reducing production costs, must be put back at the centre of our concerns... Improving safety is the most direct way to reach nuclear energy production that is really profitable".

Maeda also warned that, even if the public understands that nuclear energy has advantages, "this does not mean that it is automatically accepted by the public".

Madea and others instantly requested members of the WANO to remove all barriers that would continue to block the communication of data regarding operating experiences, and to exploit data that they obtain from others. The non-submission, from a number of members, of operating reports – as requested by the WANO – has once again been criticised in Berlin. However, during a press conference, Gullberg pointed out that in Paris, which was the main laggard amongst the organisation's four centres, the number of incidents reported so far this year represented three times the number of incidents that occurred in 2002.

Even so, Sig Berg, the director general of the WANO, declared that the important thing is to know how WANO members use the information that they obtain, and that the organisation undertakes new programmes to analyse data from operating experiences and take decisions for operations.

Source: CA Cheuvreux

Should nuclear be seen as a common good?

And could it face tighter regulation?

■ Politics and regulation

What parts of the sector will be regulated or liberalised? Is there increased momentum now, driving re-regulation of the power sector?

Our view: towards more regulation

There are arguments that nuclear might be a common good as a result of large amounts of public investment that have gone into developing the technology into its current state. And by virtue of its scale, one could discuss whether nuclear is a quasi-monopolistic industry. These issues on their own bring about a debate that we are already seeing (notably in France, see below): who should benefit from nuclear being a generation source with a cost advantage now? Should the profit from past investments go to consumers or the utility that owns the nuclear assets? Should the output be made available to the broader market, ie non asset owning competing utilities, in order to facilitate equal access to competitively priced power by all supply companies? We have seen virtual capacity auctions, long-term forced PPAs between competitors and pricing interference.

Beyond nuclear, we would encourage investors to ponder whether all of this will lead to increased momentum for a broader trend of re-regulation of the power sector. It has been our view already before the Japanese events that the sector was set for increased regulation. We have been arguing this on the basis of elevated risk premiums and the need to encourage investment. What is certain now is that risk has taken another jump up.

How will mechanisms for cost recovery across the various cost components work? Our view: caps and floors

As long as the power market remains unregulated, market force should continue to govern the recovery of shorter-term components. But this brings us straight back to the previous question of whether there will be change in the regulatory landscape. As a part of that, we believe there might be more regulatory debate on the treatment of funds to cover long-term liabilities (back-end cycle, decommissioning, risk, etc). And even more fundamentally, what cost-recovery or price-allowance mechanisms will be adopted. A traditional cost plus or even RPIX system seems inappropriate considering where regulation and markets have moved to. To recall, the two primary aims of nuclear are to ensure security of supply and to reduce the carbon footprint of the power sector; on that basis we take it as our base view that long-term liabilities will not be taken on by the public in all legislations, but that floors and maybe caps will regulate pricing bands somewhere in the range of EUR50-65/MWh.

What other conditions could be imposed on utilities if they needed to strike any kind of nuclear bargain? Our view: all kinds

We have seen it happening already: nuclear concessions don't come for free. Now that sensitivity has increased, we anticipate that more will be asked of utilities wanting to operate nuclear. This may apply to existing or new nuclear. Conditions may take all kinds of shape and, as we have observed in the past, be closely related or completely unrelated to the fundamentals of nuclear itself. By this, we mean what will the operating conditions be? What about financials? Will operators have to make other concessions? We think that a very close watch will be kept on perceived excess profits, and renewables obligations be it funding or building, will increase.

Can nuclear be in private hands ? Our view: challenging times ahead.

The aftermath of the accident in Japan may well lead to the nationalisation of its most important nuclear operators, and one of largest globally. The immediate reason is that Tepco is unlikely to be able to cope with the follow-on liabilities. This could lead to a broader conclusion that the ultimate liability may be impossible to bear for the private sector. The handling of the accident has shown conflicts of interest between shareholders

and the public. For example, the point at which to sacrifice the power station in the interest of limiting the damage and potential falsifications of records. Beyond that, there is the economic issue of nuclear being a natural monopoly which may make it unsuitable for a market model. We note France's continued high government stake in EDF, which is partly justified on the basis of nuclear being a public good that should be managed by the state. All of these issues raise the question of whether there could be a broader movement towards nationalisation of nuclear.

Against things stand, the argument is that the private sector generally tends to deliver more efficient operations. Also, in most countries, the sovereign takes on the ultimate risk of nuclear accidents even though operation is in private hands; liabilities for utilities are capped. Examples on shortfallings of public institutions on transparency and adequacy of processes abound, too, and we see that as a drawback on any large organisation be it public or private.

We expect increasing questions on whether or not nuclear can be privately managed. The most obvious answer to the issue is much tighter regulation. We therefore still expect the private model to remain in place globally.

■ Energy context

What is a future energy mix and how will the pathway towards it look?

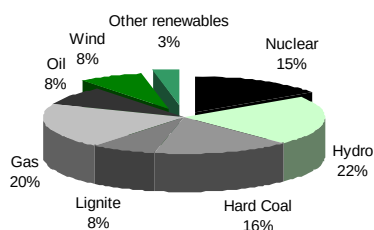
Our view: with nuclear, towards renewables, more gas

Debate set to widen

The energy mix question is an underlying constant of the sector, but it is in times of crisis that it tends to crop up with more urgency and gain more attention and impact on actual decisions. We think that in many regions, energy, and particular power generation, is already at a crossroads, and policy adjustment has become more pressing. What are the characteristics on which the energy mix should deliver? Typically, security of supply, cost and climate tend to come up, but as said above, we think that the debate will widen again to include more considerations.

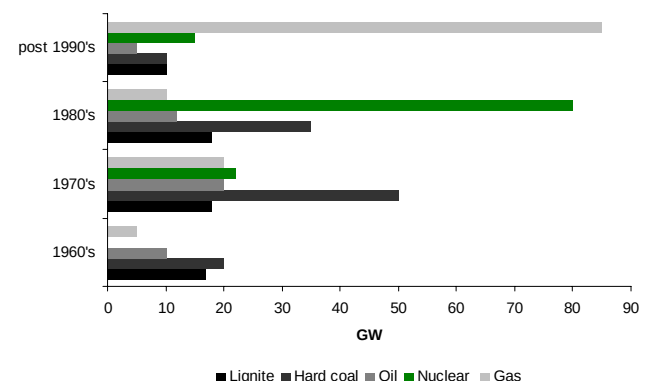
Broadly speaking, it looks as if thermal generation will diminish but remain a dominant source in most regions. Non-hydro renewables will probably account for anything between 5% to over 50% of generation, while the nuclear share will also vary widely.

CURRENT GENERATION MIX IN EUROPE



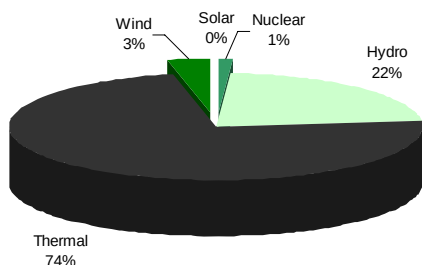
Source: Platts, CERA, RWE

SHIFT IN NEW COMMISSIONINGS IN EUROPE



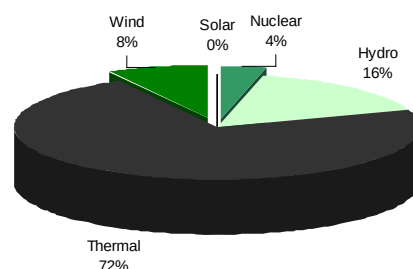
Source: Platts, Worldwatch, RWE

CHINA POWER GENERATION MIX 2010



Source: EIA

CHINA POWER GENERATION MIX 2020



Source: EIA and China Daily

ASSESSMENT OF DIFFERENT FUEL SOURCES

	Investment cost	Time to market	Generation cost	Carbon footprint	Reliability	Flexibility	Space requirement	Infrastructure requirement	Risk
Nuclear	High	Long	Low	Very low	High	Low	Low	Medium	High
Coal without CCS	Medium	Medium	Medium	High	High	Medium	Low	Low-medium	Low
Coal/CCS	Very high	Very long	High	Low	Unclear	Medium	Low-medium	Low-medium	Medium
Gas/CCGT	Low	Short	Medium	Medium	High	High	Low	Low	Low
Hydro	Medium	Short	Low	Very low	Medium	Low	Low-medium	Medium	Low
Oil	Medium	Short	High	Very high	Medium	Medium	Low-medium	Low	Low
Wind/on	Medium	Short	Very low	Very	Low	Low	High	High	Low
Wind/off	High	Medium	Very low	Very low	Low-medium	Low	High	High	Low-medium
Solar pv	High	Very short	Very low	Very low	Low	Low	High	High	Low
Solar csp	High	Short-medium	Very low	Very low	Low	Low-medium	High	High	Low
Marine/tidal	High	Very long	Unclear	Very low	Medium	Low-medium	High	High	Unclear
Geothermal	High	Medium	Low-medium	Low-medium	High	Medium	Medium	High	Medium

Source: CA Cheuvreux

Will nuclear be a part of the long-term energy mix? If so, what might its share be? Our view: 5-10% nuclear

The answer might well be very different from region to region. A global view is very unlikely. We think that nuclear will be a part of the mix, but more so in Asia than in Europe and the US.

Nuclear is the fuel source that tends to deliver the most MW in a concentrated space but also arguably the highest risk per square metre.

NUCLEAR SHARE IN GLOBAL CAPACITY

(GW)	Scenario	2008			2010			2020			2030		
		Total	Nucl.	% Ch.	Total	Nucl.	% Ch.	Total	Nucl.	% Ch.	Total	Nucl.	% Ch.
North America	Low	1 282	113.3	8.80%	1 296	114	8.80%	1 440	126	8.80%	1 568	127	8.10%
	High				1 314	115	8.70%	1 545	130	8.40%	1 807	168	9.30%
Latin America	Low	297	4	1.30%	303	4	1.30%	379	6.9	1.80%	483	10.8	2.20%
	High				311	4	1.30%	432	8	1.90%	636	23	3.50%
Western Europe	Low	780	122.5	15.70%	793	119	14.90%	880	90	10.30%	984	82	8.40%
	High				793	122	15.40%	948	131	13.80%	1 171	158	13.50%
Eastern Europe	Low	494	47.5	9.60%	498	47	9.50%	587	68	11.60%	681	83	12.20%
	High				498	47	9.50%	602	81	13.40%	775	121	15.60%
Africa	Low	118	1.8	1.50%	124	1.8	1.50%	162	2.8	1.70%	222	6.1	2.80%
	High				126	1.8	1.40%	201	4.1	2.10%	344	17	5.00%
Middle East	Low	364	4.2	1.20%	379	7	1.90%	538	13	2.50%	729	20	2.70%
	High				394	10	2.50%	639	24	3.80%	991	56	5.60%
South East Asia	Low	170			189			249			318	0	0.00%
	High				193			283	0	0.00%	411	5.2	1.30%
Far East	Low	1157	78.3	6.80%	1200	79	6.60%	1 665	138	8.30%	2 186	183	8.40%
	High				1222	80	6.60%	1 969	165	8.40%	2 822	259	9.20%
Total	Low	4 662	371.6	8.00%	4 782	372	7.80%	5 901	445	7.50%	7 171	511	7.10%
	High				4 852	380	7.80%	6 619	543	8.20%	8 958	807	9.00%

Source: IAEA

Inseparably connected with the nuclear share in the energy mix, we have to consider the other sources, and most obviously, renewables. We think it is worth sparing effort for a reflection on the potential fortunes of other conventional thermal fuels, ie coal including CCS, and gas.

Could gas be set for a revival?

Especially gas could see a revival if nuclear was to lose. It is not getting much attention at the moment but could be good for surprises. It is the least CO₂-intensive fuel after nuclear within the conventional fuel range and also efficient, flexible and fast to build. In any negative or early nuclear shutdown scenario, we would expect utilities to make up for lost capacities with gas capacity new build. As far as CCS is concerned, we find it a very difficult proposition from a cost and long-term CO₂ sustainability perspective.

But to return to the fuel that is getting all the attention as being seen at the opposite end of the spectrum from nuclear, renewables: It seems to us that it is not a question of whether renewables should be a part of the mix – they will be, whether one agrees or not – but rather:

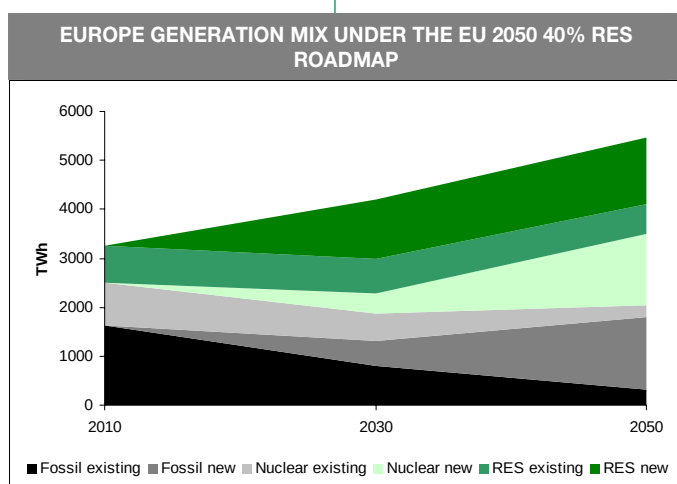
What will the share of renewables be? Our view: 20-30%

We address this topic in detail, together with a raft of follow-on, in the renewables section below. For now, suffice to say that the range of views and expectations is very wide with renewables lobbies suggesting above 50% shares and coal and nuclear lobbies saying less than 20% is viable. But most relevant to for our general reflections at this point are questions such as: what impetus will bring large-scale buildout into play? How will adequacy of the electricity system be managed? Will a climate policy be pursued? In our own view, a 20% share seems reasonable on the basis of system balancing, fuel diversification, reliability of supply and cost. Assuming that governments pursue announced policies, renewables including hydro could reasonably make up c.20-30% of global generation. But for that to happen, stronger policy momentum is required, in our view. Already for that proportion, there is massive infrastructure build requirement. For more, we see major challenges, notably: cost, system adequacy, scale and last not least political and energy consensus backing.

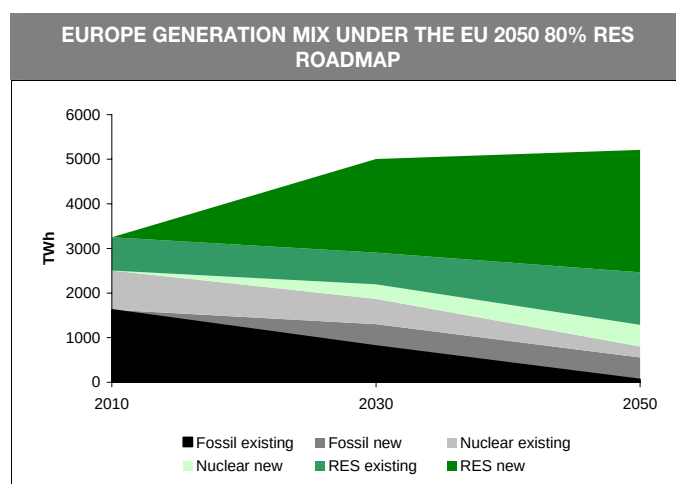
SHARE OF RENEWABLES IN VARIOUS NEW ENERGY SCENARIOS

Scenario	Global renewables capacity	Global renewables share as of capacity	Renewables generation	Global renewables share as of generation
	[GW]	[%]	[TWh]	[GW]
IEA global 2030 new policies	1704.7	21.3%	4480	16.0%
EU roadmap 200 low, RoW 20	3501.2	43.8%	9201.1	22.1%
EU roadmap 200 high, RoW 20	4392.8	54.9%	11544.3	27.7%
Nuclear lobbies implied	1065.4	13.3%	2800	10.0%
Renewables lobbies implied	5560.3	69.5%	14612.5	52.2%
Moderate progress	1065.4	13.3%	2800	10.0%
EU2020 + Current Asia targets + 15%US +12% RoW	3089.8	38.6%	8120	29.0%

Source: EIA, IEA, Roadmap 2050, GWEC, EPIA, CA Cheuvreux



Source: Roadmap 2050



Source: Roadmap 2050

Could solar overtake wind one day?

Under a global scenario of renewables (excl hydro) taking a 20-30% share we would expect that wind accounts for the highest proportion, ie 70-80%. Of that, offshore would probably be a large chunk. Solar would be the next important technology. However, solar thermal could materially change the balance between wind and solar. If solar thermal becomes viable from a cost standpoint, and some of the large desert projects can be made viable under the criteria of reliability of host countries, infrastructure buildout, cost, political cooperation and regulation, they could well account for a greater share than wind. We would not assume more than a 5-10% share for all other technologies combined.

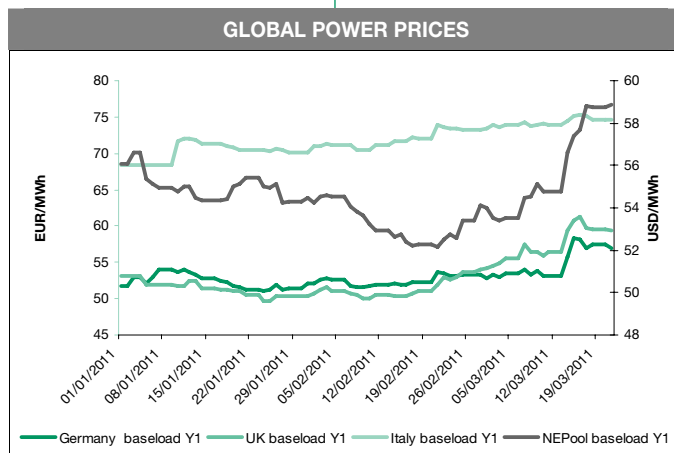
POTENTIAL SHARES OF RENEWABLE TECHNOLOGIES AS OF TOTAL NEW RENEWABLES BUILD

	Wind Onshore	Offshore	Solar PV	CSP	Geothermal	Biomass	Others
Cheuvreux Offshore wins	25%	40%	20%	10%	2%	1%	2%
Cheuvreux Solar thermal wins	20%	25%	15%	35%	1%	1%	3%
Solar lobby implied/IEA 32% 2030	12%	14%	65%	6%	1%	1%	1%
Wind lobby implied/IEA 32% 2031	35%	53%	6%	5%	1%	1%	0%

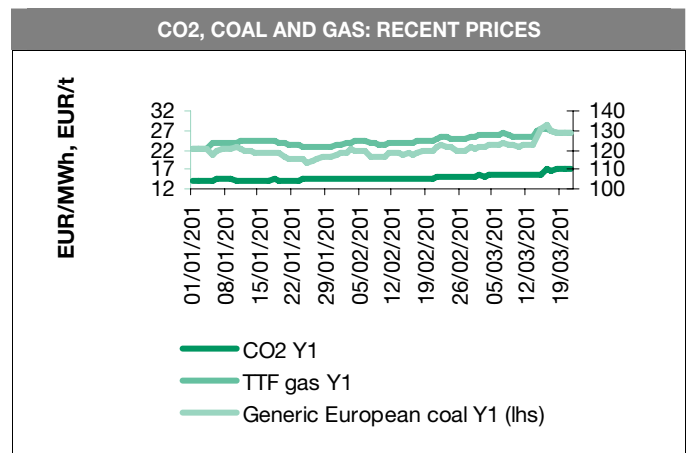
Source: EPIA, GWEC, CA Cheuvreux

What is the impact on energy prices of nuclear integrated and nuclear-free scenarios? Our view: power prices will rise

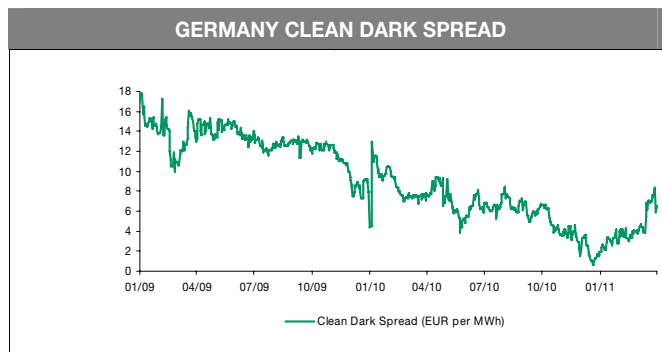
We have seen a massive bounce in electricity prices as an immediate reaction to the Japanese events. Answers covering a short-term view will depend on whether any nuclear-related action might be taken and how immediate it might be. At this moment, reserve margins in Europe are at very comfortable levels. But despite that, there is an impact from carbon prices as even a short-term mix might get more carbon-intensive. We have already seen a 10% increase in CO₂ prices in the immediate wake. If there was a shift away from nuclear, fossil fuel generation would inevitably increase, thereby pushing up CO₂ prices, probably above the EUR20/t mark.



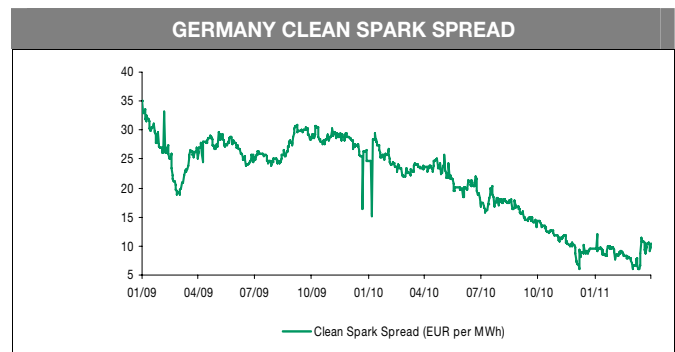
Source: Bloomberg



Source: Bloomberg



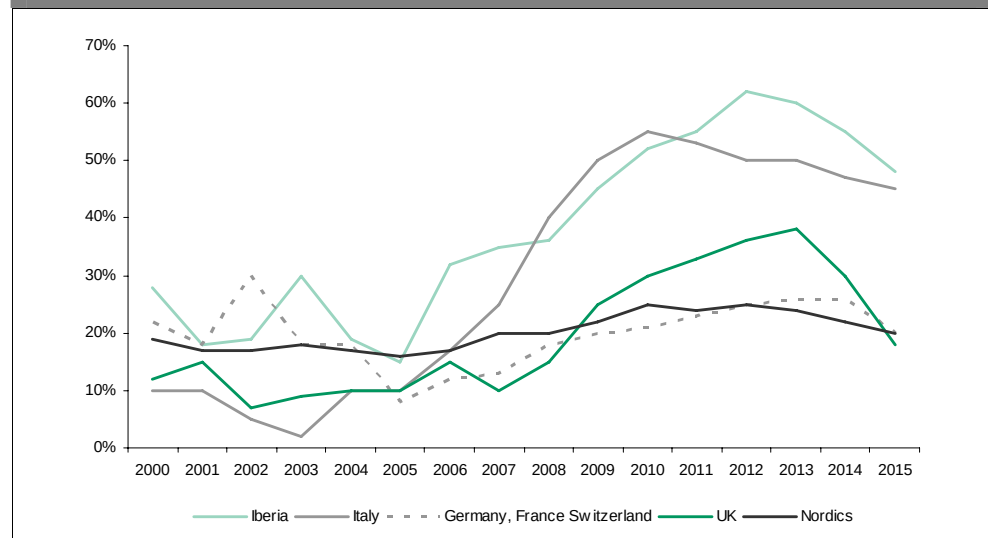
Source: Bloomberg



Source: Bloomberg

Another profound impact will come from the potential change in reserve margins as the prime electricity price driver. When will they tighten again, ie fall below 15%, and where? Our analysis suggests that the German reserve margin would drop from 20% to 10% if the seven reactors that have been temporarily closed were shut down for good. Such a change should result in a sustainable increase in power pricing in order to reflect marginal new entrant costs, ie a move firmly above the EUR60s mark. Conversely, for the UK, we would estimate a reserve margin impact sub 8% and still an over-supplied market if the two new build projects that are not yet approved were never to get approval. But a revival of gas leading to a second dash for gas would drive up UK power prices nevertheless.

RESERVE MARGINS IN EUROPE: CURRENT BASE CASE



Source: CA Cheuvreux

What follow-on effects will the various energy price scenarios have? Our view: cost of energy back into focus, energy efficiency to rise

In function of the price scenarios that we will be looking forward to, there is a raft of other impacts within related energy sectors. Relative economics of renewables will improve. For that, we would need to see a prospect of prices north of EUR70/MWh, according to our calculations. Energy affordability may move up the agenda with all of its impacts on regulation. Based on precedence and anecdotal evidence, we would expect affordability and competitiveness of electricity to become a significant issue once wholesale prices go over EUR60/MWh. That in turn may lead to measures such as utility levies, but also toning-down of renewables targets and subsidies. Energy conservation and efficiency might see another boost. We expect to see a further push of new efficiency regulations. But beyond that, assuming that we return to an environment of rising energy prices, there should be plenty of economic incentive for companies and residential consumers to adopt energy-efficient products. Again, there is circularity here as different energy price scenarios may influence answers to some of the other questions relating to costs, energy mix, investment signals, where investment will come from, acceptance and the like.

Irrespective of whether or not this is sensible from an energy mix point of view, there are major topics that can make or break nuclear. We address them in the following sections.

■ Financing and costs

Can it be financed? Our view: only if the framework is right

Nuclear involves one of the longest horizon investment decisions. From planning to end of life, the investment horizon that utilities are considering can be in excess of 60 years, depending on plant lifetime. Decommissioning adds to that. The investment cost is enormous (see below).

Will private debt financing be available, and on what terms? Will other, including public, funding be available? Current public balance sheets look even more strained than corporate ones in some cases. Where might governments, if they are willing and able to provide funding, make arbitrage decisions? Would other energy sectors be impacted (eg renewables, oil/gas)? Will utilities be able and willing to finance it?

Nuclear involves investment horizons of 60 years and more

Much depends on policy security and a very long-term, if that is at all possible, commodities outlook. To our knowledge, the major utilities are not prepared to make long-term bets on commodities. Utilities are slowly coming out of a massive deleveraging process, which has repaired their balance sheets. But, to get a better view, we think it very worthwhile to stress-test their balance sheets to ascertain how much nuclear they could potentially build. If it comes out that capital increases would be required, the financing question reverts to the regulatory question: politics and regulation will need to provide a framework of long-term visibility. Even though this is the case anyway, it is even more important when new money needs to be raised.

FINANCES OF MAJOR UTILITIES WITH NUCLEAR AMBITIONS

	Net economic debt [Eur m, company definition, published]]	FFO [Eur m]	EBITDA [Eur m]	Last published net debt/EBITDA	Target net debt/EBITDA	Outlook / other targets	Cheuvreux net debt/EBITDA 2015E
E.ON	44,941	9,161	10,809	4.2	2.8-3.3x	min Eur 2.6bn divi payout; flat EBITDA	2.6
RWE	28,717	7,849	10,256	2.8	<3.0	50-60% payout; EBITDA -15%, net debt >3.0x 2011	3.0 pre disposals, 2.5 post disposals
GDFSuez	33,800	12,200	15,100	2.2	<2.5	DPS growth, EBITDA Eur 17-17.5bn	1.3*
EDF	34,400	11,446	16,623	2.1	2-2.2x	4-6% EBITDA growth	1.95*
ENEL	44,924	1,062	17,480	,3	<2.0	3.5% EBITDA CAGR, 6.6% EPS CAGR 2015, 60% payout	2.0

Source: Company data, CA Cheuvreux * Bloomberg

GLOBAL SOVEREIGN FINANCES

Country	Debt [fx,MM]	S&P	Moody	Fitch	Def %GDP	Debt as %GDP
Greece	464 070	BB+	B1	BB+	-15.4	144
Ireland	138 149	A-	Baa1	BBB+	-14.4	94.2
United Kingdom	1 648 023	AAAu	Aaa	AAA	-11.4	76.5
Spain	899 869	AA	Aa2	AA+	-11.1	63.4
Portugal	199 106	BBB	A3	A-	-9.3	83.2
United States	9 158 018	AAAu	--	AAA	-8.6	58.9
France	1 783 949	AAAu	Aaa	AAA	-7.5	83.5
Japan	10 709 088	AA-u	--	AA	-7.32	225.8
Belgium	443 268	AA+u	Aa1	AA+	-6	98.6
Netherlands	441 564	AAAu	--	AAA	-5.4	64.6
Italy	2 227 620	A+u	Aa2	AA-	-5.3	118.1
Austria	267 170	AAA	Aaa	AAA	-3.5	70.4
Germany	1 702 886	AAAu	Aaa	AAA	-3	78.8
Denmark	145 252	AAA	Aaa	AAA	-2.7	46.6
Finland	107 961	AAA	Aaa	AAA	-2.5	45.4
Canada	607 386	AAA	Aaa	AAA	-2.09	34
Hong Kong	93 804	AAA	Aa1	AA+	-1.88	18.2
Sweden	150 747	AAA	Aaa	AAA	-0.9	40.8
Australia	188 586	AAAu	Aaa	AA+	-0.39	22.4
Iceland	17 926	BBB-	Baa3	BB+	0.58	123.8
Switzerland	106 414	AAAu	--	AAA	1.13	38.2
New Zealand	44 032	AA+	Aaa	AA+	3.16	25.5
Singapore	110 722	AAAu	--	AAA	7.64	102.4
Norway	89 627	AAA	Aaa	AAA	9.52	47.7

Source: CA Cheuvreux

What is the true cost of nuclear? Our view: EUR50-70/kWh

It seems to us that the full cost of nuclear is far from clear. This goes for existing and new nuclear. Below we look at the key elements that go into the reflection:

What is the capital cost of new nuclear?

As the nuclear revival began, early indications were that the capital cost was around EUR2000-3000/kW, which could under the assumption of serial build and standardised architecture lead to a generating cost of around EUR34MWh. EDF has subsequently raised its estimate towards Eur 3300/kW and EUR54/MWh. The latest European capex budgets are almost without exception in excess of EUR3000-3500/kW. The Chinese nuclear commission targets around USD1000/KW for the long-term construction cost for its most advanced designs once they get standardised from 2017. But some high-end estimates in the US range well above USD7000/kW. Judging by the time and budget overruns so far, we would suggest that the last word hasn't been spoken yet. The full capital cost will impact financeability, relative competitiveness and thereby potential buildout of other sources including renewables. It will also impact one's view on whether policy measures will be introduced in order to complement power prices as an incentive for investment. As a first central scenario, we suggest a build cost of EUR3500-4000/kW.

NUCLEAR CAPITAL COSTS FOR GENERATION COST ESTIMATES AND CURRENT PROJECTS

Capital cost	[Eur/kW]	Cost ranges						Finland EPR latest	Flammantville 3 EPR original	Flammantville 3 EPR latest
		3500	3500	2500	2500	5000	5000	3600	2400	3300
Life time	[years]	50	60	50	60	50	60	50*	50*	50*
WACC		5.5%	7.5%	5.5%	7.5%	5.5%	7.5%	6.0%	5.5%*	n/a
Implied new entrant	[Eur/MWh]	46.3	49.6	35.7	38.0	62.2	66.9	50	34	54

*Cheuvreux assumption for cost calculation and depreciation before any life extension

Source: CA Cheuvreux, company data

What is the decommissioning cost?

The answer only exists in estimates and we feel the topic is well understood and won't swing the debate at this point. It may come up in the debate again, though, if and when there is a discussion on how competitive nuclear is and how it should be financed. Current decommissioning cost estimates range between USD200 and USD500/kW. Considering the size of new reactors is typically more than 2GW, this means a decommissioning cost probably in excess of USD600m per plant. In the table below we show a sensitivity of decommissioning costs for different lifetimes and discount rates. To this should be added site rehabilitation costs and probably other ancillary costs.

NUCLEAR DECOMMISSIONING COST SENSITIVITIES

Assumed decom cost	[USD/kW]	350	350	350	350	350	350	350	350	350
Lifetime	years	40	50	60	40	50	60	40	50	60
Discount rate		5%	5%	5%	6%	6%	6%	6.50%	6.50%	6.50%
NPV for 3GW reactor yr 1	[USD m]	181	116	75	123	72	42	85	45	24
NPV for 3GW reactor yr 20	[USD m]	435	280	181	360	211	123	298	159	85

Source: CA Cheuvreux

NUCLEAR DECOMMISSIONING COSTS

Country:	Location:	Reactor type:	Operative life:	Decommissioning phase:	Dismantling costs:
Bulgaria	Kozloduy NPP-1,2,3,4	PWR VVER-440	Reactors 12 closed in 2003,	De-fuelling	?
		(4 x 408 MWe)	reactors 3,4 closed in 2006		
			(Closing forced by European Union)		
East Germany	Greifswald NPP-1, 2,3,4,5	VVER-440 5 x 408 MWe		Immediate dismantling (underwater cutting)	(~ \$ 330/kWe)
East Germany	Rheinsberg NPP-1	VVER-210 70–80 MWe	24 years (1966–1990)	In dismantling since 1996	(~ \$ 330/kWe)
East Germany	Stendal NPP-1,2,3,4	VVER-1000	Never activated	NOT radioactive	(?)
		(4 x 1000 MWe)	(1st reactor 85% completed)	(Cooling towers demolished with explosives)	(Structure in exhibition inside an industrial park)
Russia	Mayak ^[55] (Chelyabinsk-65)	PUREX plant for uranium enrichment	Several severe incidents (1946–1956)	?	?
Russia	Seversk ^[56] (Tomsk-7)	Three plutonium reactors Plant for uranium enrichment	Two fast-breeder reactors closed (of three), after disarmaments agreements with USA in 2003	?	?
Slovakia	Mochovce NPP-1,2	VVER 440 2 X 440 MWe	(1998–2028?)	?	
Ukraine	Chernobyl NPP-4	RBMK-1000	? years	ENTOMBMENT	Past: ?
		1000 MWe	WORST NUCLEAR ACCIDENT IN ALL HISTORY: hydrogen explosion, then graphite fire (1986)	(armed concrete "sarcophagus")	Future: riding sarcophagus in steel
Canada (Québec)	Gentilly-1	CANDU-BWR	180 days	"Static state" since 1986 ^{[4][5][6]}	stage two:
Canada	Pickering NGS	250 MWe	(between 1966 and 1973)	Two units currently in "cold standby"	US \$ 25 Million
(Ontario)	Units A2 and A3	CANDU-PWR	30 years	Decommissioning in 2012?	\$ 270–430/kWe
USA	Fort St. Vrain	8 x 542 MWe	(from 1974 to 2004)	Immediate Decon	\$ 195 Million
		HTGR (helium-graphite) 380 MWe	12 years (1977–1989)	SAFSTOR: 5–10 years	?
				completion 2018	(\$ 200–500/kWe)
USA	Rancho Seco	Multiunit: PWR 93 MWe	12 years (Closed after a referendum in 1989)	Post-Defuelling Phase 2 (1979)	\$ 805 Million (estimated)
USA	Three Mile Island 2	Multiunit: 93 MWe PWR	INCIDENT: core fusion (in 1979)	Decon completed	
USA	Shippingport	(The first BWR) 60 MWe	25 years (closed in 1989)	dismantled in 5 years (first small experimental reactor)	\$ 98.4 Million
USA	Trojan	PWR 1.180 MWe	16 years (Closed in 1993 because nearby to seismic fault)	SAFSTOR: (cooling tower demolished in 2006)	
USA	Yankee Rowe	PWR 185 MWe	31 years (1960–1991)	DECON COMPLETED - Demolished (greenfield open to visitors) [13]	\$608 million with \$8 million per year upkeep
USA	Maine Yankee	PWR 860 MWe	24 years (closed in 1996)	DECON COMPLETED - Demolished in 2004	\$ 635 Million
USA	Connecticut Yankee	PWR 590 MWe	28 years (closed in 1996)	Decon - demolished in 2007 (greenfield open to visitors) [17]	\$ 820m
USA	Exelon - Zion 1 & 2	PWR - Westinghouse 2 x 1040 MWe	25 years (1973–1998)	Safstor-Energy Solutions	\$ 900–1,100m
			(Incident in proceedings, abandoned because of the excessive cost of vaporizers substitution)		
China	Beijing (CIAE)	HWWR 10 MWe (multipurpose) (Heavy Water Experimental Reactor for the production of plutonium and tritium)	49 years (1958–2007)	Safestore & Decon in	proposed:
				20 years (until 2027)	\$ 6 Million for dismantling \$ 5 Million for fuel removal
North Korea	Yongbyon	Magnox-type (reactor for the production of nuclear weapons through PUREX treatment)	20 years (1985–2005)	SAFESTORE:	
			Deactivated after a treaty [23][24]	Cooling tower dismantled	?
Japan	Tokai-1	Magnox (GCR) 160 MWe	32 years (1966–1988)	Safestore: 10 years then DECON until 2018	estimated cost: Yen 93 Billion
India	Tarapur-1,2 (Maharashtra)	2x BWR 160 MWe	40 years ? (1969–2009?)	NOT deactivated	?
India	Rawatbhata Atomic Power Station-1,2 (Rajasthan)	1x PHWR 100 MWe	40 years ? (1970–2011?)		
		1x PHWR 200 MWe			
		(similar to CANDU)		NOT deactivated	?

Source: World Nuclear Organisation

NUCLEAR NEW ENTRANT COST ESTIMATES FOR VARIOUS ASSUMPTIONS

Capital cost	[nits]	3500	3500	3500	5000	5000	5000
Life time	[years]	40	50	60	40	50	60
WACC	%	6.50%	7.50%	##	6.50%	7.50%	7.50%
Fuel & O&M	[EUR/MWh]	8.8	8.8	8.8	8.8	8.8	8.8
Capital costs	[EUR/MWh]	42.0	47.4	46.0	60.1	67.8	65.6
Total new entrant cost	[EUR/MWh]	51.6	56.9	55.3	69.6	77.2	75.0

Source: CA Cheuvreux

Is nuclear really carbon-free?

What are the other hidden costs (benefits) and how can they be quantified?

Other than the large obvious capital costs, we would urge investors to carefully consider potential other hidden costs. Some might be easy to quantify, for example, carbon. Nuclear is commonly seen as carbon-free. But things might look different under a "construction to home" approach, when considering the large quantities of carbon intensive steel and cement that go into nuclear plants. Some of those elements are shown in the following table:

HIDDEN CO2 COSTS OF NUCLEAR PLANT

Steel consumption	mt	40
Concrete consumption	mm3	190
CO2 Steel	mt	80
CO2 concrete	mt	57
Total new plant construction emissions per 1 GW	mt	137
Average CO2 per MWh over plant lifetime under 50 year assumption	kg/MWh	282
Implied CO2 cost per MWh at current market	Eur/MWh	4.22

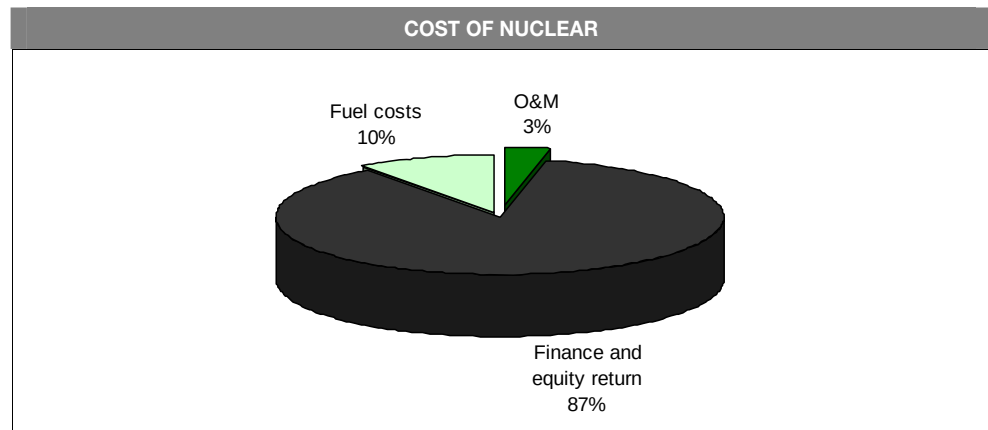
Source: CA Cheuvreux

Beyond that there are the harder-to-quantify elements: health & safety, operational risks, security risks related to criminal or terrorist activity. Conversely, job creation is often quoted as a strong benefit in regions close to plants. The balance of these elements has in our view tipped towards a greater focus on risk. That may well influence the context and criteria under which the sector is assessed. Beyond that, it may lead to a changed perception of the energy sector as a whole; ie one that takes greater account of hidden costs and risks.

Has the cost base changed as a result of higher future security-related opex? Our view: yes

Safety-related opex set to rise

There might be a minute fraction of resources in the overall scheme of things that has to be devoted to incremental security. But it may also be that measures and control requirements are such that there is a notable swing in opex for utilities. Even though no EU wide mandatory stress tests have been introduced as yet, we would expect increased safety spend across the sector. We estimate that current O&M costs account for something above 10% of nuclear generation costs. So even for a sizeable increase, we do not think that there will be a material P&L impact on operators.



Source: CA Cheuvreux

Will capex change? Our view: it will go up

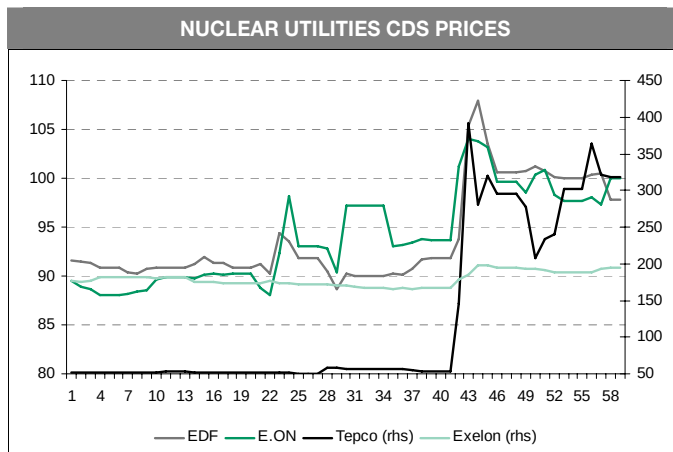
In our view, it is wise to consider growth and maintenance capex. Growth capex might need to rise because higher specifications are likely to be required before new plants are approved, and maintenance capex could come from more stringent regulation. Safety is the responsibility of the operators of plant, and there could be higher ongoing safety requirements, especially if "stress tests" become a regular feature. So far, we consider a 10% increase in maintenance capex as a reasonable base scenario. But there could also one-off shocks resulting from the immediate revisions that plants already have to undergo. Returning to our question above, what is the capital cost of nuclear?

What is the impact on credit ratings? Our view: negative

The utilities sector, which in many cases is already on the edge with its metrics vs target credit ratings, has just taken another hit. The impacts are manifold. We think that the most important topics from the credit rating point of view (and thereby potential risks or not of capital increases again) will be: Accident risk and by how much the cost of finance will increase. Even if the status quo is maintained, one must ask whether rating agencies will amend their methodologies or add new criteria, or whether the measures already taken will push some companies into issuing issue capital.

All these factors could have repercussions on new build if they impact companies' cost of financing, and thus ability to build, and/or the overall cost of new nuclear. The impact on ratios of potential earnings loss vs loss of liabilities in the case of shutdowns of existing capacity will likely be on balance negative. Conversely, will there be an impact from decommissioning obligations coming in much earlier, and if so how significant will it be? In any new build, changed capex and liability assumptions might influence long-term ratings.

S&P and Moody's have unsurprisingly downgraded Tepco (9501 JP, Not Rated) on its cleanup costs. The rating agency has also said that utilities considering new build could see an impact on their ratings. Besides the delays and budget overruns, which are nothing new, a report by Moody's after the Fukushima event mentions public reaction to nuclear plants and safety risks. However, it also notes the potential for positive impact from future stable cash flows. S&P also said that the events could have "far-reaching consequences".



S&P RATINGS CRITERIA FOR UTILITIES AND NUCLEAR

	'A'	'BBB'	'BB'	Criteria for nuclear technologies	
Pretax* interest coverage (x)	4.0 to 6.0	3.0 to 5.0	2.0 to 3.5	Licensing certainty	Construction record
FFO interest coverage (x)	5.5 to 8.0	3.5 to 5.5	2.5 to 4.0	Capital costs	Future operating risk
FFO to total debt (%)	30 to 45	20 to 35	10 to 20	Fuel & OM	Commercial track record
Total debt to total capital (%)	20 to 30	30 to 45	35 to 50	Theoretical lifetime costs	

Source: S&P

Defining the useful life of reactors

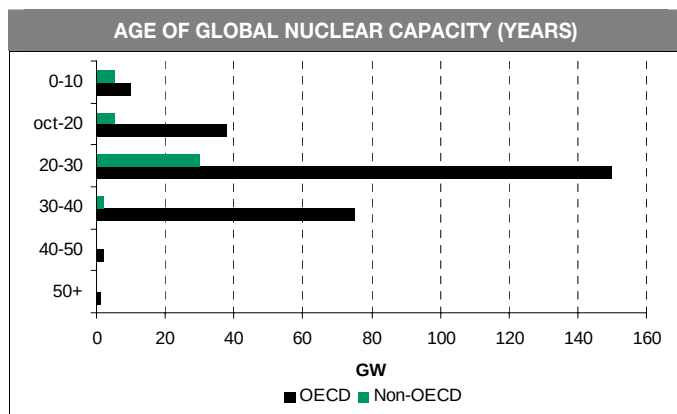
■ Taking stock: existing nuclear

Moving towards the current state of play, we now contemplate issues that surround the nuclear park as it stands and where it might go next.

What is an appropriate age and lifetime for nuclear reactors? Our view: 50-60 years

There has been discussion over reactor lifetime in many countries, usually at times when life extensions are on the agenda. The debate over an appropriate useful life of reactors will certainly recur within the current broader nuclear discussion. Here we would anticipate questions such as: should there be legislation on useful lives? Should there be hard closures irrespective of operating criteria? When do economics in favour of life extensions tip into longer lives becoming a liability? What parameters will determine a reactor's safe and useful life?

Many reactors were originally designed for 30-40 years, but life extensions have prolonged this well above 45 years, in some cases up to 60 years. French reactors were originally planned to have a lifetime of 40 years in an underlying assumption. But every 10 years, there is a thorough inspection of each reactor and a subsequent decision on whether the reactor can operate for another ten years. This can mean much more than 40 years of life. Belgian reactors were meant to close after 32 years. German reactors are on average about 30 years, and the phase-out implied an average age of 32 years but 14 years life extension on top of that according to the life extension deal. British reactors were originally licensed for 30 years, but will be older than 40-45 years post life extensions. Japanese reactors are also heading towards 40 years and above. US reactors are initially licensed by the Nuclear Regulatory Commission (NRC) to run for 40 years with an allowance for 20 year life extensions from the outset and under a well defined approval process. Russian reactors are approaching 40 years and above by now.



REACTOR AGE IN VARIOUS LEGISLATIONS

Country	Current typical lifetime	Determination
France	40 years initial licence	10 yearly inspections
Germany	32 years	Legislation; safety checks
Belgium	32 years	Legislation
UK	30 years	Safety clearance for 5-10 extensions
US	40 years plus 20 years extension	NRC license
Japan	40 years licence, 10 years extension	Government licence
Russia	30 years	Government authorisation; Rosatom decision; Environment clearance; upgrade requirement for 15 year life extensions
China	old reactors 40 years, current projects planned for 50-60 years	Government determination

Source: Various regulatory and internet sources

As said above, we think that the issue of reactor lives will come up in global safety reviews. For existing plant, a 50-year lifetime is in our view a reasonable baseline assumption, even though in some regions, we would assume shorter lives, notably in Germany due to political pressure rather than anything else.

Will there be precipitate shutdowns? How fast could they come? Our view: likely but not that many

The thought immediately springs to mind that nuclear capacity could be taken out of service right away. Certainly, some politicians have called for that. Precipitate shutdowns can take all forms, from wholesale exits from nuclear to early shutdowns and phase-outs. More precisely, parts of generation fleets could get shut down before their planned decommissioning dates, eg older or problem reactors. And new programmes for exits from nuclear could come under discussion or get passed. Moreover, we might even see unexpected shutdowns of fully functioning younger reactors.

In our view, early shutdowns are unlikely in Europe, except in Germany (see our country-specific section below). The same goes for the US and Asia, with the exception of Japan. But even there, we doubt that there will be an extensive shutdown programme, given the likely disruptions to electricity supply that it would cause in an already disturbed economy.

Will existing plant face new conditions and obligations? Our view: yes

Even when assuming status quo on plant life, utilities might still see new requirements for their nuclear plant, and these might be completely disconnected from the actual nuclear facts (eg renewables funding, etc). On an operational basis, authorities might change inspection intervals, maintenance and control parameters. The probability of more frequent inspections and tighter maintenance is high, in our view, and might lead to lower nuclear availability. This could impact load factors by around 1%.

Will life extensions be cancelled or reversed? Our view: likely

Life extensions of the existing fleet have been a part of the nuclear revival and in some regions they are something of a preliminary step that could lead to future new build. In regions where nuclear is part of the current generation park but where there is no commitment to new nuclear, there might well be renewed critical thinking about potential, pending or already approved life extensions (see Germany below). It could also be that they will be delayed or coupled with new obligations. If life extensions are kept up, they might be shorter, subject to increasingly frequent re-evaluations and/or new taxes, levies or contributions to anything else imaginable. It may or may not be cynical to suggest that some governments might detect an opportunity to plug some funding gaps.

The German exception

The greatest risk in our view to life extensions is in Germany and Japan. In the UK, we expect some projects to be delayed for some months but then to eventually go ahead.

Will there be a share of profits for existing nuclear and extended lives?

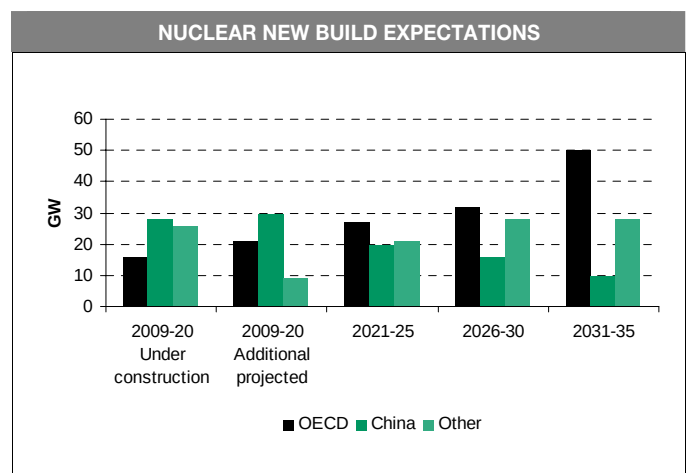
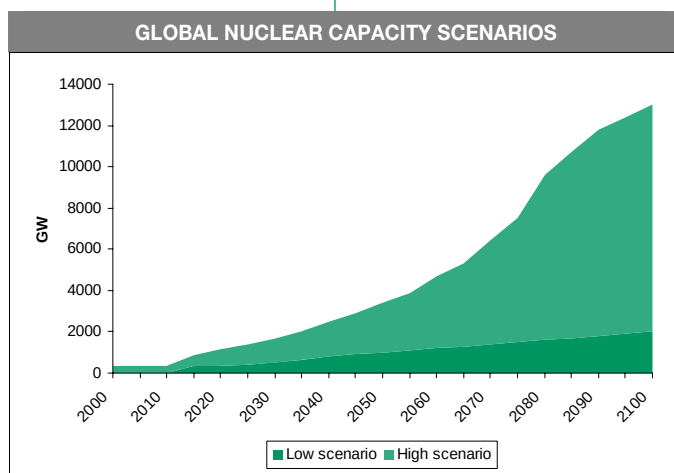
Our view: yes

This ties in closely with the point above. We have already seen that the benefit of life extensions is being shared between utilities, the public hand, other energy sources and consumers. Utility risk premiums will remain high while investor ponder the question of how much profit share there will be, if any, if parameters are changed.

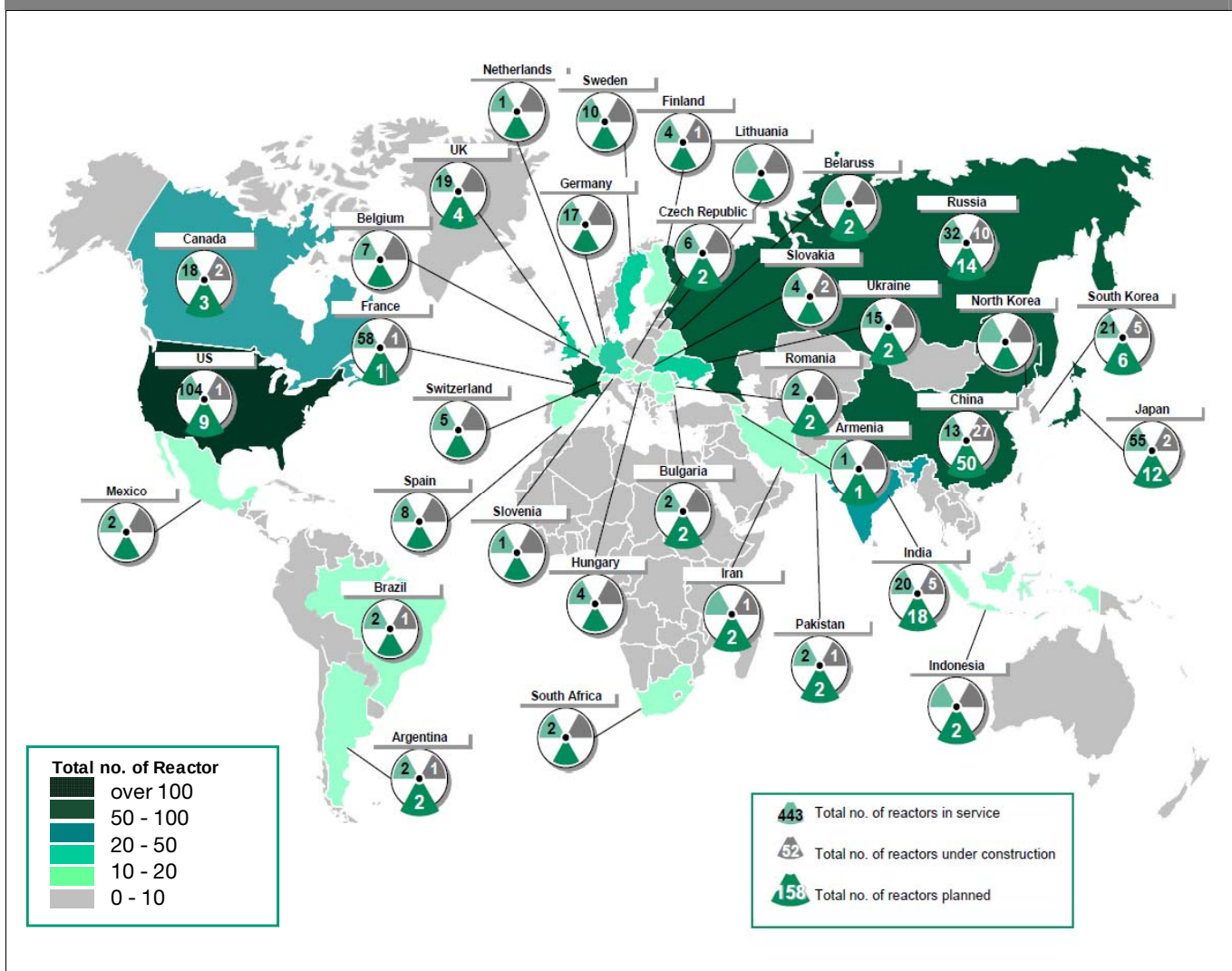
■ A way forward: new nuclear

Will there be any new nuclear? Our view: yes

This question may get answered above within the context of cost/benefit, energy mix, acceptance, financials and risk, but let's tackle some specific topics that relate to the potential global new nuclear capacity of over 300GW currently being discussed.



GLOBAL NUCLEAR CAPACITY AND NEW BUILD



Source: CA Cheuvreux

ZONES OF SEISMIC RISK



Source: Geology About

New build likely, but projects in risky regions may not materialise

We take as our central scenario that there will be new nuclear. But the revival will probably not be on the scale envisaged before Fukushima. We would expect that projects in seismic regions or coastal areas with risk of tsunamis may not see the light. That means risks for programmes in Italy, China, India and the Middle East. At a rough estimate, we think that around 30-40 reactors globally are at high risk of not getting constructed. This is c.15% of global new build. The proportion in China and India could be more than that average.

How will public acceptance levels change? Our view: less acceptance, with potential for recovery

The nuclear revival had just got to a stage where it had succeeded in tipping public acceptance levels to the positive. With all that we have said before on acceptance for nuclear in general, there might well be differentiated opinions: eg some acceptance of continuing with and perhaps even extending existing parks, but certainly no new build; or a feeling that it might be more sensible to shut down older reactors as soon as possible in order to upgrade them with new, safer and higher-spec ones.

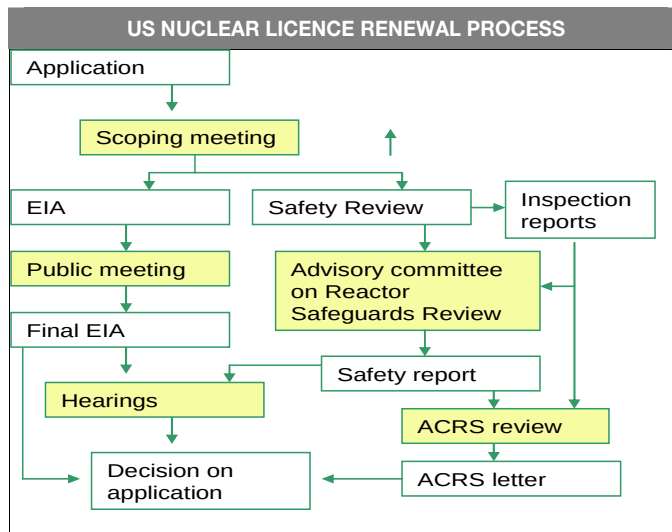
In the US, recent opinion polls show that c.44% of people think there should be new nuclear, vs 49% in 2009 (Gallup), while 47% oppose. A CNN poll in March suggested that 53% of the US population is opposed to new build. In the UK, a poll by Friends of the Earth the weekend after the Fukushima accident found 35% of respondents support new nuclear build vs 47% in November 2010. In summary, in the more pro-nuclear countries, support has weakened but is still there. Looking at other precedents (eg US opinion following Three Mile Island) makes us think that there is long-term damage and that any recovery of the social acceptance is closely linked to the extent of the further consequences of the Fukushima crisis.

How much delay will there be to existing applications? Our view: up to several years

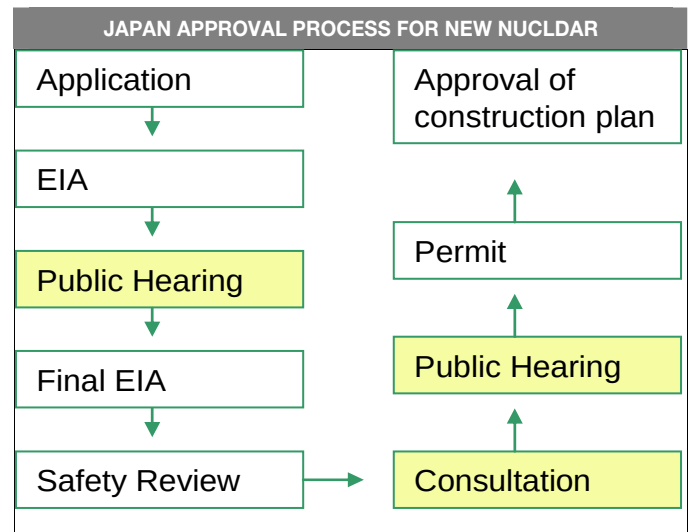
At the moment, the situation appears frozen and many governments are adopting a wait-and-see approach. Once there is some more clarity, and depending on the broader nuclear policy, the focus will move to applications that are currently pending. Almost certainly there will be delay, but how long? When will an orderly administrative path resume its functioning? What kind of new approval processes will be set up? Will they be longer? Will delays occur at public interaction points or during the administrative path?

We would suggest as a central scenario that the current freeze will last broadly until the summer. It would then be reasonable in our view to expect decisions on existing applications in late Q3. However, we point out the risks in the UK and the US due to the high public involvement in the process through public hearings and consultations.

We expect public support to recover in time



Source: NRC



Source: JNES

Will already granted permits be revoked or amended? Our view: risk is high

The answer will partially lie in the answers to the overarching nuclear questions. But independent of that, it may be that even in the event of a full go-ahead for new nuclear, applications may be invalidated. Governments could ask to scrutinise all projects again, which may result in some of them not getting final approval. We would not be too surprised to see this happening, but take it as a borderline bear scenario.

Will new applications be considered? Our view: not immediately; long-term, yes

We can split new nuclear build into two categories: 1) new build where applications have already been submitted (whether approved or not); and 2) build that is not in the application process or even public knowledge yet. We have considered the first category above. The second one might well represent the larger portion, certainly when looking at most countries' ambitions vs submitted applications. It might not be associated with precise projects as yet but we sense that at least some of it is probably reflected in valuations of the industry. Certainly, in the very short term, any new application to an authorising body would be a daring enterprise. Once the dust has settled, and even if we assume a continuation of nuclear, we must still consider whether any new applications beyond those currently in process will be accepted, and if so, when. For those countries that remain committed to nuclear, we anticipate that new applications will be received. The current ongoing safety revisions might actually improve clarity of the framework once concluded.

Are there new criteria to be considered where nuclear build is unsuitable? Our view: yes

This question also falls into the regulatory sphere as ultimately, regulators will decide over any such criteria. Geographic zones with seismic activity and flooding risk are just a point of focus that has recently moved centre-stage, even though the topic is not new. But other issues, eg closeness to water supply, demographic centres and others should also be examined in the consideration of new nuclear, as should the extent of any constraints on the sector. The chances are that some projects will be tipped over the edge by new criteria making them unviable. Investors should consider companies' projects under these criteria with a fresh pair of eyes.

GLOBAL NEAR-TERM NEW NUCLEAR PROJECTS

Project	Country	Plant Operator	Supplier	Status	Original Budget/ kW	Revised budget kW	Original Commissioning date	Revised Commissioning Date
Flammanville 3	France	EDF	Areva	Construction	~ 2 363 EUR/kW	~3 030 EUR/kW	September 2012	2014
Olkiluoto 3	Finland	TVI, Fortum	Areva	Construction	~1875 EUR/kW	~ 3 600 EUR/kW (35% engineering & procurement, nuclear Island)	2009	2013
Taishan 1	China	CGNOC	Areva	Construction	~ 2 500 EUR/kW (60% engineering & procurement, nuclear Island)		2013	
Taishan 2	China	CGNOC	Areva	Construction	~ 2 500 EUR/kW (60% engineering & procurement, nuclear Island)		2014	
Penly	France	EDF	Areva	Under negotiation	-		2017	
Lungmen 1	Taiwan	Taiwan Power CO	General Electric	Under negotiation	~ 1235 USD/kW	~1466 EUR/kW	2009	2011
Lungmen 2	Taiwan	Taiwan Power CO	General Electric	Under negotiation	~ 1235 EUR/kW	~1466 EUR/kW	2010	2012
Watts Bar-2	US	TENNESSEE VALLEY AUTHORITY	Bechtel, Siemens, Westinghouse, Day and Zimmerman NPS	Construction	~ 1459 USD/kW	~ 2146 USD/kW	1996	2012
Kaiga-4	India	NUCLEAR POWER CORPORATION OF INDIA LTD.	Indian Department of Atomic Energy (DEA)	Construction	~ 757 USD/kW	~ 1434 USD/kW	2011	
Kakrapar-3	India	NUCLEAR POWER CORPORATION OF INDIA LTD.	Indian Department of Atomic Energy (DEA)	Construction	-		2015	
Kakrapar-4	India	NUCLEAR POWER CORPORATION OF INDIA LTD.	Indian Department of Atomic Energy (DEA)	Construction	-		2016	
Kudankulam-1	India	NUCLEAR POWER CORPORATION OF INDIA LTD.	Indian Department of Atomic Energy (DEA)	Construction	-		2011	
Kudankulam-2	India	NUCLEAR POWER CORPORATION OF INDIA LTD.	Indian Department of Atomic Energy (DEA)	Construction	-		2011	
PFBR	India	Bharatiya Nabhiya Vidyut Nigam Limited	Indian Department of Atomic Energy (DEA)	Construction	-		2011	2012
Changjiang-1	China	Hainan	China Guangdong Nuclear Power Company	Construction	~ 1229 USD/kW		2014	
Changjiang-2	China	Hainan	China Guangdong Nuclear Power Company	Construction	~ 1229 USD/kW		2015	
Fangchenggang-1	China	Guangxi Fangchenggang	Shaanxi Diesel Heavy Industry, Alstom	Construction	~ 2600 USD/kW		2015	
Fangchenggang-2	China	Guangxi Fangchenggang	Shaanxi Diesel Heavy Industry, Alstom	Under negotiation	~ 2600 USD/kW		2016	
Fangjiashan-1	China	QINSHAN	China Guangdong Nuclear Power Company	Construction	~1900 USD/kW		2013	
Fangjiashan-2	China	QINSHAN	China Nuclear Power Engineering Co.	Construction	~1900 USD/kW		2014	
Fuqing-1	China	CNNC Fujian Fuqing	China Nuclear Power Engineering Co.	Construction	~1633 USD/kW		2013	
Fuqing-2	China	CNNC Fujian Fuqing	China Nuclear Power Engineering Co.	Construction	~1633 USD/kW		2014	
Fuqing-3	China	CNNC Fujian Fuqing	China Nuclear Power Engineering Co.	Construction	~1633 USD/kW		2015	
Haiyang-1	China	Shandong	Westinghouse	Construction	-		2014	
Haiyang-2	China	Shandong	Westinghouse	Construction	-		2015	
Hongyanhe-1	China	Liaoning Hongyanhe (LHNP)	China Guangdong Nuclear Power Company	Construction	~1180 USD/kW		2012	
Hongyanhe-2	China	Liaoning Hongyanhe (LHNP)	China Guangdong Nuclear Power Company	Construction	~1180 USD/kW		2013	
Hongyanhe-3	China	Liaoning Hongyanhe (LHNP)	China Guangdong Nuclear Power Company	Construction	-		2014	
Hongyanhe-4	China	Liaoning Hongyanhe (LHNP)	China Guangdong Nuclear Power Company	Construction	-		2014	
Lingao-4	China	Lingdong	Areva	Construction	-		2012	
Ningde-1	China	Ningde	China Guangdong Nuclear Power Company	Construction	~ 1125USD/kW		2012	
Ningde-2	China	Ningde	China Guangdong Nuclear Power Company	Construction	~ 1125USD/kW		2013	
Ningde-3	China	Ningde	China Guangdong Nuclear Power Company	Construction	~ 1125USD/kW		2014	
Ningde-4	China	Ningde	China Guangdong Nuclear Power Company	Construction	~ 1125USD/kW		2015	
Qinshan-2-4	China	QINSHAN	Westinghouse	Construction	-		2012	
Sanmen-1	China	SANMEN NUCLEAR POWER CO	Westinghouse	Construction	~1470 USD/kW		2013	
Sanmen-2	China	SANMEN NUCLEAR POWER CO	Westinghouse	Construction	~1470 USD/kW		2014	
Yangjiang-1	China	Yangjiang Nuclear Power Company	China Guangdong Nuclear Power Company	Construction	~1133 USD/kW		2013	
Yangjiang-2	China	Yangjiang Nuclear Power Company	China Guangdong Nuclear Power Company	Construction	~1133 USD/kW		2015	
Yangjiang-3	China	Yangjiang Nuclear Power Company	China Guangdong Nuclear Power Company	Construction	~1133 USD/kW		2015	
Angra-3	Brazil	ELETROBRAS ELETRONUCLEAR	KWU, Areva, Siemens	Construction			2015	2018
Mochovce-3	Slovakia	ELECTROSTATION MOCHOVCE	Enel, Siemens	Construction	~1774 EUR/kW		2012	
Mochovce-4	Slovakia	ELECTROSTATION MOCHOVCE	Enel, Siemens	Construction	~1774 EUR/kW		2013	
Bushehr-1	Iran	Nuclear Power Production & Developement Co. of Iran	Russian Ministry of Atomic Energy (MINATOM)	Construction	~1093 USD/kW		2011	
Chasnupp-2	Pakistan	PAKISTAN ATOMIC ENERGY COMMISSION	China National Nuclear Co. (CNNC), Canadian General Electric (CGE)	Construction			2011	2013
OHMA	Japan	EPDC/J Power	General Electric	Construction	-		2014	2.5-year delay in 2008 to reinforce seismic security + stopped in 03.11
Shimane	Japan	CHUGOKU ELECTRIC POWER CO.,INC.	Hitachi- GE	Construction	-	-	2012	delayed on 03.11. Restart date not communicated

Source: Company data, World Nuclear Organisation, Wikipedia, PRIS,

Gas could be a key winner globally

■ Another way forward: no nuclear

In a hypothetical scenario of zero new nuclear, even more fundamental questions arise. First and foremost:

How would a large scale source of low cost base load power be replaced? Our view: by renewables, energy efficiency... and fossil

We will address the topic below in the section of renewables. But it is not renewables alone that would replace nuclear as they are not suitable as base load fuel. Inevitably, other sources would have to come in. Globally, close to 2400TWh pa comes from nuclear. What would replacement fuels be, and what would be their carbon profile? We would suggest that investors take a close look at both short-term replacement strategies being adopted already in those regions with moratoriums (eg Germany), and at gas with a long term view.

That leads us to expect that coal and gas will increase over the short term as generation fuels. We see gas as a key winner globally. Beyond pure capacity replacement, how much could much more radical energy consumption management, conservation and efficiency contribute? As a reminder, each 1MWh consumer energy saving typically equates to 3-4MWh savings at the production level. Replacement of, say 20% of current nuclear capacity would thus require savings of c.4% of global electricity consumption.

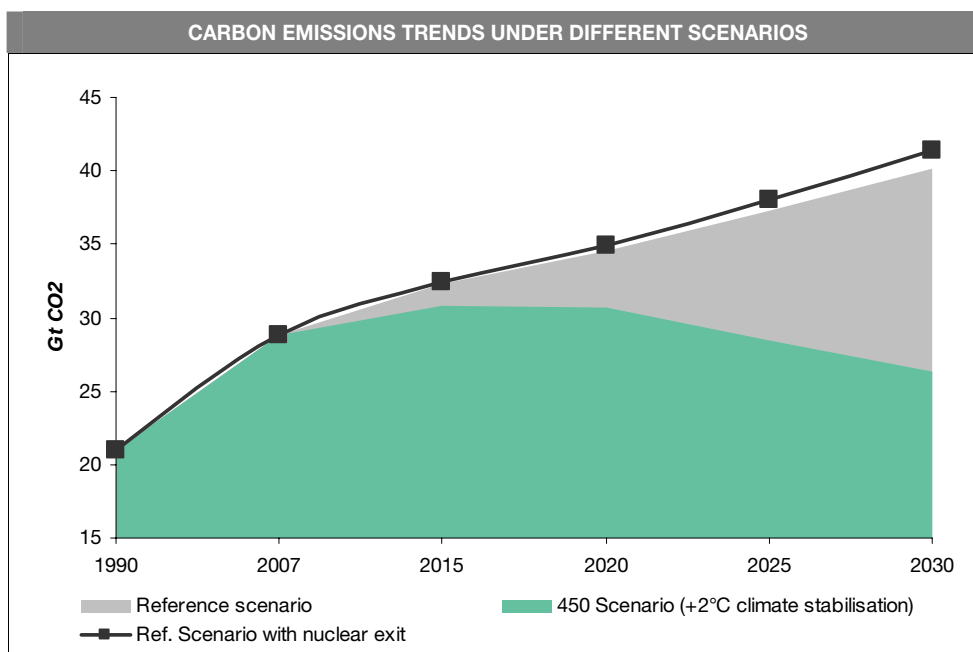
Other fundamental questions come back to those already spelt out above, ie cost and security of energy.

Would climate goals be achievable? Our view: no

The climate stabilisation target agreed on by world leaders at the Copenhagen summit in December 2009 is to limit global warming to +2°C. We have already concluded in our note "Copenhagen: 20/20 vision hanging in the balance" that the emissions reduction targets for 2020 set by developed and developing countries already fall short of the emissions pathway recommended by the IPCC (International Panel on Climate Change) notwithstanding that some of national climate policies clearly rely on a significant expansion of nuclear capacities (e.g. China).

A "no nuclear" scenario would only darken the picture and put the +2°C climate stabilisation target further from reach, by increasing emissions by 1.2 to 2.8bntCO₂ by 2030, implying a further +3-7% increase compared with a business-as-usual scenario.

The reference scenario (i.e. base case) set by the IEA in the World Energy Outlook 2009 foresees a rather constant increase (c.+0.6bn tCO₂e p.a.) in energy-related CO₂ emissions until 2030, when carbon emissions are expected to reach 40 GtCO₂. Assuming a gradual closure of existing nuclear capacities by 2030 replaced by different sets of technologies, this scenario would add from 0.96 to 2.16bn tCO₂ of annual emissions by 2030 to the reference scenario. In addition, nuclear capacity additions foreseen in the Reference scenario until 2030 (+104 GW net) would have to be replaced by other power generation technologies, thus adding between 0.27 and 0.6 GtCO₂ by 2030.



In addition, in setting an alternative scenario that would put the world on track to cut carbon emissions by c.14 GtCO₂ compared with a reference scenario, the IEA had placed 10% of the CO₂ reduction burden on nuclear.

If nuclear, the biggest source of low-carbon power generation, were to leave the market, global efforts to meet even the least ambitious climate change goals would be knocked well off course, unless it was replaced with similar low-carbon capacity.

CO₂ IMPACT OF VARIOUS NUCLEAR SUBSTITUTION SCENARIOS

		Current nuclear production – substituted with:	Coal / no CCS	CCGT	50/50 Coal/Gas	30/70 Coal/Gas	30/30/40 Coal/Gas/ Renewables
CO ₂ intensity	[kg/MWh]	0	900	430	665	571	399
Additional annual emissions	[mt]	0	2160	1032	1596	1370	958
Copenhagen 2020 annex ambition low	[mt]	-6000	-6000	-6000	-6000	-6000	-6000
Copenhagen 2020 ambition high	[mt]	-7200	-7200	-7200	-7200	-7200	-7200

Source: CA Cheuvreux

Could public priorities shift away from climate to other energy goals? Our view: possible

If the public decided firmly against nuclear, but came to realise what a challenge climate change goals would become, there might well be a conscious trade-off between climate change (an almost abstract concept) vs security (impact of nuclear accident, with graphic and shocking images). Looking further, if climate goals were pushed onto a secondary plane, what would this mean for the other generation sources that are meant to deliver climate change remedies, ie renewables? All of a sudden, the nuclear question could become a boomerang for renewables.

IV – Green questions

We attempt to shed light on the rather ambitious question of whether the world has changed, and is turning green. At the same time, we look at whether the renewables and green sector in the widest sense has returned to favour and can expect a major lift in growth, earnings and share price performance, and if so, to what degree. Outright renewables are the immediate thought, but other elements, including consumption management and energy efficiency, also come into play. However, in the first instance, we aim to channel our thoughts and put them in context.

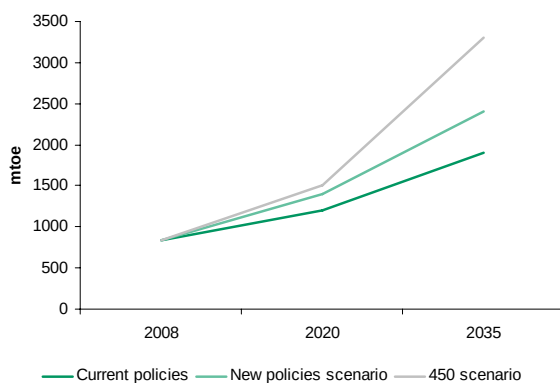
■ Will the world move to green energy?

Will there be increased renewables build and if so to what degree? What might substitution scenarios look like? After the dismal sector performance and disappointments in green markets, this is the question carrying the greatest hopes. Below we consider the currently accepted and potential new scenarios.

What is the basic expectation on renewables build? Our view: 1000-1500GW

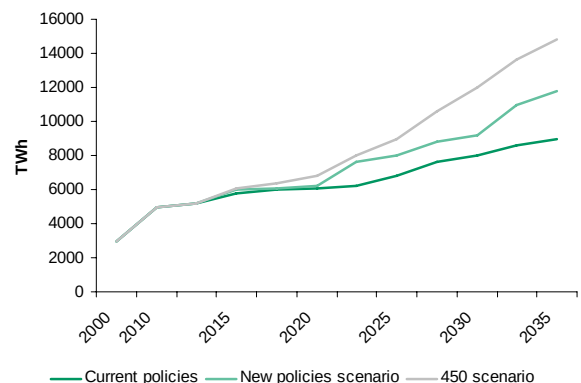
Even in the pre-Fukushima world, the range of expectations was wide. The IEA itself was looking for a range of renewable capacity anywhere between 9TW and 15TW and generation between 8,900TWh and 14,500TWh (including hydro). This implies renewables taking a share of 23-45% of electricity production by 2035 and a share of 5-12% of primary energy sources.

GLOBAL PRIMARY RENEWABLE ENERGY SUPPLY FORECAST



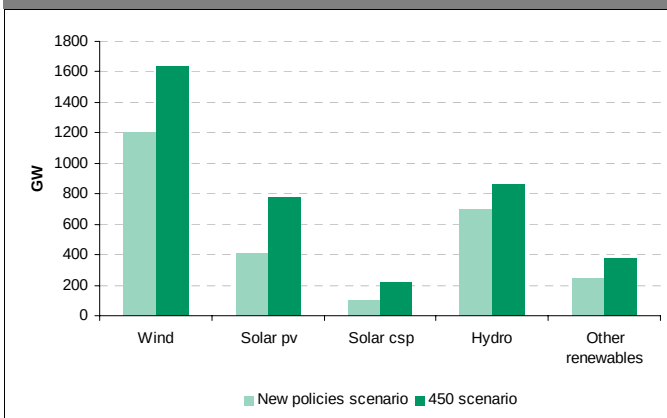
Source: IEA

GLOBAL RENEWABLE ELECTRICITY GENERATION SCENARIOS



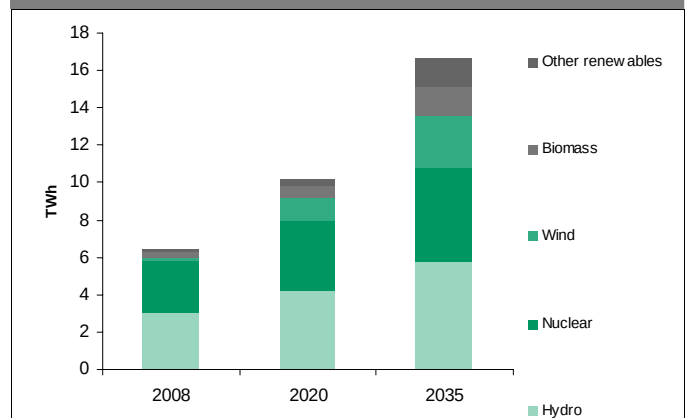
Source: IEA

CUMULATIVE NON HYDRO RENEWABLES CAPACITY ADDITIONS 2010-35



Source: IEA

ELECTRICITY GENERATION FROM RENEWABLES IN THE IEA NEW POLICIES SCENARIO



Source: IEA

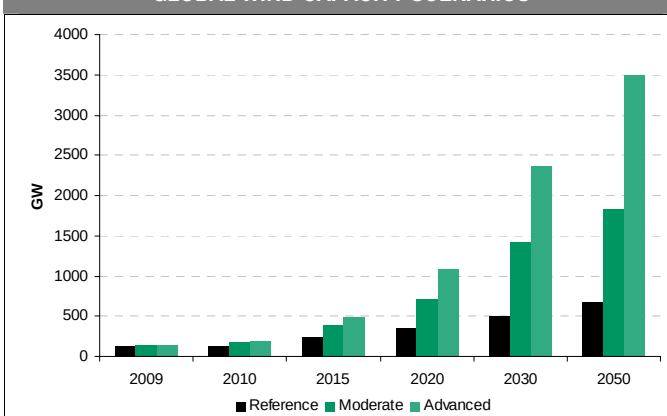
Asia will be the most important region for renewables build in any scenario, by virtue of its power demand. As a reminder, China alone is looking to build 235GW of renewables capacity, of which 150GW wind under its Five Year Plan published just before Fukushima.

Even though no longer the biggest renewables market on all accounts, Europe has the most ambitious goals with its 2020 targets. The EU Roadmap 2050 project goes even further with a postulate for a transition towards a long-term energy mix with 40-80% renewables.

US President Obama's last proposed national clean energy standard (CES) calls for 80% CO₂-free generation, but that includes nuclear, gas, energy efficiency and others. Stripping out nuclear only would imply a c.40% share of renewables. We estimate that that could theoretically lead to an annual market of 50GW for renewables build at the high end.

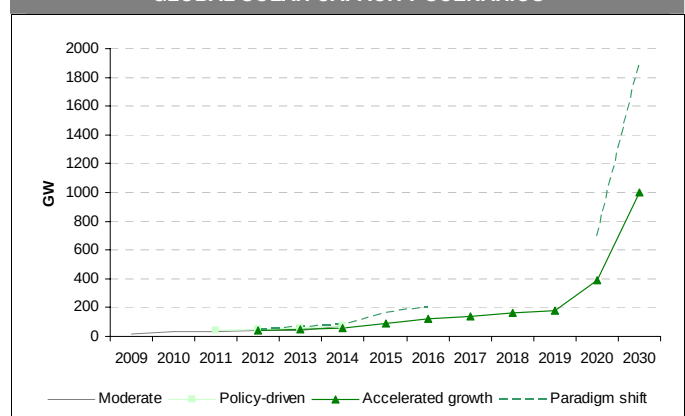
The global industry bodies, namely wind and solar associations, look for 1-4TW of solar PV and wind capacity (together) alone by 2030.

GLOBAL WIND CAPACITY SCENARIOS



Source: GWEC

GLOBAL SOLAR CAPACITY SCENARIOS



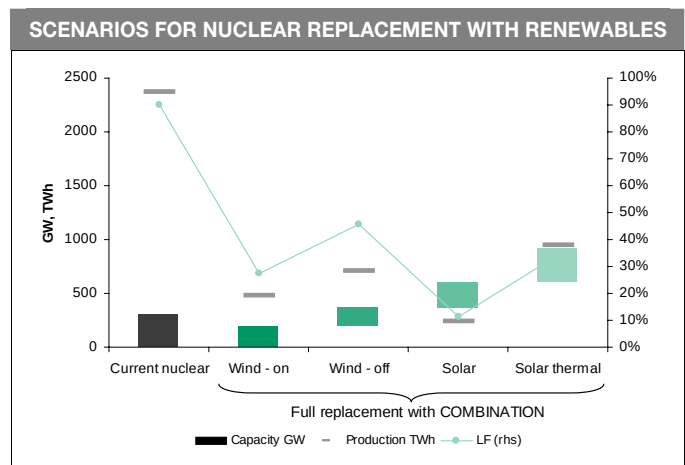
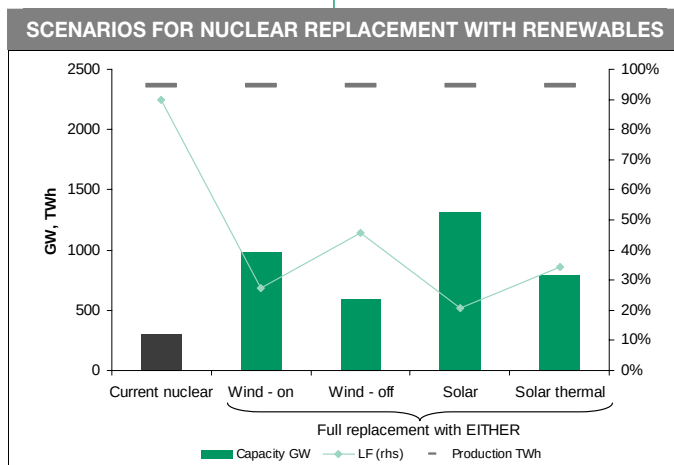
Source: EPIA

The substitution scenarios. Our view: partial substitution most likely

I – Full substitution of existing capacity

We have looked at a hypothetical scenario of a complete exit from nuclear globally and full replacement of current capacity by renewables only for illustration purposes. For this, we have in one step looked at what single renewable source of the most mature technologies (on- and offshore wind, solar PV, solar thermal) could on its own serve as replacement. Then, we have assumed a combination of those technologies.

There is currently somewhat over 300GW of nuclear capacity in operation. To put this in perspective, to deliver a similar output from renewables of whatever combination, around 1000GW of incremental capacity at least would be required. Thermal backup capacity of at least 100GW would also be needed, on our estimates. How the world would cope with prolonged periods of poor output, perhaps combined with above-average demand, for example from low wind during hot summers such as in 2006, is yet another question.



Is there enough space
for installations
needed for wind...

... and solar...

Wind

Looking at onshore wind, assuming an average turbine size of 2.5MW (there will be locations with say 3MW turbines, which is at the high end of the current onshore standard and implies the assumption of turbine sizes increasing further; but others were much smaller turbines need to be used) would mean that around 500,000 turbines or 5,000 200MW wind parks would need to be erected. This would equate to roughly 15,000 football pitches. We would encourage questions on whether there is enough wind resource and situation regarding space and land resources. We would further encourage a similar calculation for offshore under a working assumption of an average 6MW turbine size and, say 40-50% load factor. Production capacity is another topic. We currently estimate global turbine production capacity of c 40GW pa having to almost double if the scenario was to be achieved on a 2050 basis. How would capacity expand in a viable way?

Solar

In line with our thoughts above, would there be enough suitable rooftop and other space for 2000GW of solar? As a reminder, 1kW of solar requires c 10-20m², so substituting nuclear with PV alone would require a total of c 3tn m² vs an average roof space of 10-30m² per residential home and c.1.5bn residential homes globally. Large rooftop and ground-mounted projects would have to become the lion's share of solar. And, what would the impact on the manufacturing chain be? There are currently just short of 30GW of global module capacity. Assuming that this expands to 50GW net fully available nameplate capacity after retirements would mean it would take 40 years to get to the required amount of solar capacity to replace nuclear. Alternatively, a much faster expansion of the industry

... and what about the desert sun?

get underway. That would be very challenging across the supply chain, and it would be unlikely to lead to the required cost reduction path to make solar viable.

Alternatively, the big futuristic solar thermal projects spring back to mind. Theoretically, they could play a role in potential replacement due to their large scale and resources of global deserts. As a reminder, Desertec claims potential for 10,000GW from global deserts and c 500GW from Desertec alone by 2050. Investors might want to reconsider the many questions around political stability, cost, transmission and regulations again, and also if there will be new momentum on any of these and the projects as a whole.

EU NUCLEAR SUBSTITUTION SCENARIO WITH IMPORTED SOLAR CSP						
	2000	2010	2020	2030	2040	2050
Renewables in EU	2%	8%	20%	27%	35%	46%
Hydro	18%	18%	17%	16%	17%	18%
Oil/gas	21%	24%	22%	23%	18%	9%
Coal	30%	28%	26%	23%	17%	9%
Nuclear	29%	22%	14%	6%	1%	0%
Imported solar	0%	0%	2%	5%	11%	17%
Total	100%	100%	100%	100%	100%	100%

Source: Trans CSP

II. Substitution of new build while maintaining existing capacity

Looking at new nuclear build, ie another more than 350GW globally, the same questions as above repeat on a similar scale. However, the time frame would be more in favour of renewables. New build is meant to be available in scale from about 2020. We would expect the renewables markets to gather speed from 2015 onwards, but with a backend-loaded profile towards 2020+. This scenario would leave more room for the value and supply chains to adapt, and technology and scaling up to enable cost reduction. This then still leaves the huge question over how retiring existing capacity will be replaced.

III. Partial substitution of existing capacity and new build

We suggest another scenario as the most likely one, where current and new nuclear capacity is scaled back and renewables buildout is increased. Let's assume that 15% of existing capacity leaves the global generation fleet and that there is 20% or c.70-100GW less new build. The capacity gap in the existing would be filled by renewables, coal and gas with each taking one-third. In new capacity build, renewables would take a 40% share with the rest being filled by coal and gas. That would imply a total of 450GW of new renewables capacity in addition to current expectations.

Overall, a hypothetical substitution of nuclear with renewables (excluding hydro) could mean them taking a share well in excess of 40% of global capacity, and in some countries materially more. In regions where nuclear represents significant parts of base load power procurement, scale, space and reliability would become very big issues. Big questions over infrastructure requirements would arise, too. And again, how would such a substitution be achieved practically?

Assuming current government targets for renewables in a pre-Fukushima world with some leeway for misses and delays implies just short of 1000GW of wind build globally by 2020. Adding in substitute capacity, let's assume that because of the larger scalability, wind would take the lion's share, say 70-80%, followed by solar as the next biggest technology to benefit, this would imply additional capacity of over 1000GW of wind. The solar market would increase by 30-50% on an annual basis globally.

INCREMENTAL RENEWABLES CAPACITY REQUIREMENT BY SUBSTITUTION SCENARIOS

	Wind onshore	Wind offshore	Solar thermal	Solar pv	Biomass	Others
Full substitution	993	473	375	821	68	45
Full substitution of existing nuclear	497	236	188	411	34	28
Full substitution of new nuclear	472	224	178	390	20	11
Partial replacement of existing and new nuclear	231	110	128	280	23	15

Source: CA Cheuvreux

INCREMENTAL ANNUAL MARKET 2015-50 FOR SUBSTITUTION SCENARIOS WITH 2050 HORIZON

	Wind	Solar	Biomass	Others
Full substitution	42	34.2	1.9	1.3
Full substitution of existing nuclear	21	17.1	1.0	0.8
Full substitution of new nuclear	20	16.2	0.6	0.3
Partial replacement of existing and new nuclear	10	11.7	0.7	0.4

Source: CA Cheuvreux

IMPACT OF SCENARIOS REPLACING NUCLEAR WITH RENEWABLES

Scenario	Capacity requirement renewables	Land requirement, ass 35% onshore wind, 35% offshore wind, 30% solar	Incremental manufacturing capacity requirement
	GW	ha m	GW
Full substitution of existing nuclear	1393	10.5	60-80
Full substitution of new nuclear	1296	5.25	60-81
Partial replacement of existing and new nuclear	788	2.4	30-50

Source: CA Cheuvreux

■ How likely are the various renewables scenarios?

Before getting too excited about the potential vast growth that may be implied in the very large numbers for the optimistic renewables scenarios, let's ask how realistic it is that the world may move from moderate to high renewables build scenarios.

Renewables: potential substitute for nuclear? Our view: not on their own

As nuclear power gets questioned in many places, there are many voices proposing renewables as the direct substitute. The immediate connect between renewables and nuclear obviously comes from the carbon profile. But that is where the comparison ends. The scale, shape, production profile and cost of most renewables is radically different from large-scale and centralised nuclear generation.

First and foremost, we think it is vital to ask whether renewables in their current form can deliver base load power. How would intermittency be coped with? What reserve capacity would be required? And how would it be remunerated? This brings back the fundamental topic we have examined above: what would be the impact on power sector regulation? Is an unregulated power sector possible with a capacity mix that would not naturally be built by utilities in such a form? Our view is in its purest form it is not. The very minimum requirement would most likely be some sort of capacity payment framework and ongoing subsidies (ie regulated prices) for renewables for a long time to come. And to return to renewables themselves, if the current park cannot deliver reliable base load, what mix of renewables could? For example, solar generation tends to often occur at different times from wind availability, so could combinations of such sources lead to a base load production profile? What would it take to achieve such a mix? What other infrastructure would be required (storage, etc).

EU needs to replace 50% of its generation fleet by 2050

However, another essential topic needs to be thought through: what would be the impact of a very differently structured generation market? How would it impact the remaining wholesale market of large centralised generation? How would system redesign be achieved?

In addition, the major issues of cost of energy and its impact on the economy need to be considered. We deal with some of the related questions separately below.

What is an appropriate share of renewables in the energy mix? Our view: c.20-30% (ex hydro)

In line with the earlier question on nuclear, this topic fits into the broader energy mix context. There are forecasts for a share of non-hydro renewables of around 15-20% of consumption over the long term. Including hydro, the share could rise to above 30% globally. There will be very wide differences from region to region, depending on local resource and demand characteristics. The share of renewables in capacity will always be higher than that of consumption due to its typically lower load factors. Globally, there is a vast need of capacity replacement. With this, the proportion of renewables is likely to grow as they take an overproportionate share of new build.

For example, the EU Roadmap 2050 recognises that Europe will need to replace more than 50% of its generation fleet anyway by 2050. It is looking for renewables to take an overproportionate share and forecasts a 40-80% share of renewables. But it is still worth noting that even the Roadmap 2050 includes nuclear and CCS.

SHARE OF RENEWABLES IN ELECTRICITY GENERATION IN THE IEA CORE SCENARIO (NEW POLICIES)

	2008	2035
OCED	17%	33%
Europe	21%	44%
Europe	17%	41%
US	9%	25%
Japan	10%	19%
Australia/New Zealand	15%	31%
Non OECD	21%	31%
China	17%	27%
India	16%	26%
Other Asia	16%	31%
Brazil	84%	75%
Other Latam	52%	65%
RoW	12%	28%
World	19%	32%

Source: IEA

**Will the momentum
towards renewables
be sustained?**

**Do renewables have externalities? Will they change public acceptance?
Our view: yes**

Just because renewables are seen as a way to clean up the power sector, it does not mean that they are free from externalities. We have increasingly observed that renewables are meeting resistance. Most of this has brought out concerns over cost and destruction of countryside. The latter is an externality that is very hard to quantify. It affects onshore wind more than any other source. There are also other externalities, such as noise (wind), substitution of land use, impact on wildlife (wind) and marine environments (wave/tidal, offshore wind) as well as toxicity risk (CdTe based solar thin film). Others may well crop up. We anticipate that the discussion of externalities will intensify with increasing uptake. In some areas, there has already been an impact on public acceptance, notably wind.

Will they move into another regulatory sweet spot? Our view: short-term yes, but action will lack

One could be tempted to think that there will be a strong reaction to return to renewables support by regulation and policies. Some politicians have of course called for that. But, will actual regulations be overturned? Regulation is going through evolution on renewables. In the early stages it was all about adoption and fast buildout. Costs were often considered secondary, and super-normal returns acceptable. We now are in a stage of transition towards a subsidy-free sector.

But the regulator's visible hand is still there. It is about facilitating and orderly transition and keeping costs within acceptable levels (whatever they may be, see our question below). The second point could perhaps be overcome if the notion of what costs are acceptable were to change. But even then, the first remains a stronger driver than before: regulators are much less willing to allow professional manufacturers, developers, financiers, speculators and others to make excess returns. They have also understood that boom/bust runs tend to harm the industry more than they lead to broad and efficient buildout.

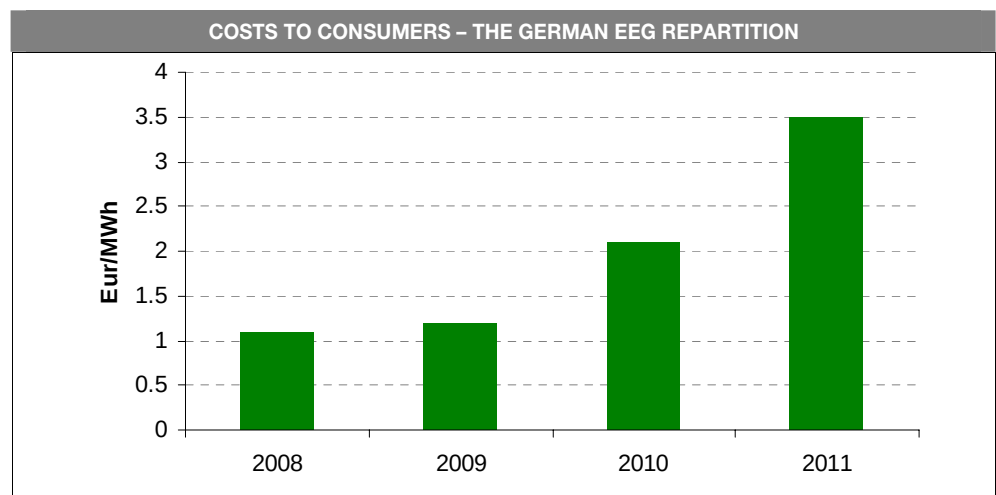
So, will there be reverse action? So far, we haven't seen any. None of the governments that have slashed solar tariffs for example have made any statements of the like. The UK government went through with a material reduction of solar subsidies a few days after Fukushima. Again, we would think of directing thoughts towards the non-subsidy elements of regulation, eg market regulation, planning, authorisation and other normative measures. In our view, these will view see positive momentum, but on their own, they won't swing the market.

The other question is whether the new policies that have already been announced will be put firmly into place. These policies alone could lift up renewables build above 30% of global electricity consumption. There is probably positive momentum on the political front for policies to be enacted. But how durable it is remains to be seen. And many countries are still in a state where there is not much room for governments to provide the real required impetus, and underpin policy statements with money.

What would be the cost impact of a much increased renewables share? Our view: cost increase, infrastructure, smart energy solutions and backup capacity requirement

The cost argument is among the strongest points being brought up against renewables. Because absolutely all of them need subsidies of some sort for a time still, a larger or speedier buildout will substantially impact the cost burden, be it to public or consumer finances. The impact has already been seen in an exemplary case in Germany where the contribution from the EEG repartition doubled in 2010 vs 2009 as a result of the enormous increase in solar capacity. Even the EU Roadmap 2050 assumes an average 10-15% increase on a horizon to 2020, and acknowledges that the cost increase will be more than that in the early years.

Other than the amount of capacity, the mix within renewables will be another determinant of costs due to the different subsidies and amounts of MW's per unit of subsidy getting delivered by the various technologies. We also think that investors should take the analysis a step further and look at the impact of their respective scenarios on various sectors across energy-consuming industries and what their likely reaction would be. And then, there is the very important point on financing that follows next.

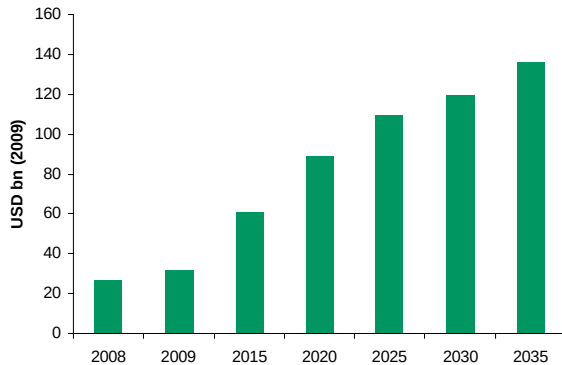


Source: Renewable Energy Agency

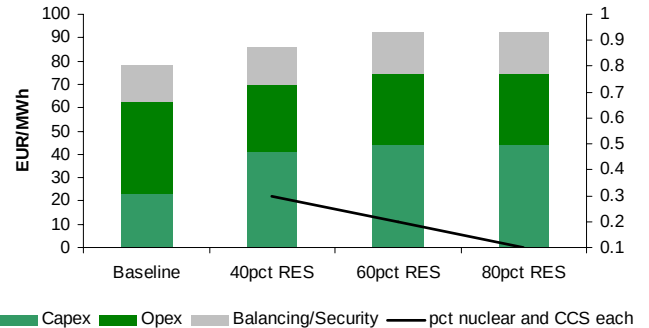
**Governments may not
 be able to fund even
 current programmes**

How are renewables to be financed? Our view: through the consumer

That renewables build will not occur under current conditions on the basis of market forces alone is rarely disputed. Power prices may eventually send a positive investment signal, but that could be a long time out. If we take it as given for now that there is some sort of financing requirement, we need to look at where it will come from, ie will consumers finance it? What burden is the consumer willing and able to take? The same goes for governments. A look at the current state of public finances around the globe raises serious questions over their ability to even continue to fund current programmes. It certainly makes for a challenging outlook for any new public funding (ie action beyond politicians' words that we have already heard) to say the least. Then, there are the other options that go half way between market and regulatory regimes], eg floor pricing, etc.

GLOBAL GOVERNMENT SUPPORT FOR RENEWABLES


Source: IEA

COST OF FUTURE ENERGY BEFORE SYSTEM COSTS UNDER THE EU ROADMAP 20 50 SCENARIO


Source: Roadmap 2050

What is the path to competitiveness and how could it be impacted by nuclear scenarios? Our view: solar will get there, less nuclear could be negative

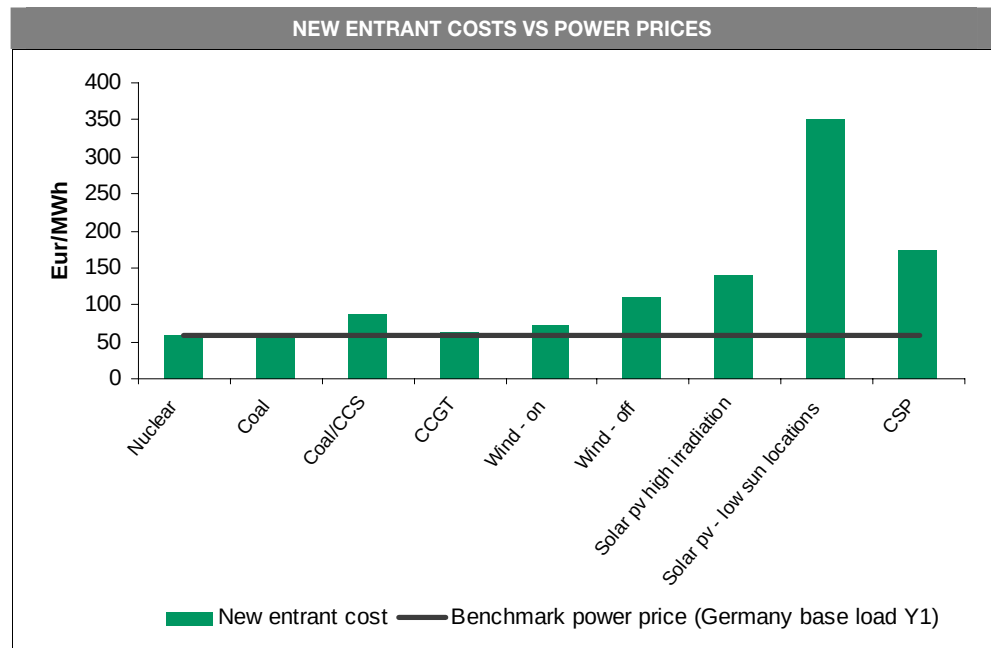
On pure relative cost levels, onshore wind is already competitive with most thermal fuels, but not with nuclear. We estimate that solar is competitive with retail power in the most sunny regions. But to be competitive in average sun regions, we estimate it will take about four years at an annual technology and scale induced cost reduction rate of 5% pa. Faster take-up on the back of less nuclear could lead to a speedier downward shift of the cost curve. But we are wary of this theory, because it could also lead to less incentive for cost reduction as tighter supply-demand balances may reduce pricing pressure and remove urgency to innovate and optimise.

Will competitiveness mean mass adoption or what else leads to mass adoption? Our view: not necessarily

Up to this point, the adoption of renewables has been driven by public mandate and incentives and supernormal returns (again from public mandate). Other than that, great hopes have been pinned on renewables becoming standalone-competitive.

We would urge investors to scrutinise this point very carefully. First of all through a full reassessment of relative new entrant costs. Many models, including our own, suggest that onshore wind is competitive with most thermal generation sources under reasonable carbon assumptions. The other sources, eg offshore, solar in its various permutations and the even less mature technologies such as marine power, etc, are still some time away from being competitive, according most assessments. But many estimates suggest solar PV grid parity within not too many years.

Can renewables become standalone-competitive?



Source:

Apart from finding one's own view on these issues, we would suggest some deep thinking about the idea that standalone economics will drive adoption.

Looking at wind, what will drive utilities' adoption? The answer may well, be growth, CO₂ reduction, fuel security, green strategy, but we leave these items as a non-exhaustive list to be examined.

For solar PV at small scale, grid parity has often been seen as the holy grail for adoption with the hope of a step change in market growth once it will be reached. We would again urge for close examination of this thesis. We also suggest that it is worth considering what it will take to change the current pattern of solar being a financial rather than an energy or environmental product, at least in developed markets. Within the context of this question, it is worth examining whether switching patterns in the conventional electricity markets are a useful indicator; ie, switching rates tend to be around 8% for very little effort (an online process), which is low and probably due to inertia and perception of incremental savings not being worthwhile. How does a EUR10k-20k investment fare under an energy/cost savings optic, even if debt-financed? Will debt financing still be available in the same form or at all if there are no subsidies (which will most likely be the case at grid parity)?

Beyond these points, it might be necessary to reflect whether other measure or drivers may lead to mass adoption: desire for energy autonomy, a revival of "green sentiment", the arrival of smart infrastructure, to name a few.

■ Will any scenario cure the renewables industry challenges?

A bullish growth outlook for renewables is one thing, but profitable investment in the sector may be another. For that, we think investors need comfort with the industry structure and reassurance over the sustainability of its long-term profitability. We address the key questions in this context below.

On the rocky road to the mainstream

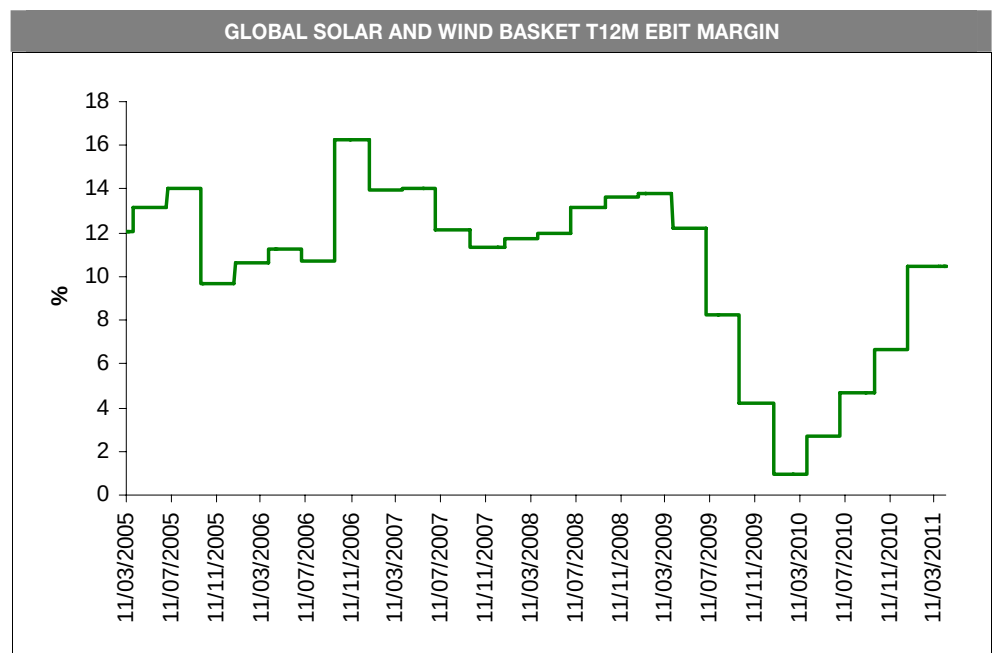
Further scope for margins to decline

What does the outcome for any scenario for renewables mean for the industry structure? Our view: very high renewables build could save some European manufacturers, but shift to Asia continues

The renewables industry is on a bumpy road to mainstream. This process doesn't go without upheaval, casualties and volatility. For any kind of investment view, the analysis should be applied to the impact on the ongoing industry evolution. Will there be any change in competitive dynamics, ie reversal or reinforcement of the manufacturing shift towards Asia? Will European manufacturers be able to recover lost territory? Where will the pressure points on the value chains move? In a rapidly moving and technology-intensive industry, there will be ample scope for surprises and opportunities, whatever the outcomes.

Will new renewables scenarios change profitability in the sector? Our view: yes, the radical ones

Arguably, the renewables sector has started life with excessive profitability. This has attracted new entrants with aggressive ambitions. This and the bumpy road of intermittent growth have already crushed margins. Profitability has constantly declined since 2005. Comparing the sector to other industries' precedents (manufacturing, DRAM, utilities) suggests there is still further scope for margins to come down.



Source: Bloomberg

We think that it unlikely in the moderate renewables scenarios that the downward trajectory of profitability will end. It may be interrupted or pushed back in those scenarios with high renewables build. But it is our view that excess profits will eventually be eliminated, especially in the commoditised segments, notably solar.

■ Will new opportunities arise?

Beyond pure renewable power generation, where else could new energy opportunities lie? Our view: infrastructure, smart solutions and efficiency

Irrespective of what will be the fate of nuclear buildout, we believe there will be ample opportunities in new energy. Namely, energy infrastructure and energy efficiency will be major growth areas. If nuclear goes ahead as planned pre-Fukushima, there is still a massive requirement for infrastructure build and with it upgrade to new energy infrastructure. Energy efficiency will also be a big part of the picture in any case.

Will new technologies and areas emerge? Our view: yes

We leave this question up to the imagination. We are confident that much innovation, and the consequent opportunities for society and investors, has yet to be seen.

**Nuclear power?
No thanks!**

V – Country specifics

■ Germany

Germany is arguable the most sensitive country on the nuclear question. We have recently seen a return of the "Nuclear Power? No Thanks!" signs from the 1970s and 80s, while the discussion over life extension continues. Chancellor Merkel has ordered a three-month moratorium on the life extension deal, thorough safety inspections on all reactors and an immediate shutdown for three months of the country's seven oldest reactors. In addition, she has announced that she is looking for an "energy turnaround" and "national energy consensus" with an accelerated transition towards renewables.

The main issues that we see as now outstanding are as follows:

■ **Will there be a wholesale shutdown and an immediate end to all nuclear?**

This is certainly a very radical question, but looking at the rising emotions in Germany and the statements made after the last election and in recent discussions, it should at least be included for completeness sake. It looks like a pathway of accelerated shutdown might return to the agenda. On this point, we would raise the basic question: how would the lights would be kept on in the short term?

■ **What is the fate of the seven reactors that have been temporarily shut down?**

Theoretically, they should reopen once safety inspections have been carried out in the three months time frame announced. As we have seen in the past, that can mean longer delays before reopening. Also, now that the government has u-turned on its energy policy, we would no longer rule out that they might remain closed for good.

■ **Is the life extension deal dead before coming to life?** The deal was declared legal with the President's Signature as it was deemed that no Upper House approval was necessary. Could this be overthrown? We think not, without the government. But there could be a Constitutional Court hearing this winter. Further, the government appears to have changed its stance, so we see danger for the deal. If so, what would happen to the nuclear fuel tax? This is a major question, because this tax is not directly connected to the life extension. It could well remain in place. The next question is one that might affirm that: what would happen to utilities' contributions to renewables funding? They are connected to the life extension deal, and would end if there was no deal. However, Ms Merkel's conversion to an acceleration of renewables build leaves her government with a funding gap that it might well decide to alleviate through the nuclear fuel tax.

■ **Could the conditions be altered?** Most of the above questions recur here, in a softened version.

■ **Will certain States single-handedly take action on nuclear?** The Federal Environment Ministry has the ultimate supervisor authority over the regional authorities in which plants operate. But in the last instance, safety is the responsible of State level authorities. The Prime Minister of Hesse has announced action on Biblis, and the Green Party in Baden Württemberg has promised a full exit from nuclear. All of this could impact single reactors, that could effectively get closed. We think it is more sensitive in Baden Württemberg, because the new Green/SPD government controls ENBW.

Major new build programme in the UK

■ What are the broader ramifications for energy policy, particularly renewables?

The important point here is whether there will or can be a material step-up in renewables commitment. Can Germany's infrastructure cope with more renewables? In its current state, the system cannot accommodate much more renewables already without big infrastructure upgrades and new build. What about the cost to its export-driven industry? What do the various scenarios mean for the near- and medium-term trajectory of subsidies? It looks unpalatable in the current political climate that the government will take any action on extraordinary reductions of renewables subsidies. But in our view, this does not mean that they are definitely off the agenda as there is still a goal to normalise the market. This will also have repercussions for other European renewables markets and profitability of the global renewable technology sector. What would happen to the current funding for renewables from nuclear profits and how would that impact the sector (see above)?

■ UK

The UK is planning the most substantial new build programme within Western Europe with ten new reactor sites going through planning and eight of them approved for construction this decade. All the sites are close to the coast. The government initially said that it stood by its policy of new build, but it has still ordered an urgent comprehensive safety review with the outcome due to be published in May. Most recently, the Energy Secretary said that the programme could be scaled back, but the Prime Minister has reiterated that the government will push for nuclear as planned.

A key measure in favour of new nuclear was implemented after Fukushima as part of the energy review, with the carbon floor price. But, in light of the cost discussion above, will it be enough to serve as a build incentive?

Here, we would propose inquiring into topics such as the following:

■ Will the programme be scaled back? If so, what sites would be impacted?

The government has said it is pursuing its new build policy, but at the same time, it is not taking any decision on the wider programme or on any applications until an independent review produces a comprehensive report. That will throw the programme back by about three months at least. The Health and Safety Executive, which approves proposed reactor designs, has stated that there will be delays until at least after the summer. To us, it looks more like delay, possibly more than that announced by the government agencies rather than scaleback. If there is any scaleback, we would guess it could impact sites that haven't been approved yet.

■ Could permits for the already cleared sites be revoked or altered?

Theoretically yes, if there was an overriding government decision. It is in our view unlikely that any of the eight sites that have been selected already would be taken out of the programme. There is more uncertainty about other sites beyond that, namely the two sites that haven't been cleared yet.

■ What are the prospects for fuel reprocessing, and how will this impact economics of plant?

So far the back-end cycle has not been touched in the discussion, and we think it is unlikely that it will be.

France to continue unchanged

■ France

The French government has said that there won't be any change to its nuclear policy, but that there will be stress tests albeit without any stoppages for now. Any reactors that fail such stress tests would be shut. On average, the French reactor fleet is young, at 24 years. However, despite a broadly unchanged policy for now, there are major issues outstanding. We recap these below.

■ **Will nuclear continue as the biggest generation source or will there be changes to the existing fleet and new build?** At this stage it does not look like there will be major changes to nuclear policy. But we note a decrease in support for nuclear (see above public acceptance). We also note the vote by the city of Strasbourg to close the Fessenheim reactor. But this is one of the oldest reactors in France, aged 34 this year, and it is situated in a seismic region and has suffered from previous problems such as cracks. At this stage it is not certain that it will be closed as the government is against it, but the chances are high. Some other reactors may suffer the same fate, but we think they will be few. Over time, there is little question in our view that the generation fleet will move more towards renewables and also gas. That has been a trend that was already under way before Fukushima.

■ **Who does the benefit of nuclear belong to?** This is the fundamental question underlying all discussion of the regulation of tariffs and implicitly generation prices in France. There is a view in France that consumers should share the benefits of past investment, on the basis that nuclear is a public good and that past investments were undertaken by the state (while EDF was fully state-owned) and the return therefore belongs to the public. But since EDF's privatisation, the shareholder now also demands a share of the profit. We suspect that consumers will continue to take a significant share of the benefit for a long time to, certainly now that awareness has risen again that they also bear a large share of the risk.

■ **How will nuclear be integrated into the overall electricity market structure?** Because of the size and concentration of plants, nuclear power generation can be seen as an almost monopolistic activity. As long as competitive generation markets are the way forward, legacy nuclear owners have a substantial competitive advantage. This is particularly pronounced in France where nuclear accounts for 85% of generation and all of this is controlled by EDF. Before this background, the major outstanding issues relating to the NOME law that will reorganise energy markets reflect this background are known, but the Japanese events might well influence the outcome.

■ **At what level will the Arenh price be set?** The core of the question over the allocation of the benefit from nuclear and market structure is reflected here. The Industry Minister has said that the price will reflect consumers' purchasing power, EDF's investment needs and historic nuclear cost, but also that it will be in line with the Tartam rate. EDF has been pushing for a price in excess of EUR45/MWh, while its competitors are looking for a level around EUR35/MWh.

■ **What is the long-term outlook for regulation of the generation market?** In our view, a consideration of the French power generation market leads to questions over whether a trend towards re-regulation may be further reinforced or whether EDF's generation will at some stage achieve prices that reflect wholesale markets. For the moment, the way ahead looks more like continued, or even heavier, regulation to us.

A one-year moratorium in Italy...

... or maybe longer?

US still committed

■ Italy

Despite initially rushed statements that Italy was going ahead with nuclear new build, the government stepped slight from this position shortly afterwards. There is now a moratorium of at least one year on construction of new nuclear plants. Italy has some specifics, too: it does not have any existing nuclear capacity and hardly any domestic expertise, and it is exposed to high seismic activity.

With all of this in mind, we see the fundamental questions as related to the following:

■ **Will there ever be new nuclear?** The moratorium could well turn into something permanent or mean the end of the programme before it has begun, if the government reconsiders its position in the wake of a generally weak stance by centre-right governments in Europe that has been made worse by the events in Japan. Furthermore, considering the history of government stability, how would other successive governments view the issue?

■ **Is Italy a suitable location for nuclear?** We think that this is one of the questions that the government may be considering. With high earthquake risk and closeness to coasts in many locations, the question is certainly relevant. In our view, it puts a high risk on the country's nuclear revival.

■ **How long will the moratorium last?** The government has stated that it will be at least one year. But, this could well mean it remains in place longer, potentially much longer. It could well become a hot political subject, and the longer the moratorium remains, the lower the expectation of a resurrection of nuclear plans might become. Could there be another referendum? As said above, with such a long and potentially open-ended moratorium, we believe investors should also ask themselves whether nuclear will ever come back to life.

■ **Could the programme be scaled back?** While this question applies to any country with a new nuclear programme, the specific geographic situation of Italy makes it particularly relevant (see question suitability of location above).

■ US

The US government has reiterated its commitment to nuclear, and the Obama administration sees it as a crucial element of its clean-energy and energy-independence ambitions. The Nuclear Regulatory Commission (NRC) has ordered a safety review of all plants, though. We would point out that, paradoxically, less support for nuclear could also be negative for renewables. We see the following as the key biggest questions.

■ **Will there be less new nuclear and/or delays to build?** Even though it is not obvious from any public statements, there might still other factors that can impact new build and the timing of it: eg public opinion having a high weight in authorisation decisions, cost being at the high end of the range globally, to name a few. We see the likelihood of delays as high and also see risk of scaleback, albeit not material.

■ **Will there be enough and sufficient loan guarantees?** The US government has committed loan guarantees to new nuclear build without which new plant is by and large not financeable. In order to ascertain to what degree the loan guarantees enable build, we think the cost of financing needs to be looked at again. Also, would there be a higher amount of loan guaranteed required? Would the government need to step up the volume of its loan guarantee programme if the total cost of nuclear has increased? If so, would it be able and willing to do so? These are all very contentious issues, and we think chances of any of them getting addressed in a meaningful way before the next presidential election are very low.

■ **Have the prospects for an energy bill changed?** The chances of a comprehensive and meaningful energy bill seeing the light any time soon were already slim before the events in Japan. Too many controversial determinations meant it was impossible to rally enough support through both Houses. All draft versions have included support for nuclear. One of the minimum items for the bill to be anything but a shell has been a national Clean Energy Standard (CES). In itself, passage of a bill with a CES could be shaky, depending on the actual requirement and what is included. So far, the administration has included nuclear in any potential CES. Without it, any CES is probably impossible. The question now is whether there will be even less support for a CES, and more broadly an energy bill, as political risk has just increased again. Prospects look remote, with the next presidential election already beginning to loom. This leads to fundamental follow-up question: what will happen to the renewables market? In our view, the solar market is picking up speed on its own dynamics as economics favour solar build. But the outlook for the wind market remains unpromising. The energy legislation topic leads on to the next question, which is equally important and has geopolitical ramifications.

■ **What will happen to climate change goals?** On the domestic front, the question stands for itself. But beyond that, there are larger implications. It is in our view fair to assume that global climate change negotiations will be very difficult without a US energy bill or any other significant climate change commitment. The US chief negotiator has already stated that the US considers a binding global target unworkable. That stance might mean very little tangible outcome for the next rounds of climate talks still. That in turn bears huge consequences for the global climate change and renewables and related sectors.

■ China

China: overall goals still in place

The government was quick to confirm support for nuclear and that its programme will be ongoing, but subsequently said that it may slow its ambitions. Approvals of new projects have been suspended while nationwide safety checks are ongoing. Yet, the overall goals seem unchanged so far. With China being the largest builder of new nuclear globally, with electricity demand set to triple in the next 20-25 years, many of the fundamental global questions turn up in concentrated form, most notably:

■ **Is nuclear required to satisfy electricity demand growth?** To put things in perspective, under the above base case demand, China will need to install in excess of 1.2TW of capacity between now and 2025. The current plans are for 40GW of nuclear by 2020, and the industry even claims that 80GW could be feasible. This also leads back to the very basic question of costs vs benefits of energy as a function of the country's stage on its path of development.

■ **How will climate change policy evolve?** And along with this: is nuclear indispensable to keep the growth of emissions in check? The country's current goal is for a 17% reduction of emissions per unit of GDP by 2015.

■ **How safe is nuclear in China?** China's experience with nuclear is relatively recent. In the late 1990s, the country had only six reactors. Besides a track record that is not free of accidents, China is also earthquake-prone with earthquakes of more than of 7 on the Richter scale not uncommon. Many new build projects are located in coastal regions, which leads to the additional question of whether some of these locations might be considered no longer suitable.

THE CURRENT STATE OF NUCLEAR POLICIES

Japan	2010 METI planned to increase energy self sufficiency to 70% by 2030, supposing new reactors as well as achieving 90% capacity factor across all plants. In 2010 the oldest operating reactor reached their 40-year mark implying some necessary close down. However, JAPC obtained approval for its small Tsuruga unit 1 to continue to 2016, due to 2 x 1538 MWe new capacity at that site being delayed. Then Kansai applied for a 10-year licence extension from November 2010 for its Mihama-1.	Japan's government estimated it would have to spend over 10 trillion yen (\$120 billion) in emergency budgets for disaster relief and reconstruction. The government acknowledged that norms were insufficient when the March 11 earthquake and tsunami wrecked Fukushima Daiichi nuclear power station. It plan to set comprehensive rules for power plant operators monitoring.
EU	N/A	Member states agreed on March 25 to set "highest standards on nuclear safety and to submit all national plans to voluntary "stress tests" to be put in action by the end of the year across 13 of the 16 EU's member states totalling 157 reactors in operation. These tests will have no legal backing but findings are to be public. The European Energy Commissioner Günther Oettinger is in charge of the practical implementation. Criteria are to be released by June, to be able to begin tests by Autumn and to publish results by the end of the year.
Germany	The government coalition, formed after 1998 federal elections, implemented a phasing out. With the new government in 2009, the phase-out has been cancelled. In September 2010, an agreement was reached to continue to operate the 17 nuclear plants installed consisting in 8-year licence extensions (from 2001-agreed dates) for reactors built before 1980, and 14-year extensions for later ones.	In March 2010, operations at seven ageing nuclear plants were temporary closed and the life-span extension program was suspended for three month. Germany pushed at the EU summit for safety tests and intend to close any reactor that fails the implemented stress tests.
UK	The UK has 19 reactors generating about 18% of its electricity and all but one of these will be retired by 2023. In 2009, the government assumed that there will be a requirement of 60 GWe of net new generating capacity by 2025, of which 25 GWe would come from nuclear. Although, no target has been fixed. Life extension programs are used since 2005. Nuclear power regained political support since 2006 which opened the path for new build projects: 4 reactors planned today.	UK is also for the review of all nuclear plant, which was already on process in the country but is not favourable for a thickening of the regulatory environment. Russia and US are currently negotiating to share uranium enrichment technologies and would start the cooperation by 2013.
France	France derives over 75% of its electricity from nuclear energy with 58 operating reactors. 900 MWe reactors all had their lifetimes extended by ten years in 2002, 1300 MWe series had extra ten years' operation conditional upon minor modifications One EPR is currently in construction. In July 2010 EdF said that it was assessing the prospect of 60-year lifetimes for all its existing reactors. This would involve replacement of all steam generators (3 in each 900 MWe reactor, 4 in each 1300 MWe unit) and other refurbishment, costing EUR 400-600 million per unit to take them beyond 40 years. EdF is currently replacing steam generators at two units per year, and plans to increase this to three units in 2016.	France is committed to carry stress tests under the National Authority for Nuclear Security by the end of the year and proposed to close any reactor that fails to meet safety requirements. Nicolas Sarkozy confirmed France' strategic commitment to nuclear the opening day of G20 meeting hold in March. He called nuclear industry chiefs of the Group of Twenty countries to held a meeting in Paris to define international nuclear safety standards.
US	The US account for more than 30% of worldwide nuclear generation of electricity. The country's 104 nuclear reactors produced 799 billion kWh in 2009, over 20% of total electrical output. A lifespan extension program was set in 2000 and is to continue out to 2015E. New build programs (9 reactors) are on approval process and one reactor is in construction.	The U.S. Nuclear Regulatory Commission would conduct a general review of nuclear facilities currently performed for six of U.S. plants. Specifically plants will be tested to cope with flooding, fire, explosions and a total loss of power and backup power systems. US government also plans to increase the National Nuclear Security Administration budget. Obama reaffirmed in March 2011 that nuclear power continued to be a key component of the US energy mix strategy.
Russia	The Russian Federal Nuclear Agency adopted a life extension program in 2000 for 12- first generation reactors. In 2010, the government initiated a new life extension period from 15 to 25 years but necessitating major investment in refurbishing. In 2010, 24 reactors are planned to be built at a launch rate of one p.a.	Russia and US are currently negotiating to share uranium enrichment technologies and would start the cooperation by 2013.
China	From 2008 to 2010, China double its 2020 targets for nuclear energy use. The 77 additional reactors are planned to give more than a ten-fold increase in nuclear capacity from currently 10GWe to at least 90 GWe by 2020, 200 GWe by 2030, and 400 GWe by 2050.	Approval of any new plant suspended but not stopped. Hu Jintao renews in March 2011 its cooperation with France on civilian nuclear. Wei Shaofeng, deputy director of the China Electricity Council indicated that China was likely to reduce its 2020 nuclear expansion target by 10GW, coming back to previous level.

Source: World Nuclear Association, Reuters, Market Watch

VI – Investment implications

We see the industrials sector as the biggest beneficiary due to its diversified exposure to energy with a defensive nuclear profile and exposure to new areas of energy, such as renewables and energy efficiency. We see risk in utilities remaining high. The recent outperformance of the renewables sector is set to unwind once a weak Q1 reporting season begins to hit the screen. Our preferred names are Siemens and Schneider Electric, while EDF now offers good upside after its recent underperformance, even though visibility is low. We are wary of sentiment on Solarworld being fickle.

■ Renewables, Capital goods, Utilities: key sectors exposed to the theme

INVESTMENT IMPLICATIONS

		Scenarios		
Sector	Global view	Business as usual	Nuclear scale back, balanced compensation	The world goes green
Utilities	Risk premium will remain high. Generators exposed to earnings loss from nuclear vs rising power prices. Renewables build won't fully compensate.	Sector underperformance	Generators outside of Germany outperform. Supply margins strengthen.	Low nuclear and renewables generators outperform. Nuclear exposure underperforms. Pressure on supply margins.
Capital good:	Diversified nuclear exposure mitigates against risk of less new nuclear. Other new revenue streams may compensate. Beneficiary from energy efficiency, infrastructure.	Outperformance on the back of strong order flow from nuclear, energy efficiency; less from renewables	Strong order flow from nuclear, energy efficiency, less from renewables	Risk to new nuclear orders, but growth in energy efficiency and renewables will drive the sector
Renewables	Differentiation will return to the sector. We anticipate performance to reverse on the risk of a weak Q1.	Sector underperformance	Rising volumes, but challenging industry structure caps performance	Prolonged sector outperformance across the board
Key names	EDF Enel Siemens Schneider Electric ABB Wacker Chemie	EDF Siemens Schneider Electric Wacker Chemie	Centrica Wacker Chemie Abengoa Vestas Meyer Burger	Iberdrola Enel Schneider Electric SMA Solarworld Vestas Meyer Burger

Source: CA Cheuvreux

■ Renewables: don't get carried away

In any scenario, we believe there is some uplift in outlook for the renewables sector. Even if nuclear gets back on the rails almost unscathed, the reminder of its risks and perils may have at the very least brought the spotlight back on renewables. Then, there are the much more optimistic scenarios of speedier and more extensive renewables build.

But we are wary of the underlying short-term fundamentals of the industry. The renewables sector has outperformed in an undifferentiated fashion. We think that over a longer time horizon, some basic criteria should still prevail for investment selection even if they might temporarily be in the background: Competitive advantages across the value chains, barriers to entry and financial strength will in our view remain the most important determinants of performance. In our view, whatever the outcome will be once the turmoil settles, those will remain unaltered. Many names in the European sector look rather weak under these criteria. Margin pressure remains as competition intensifies in markets with weak or uncertain volume outlooks. We prefer the upstream end of the solar value chain as well as the market-leading European solar equipment names.

Further, we are very concerned that a weak Q1 reporting season and weakening fundamentals post Q2 may put an abrupt end to the broad-based renewables outperformance. The solar market has had a weak start to the year, and order momentum in the wind sector has been dismal so far. This makes for disappointment vs high expectations.

We feel that in any event, momentum in favour of lean, energy consumption and savings management and energy efficiency names will remain strong. If nuclear goes ahead, these sectors have the benefit of producing results quickly before any plant gets commissioned, and at a low cost. If renewable power generation technologies win to a great extent, they will be a very important complement for systems to cope with a different energy mix.

Wacker Chemie (WCH GR; 2/Outperform, TP EUR175) benefits from solid competitive advantages and high barriers to entry while having volume growth contractually secured. We are wary that sentiment towards **Solarworld** (SWV GR; Not Rated /R) is fickle. **Vestas** (VWS DC; Not Rated) may increasingly benefit from offshore wind build, but the near-term outlook for the global wind market remains uninspiring.

■ Green capital goods: the best of all worlds

The capital goods sector benefits from its broad energy exposure. So, whatever is bad for its nuclear exposure might come through in a positive way for other parts, ie services, energy efficiency and renewables.

The nuclear exposure in itself is broad; it encompasses global scale (as opposed to utilities' European focus where the risk on nuclear is arguably higher), reactor services, new generation technology and build, and even decommissioning services and equipment. Considering the current exposure, we see limited risk. Projects under construction have not been halted so far. And nearly all new projects in the order books of capital goods vendors have already started. The majority of the existing backlog relates to service, maintenance and uranium or fuel supply. Unless reactors are halted on a massive scale, fuel supply will continue as planned. Maintenance and service might even increase if one listens to the plant 'stress tests' that are proposed by some. Clearly, there is risk to new orders: how much is as yet impossible to assess.

We expect energy efficiency and infrastructure to be growth drivers for the sector in any scenario.

We highlight **ABB** (ABB US; 2/Outperform, TP USD28), **Siemens** (SIE GR; 1/Selected List, TP EUR105) and **Schneider** (SU FP; 2/Outperform, TP EUR132) for their energy-efficiency exposure.

Outside the Green Tech segment, we also note that our capital goods team rates **Areva** (CEI FP; 2/Outperform, TP EUR39) as outperform on the grounds that the name offers a compelling opportunity.

■ Utilities face more challenges

The picture is very muted to say the least, and probably still negative. The market's gut reaction has claimed so. Yet, depending on the answers to the questions that we have set out above, we think things are not as black and white.

First and foremost, there is risk of lost earnings from early nuclear shutdowns, scaleback to new nuclear and higher capex and opex as a result of higher safety requirements. The German names are most exposed. We see the single biggest impact, though, on utilities as more regulatory uncertainty compounds with the already existing high regulatory risk.

Utilities have the opportunity to make up with renewables build, but again, this is a road with many uncertainties. Offshore is the area that can deliver the most sizeable impact, but risk on execution and value destruction is high. Supply businesses might benefit from enhanced revenues and margins in the energy services businesses as we anticipate a renewed push for energy efficiency.

There could be positive impact on generators. The chances are that the seven pre-1980s German reactors that have shut down will remain so, with Brunsbüttel shut too. This would tighten the market in such a way as to move German research margins towards 10%. We expect that demand for coal and gas will increase and drive up commodities, thereby sustainably lifting power prices. This in turn would make us turn positive on generators. There is risk that additional power price driven profits might be taxed away, but we judge that this risk will become material only after sizeable profit growth has been generated and power prices go over EUR65/MWh.

EDF (EDF FP; 2/Outperform, TP EUR32) is heavily exposed to nuclear, but has underperformed severely and has now regained a strong exposure to renewables through the **EDF EN** (EEN FP; 3/Underperform, TP EUR36) buyout. **Enel** (Enel IM; 2/Outperform, TP EUR5.20) stands out as a beneficiary from power prices while being relatively immune to the sector's risks. **Veolia's** (VIE FP; 2/Outperform, TP EUR25) energy services business might benefit from an increased push for energy efficiency. **Iberdrola's** (IBR SM; 2/Outperform, TP EUR3.40) renewables exposure looks much more attractive again. The German names (**E.ON** – EOAN GR; 3/Underperform, TP EUR25; **RWE** – RWE GR; 2/Outperform, TP EUR56) and **Fortum** (FUM1F FH; 3/Underperform, TP EUR17) are exposed to the risk of earnings loss from reactor closures, a revocation of the life extension deal, and arguably the highest regulatory risk. That makes up for their positive exposure to power prices.

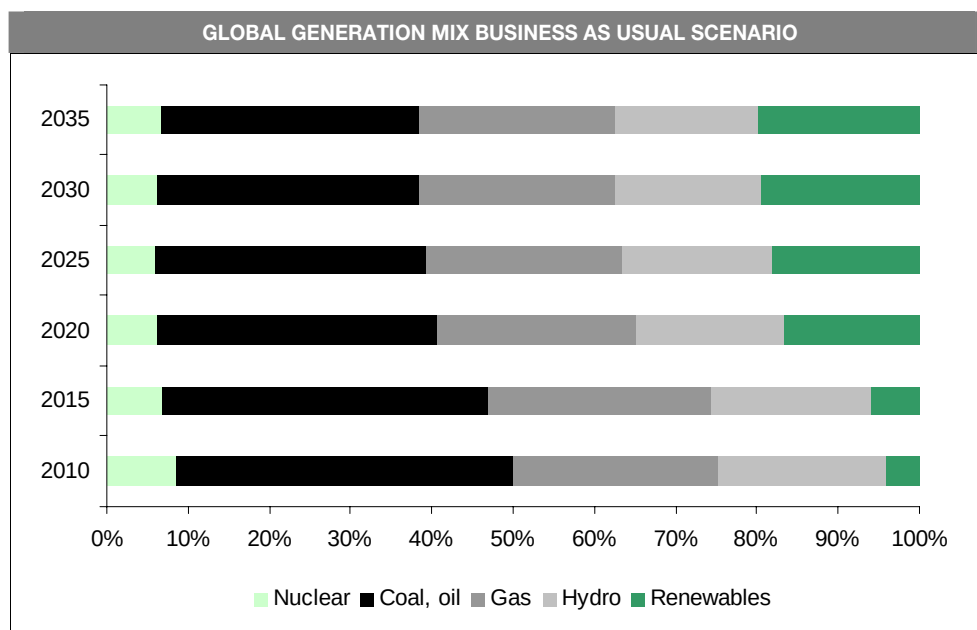
■ Looking at potential new energy scenarios

We have looked at a number of routes that the world could go down in its capacity decision and at the impact of a strong commodities scenario. Below we analyse implications.

Scenario 1: business as usual

The assumption is that the nuclear revival will resume its course basically unscathed, but that Germany will phase out its nuclear plants once the currently agreed life extensions are used up. Policy support would just be enough to get renewables build to current moderate scenario assumptions.

The global generation mix would include just short of 8% nuclear and 20% renewables by 2035, but remain dominated by fossil fuels.



Source: EIA, AIEA, CA Cheuvreux

We see the most likely sector implications as follows:

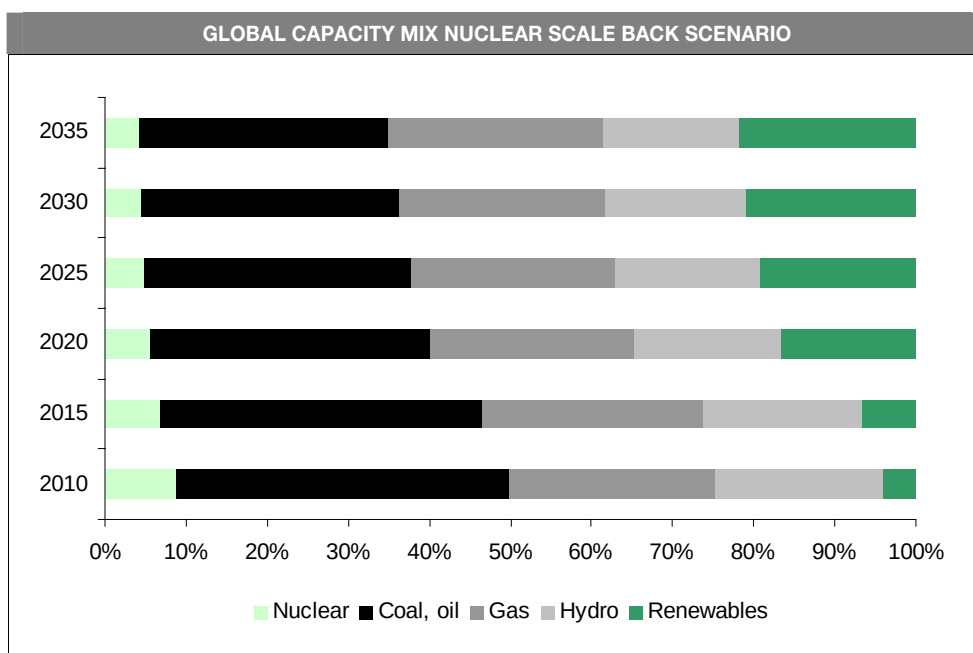
- **Utilities** will build nuclear in Asia, the US and Europe ex Germany. The German utilities will not be able to fully make up for weak pricing and capacity retirements with renewables build. Sector-wide underperformance will continue but those names with strong nuclear exposure and below-average exposure to regulatory risk (ie German players) will recover.
- The **industrial** nuclear suppliers will benefit from strong order and volume growth from nuclear, and energy efficiency. There will be weakness in renewables businesses.
- The **renewables** sector will continue to shift towards Asia, and Asian solar and wind manufacturers will be global market share leaders. European manufacturers will struggle with intense competition. Margins will remain under pressure. The European sector will underperform despite strong volumes. The solar upstream sector, equipment manufacturers and turbine names with strong offshore portfolios will outperform the sector.

Names that stand out in this scenario:

- **Siemens**, on the grounds of its offshore wind and energy efficiency exposure;
- **Schneider Electric**, for its energy efficiency business;
- **EDF**, as a name that has been hit hard while benefiting from nuclear in regions that are committed to the technology; and
- **Wacker Chemie**, as it benefits from solid and sustainable competitive advantages in any scenario.

Scenario 2: nuclear scaleback, balanced replacement

We have assumed that retirements will be accelerated, notably in Germany where the reactors shut remain closed. We have further assumed that only 50% of current expected new capacity will be built. Lost nuclear capacity will be replaced first and foremost by gas, and then in equal proportions by gas, coal and renewables. This would reduce the nuclear share below 5% and lift gas build by 15% and the renewables share of total capacity just above 20%.



Source: EIA, AIEA, CA Cheuvreux

We see the most likely sector implications as follows:

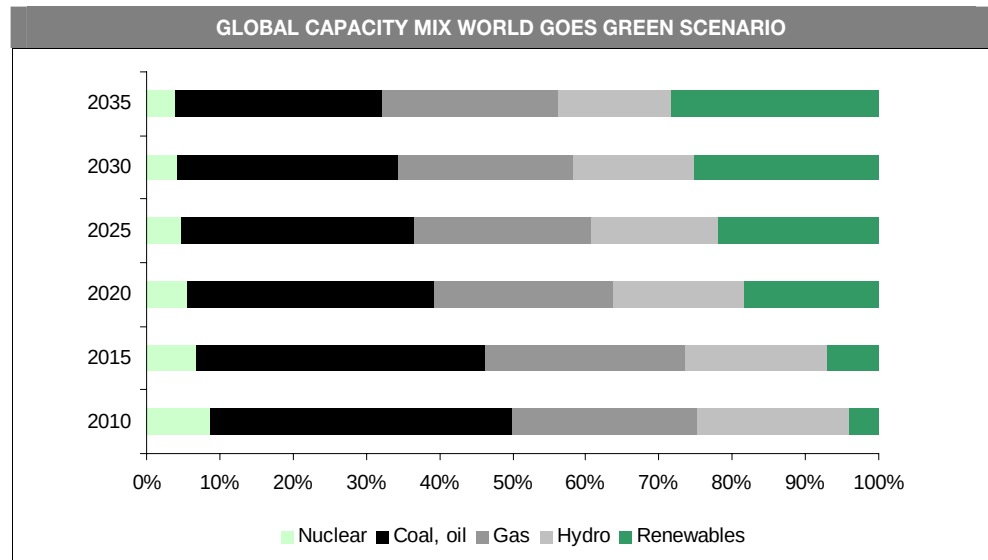
- In the **Utilities** sector, generators that lack exposure to German reactor closures and regulation will outperform as power prices rise. There will be a second dash for gas. Supply margins will improve.
- The **industrial** nuclear suppliers will benefit from strong order and volume growth from nuclear, renewables and a stronger push for energy efficiency. Renewables orders will gradually improve as growth prospect pick up and industrials gain market shares.
- The **renewables** sector will benefit from the prospect of stronger volumes, but industry challenges such as competition, near-term oversupply and lack of new policy measures will cap performance.

The following names stand out in this scenario:

- **Centrica** would benefit from increasing commodities prices, strengthening supply markets and its growing renewables exposure. This would make up for risk from its nuclear exposure. The bulk of its nuclear will probably remain unaffected.
- **Wacker Chemie** would benefit from massive solar expansion.
- **Abengoa** would benefit from a stronger push for solar thermal over the long term.
- **Vestas** should see order growth from offshore, even if industrials capture a larger share.
- **Meyer Burger** will benefit from its unrivalled market position that has been further strengthened by the Roth & Rau acquisition. The order cycle would become longer.

Scenario 3: the world goes green

We have assumed a gradual but not complete exit from nuclear, with global net capacity reducing by 50% and the loss to be made up by renewables only. This would lift the renewables share to 30%. This has to entail the assumption not only that there will be strong policy support but that there will be new action on renewables support.



Source: EIA, AIEA, CA Cheuvreux

In such a scenario:

- **Utilities** will be beneficiaries from sustained higher power pricing. Low nuclear and renewable generators will outperform. Nuclear-exposed names will underperform. Supply businesses will underperform as large increases in the cost of energy put the spotlight on end user prices.
- The **industrial** nuclear suppliers will partially compensate lost new nuclear orders with new revenue streams such as decommissioning and related services. They will benefit from renewables and energy efficiency and infrastructure growth.
- The **renewables** sector will outperform over a prolonged period on the prospect of strong volumes. Bottlenecks returning to supply chains will keep pricing high and thereby slow margin compression for European manufacturers.

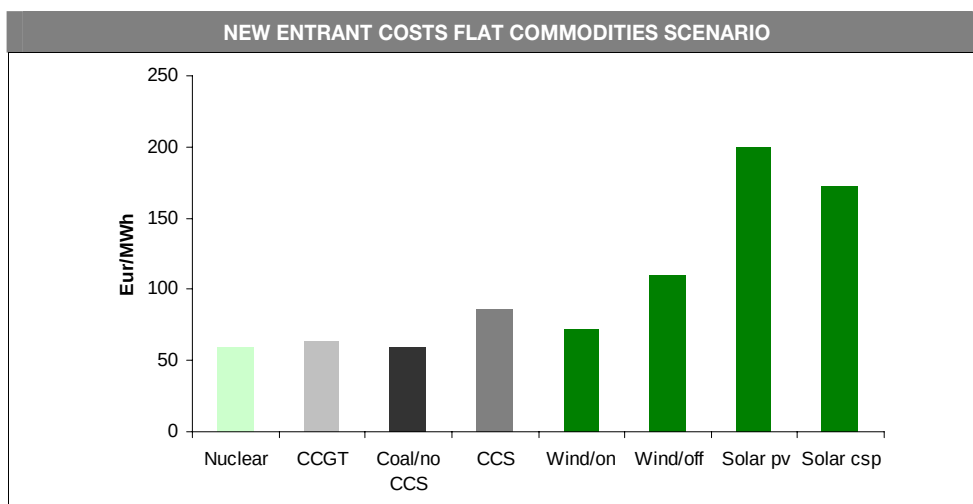
We highlight the following names for this scenario:

- **Iberdrola** is the largest renewables developer, with growing exposure to offshore.
- **Enel** should benefit from rising power prices while lacking significant nuclear exposure and through its share in Enel Green Power.
- **Schneider Electric** would probably see a major uplift to its energy efficiency revenues as that segment would become highly relevant in a full green scenario.
- **SMA** would be a major beneficiary from solar expansion, irrespective of who the winning manufacturers are.
- **Solarworld's** profitability could (despite its high cost structure) benefit from a very bullish renewables scenario requiring significant solar build and entailing tight capacity and thus sustained pricing. Especially if European commitments remain very high and/or rise, the company's premium model may remain viable.
- **Wacker Chemie**: see above, just in compounded form.
- **Meyer Burger/Roth&Rau**, the market leader in solar manufacturing equipment, may see long-term and substantial order uplift.

■ **Vestas** would benefit from a broad-based wind market recovery, including in the US market.

Scenario 4: flat commodities

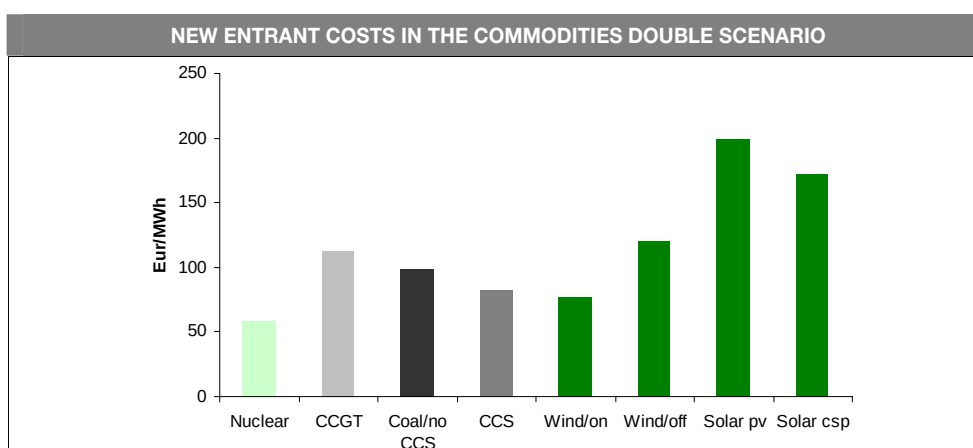
We have further looked at commodities scenarios. If there was indeed a shift in the structure of the global power generation park, this would influence global commodity prices, ie coal, gas and CO₂ on the back of fossil fuel generation.



Source: CA Cheuvreux

Scenario 5: commodities double

A bullish commodities scenario would materially alter relative economics between fossil fuels and renewables. There might be little prospects of it now, but we would certainly see a scenario of commodities doubling from current levels over the very long term as not completely remote. The origins of another commodities run might be many, but a shifting generation park might be one. This scenario would in our view lead to a significant revival of renewables ambitions and a standalone commercial market.



Source: CA Cheuvreux

In this scenario, offshore wind would begin to become viable. Solar remains uncompetitive and still needs to see a significant downward shift of the cost curve. We find it intriguing to see CCS become competitive, but we remain wary of the fundamental sustainability question concerning space and the long-term fate of the captured CO₂.

IMPACT OF THE FUNDAMENTAL NUCLEAR QUESTIONS ON SECTORS

Sector	Questions	Impact
Utilities	Will the short nuclear/long renewables trade unwind?	↑
	What is a future energy mix and a path thereto?	?
	What are the shares of nuclear and renewables?	↓
	What is the impact on energy prices?	↑
	What is the future of regulation?	↓
	Can nuclear be financed?	↓
	What is the true cost of nuclear?	↓
	Will capex change?	↓
	What is the impact on credit ratings?	↓
	What is an appropriate age and life for nuclear reactors?	↓
	Will there be precipitated shutdowns and if so how fast?	↓
	Will there be new conditions and obligations on existing plant?	↓
	Will life extensions be cancelled or reversed?	↓
	Will there be profit share for existing nuclear and extended lives?	↓
	Will there be new nuclear?	= - ↓
	How will public acceptance levels change?	↓
	How much delay will there be to existing applications?	↓
	Will already-granted permits be revoked or amended?	↓
	Will new applications be considered?	↓
	Are there new criteria to be considered for new nuclear?	
	How would nuclear be replaced?	↑
	How would climate change be impacted?	↑
Capital goods	Will there be order cancellations or delays?	(↓)
	How would early shutdowns affect revenues?	↑
	What is the impact of increased safety?	↑
	What does the picture look like for new reactors?	↑
	Will warranty/provision risk increase?	↓
	Will R/D budgets rise?	↓
	Will there be new revenue streams?	↑
	What other new energy opportunities may arise?	↑
Renewables/cleantech	Will renewables replace nuclear?	↑
	What is an appropriate share of renewables?	↑
	Do renewables have externalities?	↓
	Will they move into a new regulatory sweet spot?	↓
	How are renewables to be financed?	↓
	What is the impact on competitiveness and mass adoption?	=
	Is there any impact on the industry structure?	=
	Where else could new opportunities lie?	↑

Source: CA Cheuvreux

POSITIVE AND NEGATIVE INVESTMENT POINTS BY SECTOR

Sector	Positives	Negatives	Comment
Utilities	Tightening power markets in bear scenarios		To benefit French/Italian names, German names impacted by shutdowns that offset
	Offshore build		Positive for UK and German projects (Centrica, SSE, RWE, E.ON, Iberdrola).
		Less nuclear	Highest earnings hit in Germany
		Higher regulatory risk	Positive impact UK, negative Germany
		More capex	Hits German and UK names
Capital goods	New revenue streams		Positive across the sector
	Renewables build		Benefits Siemens, Alstom
	Energy efficiency to gain		Benefits Schneider, ABB
		Less new build	Will impact concept sentiment and orders that are far out
Renewables/cleantech	Beneficiary from reduced nuclear		Benefits major utilities with strong renewables businesses, namely offshore wind. Positive for solar upstream and Chinese downstream names.
	Political support restored		Will only have an impact if followed by action and funding
		No reversal of downward trajectory of subsidies	Will continue as a challenge, mainly for solar
		Industry structure	Intense competition and oversupplied market in a sector in transition pressure margins

Source: CA Cheuvreux

CHEUVREUX VIEWS ON KEY NAMES DIRECTLY EXPOSED TO NUCLEAR AND CLEAN ENERGY

Name	Ticker	Rating target price	Mkt cap (FX m)	Exposure to nuclear/renewables/clean energy	Positives	Negatives	Comment
ABB	ABB US	1/Selected List, USD28	56,911	Nuclear: minimal; Energy efficiency through T&D, industry, building, utilities	Beneficiary from renewed push for energy efficiency and infrastructure build		Strong demand recovery on the way
Areva	CEI FP	2/Outperform EUR39.60	11816	Leading reactor manufacturer and service provides	Potential for share price recovery after shock reaction Potential for new revenue streams	Uncertainty over future new reactor orders	The worst is over, even when toning down our nuclear revival scenario
Centrica	CNA LN	3/Underperform, 310p	17114	1.8GW of nuclear output from British Energy / over 1.5GW of offshore wind and looking for more	Beneficiary from renewables build, rising commodities, power prices and supply margins	Nuclear exposure	
EDF	EDF FP	2/Outperform, EUR40	54430	Nuclear 75% of power generation; new build in the UK and Asia; buyout of EDF EN	Increased renewables exposure from EEN deal	Risk to nuclear, low visibility	Opportunity following recent underperformance
EDF EN	EEN FP	3/Underperform, EUR36	2880	100% renewables developer	Beneficiary from improved outlook for renewables	Weak US wind market. French solar market opportunity much reduced	No longer relevant as buyout by EDF
E.ON	EOAN GR	3/Underperform, EUR24	43742	26% of power generation nuclear (22% in Germany), 10% renewables 6GW renewables pipeline	One of the strongest utility owned renewables portfolio. Exposure to power price strength	Nuclear and German risk	Risk over nuclear and German regulation prevails
Enel	ENEL IM	2/Outperform, EUR5.20	42560	14% of power generation nuclear. 70% stake in Enel Green Power; 7% of EBITDA	Power price and renewables exposure	Some French nuclear exposure. Strained balance sheet	Risk on Italian nuclear revival but largely sheltered
Exelon	EXC US	Not Rated	27242	Nuclear 93% of generation park, Renewables 1%	Operational track record, US commitment to nuclear	Risk to new projects	Under-performance less pronounced than European names reflects US commitment
GDFSuez	GSZ FP	3/Underperform, EUR30	60859	Nuclear 16% of power generation, renewables 4%	Low carbon generation, solid BS, strong growth profile	Belgian nuclear tax	Low visibility on French gas prices will weigh
Gamesa	GAM SM	Not Rated	1817	Second largest European wind turbine manufacturer	Benefits from renewed support for renewables and stronger global growth	Weak US and European markets	Near-term visibility is low

Source: CA Cheuvreux, Bloomberg

CHEUVREUX VIEWS ON KEY NAMES DIRECTLY EXPOSED TO NUCLEAR AND CLEAN ENERGY, CONT'D

Name	Ticker	Rating target price	Mkt cap (FX m)	Exposure to nuclear/renewables/clean energy	Positives	Negatives	Comment
GCL Poly	3800 HK	Not Rated	76154	100% renewables through solar	Benefits from poly market tightness and post Fukushima price strength	Tier 2 manufacturer.	Uncertainties remain from H2 11; contract position less strong than sector benchmarks.
Iberdrola/ Iberdrola Renovables	IBE SM/ IBR SM	2/OP, EUR8.04 / 2/OP, EUR3.40	36330 / 13027	Nuclear 37% of power generation, renewables 23% of power generation, >25GW pipeline	Benefits from renewed support from renewables. Limited nuclear exposure	Oversupplied domestic power market. Weak US wind market.	Expect little inspiration while the US wind market remains weak.
Meyer Burger	MBTN SW	3/UP, TP CHF 34	1911	100% renewables through solar	Roth & Rau deal materially strengthens market position	Market leadership reflected in premium rating	High quality name, but well understood
Q-Cells	QCE GR	Not Rated	545	Fourth largest global solar cell manufacturer	Solar market might see new uplifts	Commoditised segment of the value chain	Risk of weak Q1 and margin squeeze from H2
RWE	RWE GR	2/OP, EUR63	25,809	Nuclear 20% of power generation, renewables 4.2%. 2.6GW renewables pipeline	Positive power price leverage. Improving carbon footprint.	Nuclear and German regulatory risk. Still carbon heavy.	The most exposed to German nuclear risk
Schneider Electric	SU FP	2/OP, EUR132	33492	Nuclear minimal, Energy efficiency a major revenue driver (32%)	Beneficiary from new push for energy efficiency	Risk of value-destructive expansion/acquisitions	Long-term beneficiary from energy efficiency
SMA Solar	S92 GR	Not Rated	3070	100% renewables through solar	Market-leading product with IP. Supplier agnostic leverage on growth	Driven by sentiment on German solar market	Growing international exposure compensates for Germany. But little inspiration with margin compression in 2011
Solarworld	SWV GR	Not Rated	1282	100% renewables through solar	High end product with strong brand equity	Cost structure. Exposure to German solar market	A likely survivor, but performance may reverse when margins get squeezed again
Vestas	VWS DC	Not Rated	45751	100% renewables; largest global wind turbine manufacturer	Technology advantage and growing foothold in offshore	Lack of visibility on market and earnings recovery	Uninspiring in the absence of a turnaround of the US market
Wacker Chemie	WCH GR	2/OP, EUR175	8691	>60% of EBITDA. Global market leader polysilicon	Unrivalled position in a very strong market	Wafer, exposure leaves earnings volatility	A high-quality name in almost any scenario. Highly leveraged to poly prices
Yingli	YGE US	N/R	1922	100% renewables through solar	Competitive cost structure. Growing market share and brand equity	Exposure to Italian market	A likely outperformer in most scenarios due to its strong market and cost position

Source: CA Cheuvreux, Bloomberg

COMPANY VALUATION RATIOS

TICKER	Share price [€]	Rating	TP	Up- /Downside	Mkt cap [€]	Mkt cap [USD]	P/E			P/B			EV/Sales			EV/EBITDA			P/CF		
							1y	2y	3y	1y	2y	3y	1y	2y	3y	1y	2y	3y	1y	2y	3y
UTILITIES																					
Integrated power generators																					
E.ON	22.35	3/UP	24	7.4%	44,722	64,312	11.8	10.7	10.0	1.0	1.0	0.9	0.8	0.8	0.7	6.4	6.0	5.6	5.9	5.3	4.9
RWE GR	46.59	2/OP	56	20.2%	26,133	37,579	9.3	9.0	10.7	1.6	1.5	1.4	0.9	0.8	0.8	5.1	4.9	5.1	4.1	3.9	4.2
EDF	27.35	2/OP	32	17.0%	50,557	72,702	15.3	13.0	11.8	1.5	1.5	1.3	1.3	1.3	1.3	5.6	5.3	5.2	4.6	4.4	4.2
GDF-Suez	27.04	3/UP	30	11.0%	60,837	87,485	13.0	11.6	10.9	0.9	0.9	0.9	1.1	1.1	1.0	6.0	5.5	5.1	4.8	4.5	4.2
Exelon	39.90	N/R	n/a	13.9%	26,408	268,486	9.9	13.1	13.7	1.8	1.8	1.8	2.1	2.2	2.3	6.1	7.6	7.8	5.9	6.7	6.9
Integrated power generators total																					
					200,613	288,486	11.9	11.5	11.4	1.4	1.3	1.3	1.2	1.2	1.2	5.8	5.9	5.8	5.1	5.0	4.9
Renewable power generators																					
Iberdrola Renovables	3.06	2/OP	3.4	11.2%	12,917	18,575	30.3	25.5	22.0	1.1	1.0	1.0	7.4	6.7	6.3	11.3	10.0	9.4	10.0	8.8	8.2
EDP Renovables	5.20	N/R			4,539	6,527	43.0	31.0	24.1	0.8	0.8	0.8	7.9	7.1	6.2	10.3	9.1	8.0	7.6	6.5	6.1
EDF Energies Nouvelles	40.16	3/UP	36	-10.4%	3,115	4,480	23.9	18.9	15.7	2.0	1.9	1.6	4.9	4.7	4.5	13.6	12.1	10.6	8.6	7.0	5.6
Enel Green Power	1.99	3/UP	1.8	-9.5%	9,945	14,301	21.9	19.5	16.0	1.4	1.4	1.3	5.8	5.4	4.9	9.6	8.8	7.8	9.7	8.4	7.2
Acciona	77.10	2/OP	97.65	26.7%	4,900	7,046	27.2	22.2	18.0	0.8	0.8	0.8	1.9	1.8	1.7	9.4	8.7	7.8	5.8	5.0	4.7
Renewable power generators total																					
				4.5%	35,416	50,928	29.2	23.4	19.2	1.2	1.2	1.1	5.6	5.1	4.7	10.8	9.7	8.7	8.3	7.1	6.3
UTILITIES TOTAL																					
				9.7%	236,029	339,415	19.8	16.9	14.9	1.3	1.3	1.2	3.2	3.0	2.8	8.1	7.6	7.1	6.5	6.0	5.5
WIND																					
Wind turbines and equipment																					
Vestas	196.80	N/R			40,089	7,729	17.8	13.6	11.3	1.8	1.5	1.3	5.9	5.3	4.8	47.4	39.4	33.3	9.0	8.5	5.8
Gamesa	7.00	N/R			1,720	2,473	24.8	17.2	12.9	1.0	1.0	0.9	0.8	0.7	1.2	6.9	6.0	5.3	14.1	7.3	6.0
Goldwind	20.13	N/R			50,005	55,946	16.4	13.2	10.2	3.5	2.8	1.9	0.0	1.7	0.2	0.0	11.9	7.9	17.8	15.4	13.0
Hansen Transmissions	47.50	N/R			318	519	0.0	0.0	26.9	0.6	0.6	0.6	0.8	0.7	0.6	8.0	5.6	4.2	5.7	6.1	5.6
Wind turbines and equipment total																					
					46,356	66,667	14.7	11.0	15.3	1.7	1.5	1.2	1.9	2.1	1.8	15.6	15.7	12.7	11.7	9.3	7.6
WIND TOTAL																					
					81,771	117,596	23.1	18.3	17.4	1.4	1.3	1.1	4.0	3.8	3.5	12.3	11.7	10.0	9.4	7.8	6.7
SOLAR																					
Solar upstream																					
Wacker Chemie	160.15	2/OP	175	9.3%	8,352	12,011	13.7	11.6	10.6	2.8	2.4	2.0	1.6	1.4	1.3	6.2	5.4	4.9	7.6	6.8	6.2
PV Crystalox	57.25	N/R			239	389	9.1	9.7	0.3	0.8	0.8	0.8	0.7	0.7	0.6	3.6	3.9	3.4	6.1	6.8	7.7
GCL Poly	4.77	N/R			73,842	9,495	10.4	8.6	9.0	3.2	2.4	2.0	3.2	2.7	2.5	7.8	6.3	6.5	8.3	6.2	6.5
Solar upstream aggregate total																					
				9.3%	15,224	21,895	11.1	10.0	6.6	2.3	1.8	1.6	1.8	1.6	1.5	5.9	5.2	4.9	7.3	6.6	6.8
Solar integrated and downstream																					
Solarworld	11.11	N/R			1,241	1,785	15.0	14.7	11.1	1.3	1.2	1.1	1.2	1.1	1.1	6.9	6.7	6.9	7.0	6.7	6.4
Q-Cells	3.02	N/R			533	766	17.6	17.4	11.2	0.6	0.5	0.5	0.6	0.6	0.6	5.2	4.7	4.3	4.5	4.1	3.2
Yingdi	12.39	N/R			1,839	1,279	7.7	7.8	11.2	1.2	1.1	1.0	0.9	0.9	0.9	4.2	4.3	4.4	5.0	4.7	4.9
Trina Solar	29.63	N/R			2,339	1,627	7.1	6.9	7.9	1.5	1.2	1.0	0.8	0.7	0.6	4.6	4.2	3.9	5.4	10.6	9.7
JASO US	6.56	N/R			1,101	766	4.9	5.0	6.8	0.9	0.8	0.8	0.5	0.5	0.4	3.6	3.3	3.0	4.1	3.9	4.7
REC	17.64	N/R			2,236	3,215	15.7	15.3	13.5	0.8	0.7	0.7	1.4	1.4	1.2	4.9	4.5	3.9	5.0	4.5	4.3
Solar integrated and downstream total																					
					7,681	11,045	11.3	11.2	10.3	1.0	0.9	0.9	0.9	0.9	0.8	4.9	4.6	4.4	5.2	5.8	5.5
Solar equipment																					
CTN GR	38.85	N/R			822	1,182	14.2	13.6	12.8	1.9	1.7	1.6	1.0	0.9	0.7	5.9	5.5	4.8	14.1	12.7	8.6
R8R GR	22.51	N/R			365	525	25.1	21.3	16.6	1.3	1.3	1.2	1.0	0.9	0.7	8.1	6.7	4.6	16.0	9.7	7.7
M8TN SW	42.75	3/UP	34	-20.5%	1,950	2,182	14.8	15.1	12.9	2.5	2.1	1.7	1.4	1.2	0.8	6.9	6.1	3.9	10.8	8.9	7.2
M8Z GR	51.62				231	333	20.8	14.0	48.7	1.2	1.1	1.1	0.9	0.7	0.6	7.7	5.8	4.1	12.5	9.6	4.7
S92 GR	79.10				2,745	3,947	10.1	10.7	10.1	3.1	2.6	2.2	1.4	1.3	1.2	5.5	5.4	5.1	8.7	8.9	7.5
SMA Solar																					
Solar equipment total																					
					5,680	8,168	17.0	14.9	20.2	2.0	1.8	1.7	1.1	1.0	0.8	6.8	5.9	4.5	12.4	10.7	7.1
SOLAR TOTAL																					
					13,360	19,213	13.9	12.9	14.8	1.5	1.3	1.2	1.0	0.9	0.8	5.8	5.2	4.5	8.5	7.7	6.3
ENERGY EFFICIENCY																					
ABB	24.24	2/OP	28	15.5%	55,965	38,918	16.1	13.3	0.0	3.5	3.0	0.0	1.4	1.2	0.7	8.9	7.2		13.6	11.9	
Aixtron	29.52	1/Sel List	42.5	44.0%	2,986	4,294	13.9	13.4	11.1	3.9	3.2	2.5	3.0	2.7	2.1	7.9	6.9	5.8	13.4	12.3	11.5
Schneider	110.95	2/OP	132	19.0%	30,179	43,398	12.9	11.4	10.4	1.9	1.7	1.6	1.5	1.3	1.2	8.0	7.0	6.3	10.9	9.6	8.8
Siemens	92.62	1/Sel List	116	25.2%	84,674	121,762	12.6	11.7	10.6	2.5	2.2	1.9	1.1	1.0	0.9	7.1	6.6	5.8	9.0	8.3	7.7
ENERGY EFFICIENCY TOTAL																					
				25.9%	156,757	225,419	13.9	12.5	8.0	2.9	2.5	1.5	1.8	1.6	1.4	8.0	6.9	6.0	11.7	10.5	9.3
Others																					
Areva	31.05	2/OP	39.6	27.6%	11,639	16,736	22.3	15.1	16.1	1.4	1.2	1.1	1.6	1.5	1.4	12.5	10.6	9.0	17.0	9.2	9.0
Others total																					
				27.6%	11,639	16,736	22.3	15.1	16.1	1.4	1.2	1.1	1.6	1.5	1.4	12.5	10.6	9.0	17.0	9.2	9.0
CLEAN ENERGY TOTAL																					
				12.9%	251,888	362,228	16.6	14.2	13.8	1.8	1.5	1.3	2.2	2.0	1.9	8.5	7.8	6.8	9.3	8.1	6.9

Source: Bloomberg, Fact Set and CA Cheuvreux

VII – Green Tech company profiles

- ABB
- Iberdrola Renovables
- Schneider Electric
- Wacker Chemie

ELECTRICAL EQUIPMENT



ABB

Late cyclical recovery and energy efficiency

■ 2011 outlook and nuclear exposure

The **automation demand recovery** still looks very strong and could continue for several quarters. Incremental margin in some automation sub-segments could reach 50%. In **Power** T&D, Distribution has definitely started to recover, and prices have even begun to improve. Power Transmission remains weak with price/competitive pressure, but ABB expects this segment to improve by H2 2011E. The negative cable-project one-offs are to stop in 2011E. There will also be updates on the Baldor acquisition, which makes a lot of sense in our view (business and US exposure). **Price** pressure could represent around 3% of group sales on average in 2011E incl. backlog business, but a gradual reduction of the price decline and Q1 price hikes in the automation businesses are likely to improve the numbers quarter after quarter.

The new USD1bn in **cost cuts** for 2011 are mainly designed to offset this factor, while the volume rebound and fewer one-offs should clearly improve margins. In terms of business outlook, management will also present a new **five-year plan** in September, which will improve the visibility on growth and margins. Lastly, ABB's net cash position could produce a special dividend or **share buyback** announcement in 2011E.

ABB's **nuclear** exposure is less than 2% of revenues, mainly focused on control systems, instrumentation, switchgear and circuit breakers for power plants.

■ Investment case and valuation

After a difficult H2 2010, we expect 2011E to be the year of a **real recovery for ABB**. Most of the problems have been cyclical in nature and are improving: automation orders are growing at double-digit rates and margins are recovering rapidly; power distribution is seeing the beginning of demand recovery and USD3bn in cost cuts in 2009 and 2010 have kept EBIT margins above 12%.

Energy efficiency relates to c. 45% of revenues and includes Power and Automation businesses. ABB caters to industry, building and Utilities in this field, tackling all major sources of power consumption or loss. This could boost revenue growth further. We expect a tremendous margin recovery over the next two years (2011E EBIT margin of 13.3%E vs. 12.1% in 2010; 2012E: 15.6%E). The net cash position, combined with continuous strong FCF, could also allow for a cash return to shareholders.

Our DCF-based **valuation** currently stands at **USD28.0/CHF27.0/SEK180**. ABB is currently trading with a slight premium of 5% to the usual comparables vs. a historical 10-25% premium

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GREEN TECH ■ Green Technologies

Rating 1/Selected List

Target price (6 months) **+15.8% \$28**

Price (13/04/2011) **\$24.24**

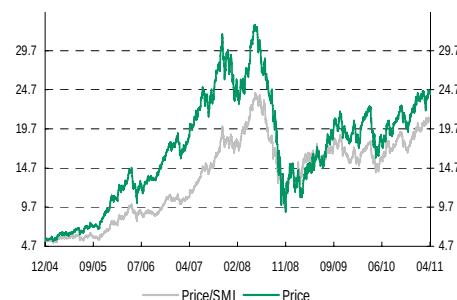
Reuters: **ABB.N** Bloomberg: **ABB UN**

Stock data

Market capitalisation	\$55534m
Free float	\$51313m
Enterprise value	\$55262m
No. of shares, adjusted	2291m
Daily volume	\$23.35m

Performances

	1 month	3 months	12 months
Absolute perf.	4.2%	4.2%	8.6%
Relative perf.	4.0%	7.4%	17.5%



Shareholders

Free Float 92.4%, Investor Ab 7.6%

	2009	2010E	2011E	2012E
P/E (x)	15.1	20.1	17.6	13.1
EV/EBITDA (x)	7.9	10.2	10.0	7.9
Attrib. FCF yield (%)	6.7	6.3	5.1	7.0
Net debt/EBITDA (x)	(1.0)	(0.9)	(0.3)	(0.6)
Yield (%)	2.4	2.7	2.7	3.0
ROCE (%)	38.6	30.8	27.8	34.0
EV/Capital empl. (x)	3.6	3.9	3.2	3.0

Disclosures available on www.cheuvreux.com

ELECTRICITY UTILITIES



Iberdrola Renovables

A way to play IBE with potential for extra

■ 2011 outlook and nuclear

At the recent Iberdrola Renovables investor day, capex prospects for the 2010-12 period we updated: IBR expects new adds of 1450MW in 2011 and then a sharp slowdown to 750MW in 2012. Such a slowdown is related to: 1) the uncertainty on what the new regulation for Wind will be in Spain for capacity adds post 2013, 2) the uncertainty on the maintenance of a cash grant system in the USA after the end of 2012. Ignoring post-2013 growth prospects, we believe, may present too gloomy a picture. There appear to be plenty of growth opportunities post 2012: 1) In Spain, the Government's plan is to have 35000MW installed in Wind onshore as of 2020 in order to comply with the 2020 EU targets of renewables representing >20% of final energy consumption (these plans have been reiterated). This should imply c. 1500MW/yr roll-out over the next decade, 2) a significant effort in the UK offshore project should be another opportunity, 3) finally, an extension of the Grant system in the USA and progress towards a Federal RPS would also help growth prospects in this area. Specifically for 2011-12, IBR is suggesting it will still be FCF negative to the tune of EUR1.3bn (FCF positive in EUR540m in 2012), and is guiding for double-digit growth in EBITDA and Net for 2010-12. IBR has no nuclear capacity.

■ Investment case and valuation

Iberdrola Renovables' fortunes as an investment are now tied to the price of parent company IBE and the exchange equation for the proposed minorities take-out, to be completed by early July '11. The main rationale for investing in IBR should be gaining exposure to Iberdrola, in the belief that the exchange equation has yet to be improved in favour of IBR shareholders. The most recent update of the exchange equation (announced on March 22 following both companies' Board Meetings to discuss the deal) is of 0.5045 shares of IBE per share of IBR. This, including the final DPS for IBR and the final DPS of IBE accruing to IBR shareholders in early July (post-deal completion) results in an implied value for IBR shares of EUR3.08 per share. This is a 3% improvement vs. the initial proposal (EUR2.978), but if we adjust for dividends (not mentioned in the initial proposal), it represents a meagre 1% improvement. With the implied deal price of EUR3.08, IBR investors would actually be getting a value that is 5% below our IBR "ex growth" valuation of EUR.25 per share -based on a DCF valuation on a per country & technology basis, and using a spread vs. German bonds of 250bp in our WACC calculations. We continue to believe that Iberdrola could improve the terms of the deal without it hurting its own valuation. For instance, "handing over" Iberdrola's estimate of deal synergies (EUR20/yr) to minorities, taxed & capitalised, could boost the value of the deal (for minorities), by 8%.

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GREEN TECH ■ Green Technologies

Rating **2/Outperform**

Target price (6 months) **+10.0% EUR3.4**

Price (13/04/2011) **EUR3.085**

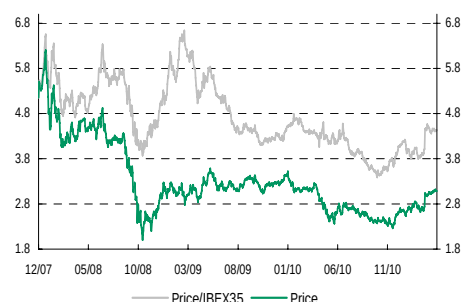
Reuters: **IBR.MC** Bloomberg: **IBR SM**

Stock data

Market capitalisation	EUR13031m
Free float	EUR2606m
Enterprise value	EUR18422m
No. of shares, adjusted	4224.065m
Daily volume	EUR41.75m

Performances

	1 month	3 months	12 months
Absolute perf.	2.5%	17.7%	-4.5%
Relative perf.	-1.2%	13.1%	1.5%



Shareholders

Iberdrola 80.0%, Free Float 20.0%

	2009	2010E	2011E	2012E
P/E (x)	37.8	31.1	31.3	25.7
EV/EBITDA (x)	13.4	11.0	10.7	9.3
Attrib. FCF yield (%)	NS	NS	NS	5.8
Net debt/EBITDA (x)	2.8	3.3	3.1	2.5
Yield (%)	0.8	0.9	0.9	1.1
ROCE (%)	4.3	3.9	4.6	5.5
EV/Capital empl. (x)	1.1	0.9	1.0	1.0

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ELECTRICAL EQUIPMENT



Schneider Electric

Energy efficiency creates value

■ 2011 outlook and nuclear exposure

Our 2011 projections for Schneider Electric are upbeat, notably due to the very **good positioning** of the portfolio, prospects of a recovery in MT distribution and further cost-cutting in the ONE plan.

The group's business profile enabled it to make a fast and strong recovery after the crisis; **organic sales growth** for Q4 2010 was 12%, and we expect 8.1% in 2011E. In 2011E, **price** increases are likely to offset most of the rise in raw materials prices, following a year of virtually no change in average prices.

Schneider Electric also still has real potential for margin improvement: we expect an EBITA margin of 15.6%E (up 60bp). The objective of the 2009-11 triennial **ONE** plan is to cut general and administrative costs by EUR1.6bn, which has been confirmed even in the context of a strong recovery. Production costs are notably set to be reduced further as a percentage of sales (improvement in the purchasing process, simplification of logistics and production, etc.). Lastly, additional synergies with Areva Distribution are expected.

Nuclear exposure at Schneider is around 0.5% of revenues, mainly focused on low-voltage distribution, monitoring and control equipment.

■ Investment case and valuation

Since 2000, Schneider Electric has succeeded in radically repositioning itself in new sectors of activity and **emerging markets** (37% of 2010 sales). **Energy efficiency and services** have become one of the group's key advantages, contributing 32% of sales, and above-average organic growth; Schneider is strong in building automation systems, but cross-fertilizes into industry, medium voltage and data centres.

Our **DCF model values the group at EUR132 per share**. It is based on a long-term sales growth assumption of 4.5% (the group targets 5.5%), with an EBITDA margin of 15.5% (vs 18.8% in 2010). We use a cost of capital of 9.7% (beta of 1.3) and a WACC of 9.4%.

Current **valuation** levels remain very reasonable. Schneider Electric trades at a 2011E P/E of 12x, 20% **below its historical average** of 15x (1996-2010). Regarding the EV/EBITDA multiple, Schneider Electric also currently trades 8% below its historical average of 10.0x.

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GREEN TECH ■ Green Technologies

Rating

2/Outperform

Target price (6 months)

+17.1% EUR132

Price (13/04/2011)

EUR112.75

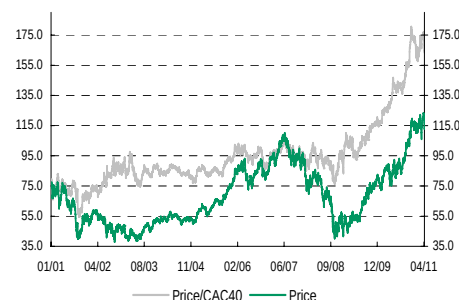
Reuters: **SCHN.PA** Bloomberg: **SU FP**

Stock data

Market capitalisation	EUR30454m
Free float	EUR24728m
Enterprise value	EUR33212m
No. of shares, adjusted	270.1m
Daily volume	EUR134.42m

Performances

	1 month	3 months	12 months
Absolute perf.	-1.5%	-4.0%	30.3%
Relative perf.	-3.4%	-4.7%	31.2%



Shareholders

Free Float 81.2%, Capital Research 8.0%, Cdc 4.4%, Employees 3.4%, Treasury Stock 3.0%

	2009	2010E	2011E	2012E
P/E (x)	20.0	15.7	12.9	11.7
EV/EBITDA (x)	10.8	9.4	8.3	7.3
Attrib. FCF yield (%)	8.8	5.6	7.1	8.3
Net debt/EBITDA (x)	1.2	0.8	0.4	0.0
Yield (%)	2.5	2.9	3.8	4.3
ROCE (%)	11.4	15.5	18.0	19.6
EV/Capital empl. (x)	1.6	1.8	1.7	1.7

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DIVERSIFIED CHEMICALS



Wacker Chemie

Leader in strong markets

■ Nuclear and renewables exposure

The company has no nuclear exposure. Its renewables exposure essentially comes from the polysilicon manufacturing business which accounts for over 60% of EBITDA. That proportion is rising as growth in the poly business surpasses that of most of its other activities.

■ Investment case

Wacker enjoys unrivalled leadership on a product, pricing power and cost basis as the globally leading polysilicon manufacturer. Its output is forward-sold into 2014 and contract momentum is strong. There is some uncertainty over the timing of a recovery in the wafer business, but we are confident that a sizeable earnings swing will come through from this 2011 in any case.

■ Valuation

We reiterate our 2/Outperform rating and EUR175.0 target price for WCH's shares, which are currently trading at inexpensive multiples of 9.6x P/E and 4.6x EV/EBITDA (both 12E).

Rating 2/Outperform

Target price (6 months) +7.9% **EUR175**
Price (13/04/2011) **EUR162.2**

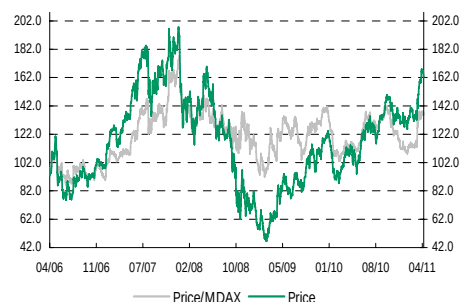
 Reuters: **WCHG.DE** Bloomberg: **WCH GR**

Stock data

Market capitalisation	EUR8061m
Free float	EUR2321m
Enterprise value	EUR8319m
No. of shares, adjusted	49.7m
Daily volume	EUR40.95m

Performances

	1 month	3 months	12 months
Absolute perf.	21.0%	21.0%	47.3%
Relative perf.	17.1%	20.4%	18.5%



Shareholders

Wacker Family 55.6%, Free Float 28.8%, Blue Elephant 10.9%, Treasury Shares 4.7%

	2009	2010E	2011E	2012E
P/E (x)	NS	13.0	13.1	9.6
EV/EBITDA (x)	52.3	7.1	6.1	4.6
Attrib. FCF yield (%)	NS	NS	0.3	7.2
Net debt/EBITDA (x)	0.8	0.0	(0.2)	(0.4)
Yield (%)	1.0	2.5	2.3	3.1
ROCE (%)	1.1	26.2	28.0	34.7
EV/Capital empl. (x)	2.7	2.4	2.6	2.2

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GREEN TECH ■ Green Technologies

Disclosures available on www.cheuvreux.com

Other sectors: company profiles

- Areva
- EDF
- ENEL
- E.ON
- GDF Suez
- RWE

ELECTRICAL EQUIPMENT

Areva

Recovery potential for the nuclear specialist

■ 2011 outlook and nuclear exposure

98% of Areva's business is in **civil nuclear**. Its activity scope ranges from uranium mining, to enrichment, plant construction and spent fuel recycling. It has one of the largest installed bases in the world, and its EPR reactor is at the forefront of safer power plants.

For 2011E, Areva **targets** 'growing sales' and an op. margin of more than 5% all included; FCF is likely to stay negative but improving. A much lower negative impact from OL3 and reduced costs are driving this trend. New EPR reactor orders were set to be signed in India and China, but this has become very unpredictable after the Japanese nuclear incidents. Still, we believe that nearly all of Areva's business will continue to be executed normally, as it is based on firm and often long-term contracts.

Areva plans a **full share listing** in May 2011, unifying the different share categories, and thus giving ICs voting rights. No other capital hike is needed. Lastly, the current limited free float and liquidity could be increased afterwards through a placement of existing shares.

■ Investment case and valuation

Areva has been plagued by various operational and financial problems over the last few years. But after the numerous provisions on OL3 in Finland, we believe **the worst is over**. The balance sheet has been strengthened by EUR6.5bn of disposals, and a EUR900m capital increase has been carried out. Areva plans to improve operating earnings and FCF in 2011E and 2012E, reaching ca. EUR12bn in sales, a double-digit margin and 'significantly positive FCF'. The heavy **investments** undertaken in Uranium mining, enrichment and equipment manufacturing sites should start to pay off. We underline at this point that 80% of Areva's revenues are made in service and maintenance, and that there is a EUR44bn backlog. The 20% of new build relates to projects that are most likely to be finished (OL3, FA3, Taishan 1+2).

Our **SOP-based** target price is **EUR39.6** after the Japanese catastrophe (EUR43.8 before). Mining assets still account for EUR25 per share. Back end – predictable and profitable – is valued at EUR9 per share. We have lowered the value of our 'nuclear revival scenario' from EUR8.2 to only EUR3.4/sh. Lastly, current reactions to the Japanese nuclear incidents could lead to bigger spending on maintenance and safety, which could benefit Areva through its very large installed base

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Rating

2/Outperform

Target price (6 months)

+28.3% EUR39.6

Price (13/04/2011)

EUR30.86

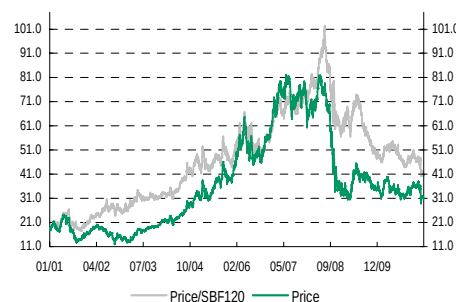
Reuters: **CEPFI.PA** Bloomberg: **CEI FP**

Stock data

Market capitalisation	EUR11826m
Free float	EUR473m
Enterprise value	EUR10473m
No. of shares, adjusted	383.205m
Daily volume	EUR4.27m

Performances

	1 month	3 months	12 months
Absolute perf.	-11.4%	-14.6%	-21.4%
Relative perf.	-13.3%	-15.3%	-22.5%



Shareholders

Cea 73.0%, French State 10.2%, Kuwait Investment Office 4.8%, Free Float 4.0%, Cdc 3.3%, Edf 2.2%, Total Sa 0.9%, Credit Agricole 0.9%, Employees 0.4%, Treasury Stock 0.2%

	2009	2010E	2011E	2012E
P/E (x)	53.3	NS	32.6	19.8
EV/EBITDA (x)	18.5	18.7	8.9	7.0
Attrib. FCF yield (%)	NS	NS	NS	0.1
Net debt/EBITDA (x)	10.6	5.2	3.1	2.5
Yield (%)	2.1	2.0	0.0	2.3
ROCE (%)	2.7	2.6	4.1	5.9
EV/Capital empl. (x)	0.9	0.9	0.7	0.7

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ELECTRICITY UTILITIES

EDF

Hard hit, but lots of improvement potential

■ Valuation

A 10% increase in maintenance capex on the back of increased safety would impact our SOP valuation by EUR3.0, as would 10% of its reactors getting shut. An end to the nuclear revival would impact our SOP valuation by EUR 2.3.

■ Investment case

Even though the company is exposed to nuclear risk, much of this has been reflected in the recent share price underperformance; and it is arguably less so than some of its peers who are might see more reactor closures, notably in Germany. At the same time, it should benefit from improved pricing. The NOME law improves visibility on EDF's ability to cover its investments, including its cost of capital, in our view. The EDF EN buyout will give it a strong renewables growth platform. Further, we argue that many parameters, including improving nuclear operations, should lead to a recovery in the company's earnings stream.

■ Nuclear and renewables exposure

Nuclear accounts for c.74% of the company's generation park and 75% of output. The renewables exposure is minimal at this point but will increase with the buyout of EDF EN, which has 1.5GW of operational capacity and a 10GW pipeline.

Rating 2/Outperform

Target price (6 months) +15.5% EUR32

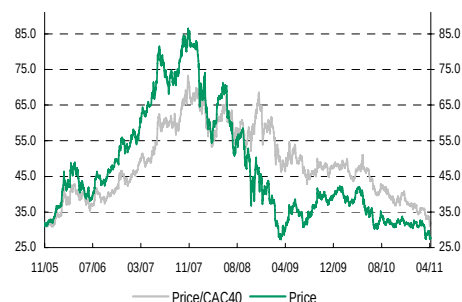
Price (13/04/2011) EUR27.695

 Reuters: **EDF.PA** Bloomberg: **EDF FP**
Stock data

Market capitalisation	EUR51213m
Free float	EUR6760m
Enterprise value	EUR122997m
No. of shares, adjusted	1849.171m
Daily volume	EUR95.82m

Performances

	1 month	3 months	12 months
Absolute perf.	-9.4%	-10.9%	-33.3%
Relative perf.	-11.2%	-11.6%	-32.9%

**Shareholders**

French State 84.8%, Free Float 13.2%, Employees 2.0%

	2009	2010E	2011E	2012E
P/E (x)	19.6	17.0	15.9	12.7
EV/EBITDA (x)	8.1	7.2	7.9	7.4
Attrib. FCF yield (%)	NS	NS	NS	0.0
Net debt/EBITDA (x)	2.4	2.1	2.3	2.3
Yield (%)	2.8	3.7	4.1	4.3
ROCE (%)	7.9	5.8	5.6	6.3
EV/Capital empl. (x)	1.2	0.9	0.9	0.8

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ELECTRICITY UTILITIES

ENEL

Limited nuclear exposure

■ Nuclear and renewables exposure

ENEL's exposure to nuclear is modest, representing only ~5% of its total installed capacity and 14% of volumes. It is related to Endesa's nuclear plants in Spain and reactors in Slovakia. In Italy there are no nuclear plants but there was a Government project to build up new capacity in which ENEL would have played a major role. After the accident in Japan the nuclear revival has been put on hold for at least one year. Anyway it is worth mentioning that ENEL had still very modest investments in nuclear (EUR400m) in its capex plan up to 2015 (EUR31bn) assuming only some design activities.

Looking at the production mix hydro represents 28% of volumes and other renewables 4%. Enel at the end of 2010 listed its renewable subsidiary, Enel Green Power, which groups the group renewables assets. EGP weights 7% on total ENEL's EBITDA. At the end of 2010 EGP had 6.1GW of installed capacity broken down as follow: 42% hydroelectric, 43% wind, 13% geothermal and 2% other sources.

Out of its EUR30bn capex plan up to 2015, 20% is dedicated to renewables mainly in Italy, Latam and Europe. The strategy is to make additions in all technologies (hydro, geothermal and wind).

■ Investment case and valuation

Following the completion of its disposal program, ENEL has a safe financial structure with 2.6x debt/EBITDA at the end of 2010. Going forward, the company will cover both capex and dividends with cash flows and deliver further organic de-leverage.

International businesses (Russia and Latam mainly) should drive future organic growth (we expect 2%). Italian electricity prices (14% of EBITDA) have been quite resilient during the crisis and the forward curve shows an upward trend (EUR72-73/MWh for 2011 vs. spot prices at EUR65/MWh).

Enel enjoys high visibility on its earnings up to 2012 as: (1) 50% of its EBITDA is regulated; (2) ~90% of 2011 and 40% of 2012 electricity volumes have already been forward-sold. Exposure to nuclear is limited (5% of EBITDA)

ENEL trades at 9.4x PE 2012 vs. 12x of peers and 5.7x EV/EBITDA vs. 7x which is no longer justified by its higher gearing and below the average growth rate. It also offers an appealing >6% DY which is sustainable as cash flows cover capex and dividends.

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Rating

2/Outperform

Target price (6 months)

+12.3% EUR5.2

Price (13/04/2011)

EUR4.63

Reuters: **ENEL.MI** Bloomberg: **ENEL IM**

Stock data

Market capitalisation	EUR43517m
Free float	EUR29896m
Enterprise value	EUR103255m
No. of shares, adjusted	9399m
Daily volume	EUR216.44m

Performances

	1 month	3 months	12 months
Absolute perf.	11.6%	19.8%	11.6%
Relative perf.	10.4%	15.5%	17.1%



Shareholders

Free Float 68.7%, Cassa Depositi e Prestiti 17.4%, Italian Treasury Minister 13.9%

	2009	2010E	2011E	2012E
P/E (x)	7.9	8.0	9.8	9.5
EV/EBITDA (x)	6.4	5.3	6.0	5.7
Attrib. FCF yield (%)	4.6	7.5	6.3	7.2
Net debt/EBITDA (x)	3.2	2.6	2.6	2.4
Yield (%)	6.1	7.5	6.1	6.4
ROCE (%)	9.1	9.4	9.3	9.7
EV/Capital empl. (x)	0.9	0.8	0.9	0.8

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ELECTRICITY UTILITIES

E.ON

Singin' the blues

■ Nuclear exposure

E.ON is Germany's largest nuclear plant operator, with eleven nuclear plants, of which three were built before 1980. In addition to this, the company partially owns the Krümmel reactor together with Vattenfall. This reactor has been mothballed since 2007 due to a fire. Net generation capacity of the company's German nuclear plants is 8.6 GW. In 2010, E.ON generated 60 TWh of electricity from German nuclear sources, which equates to 22% of the group's total electricity generation.

■ Mid-term outlook reflects bull case

For 2011, management expects EBITDA before disposals to decline to EUR11.2-11.9bn, with adj. net income declining to EUR3.3-4.0bn. One of the main negative drivers is the gas midstream business, which is set to decline from EUR2.0bn in 2010 to EUR0.7-1.2bn in 2011. This implies that at the lower end of the guidance range, E.ON's EBITDA could decline by 16% y-o-y (RWE: 15%) and adj. net income could fall by 32% (RWE: 30%). Management reiterated the dividend floor of EUR1.30 per share for 2011 and 2012.

For 2013, the company aims to generate EBITDA of at least EUR13bn, i.e. on a par with 2010. On the positive side, it assumes a power price of just EUR52/MWh. On the negative side, this number excludes disposals totalling EUR15bn and also assumes a normalisation of the gas-to-oil spread situation.

■ Investment recommendation

We rate E.ON a 3/Underperform as the company is a good example of why the utilities sector has been among the worst performing sectors over the past two years.

During the M&A boom several years ago, the company over-leveraged its balance sheet when it acquired Enel/Endesa assets. As a result, management was forced to initiate a cost-cutting programme, dispose of assets, cancel the share buy-back programme, and did not raise its dividend as expected.

Still digesting its recent past, the introduction of the nuclear tax, the decline in electricity prices and spreads as well as the de-coupling of the gas price from the oil price have forced E.ON into another cost-cutting programme, disposal of further assets.

At present, visibility is extremely low on a) the nuclear tax and lifetime extension; and b) the multi-EURbn risk from the gas-to-oil spread. On top of this, given the company's mixed M&A track record, there are numerous question marks regarding its targeted expansion outside Europe. Until visibility improves for all these issues, we believe the risk premium will remain high. Furthermore, as there is no foreseeable growth in EPS, we believe the shares will continue to underperform the market.

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Rating

3/Underperform

Target price (6 months)

+6.6% EUR24

Price (13/04/2011)

EUR22.51

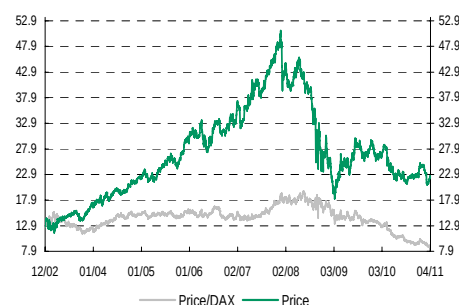
Reuters: EONGn.DE Bloomberg: EOAN GR

Stock data

Market capitalisation	EUR42891m
Free float	EUR42891m
Enterprise value	EUR87053m
No. of shares, adjusted	1905.41m
Daily volume	EUR275.44m

Performances

	1 month	3 months	12 months
Absolute perf.	-2.5%	-4.7%	-20.4%
Relative perf.	-5.1%	-6.1%	-30.9%



Shareholders

Free Float 100.0%

	2009	2010	2011E	2012E
P/E (x)	6.6	7.5	12.5	10.5
EV/EBITDA (x)	7.6	6.3	7.8	6.9
Attrib. FCF yield (%)	NS	NS	NS	6.4
Net debt/EBITDA (x)	2.6	2.0	2.9	2.6
Yield (%)	5.1	6.5	5.8	5.8
ROCE (%)	11.0	11.2	8.2	9.2
EV/Capital empl. (x)	1.2	1.0	1.0	1.0

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GAS UTILITIES

GDF Suez

Low carbon, but low visibility

■ Nuclear and renewables exposure

When it comes to generation mix, we estimate that c.10% of group EBITDA is derived from nuclear activities. We consider the main risk on that front is related to an increase in the tax burden in Belgium (currently EUR200m), with a limited ability to pass this on in electricity prices. Renewables excluding hydro account for c.4% of generation, and the company is continuing to grow its portfolio across all technologies.

■ Investment case

We consider that the French government's current focus on gas prices is reducing visibility and could ultimately translate into a gas tariff freeze. This political interference could also materialise in Belgium with higher taxes on nuclear assets, especially as GDF Suez considers the complete cost of nuclear at EUR31/MWh, while it sells its electricity at c.EUR55/MWh.

■ Valuation

Our target price of EUR 30 reflects a likely increase of the nuclear tax from EUR200m to EUR500m p.a., an increase in maintenance costs and reduced visibility on gas prices in France. The shares are trading in line with integrated power generation peers at a P/E of 12x and EV/EBITDA of 6.0x 2012E.

Rating

3/Underperform

Target price (6 months)

+9.6% EUR30

Price (13/04/2011)

EUR27.38

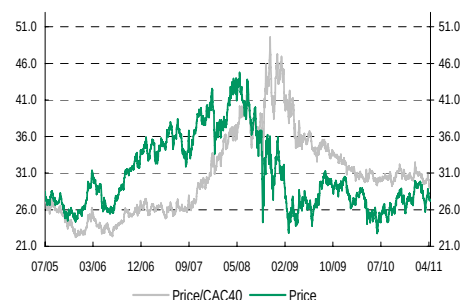
Reuters: **GSZ.PA** Bloomberg: **GSZ FP**

Stock data

Market capitalisation	EUR61851m
Free float	EUR34018m
Enterprise value	EUR112298m
No. of shares, adjusted	2259m
Daily volume	EUR155.52m

Performances

	1 month	3 months	12 months
Absolute perf.	0.5%	-2.7%	-4.3%
Relative perf.	-1.4%	-3.5%	-3.7%



Shareholders

Free Float 55.0%, French State 35.0%, Gbl 4.0%, Employees 2.8%, Cdc 2.0%, Areva 1.2%

	2009	2010E	2011E	2012E
P/E (x)	12.9	18.9	13.2	12.0
EV/EBITDA (x)	7.5	6.7	6.4	6.0
Attrib. FCF yield (%)	2.3	3.0	1.3	4.9
Net debt/EBITDA (x)	2.2	2.2	2.6	2.4
Yield (%)	4.9	5.7	5.9	6.2
ROCE (%)	6.5	6.6	7.8	8.3
EV/Capital empl. (x)	0.8	0.8	0.8	0.8

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GREEN TECH ■ Green Technologies

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ELECTRICITY UTILITIES

RWE

2013 guidance reflects bear case

■ Nuclear exposure

RWE is one of four Germany's nuclear plant operators. The company is operating five nuclear plants, of which two were build before 1980. The two oldest ones are Biblis A and Biblis B, which have been several times in the media because of outages. Net generation capacity of the company's German nuclear plants is 6.3 GW. In 2010, RWE generated 45 TWh of electricity from nuclear sources, which equates to 20% of the group's total electricity generation.

■ Cautious mid-term outlook

For 2011 management predicts a 15% EBITDA decline and expects recurrent net income to fall 30% y-o-y. Both figures are broadly in line with consensus and our estimates.

With regards to 2013 the company has adopted a cautious stance and assumes current market conditions will persist, i.e. in particular only a marginal impact from an improvement in the gas-to-oil spread burden unlike E.ON. Prior to disposals it expects EBITDA to reach EUR9bn with recurrent net income of EUR2.3bn.

Further, RWE targets EUR8bn of asset disposals and a capex reduction from EUR7 to EUR6bn p.a. After disposals management predicts EBITDA will reach EUR8bn in 2013 with recurrent net income totalling EUR2bn.

■ Investment recommendation

RWE is among the companies impacted by a potential complete shutdown of nuclear plants built before 1980. This would lead to a decline in the EBITDA of some EUR300m p.a., assuming that the nuclear tax for these plants also ceases to exist as it is linked to generation. The cash flow impact is set to be lower, at up to EUR100m each, due to the lack of maintenance capex and lower income taxes. The impact on nuclear provisions is likely to be marginal as the escalation factor in the provisions almost equals the discount factor.

Conversely, the rise in the electricity price already more than offsets the potential mothballing of these nuclear plants. According to our estimates, profitability from 2013 is set to be positively impacted by more than EUR1bn resulting from the rise in prices and spreads. In addition, according to legal experts, the moratorium to shut down the seven plants is against the law and RWE has an good chance of receiving compensation for the shutdown.

In sum, although contradictory at first glance, the shutdown could turn out to be ultimately beneficial for RWE from a financial standpoint, which is however hardly reflected in the share price. We therefore rate RWE a 2/Outperform with a target price of EUR56 per share.

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Rating 2/Outperform

Target price (6 months) +18.7% EUR56

Price (13/04/2011) EUR47.155

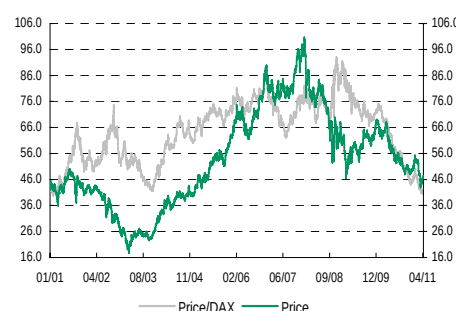
Reuters: RWE.DE Bloomberg: RWE GR

Stock data

Market capitalisation	EUR25160m
Free float	EUR20128m
Enterprise value	EUR57162m
No. of shares, adjusted	533.56m
Daily volume	EUR166.43m

Performances

	1 month	3 months	12 months
Absolute perf.	-1.6%	-11.0%	-30.0%
Relative perf.	-4.3%	-12.3%	-39.2%



Shareholders

Free Float 80.0%, Municipals 20.0%

	2009	2010	2011E	2012E
P/E (x)	10.1	8.0	10.5	9.5
EV/EBITDA (x)	6.9	5.3	6.6	6.3
Attrib. FCF yield (%)	8.4	NS	NS	2.7
Net debt/EBITDA (x)	1.9	1.7	2.4	2.3
Yield (%)	5.2	7.0	5.3	5.3
ROCE (%)	13.3	13.2	9.6	9.7
EV/Capital empl. (x)	1.2	0.9	0.9	0.9

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