



From financial crisis to energy crisis?

– *The impact of the financial crisis on the energy markets* –

Summary of the study results

Berlin, February 2009

ATKEARNEY

Introductory remarks

As a market leader in the provision of consulting services to energy utilities, Utility Practice at A.T. Kearney is tackling questions relating to future development of the energy markets and issues of strategic relevance to the energy industry.

This study entitled "From financial crisis to energy crisis?" was conducted in January 2009 with the aim of contributing to an objective, factual debate on the consequences of current developments in the financial markets on Europe's energy markets. In particular, the objective was to analyze questions concerning the financeability of necessary investments in conventional and renewable power plants, the repercussions of the increasing volatility in the commodity markets and the associated challenges facing the energy industry.

The study was initiated in-house and not commissioned by a client.

It was compiled by Dr. Florian Haslauer and Ulrich Hörmann.

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Agenda

- n Synopsis
- n Current developments in the energy markets
- n Repercussions of the financial crisis for the utilities
- n Renewable energy sources victims of the financial crisis
- n The long-term impact of the financial crisis?

Synopsis

Synopsis (1/3)

n The level of growth in power consumption will slow down

Up to 2020 we must expect continued growth in the level of power consumption in Europe. Whereas we can already recognize a decoupling of the development of total energy consumption from economic growth, power consumption up to 2020 will on the other hand continue to develop in line with economic output. Gas consumption will likewise grow similar to electricity consumption and is primarily driven by the growth in gas-fueled power generation. The downturn in economic output currently to be expected will however slow down or delay the expected rise in power consumption.

n The commodity prices will fall due to the recession

Due to the credit crunch and recession, and the resulting global fall-off in demand for commodities, gas, oil and coal prices have dropped dramatically over the past months. The same development is also to be observed in the electricity prices in the wholesale markets, which correlate very closely indeed with the gas and CO₂ prices in particular.

n Power plants will no longer be such attractive investments

Even for the big utilities, borrowing costs have in some cases risen by more than 1% in the course of the credit crunch. This is leading to a considerable fall in the attractiveness of new investments in power plants and to the growing appeal of extending the service life of existing old power plants. However, essential replacement of plants as long-term power consumption increases demands substantial investment of around €30 – 35 billion per annum in Europe's power station base. Under the present conditions, annual investments in 2009 and 2010 will however fall short of this figure by some €10 billion.

Synopsis (2/3)

n Fluctuating commodity prices put pressure on small companies in particular

Large-scale, vertically integrated utilities are better able to absorb the current and expected future fluctuations in the commodity markets. Small companies and pure power distributors without their own generation facilities are exposed to increasing price risks if the volatility of prices increases. Errors of judgment made in respect of price developments when drawing up the power procurement strategy can have a dramatic impact. This will result in some companies experiencing economic difficulties. The regulated and stable grid business and the electricity and gas businesses with their volatile prices will increasingly drift apart and require different business models.

n Slowdown in organic growth

Increasing energy consumption and simultaneously increasing commodity and energy prices have enabled Europe's energy utilities to achieve organic growth of almost 8% per annum since 2000. Add to this a similar level of acquisitive growth enjoyed by the leading utilities in Europe. However, falls in revenues and profits are to be expected over the next two years due to the current climate.

n Renewable energy sources will be particularly affected by a decline in investments

The level of investment in the expansion of power generation from renewable energy sources has nosedived over the last months and there are a number of factors that point to this trend continuing for several years: Many investors in renewable energy sources are, due to a lack of cash flow, far more heavily reliant on borrowed capital than utilities are, which means they are now suffering from considerably poorer credit terms. Add to this the cost structure of renewable energy sources, in which capital expenditure represents the main cost pool: rising capital costs have a far greater impact on the profitability of investments in this case.

Synopsis (3/3)

- n A.T. Kearney expects the financial crisis to have the following repercussions for the energy markets**

Heightened boom-and-bust cycle

The absence of essential investment in power plants over the coming years will compound the obsolescence of Europe's power station base even more. Old and inefficient power stations will remain in service, a situation which, in conjunction with a simultaneous, marked jump in power consumption in the recovery phase, will drive electricity prices upward. This in turn means the volatility of the electricity markets will be exacerbated.

Increased consolidation of and changes in the structure of the industry

Falls in the profits made in the energy business and the incurring of losses by utilities will accelerate changes in the structure of the industry. On the one hand, the number of collaborations in the volatile, high-risk energy business will increase or companies will pull out of this business entirely in order to focus on the low-risk, cashflow-stable network business. The consolidation process in the energy business, that is, the purchase or generation and sale of electricity and gas, will speed up.

What's more, the number of "independent" project developers and operators in the renewable energy sector will fall. The share of this sector held by traditional utilities will rise.

Danger of the EU's climate targets not being met

Under the current conditions, investing in power generation from renewable energy sources in particular loses its attraction. The result will be a delay in achieving the EU's climate protection targets and the targets for expanding renewables.

Current developments in the energy markets

The basic conditions in Europe for investing in power plants are deteriorating due to the credit crunch.

Current developments in the energy markets



Slowdown in the growth in power consumption

- Over the last years, the growth in power consumption was primarily driven by increasing GDP.
- The downturn in economic performance currently to be expected will slow down or delay the rise in power consumption during the coming years.



Falling commodity prices

- Commodity prices (gas, coal, oil, electricity, etc.) have eased considerably during the past months.
- Electricity prices correlate very closely with the commodity prices, and with the gas prices in particular. Theoretically, the price risk for power producers is therefore small.



Rising capital expenditure

- Credit terms have deteriorated considerably in the course of the financial crisis. Even in the case of the big utilities, capital expenditure has increased by 50 to 120 basis points.
- This development is making the realization of large-scale investments more expensive.



Deferral of investments in power plants

- In the EU, power demand growth and replacement needs require significant investment in power plants.
- Increasing capital costs together with falling power consumption, however, offer no incentive to make such investments. A fall of €10bn. in the annual level of investment is to be expected.



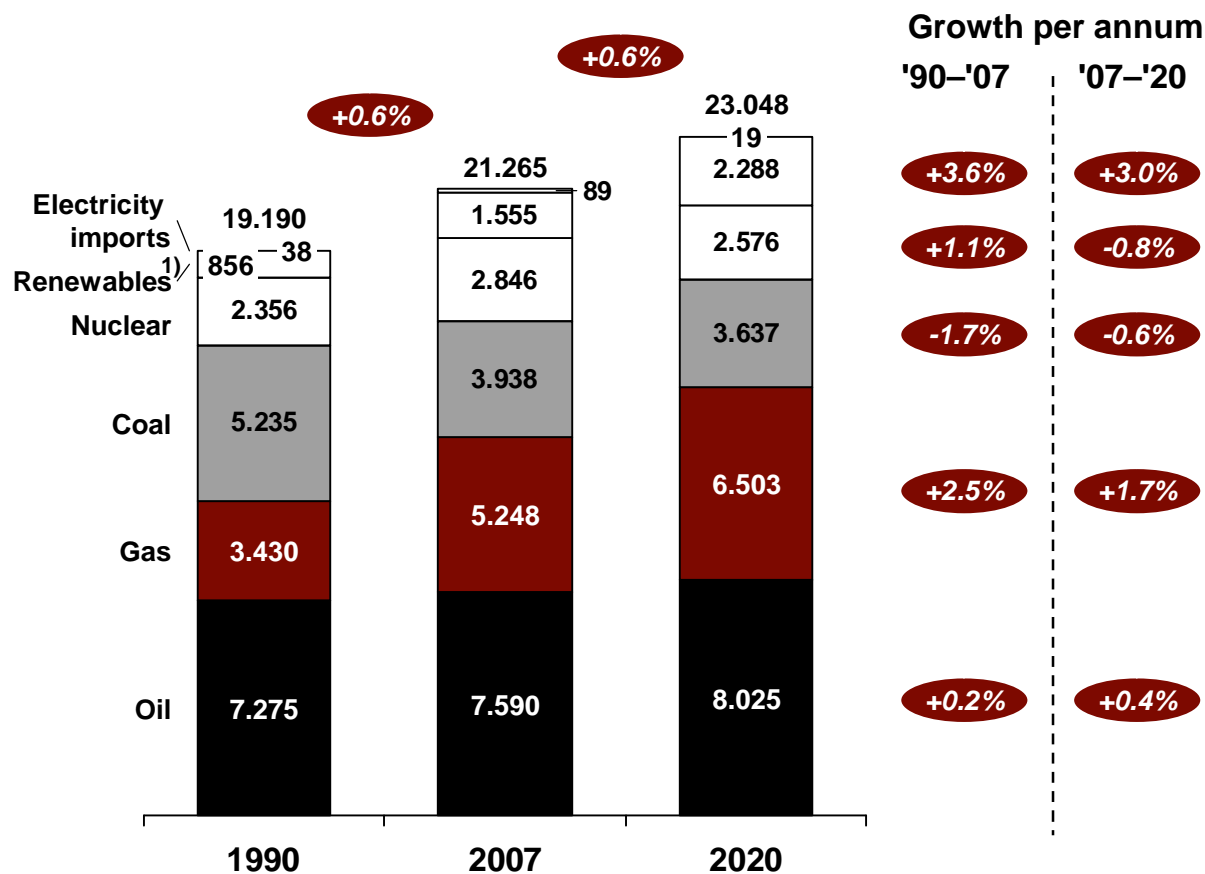
Serious decline in investment in the renewable energy sector

- The level of investment in the renewable energy sector nosedived in the second half of 2008.
- On the supply chain side, too, the ambitious growth targets originally set have already been trimmed back.



Power consumption will continue to rise up to 2020 – oil and gas will become more important.

Energy demand of the EU-27 according to energy source (in TWh)



- Gas consumption has risen rapidly in the past years owing to the increasing proliferation of gas heating and the growth in gas-fueled power generation. This trend will continue.
- Overall, primary fossil fuels (oil and gas) will further grow their share of the energy consumed up to 2020—from 56% in 1990 to 60% in 2007 and 63% in 2020.

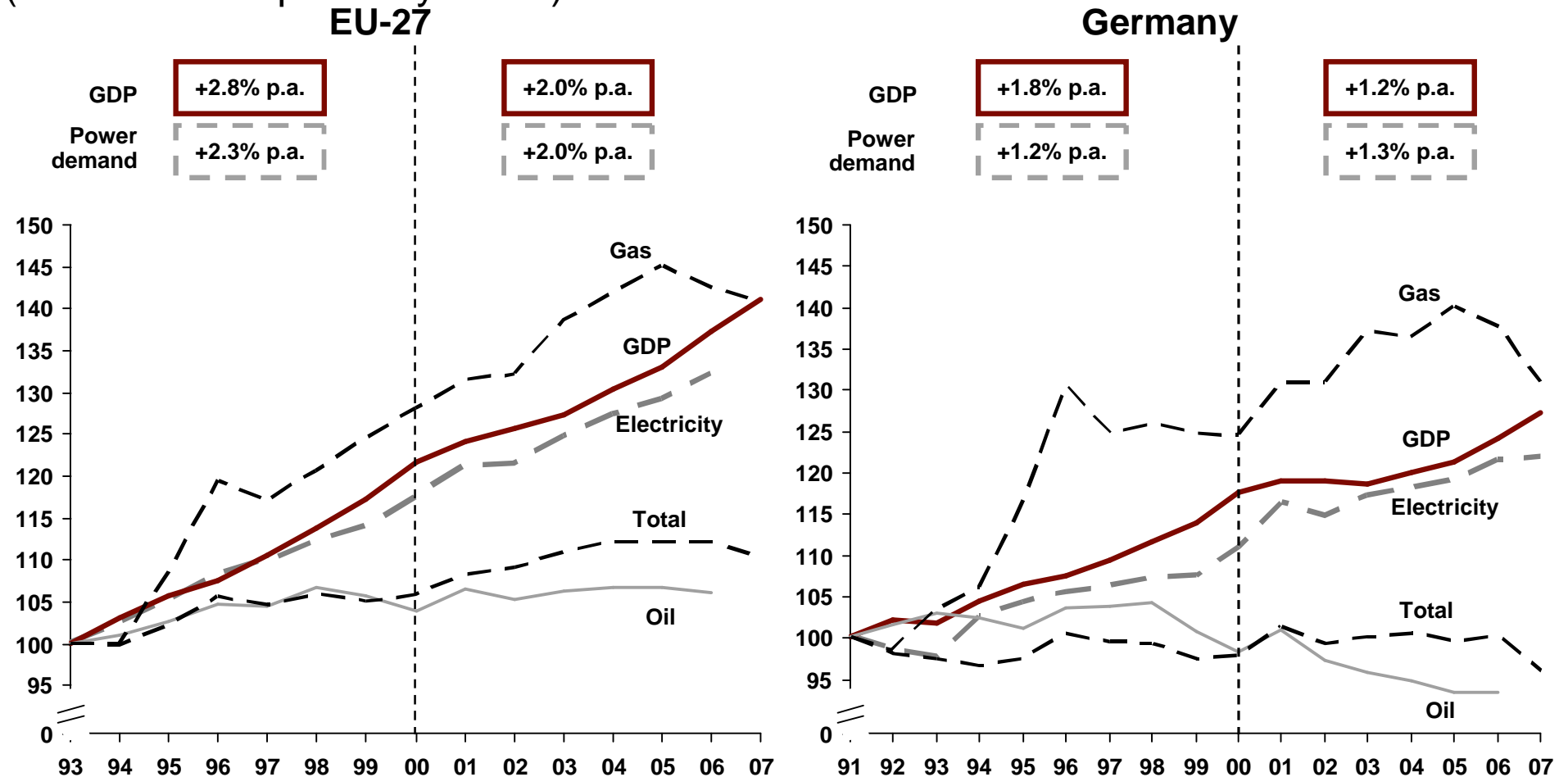
1) Including hydropower

Source: EU Commission, BP Statistical Review 2008; Eurogas, A.T. Kearney



Power consumption is driven by the development in economic output.

Index trend - GDP vs. Energy demand growth (1993/1991 respectively = 100)



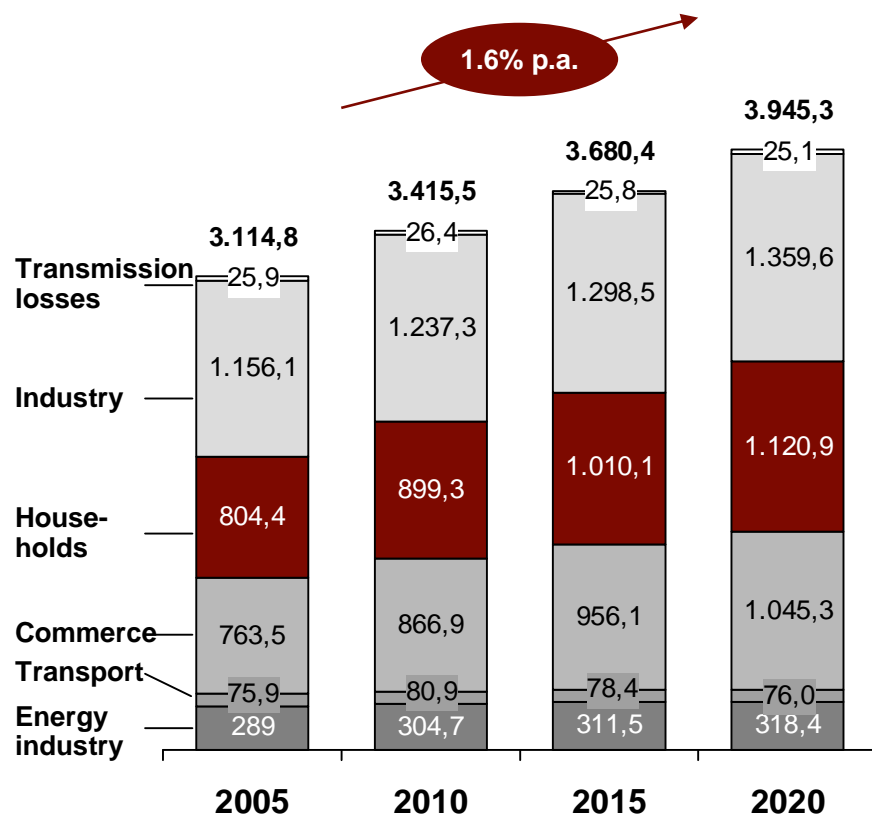
Note: Growth rates between 1993 and 2000 and between 2000 and 2006 are illustrated for the EU.

Sources: Eurostat, Destatis, Eurogas, A.T. Kearney analysis

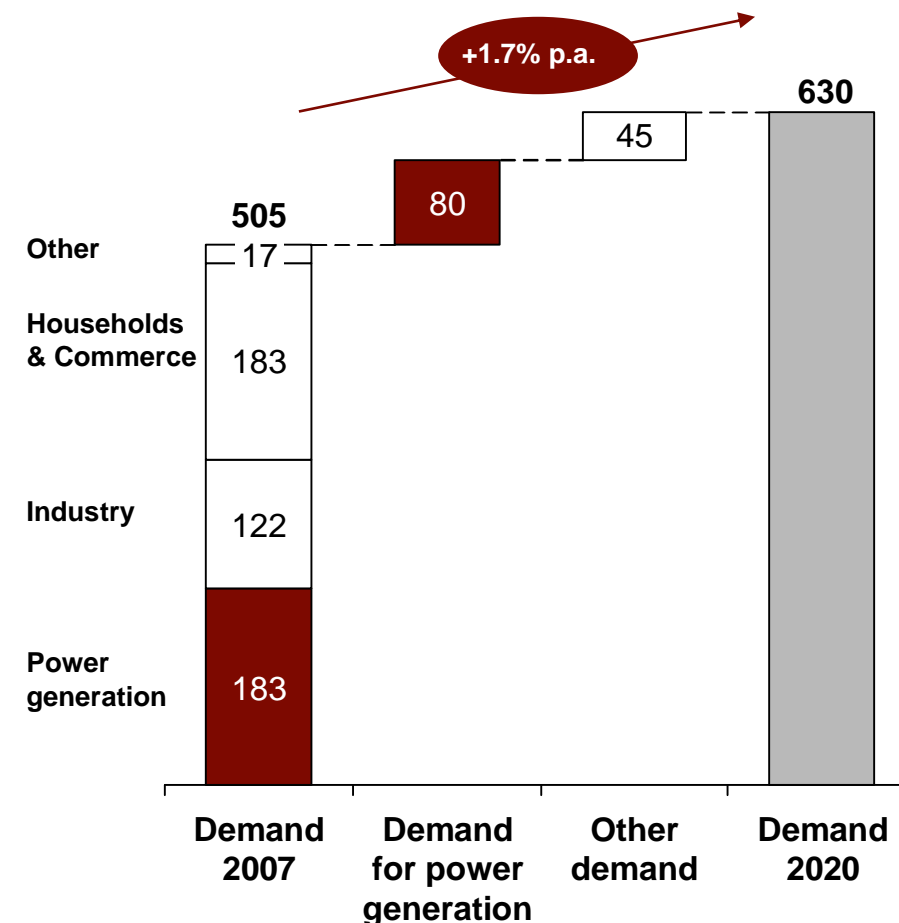


Power consumption will continue to rise by 1.6% p.a. up to 2020 - gas consumption will follow suit.

Forecast power demand 2020 of EU-27
(in TWh)



Forecast gas demand 2020 of EU-27
(in billion m³)



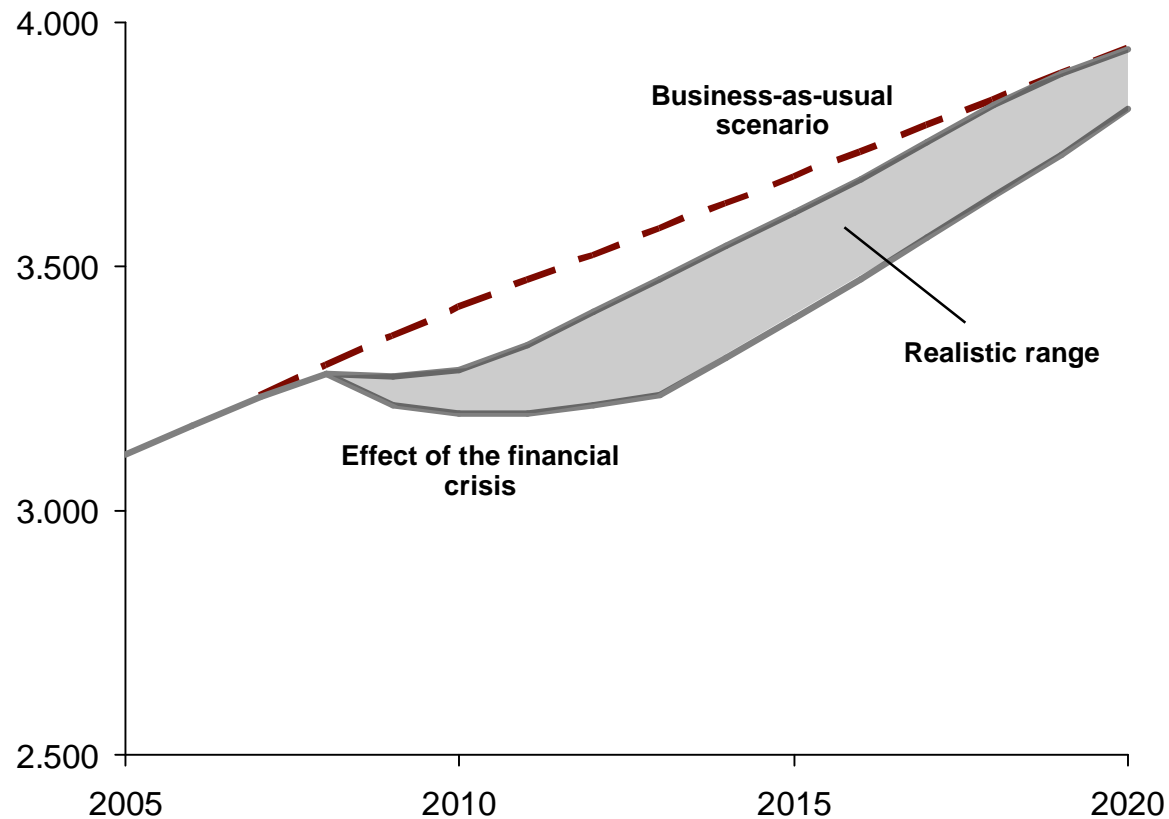
+xx% Average annual growth rate

1) Based on an average operating time of 4,300 hours p.a.
Source: EU Commission, BP Statistical Review 2008; Eurogas, A.T. Kearney analysis



Downturn in economic performance will delay the rise in power consumption.

Electricity demand growth in EU-27 up to 2020 (in TWh)



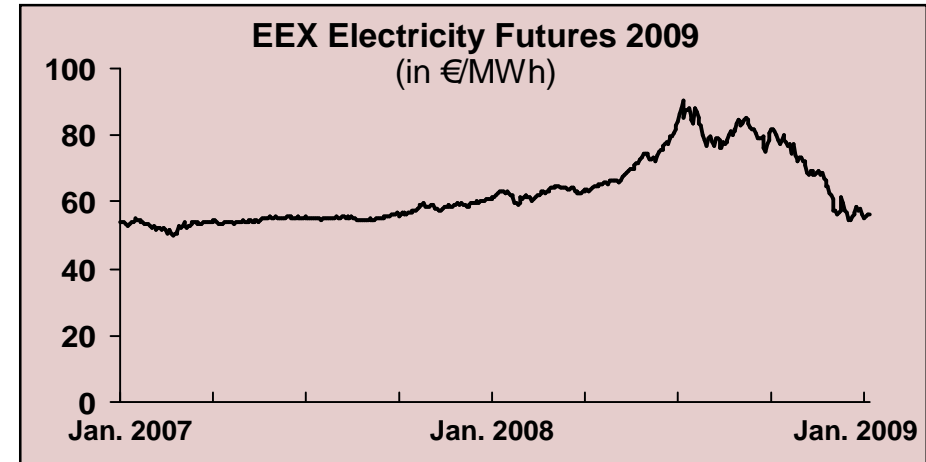
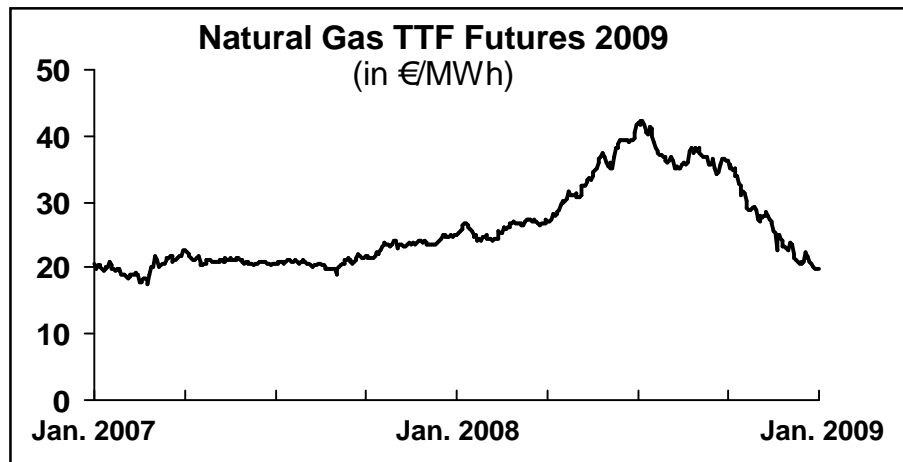
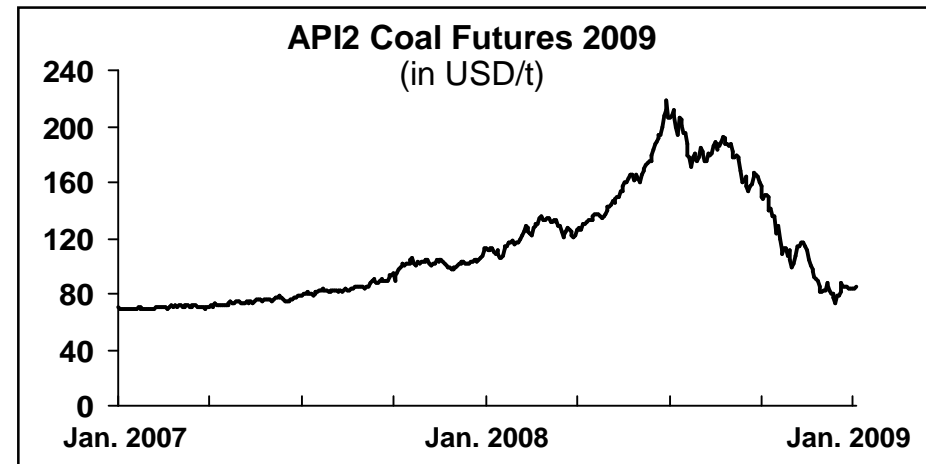
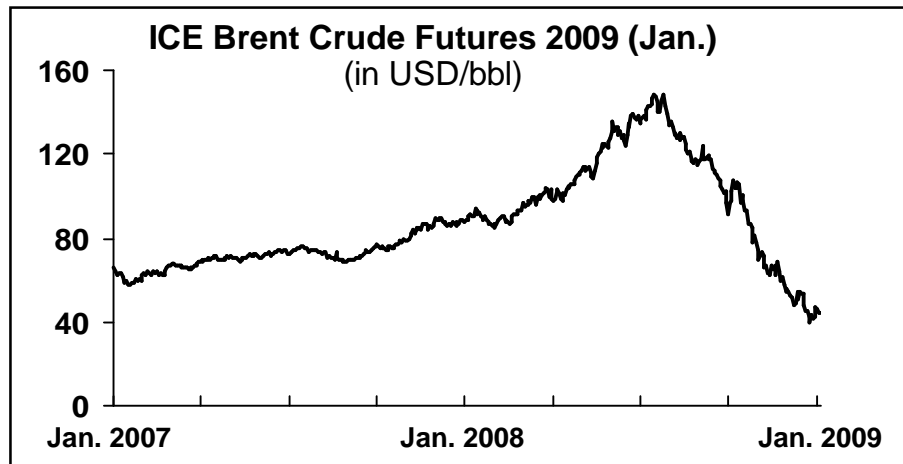
- The financial crisis will lead in the coming months to stagnation or negative economic growth. The EU Commission forecasts growth in GDP of 0.2% for 2009 and 1.1% for 2010. The IMF expects contraction of -0.2% for 2009.¹⁾
- However, more recent forecasts by the national banks are far more pessimistic (e.g. Germany -3% in 2009).
- This will result in the coming months in a lower level of power demand compared with forecasts.
- Stronger growth in consumption during the recovery phase will, however, alleviate the long-term effects of the financial crisis.

1) November 2008
Source: EU Commission, IMF, A.T. Kearney analysis



The price of commodity futures has eased considerably during the past months.

Development of commodity futures 2007 and 2008

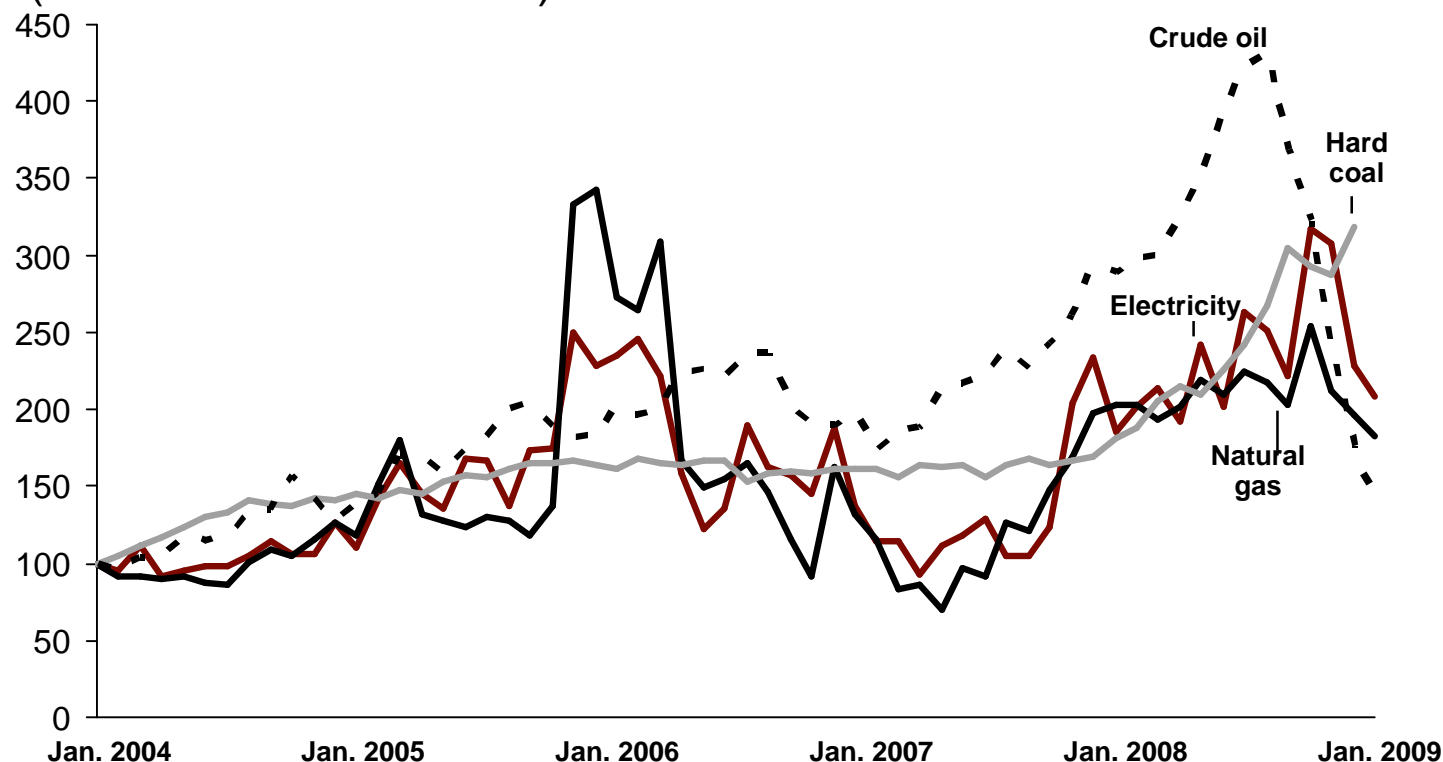




The electricity price correlates very closely with the commodity prices - especially gas.

Correlation of electricity spot prices with commodity spot prices¹⁾

(Index Jan. 2004 = 100)



Correlation with electricity price ²⁾	
Natural gas	0.84
Crude oil	0.74
Hard coal	0.63

Another important factor is the price of CO₂ certificates: Together, gas and certificate prices indicate a correlation factor of more than 0.9 with the electricity price.

Correlation between the gas and electricity prices will be maintained in the future, too.

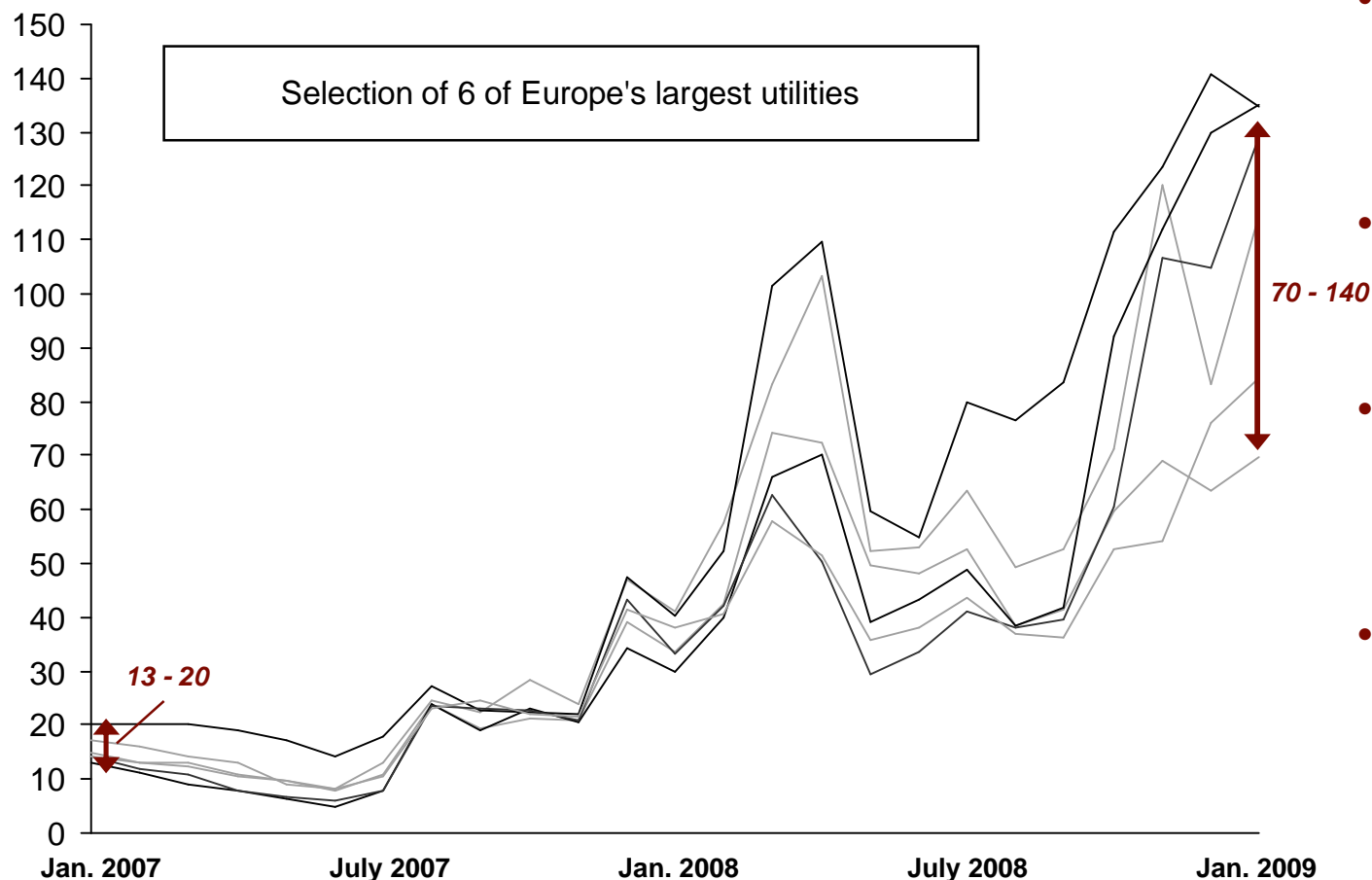
— Gas Price OTC Zeebrugge (Day-Ahead) — Hard coal (Import Price) - - - - Crude Oil (ICE Brent Index) — EEX Spot Base Price

1) Comparison of monthly averages 2) Correlation with EEX Spot Base Price
 Source: EEX, German Federal Statistical Office, Energate, A.T. Kearney analysis



The credit terms have deteriorated for financially strong utilities, too.

Performance of the 5Y credit default swaps of major utilities¹⁾ (in basis points)



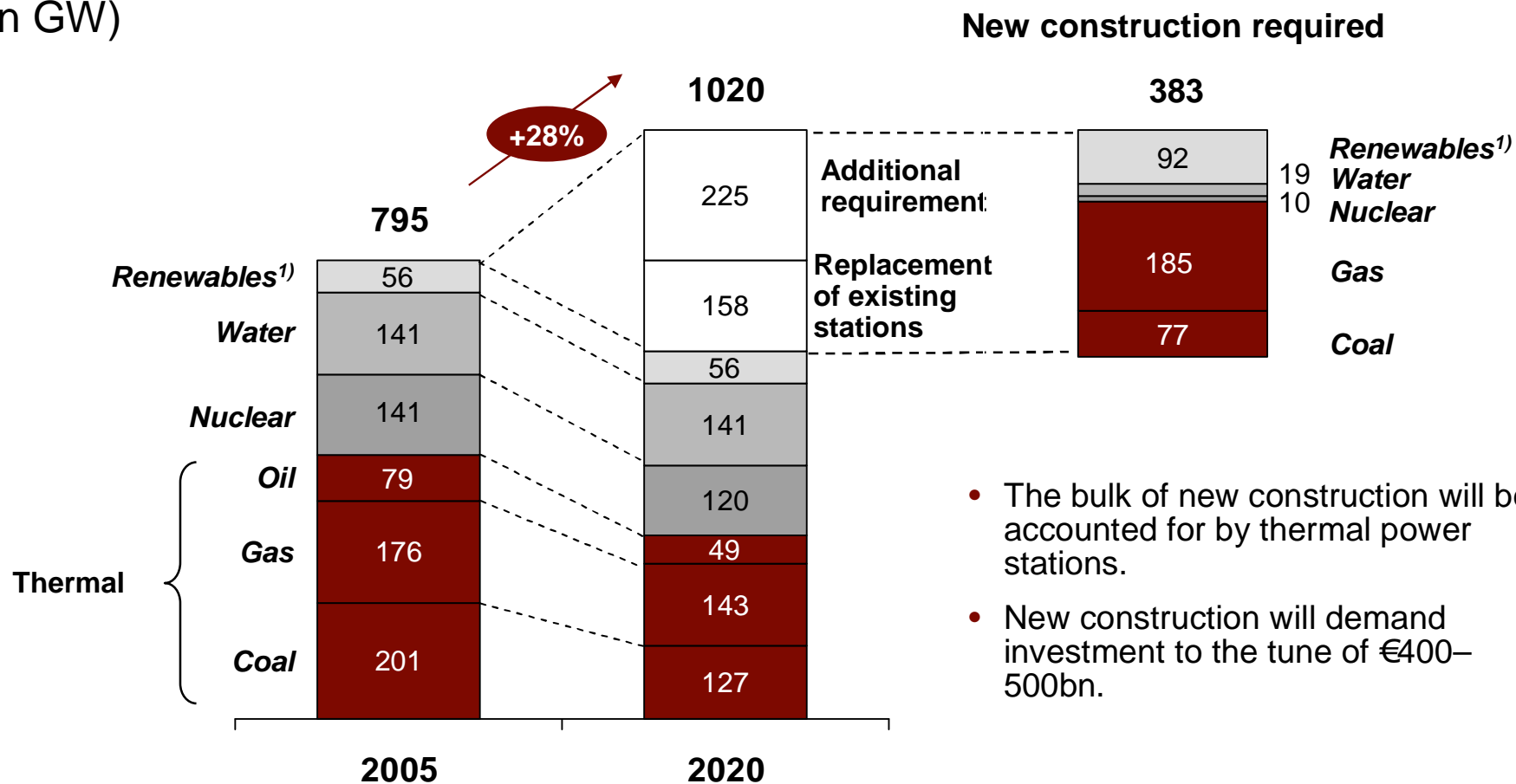
- The market prices of credit default swaps of major utilities have risen sharply since the financial crisis began.
- A first peak occurred back in April, which has been reached once again in the meantime.
- A price of 100 means that a secured party would have to pay 100 basis points per annum as a premium.
- This means that the borrowing costs even of companies with a good rating are now some 50 to 120 basis points higher than they were before the crisis.

1) A CDS (credit default swap) facilitates the trading of a credit risk (risk of default) from loans and bonds. The graph shows end-of-month values.
Source: Bloomberg; A.T. Kearney analysis



Power demand growth and replacement needs require significant investment in power plants.

Power plant capacities of EU-27 – Business-as-usual scenario (in GW)



- The bulk of new construction will be accounted for by thermal power stations.
- New construction will demand investment to the tune of €400–500bn.

1) Wind, solar, biomass/waste and geothermal
 Source: EU Commission, Prognos, A.T. Kearney analysis



The first investments in power plants are already being deferred.

Deferral of investments in the energy sector

*"The energy firm **E.ON** defers some of its **planned investments** to a value of €63bn. "In light of the falling prices of raw materials, it may make sense to postpone one or the other project", said Chief Financial Officer Marcus Schenck. [...] The company will "broadly implement" the investment program scheduled until 2010", said Schenck. "However, we have established **that procuring capital has become more difficult and more expensive today.**"*

(November 2008; Wallstreet Online)

*"Despite the financial crisis, **RWE** is well prepared to implement its investment program running to some €32bn by 2012", said Chief Finance Officer Rolf Pohlig. [...] However, he did concede **"that capital has become very much more expensive.** This will have repercussions for us in the long term also."*

(November 2008; dpa)

*"The **financial crisis** may threaten offshore **wind farms**, insofar as they are financed as separate projects", said Vahrenholt. RWE will, however, stick by its investment plans, he confirmed.*

(November 2008; FTD)

*"The **financial crisis** is threatening to see **investment in energy infrastructure**, including gas storage sites and **power stations** dry up, according to Alistair Buchanan, chief executive of Ofgem. He added that most energy firms faced increasing price pressures, including the **rising cost of finance.** He added that these issues may hit the energy market harder than most."*

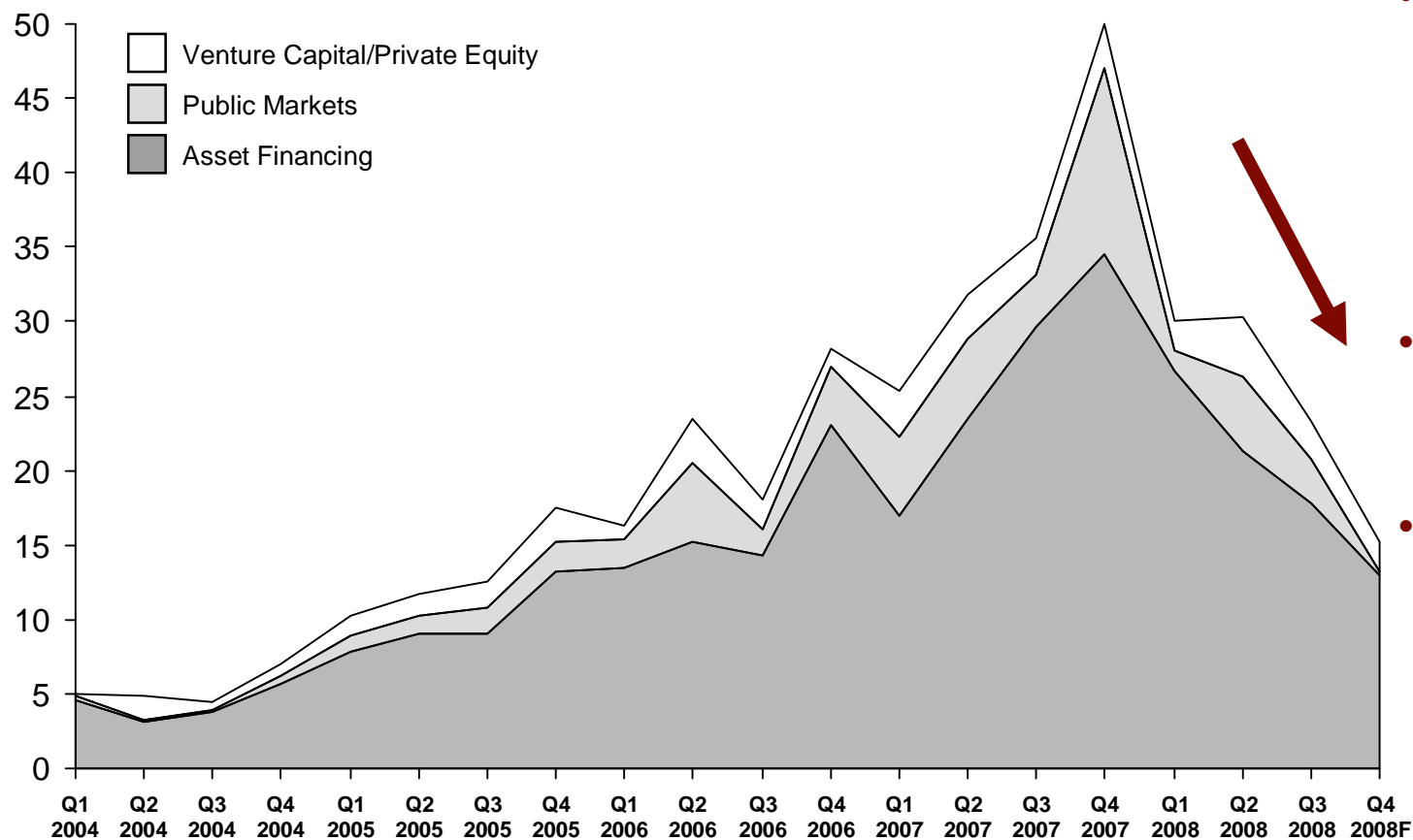
(December 2008; Financial Times)

A fall of up to €10bn in the annual level of investment must be expected in Europe.



The level of investment has declined sharply in the renewables sector in particular.

Global investment volume in the renewables sector (in USDbn)



- Owing to the credit crunch, the funders of plant and equipment are having problems finding the necessary capital due to banks restricted lending practices.
- In particular, banks view high "leverage ratios" as being critical.
- This has led to a decline in asset financing in the last two quarters and the downturn will probably continue in the next year.

Note: Asset Financing covers all the capital that has been invested in renewable energy projects (equity and borrowed capital); Public Markets covers all the capital that has been invested in the equity capital of listed companies in the renewables sector; Venture Capital/Private Equity covers investments by VC/PE funds in the equity capital of companies in the renewables sector

Source: New Energy Finance



On the supply chain side, too, the ambitious growth targets have already been trimmed back.

Reaction of plant and equipment manufacturers to the financial crisis



"... REpower sees a risk of **project postponements instigated by customers** for the coming financial year. [...] REpower is adjusting its expectations for sales growth for 2009/10 from 40%-50% to 30%-35%."



"In view of the deteriorated financing possibilities and the unsettled situation in the markets, Q-Cells SE also expects a **weak level of demand** at the beginning of 2009."



"The board expects less-dynamic growth for the industry and for Nordex in FY 2009. Crucial in this regard is customers' **increasing difficulty in financing projects** for a number of wind farms due to the crisis in the financial markets. Against this background, there is a risk of **project postponements**."

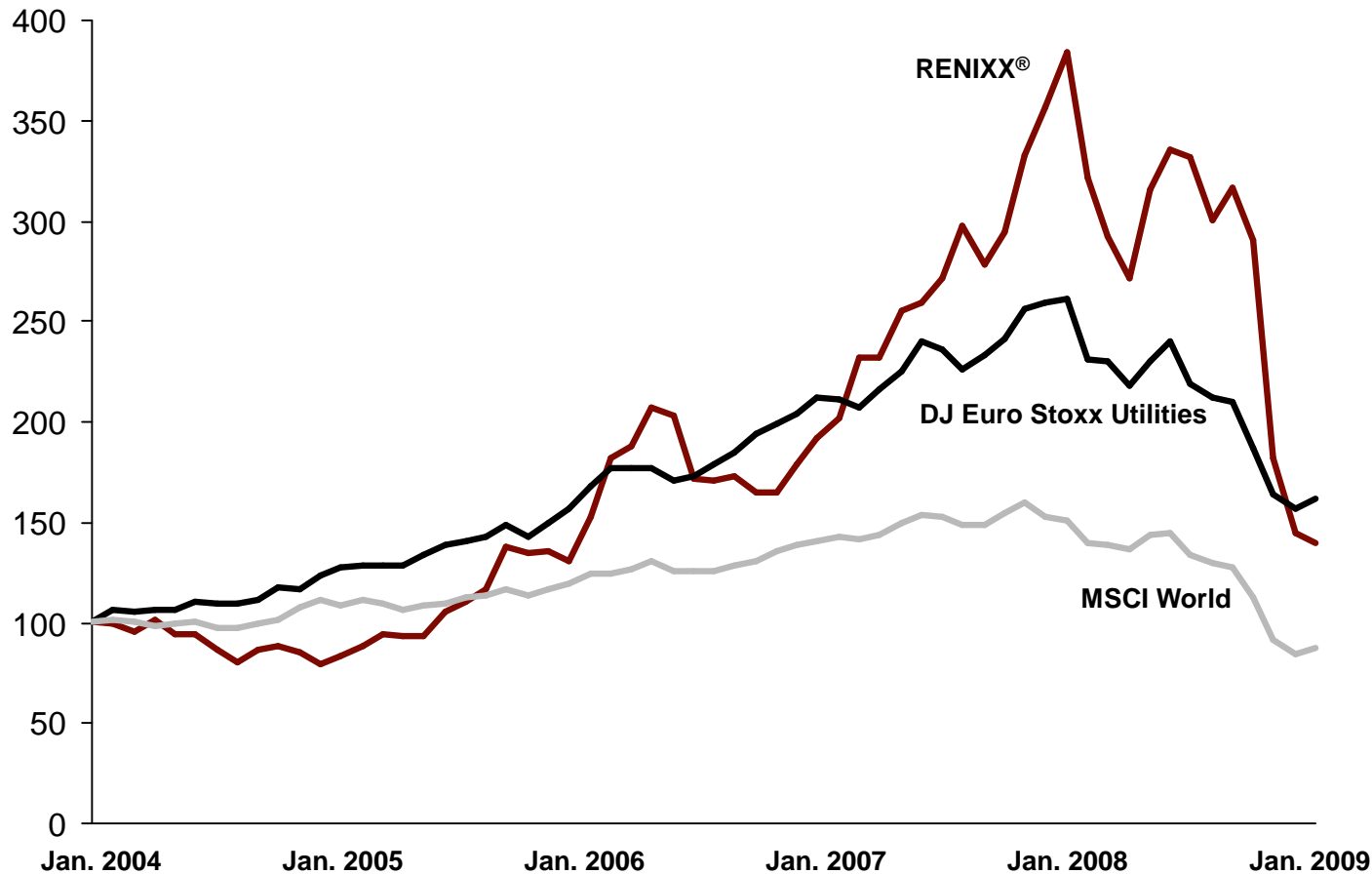


"Initial repercussions for the investment climate and consequently for the level of demand for photovoltaic products have already been noted. [...] for reasons of caution, **full-year guidance for 2008 and the expectations for 2009 have been revised**."



This has led to a disproportionately heavy fall in stock prices.

Index Performance 2004 – 2008¹⁾
(1.1.2004 = 100)



- The value of the RENIXX, which embraces companies operating in the renewables sector, almost quadrupled between 2004 to the beginning of 2008.
- In the last few months, however, it has taken a massive hit, bringing it back down to almost its 2004 level.
- The Dow Jones Euro Stoxx Utility Index rose less sharply, but has also suffered less dramatic losses in the course of the financial crisis.

1) Comparison of monthly averages
Source: IWR(RENIXX®); Bloomberg

Repercussions of the financial crisis for the utilities

The financial crisis may have profound repercussions for the utilities' business.

Repercussions of the financial crisis per value chain step

Investments lose their attractiveness

Volatility of commodity prices increases

Power consumption and prices fall

1



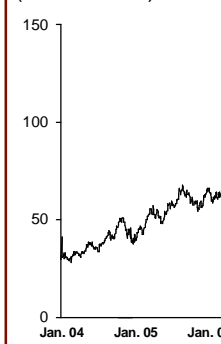
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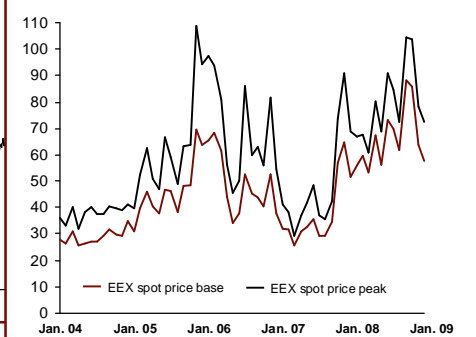
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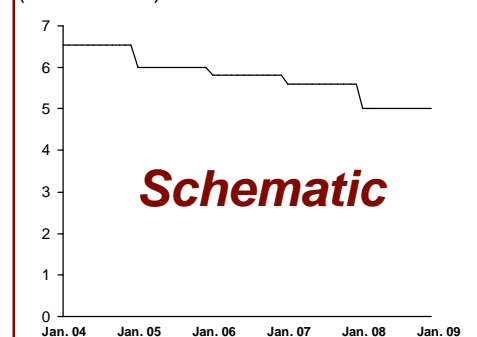
Crude Brent Index (in USD / bbl)



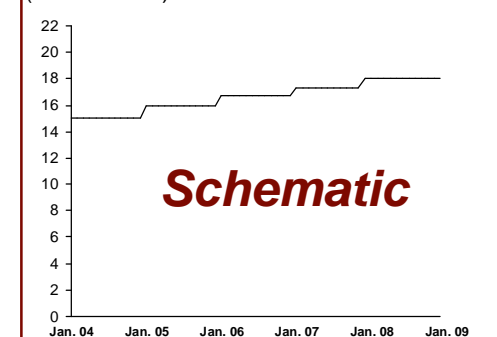
EEX electricity wholesale price (in € / MWh)



Grid tariffs distribution (in €ct. / kWh)



Retail electricity price households (in €ct. / kWh)



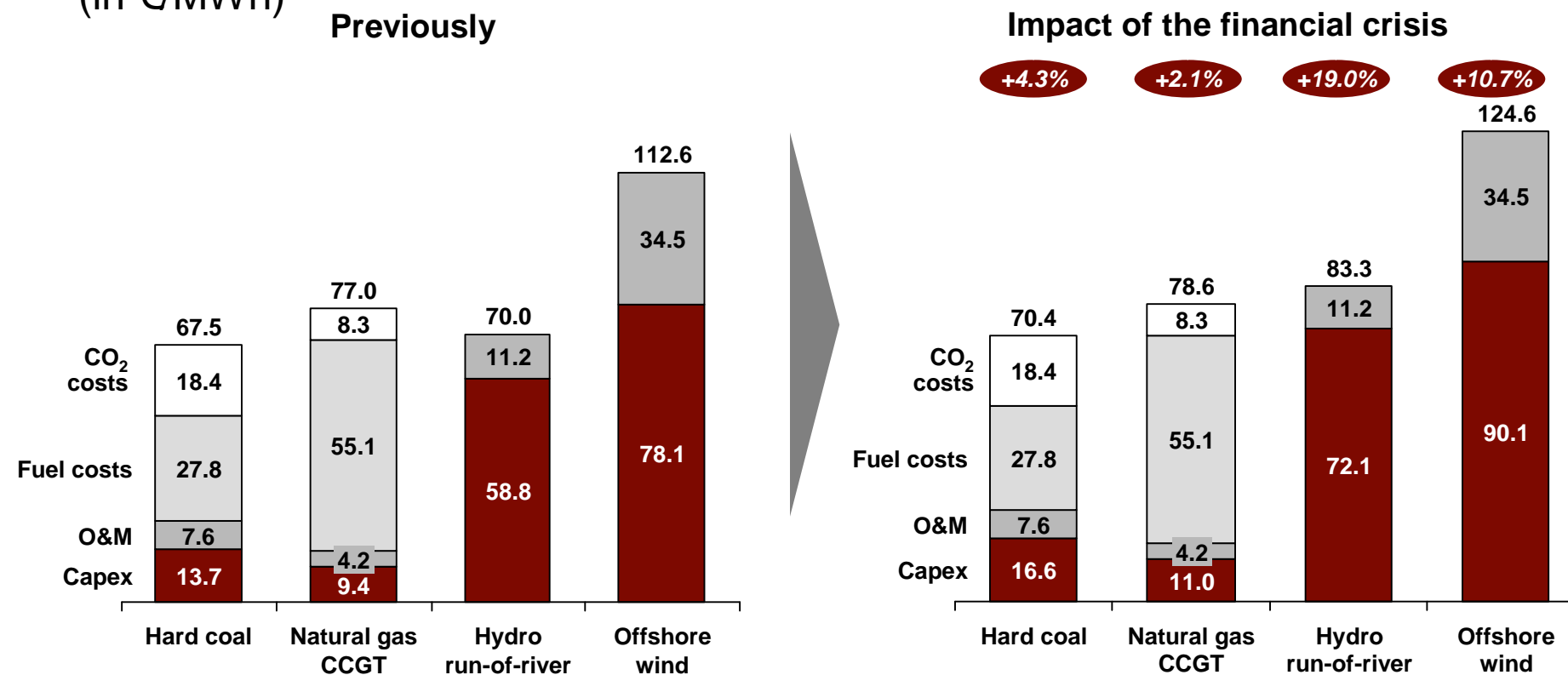
High demands on risk management due to price volatility

Low margins, cash flow stability

Increased price risk due to volatility on procurement side

The rising costs of financing impact on the attractiveness of investing in power plants.

1 Overall power generation costs per technology (in €/MWh)



Investment costs: Coal €1,200/kW; natural gas CCGT €650/kW; hydro run-of-river €3,700/kW; offshore wind €2,300/kW

Fuel costs: The average prices in 2008 of the 2009 futures for coal, gas and CO₂ respectively

Full-load hours: Coal 7,500 h/a; natural gas CCGT 6,500 h/a; hydro run-of-river 5,200 h/a; offshore wind 3,000 h/a

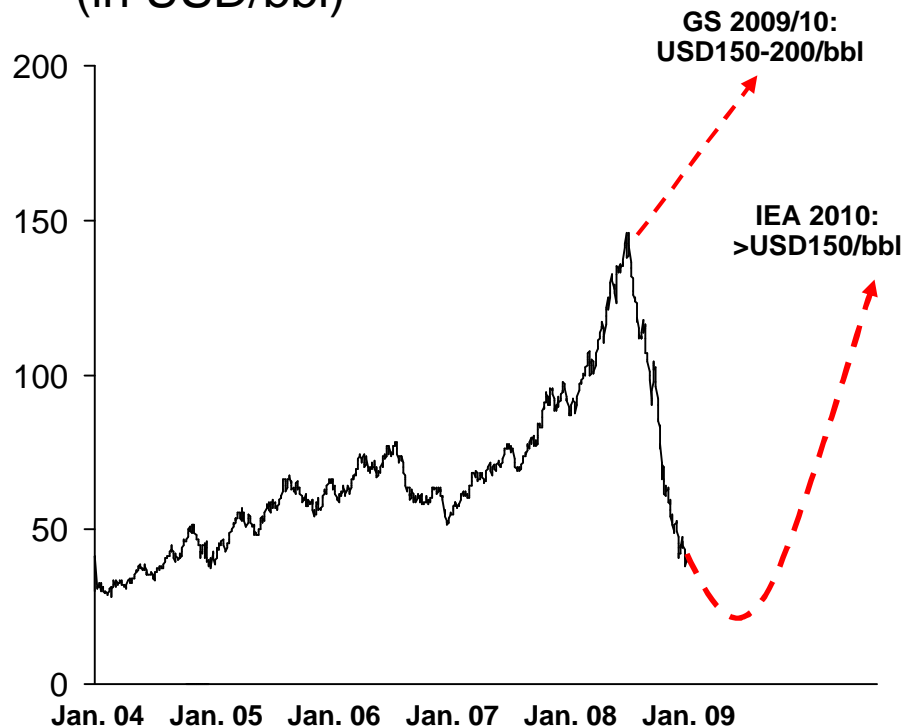
Efficiency: Coal 46%; natural gas CCGT 56%

Interest rate: So far, a WACC of 8% has been used. Assumption: the cost of capital is increasing by 2% owing to the economic crisis

Source: Energate, EEX, EWEA, A. T. Kearney analysis

Procurement is becoming more complex owing to the increasing volatility of commodity prices.

2 Trend of the ICE Brent index (in USD/bbl)



"Several power utilities want to lower their gas prices on January 1. Apart from EnBW, these include the municipal utility Stadtwerke Duisburg and Mannheimer MVV Energie."

(Tagesspiegel; Nov. 2008)

X

"Right in the middle of the recession, 354 German electricity suppliers are raising their prices to 'celebrate' the new year [...] they have already bought their electricity for 2009. And that in the phase in which the contracts climbed to €90."

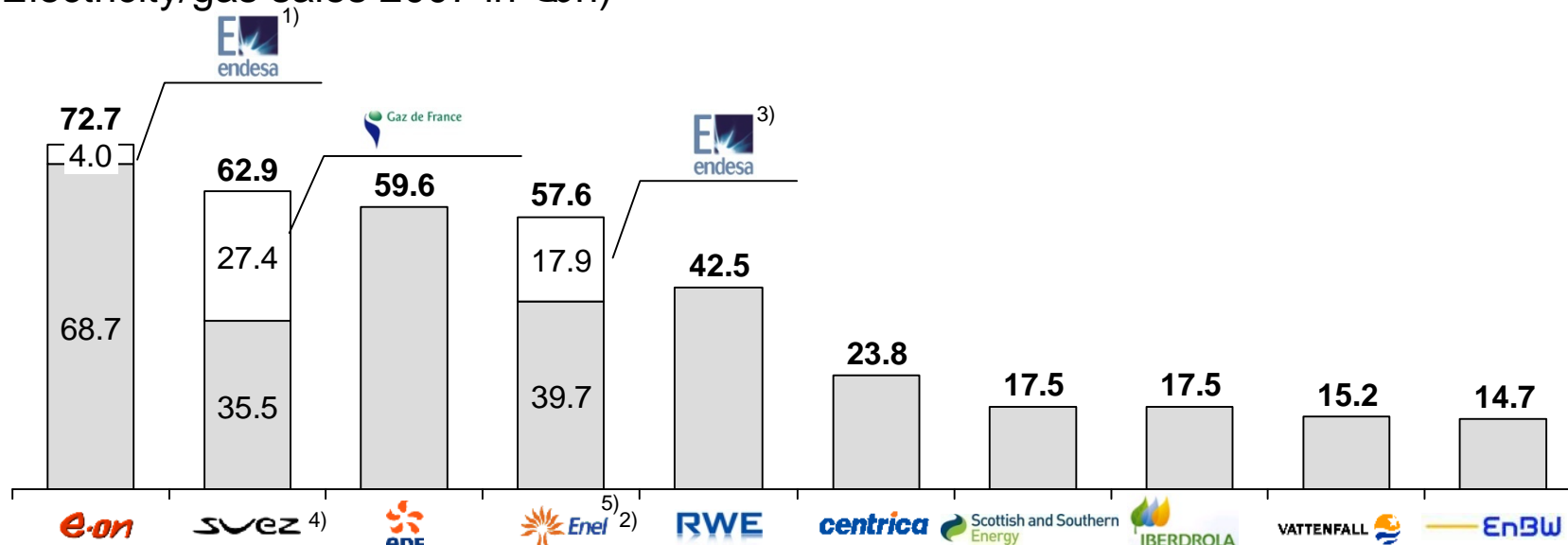
(Focus; Dec. 2008)

- Energy prices reached an absolute record level in summer 2008. The forecasts back then indicated a continuing upward trend.
- Many firms bought ahead at the price level prevailing at the time, in order to secure their position.

- Owing to the currently falling commodity prices, firms could be forced by political pressure to lower their retail prices.
- Errors of judgment made in respect of price developments could lead to financial difficulties.

Since 2000, the European utilities have grown very strongly, both organically and through acquisitions.

3 Overview of the top 10 utilities in Europe (Electricity/gas sales 2007 in €bn)



CAGR for electricity/gas in % from 2000–2007

	E.ON	Suez	EDF	Enel	RWE	Centrica	Scottish and Southern Energy	Iberdrola	VATTENFALL	EnBW	Average ⁶⁾
Total	30.9	8.7	8.1	12.9	15.9	15.5	19.3	13.8	22.4	14.6	14.3%
Organic	18.5	0.9	3.1	5.2	11.4	13.1	17.7	6.1	8.2	12.4	7.7%
Acquisitive	12.4	7.8	5.0	7.7	4.5	2.4	1.6	7.6	14.2	2.2	6.6%

1) Incl. Endesa Italy and France—Spanish business of Enel would have to be added; 2) Spanish electricity business (probably to be handed over to E.ON); 3) Excl. Endesa Italy and France (sold to E.ON); 4) Excl. Suez Environnement; Suez will be forced to cede its holding in Distrigas (57%)—this is, however, still included here; 5) In the total sales figure of Enel for 2007, Endesa's sales from the fourth quarter have been consolidated aliquot (approx. 67%)—this share has been removed here; 6) Average volume-weighted

Source: Business reports; A.T. Kearney analysis

Renewable energy sources victims of the financial crisis

A number of factors indicate that renewables will suffer more heavily and for longer under the financial crisis.

Factors pointing to a fall in investments in the renewables sector



Kind of investors in renewable electricity plants

- The traditional utilities operate just a very small number of renewable energy plants. This sector is currently dominated by non-utilities as investors.
- Current developments could lead to market shares in this sector shifting in the coming years.



Capital structure of the investors

- The investors in renewable energy sources are very heavily reliant on borrowed capital. Utilities are more likely to be able to finance investments from day-to-day cash flows.
- Companies with a lower rating suffer from ever less favorable credit terms.



Cost structures of renewable electricity plants

- In the case of renewables, capital expenditure (CAPEX) represents the main cost element. Variable costs are comparatively small.
- An increase in the interest rate increases the overall generating costs disproportionately high.



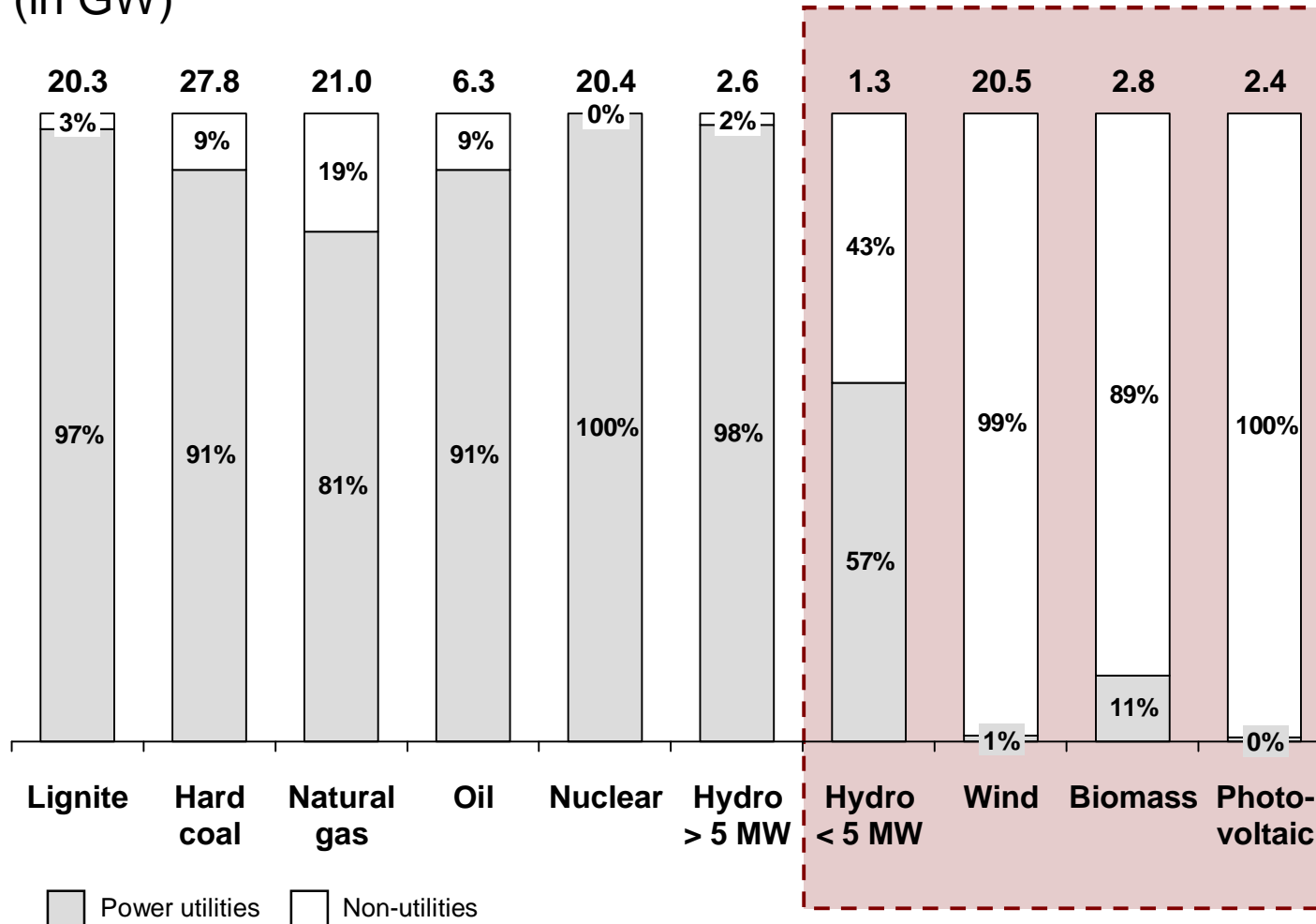
Improved profitability of the fossil energy sources

- The falling price of oil, gas, coal and CO₂ certificates makes conventional forms of power generation cheaper in comparison with renewables.
- Economic policy measures planned could reinforce this effect even more. In particular, the price of CO₂ certificates could remain cheaper in the long term.



The renewable energy sector is currently dominated by non-utilities as investors...

Power plant operators in Germany in 2006
(in GW)



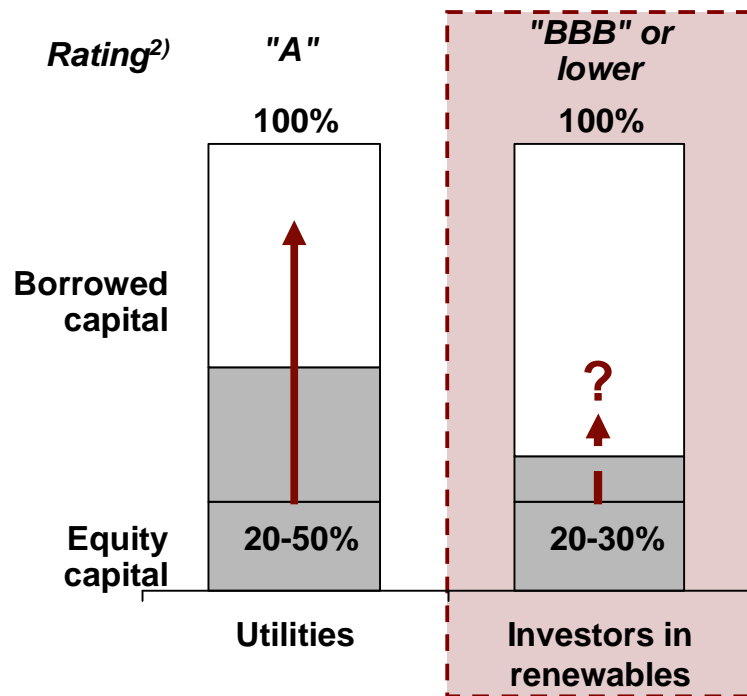
- Only a small proportion of the renewable energy power plants currently in operation in Germany are run by the traditional utilities.
- However, the share of this segment held by the traditional utilities will increase.

Source: BDEW, A.T. Kearney analysis

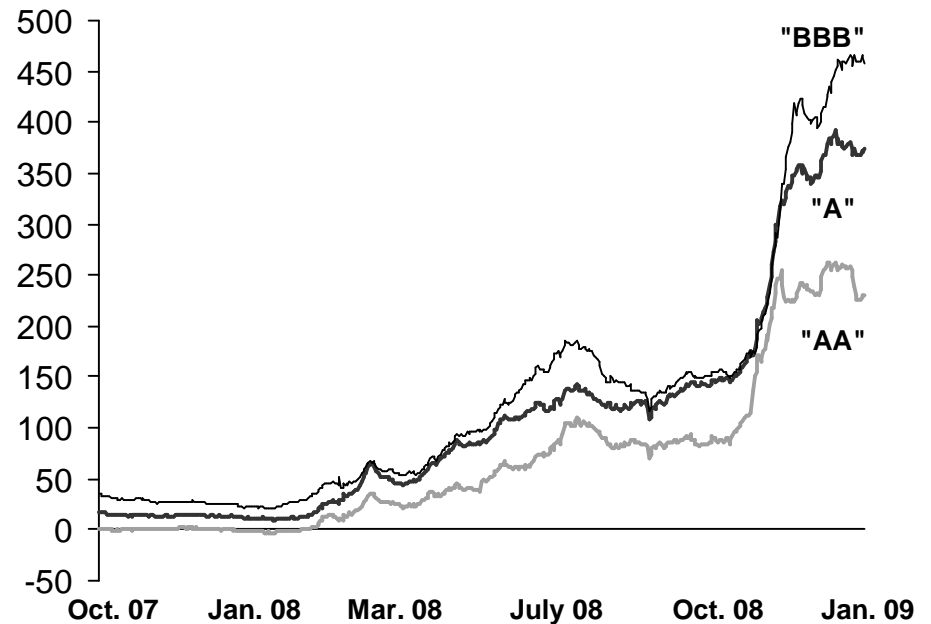


... that are hit far harder by the financial crisis than the large-scale utilities.

Capital structure and rating



Development of iBoxx corporate spreads¹⁾ (in basis points)



- Like utilities, investors in renewables finance power plants with a high level of borrowed capital.
- Utilities, however, are able to increase the share of equity capital by tapping into day-to-day cash flows

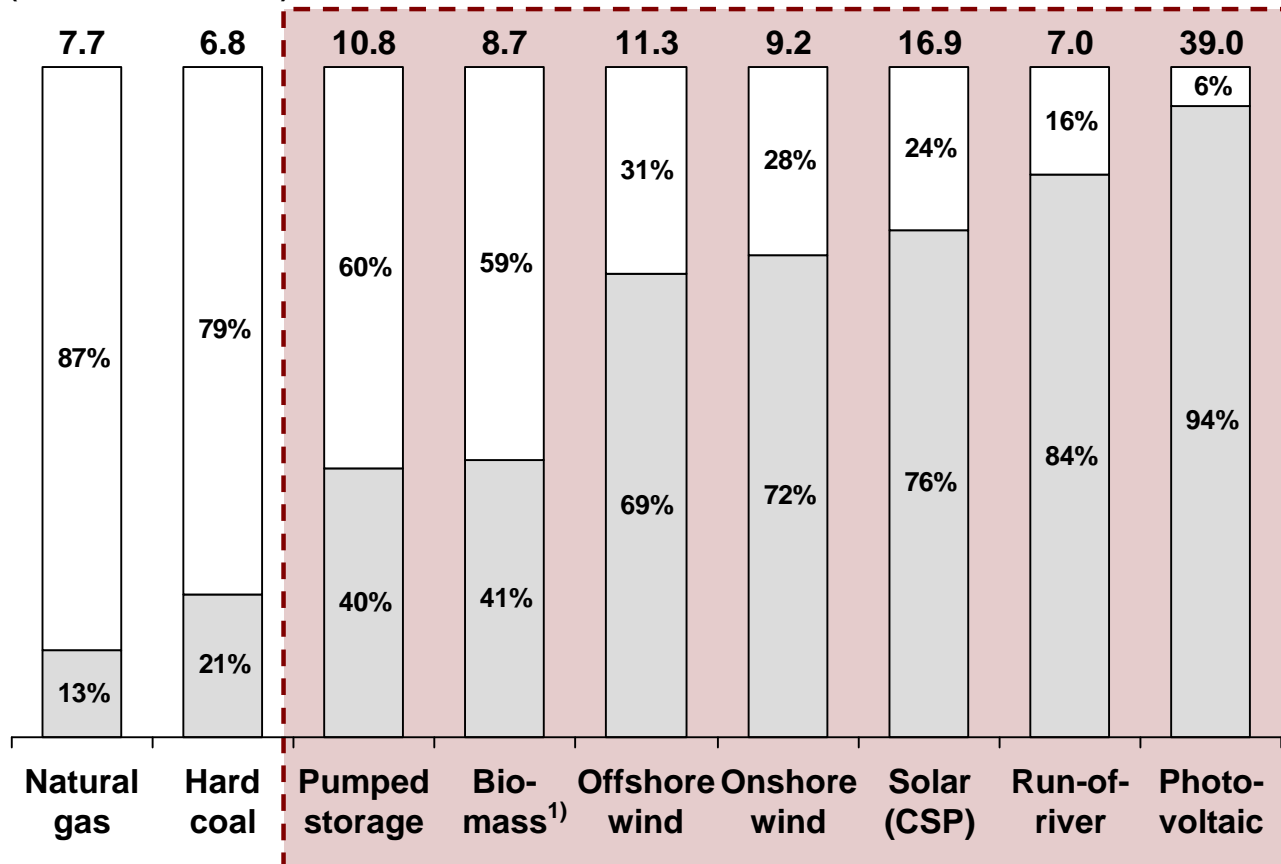
- The borrowing costs incurred by poorly rated companies are considerably higher.
- This further diminishes the competitiveness of investors in renewable energy sources.

1) Corporate spreads present the difference in yield from corporate bonds vs. government bonds. These are average values for companies (excluding financials) with a rating of AA, A and BBB; 2) Long-term S&P ratings
Source: Bloomberg, Standard & Poor's, A.T. Kearney analysis



The investment costs account for the largest share of the generating costs in the case of renewables.

Composition of the total power generation costs 2008
(in €ct / kWh)



- The initial investment costs for generation of renewable energy are considerably higher than those for conventionally generated forms for energy.
- However, the operating costs are comparatively low and calculable.

■ Capex □ Variable costs

Note: Calculated using WACC of 8%
Source: A. T. Kearney analysis

1) Conversion of scrap wood into electricity at a price of €30/t



Economic policy measures are targeted at traditional, energy-intensive sectors.

Energy-policy trends in Europe



*"After more than two decades, Italy wants to re-enter the field of civil **nuclear energy.**"*

(December 2008; APA)



*"[...] **the PV feed-in tariffs for 2009 have been considerably reduced.** Moreover, the volume of subsidies available has been limited [...]"*

(July 2008; bfai.de)



*"Federal Minister for the Environment, Sigmar Gabriel (SPD), wants to help municipal utilities **build new coal-fired power plants by providing investment aid.**"*

(October 2008; co2-handel.de)



*"Climate protection will be far less costly for industry than it had feared. The heads of State and government of the EU decided Friday on **wide-ranging emissions trading exceptions for industry and power station operators in Eastern Europe.** Nevertheless, the countries still want to stick to a target."*

(December 2008; Handelsblatt)



*"Following in the footsteps of Lower Saxony and North Rhine-Westphalia, the weekend also saw Bavaria **depart from the planned targets to reduce carbon dioxide emissions.**"*

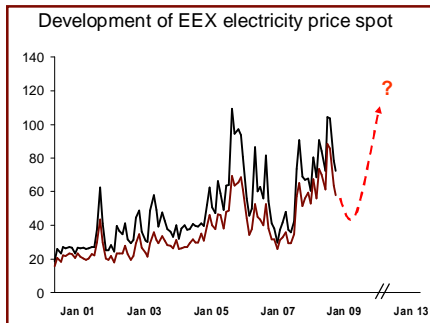
(November 2008; FTD)

Under the current conditions, lower-priced CO₂ certificates are a realistic prospect in the long term; they make the conventional forms of power generation cheaper.

The long-term impact of the financial crisis?

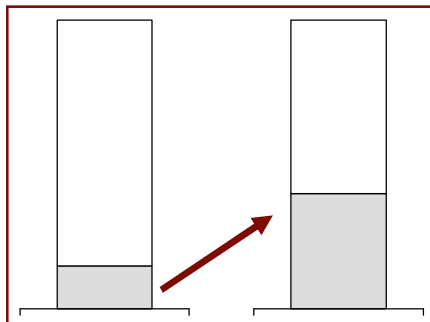
We see three long-term impacts of the financial crisis on the European energy markets.

Long-term impacts of the financial crisis



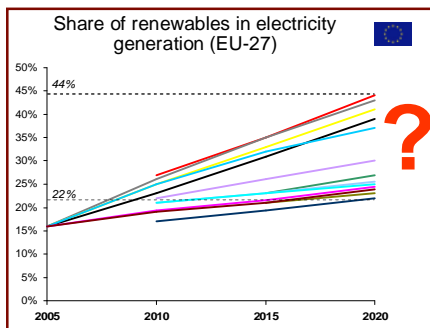
Heightened boom-and-bust cycle

- The falling electricity consumption and electricity prices and the rising costs of debt will lead to investment in power stations being less attractive.
- Despite this, massive investment in replacing power plants is already essential. The obsolescence of Europe's power station base will be compounded even more by this lack of investment.
- As a result, old, inefficient power stations - that also suffer from higher generating costs - will remain in service. This, combined with a marked rise in power consumption in the recovery phase, will drive electricity prices upward and reinforce the volatility of the markets.



Increased consolidation of and changes in the structure of the industry

- Declining profits made in the energy industry and the incurring of losses will accelerate the changes in the structure of the industry.
- On the one hand, the number of collaborations and the level of consolidation that will occur in the volatile, high-risk energy business will increase, or companies will pull out of this business entirely in order to focus on the low-risk, cashflow-stable grid business.
- What's more, the number of "independent" project developers in the renewable energy sector will fall. The share held by traditional energy utilities will rise.



Danger of the EU's climate targets not being met

- The present financial crisis is especially jeopardizing investment in power plants based on renewable energy sources.
- It is, however, absolutely essential that the power generation base be significantly expanded along these lines if the EU's target of renewables providing 20% of Europe's total energy consumption is to be met by 2020.
- We do not expect the level of electricity consumption to fall in the long term as a result of the ongoing economic crisis, making it easier for the EU's targets to be met in the process.