

Eastern German Lignite Industry



REPORT by Pao-Yu Oei, Hanna Brauers, Claudia Kemfert, Christian von Hirschhausen, Dorothea Schäfer, and Sophie Schmalz

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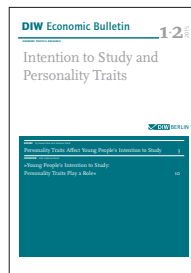
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Climate protection and a new operator: the eastern German lignite industry is changing

By Pao-Yu Oei, Hanna Brauers, Claudia Kemfert, Christian von Hirschhausen, Dorothea Schäfer, and Sophie Schmalz

According to the German federal government's climate protection targets, there will be a continuous reduction of lignite-based electricity well before 2030. Simulations show that the currently authorized lignite mines in eastern Germany would not be fully depleted if the climate protection targets for 2030 were complied with. This makes planning for new mines or the expansion of existing ones superfluous. For the planning security of all the actors involved, policy makers should bindingly exclude permits for additional surface mines.

In terms of the follow-up costs of lignite mining, the issue is whether or not the companies' provisions are high enough and insolvency-proof. In this context, the new ownership structures in the eastern German lignite industry, after Vattenfall's sale of its lignite division to Czech Energetický a Průmyslový Holding (EPH), have become a matter of importance. Simulations show that only under optimistic assumptions, the current provisions of 1.5 billion euros for the Lusatian lignite region are sufficient to cover recultivation costs. However, alternative scenarios show significant shortfalls. For this reason, policy makers should work toward independent, transparent cost estimates.

Additional measures should be considered as required, such as the creation of a public sector fund to permanently protect the general public against being forced to take on the costs of recultivation. This is also an important theme for the government's new Commission on Growth, Structural Change, and Regional Development (*Kommission Wachstum, Strukturwandel und Regionalentwicklung*). Individual federal states also have key roles to play in the creation of a dependable roadmap for a coal phase-out. For example, the government of Brandenburg is now in the process of revising its energy strategy for 2030 (*Energiestrategie 2030*).

In November 2016, the Paris Agreement of the United Nations Framework Convention on Climate Change (UNFCCC) went into effect. The world community obligated itself to restricting the increase in the global average temperature to at most 2 °C, and ideally to only 1.5 °C, above pre-industrial levels.¹ In missing these targets serious consequences of global warming loom large.² Achieving the targets will be a major international endeavor.³ To do their part in limiting climate change, both European and German climate policies must be sufficiently ambitious.⁴

In Germany, lignite-based electricity is currently responsible for a particularly high proportion of energy-related greenhouse gas emissions. The lignite industry is thus a key actor in German climate protection activities. In this report we shed light on the current state of the eastern German lignite industry. The strip mines and power plants in the coal-mining regions Central Germany and Lusatia (*Lausitzer Revier*) are currently of special interest, as the ownership structures there have recently seen substantial changes. This issue of the *Economic Bulletin* examines the new ownership structures in detail. In focus is LEAG,⁵ which in 2016 absorbed the power plants and strip mines of Vattenfall. We also show the relationship between the remaining quantity of lignite in eastern Germany and the German climate protection targets. The operating company provisions for recultivating the strip mines after mining has stopped is an issue we examine

¹ See UNFCCC, "Paris Agreement," United Nations Framework Convention on Climate Change (2015). Available online (accessed January 18, 2016, this is the case for all other online sources in this article, except when stated).

² See Intergovernmental Panel on Climate Change (IPCC), "Climate Change 2014 Synthesis Report—Summary for Policy-makers," (2014). Available online.

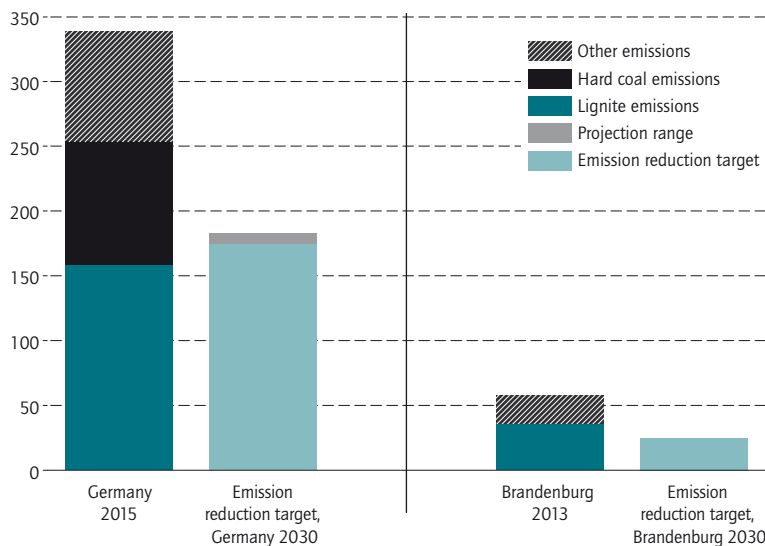
³ See William D. Nordhaus, "Projections and Uncertainties about Climate Change in an Era of Minimal Climate Policies" (discussion Paper no. 2057, Cowles Foundation, 2016): 1–43.

⁴ See Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (*Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit*, BMUB), "Klimaschutzplan 2050 – Klimaschutzpolitische Grundsätze und Ziele der Bundesregierung," BMUB (2016); also see Climate Action Tracker, "EU-Rating," (2016). Available online.

⁵ LEAG is a joint brand of the Lausitz Energie Bergbau AG and the Lausitz Energie Kraftwerke AG.

Figure 1

Annual emissions and emission reduction targets of the energy sector
In million tons CO₂ equivalent



Sources: Own graph based on: Renewable Energies Agency "Bundesländer-Übersicht zu Erneuerbaren Energien," (2016), available online; BMUB, "Klimaschutzplan 2050." The Ministry for Economic Affairs and Energy, Brandenburg, "Energiesstrategie 2030 des Landes Brandenburg." Potsdam (2012), available online. German Federal Environmental Agency (Umweltbundesamt, UBA), "Entwicklung der spezifischen Kohlendioxid-Emissionen des deutschen Strommix in den Jahren 1990 bis 2015." (Climate Change 26/2016), available online.

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The emission reduction targets imply a significant reduction of coal-based electricity generation.

in detail. Further, we discuss how they could be safeguarded on a permanent basis.⁶

German government's Climate Action Plan implies phase-out of coal-based electricity generation

The federal government adopted the national "Klimaschutzplan 2050" (Climate Action Plan 2050) as a strategy for fulfilling its international climate protection obligations.⁷ In addition to the target for the overall economy, it specifies detailed emission reduction targets for the different economic sectors to be met by 2030. In the energy industry, it calls for cutting today's emission levels in half by 2030, allowing for 175–183 million tons of CO₂ equivalent emissions. The emissions of lignite- and hard coal-based electricity production in

⁶ Some of the information in this *Economic Bulletin* is based on information acquired as part of the ongoing research project, "Klimaschutz und Kohleausstieg: Politische Strategien und Maßnahmen bis 2030 und darüber hinaus," for the German Federal Environmental Agency (Umweltbundesamt, UBA) and BMUB.

⁷ See BMUB, "Klimaschutzplan 2050."

2015 significantly exceeded this emission target. Therefore, coal-based electricity production must be greatly reduced by 2030.

Looking at the activities required to meet the federal states' emissions targets for 2030, the picture is similar for the state of Brandenburg (see Figure 1). At the state level, the national climate targets still have to be implemented. This warrants the creation of an according state strategy or its adjustment. The Brandenburg government's energy strategy for 2030 is currently being revised and will presumably be ready for publication in the second quarter of 2017. A reduction in lignite-based electricity will play an important role in the strategy.

The carbon reduction targets for 2030 imply significant changes for the energy industry and in particular a sharp reduction in highly carbon-intensive lignite-based electricity. However, these targets are only at the lower margin of a pathway seemingly able to achieve a largely carbon-neutral (decarbonized) German economy by 2050.

In recent years, there have been discussions on a number of regulatory and market-based climate protection instruments for reducing coal-based electricity in Germany, including carbon emission limit values and a "climate protection fee" (*Klimabeitrag*).⁸ Ultimately, in 2016 the federal government decided to implement a "Coal Reserve" (also called "standby mode for backup purposes", *Sicherheitsbereitschaft*) to deactivate selected coal-fired power plants but hold them in reserve in case of emergency demand.⁹ But according to the federal government's 2016 climate protection report, Germany will not meet the climate protection goals it set for 2020. One reason is the almost unchangingly high level of carbon emitted by coal-based electricity generation.¹⁰ As part of the "Coal Reserve," power plant operators have already agreed to save an extra 1.5 million tons of CO₂ if they miss the 2020 targets. If this level of carbon savings proves insufficient, further coal industry measures may be necessary to comply with the target of a 40-percent CO₂ reduction by 2020 in comparison to 1990 levels.

⁸ See Pao-Yu Oei et al., "Auswirkungen von CO₂-Grenzwerten für fossile Kraftwerke auf den Strommarkt und Klimaschutz," *DIW Berlin Politikberatung kompakt* 104 (2015); Pao-Yu Oei et al., "Effektive CO₂-Minderung im Stromsektor: Klima, Preis- und Beschäftigungseffekte des Klimabeitrags und alternativer Instrumente." Study commissioned by the European Climate Foundation (ECF) and the Heinrich Böll Foundation (2015); and Pao-Yu Oei et al., "Braunkohleausstieg – Gestaltungsoptionen im Rahmen der Energiewende," *DIW Berlin Politikberatung kompakt* 84 (2014).

⁹ See Pao-Yu Oei et al., "'Kohlereserve' vs. CO₂-Grenzwerte in der Stromwirtschaft – Ein modellbasierter Vergleich," *Energiewirtschaftliche Tagesfragen* 66 (1/2) (2016): 57–60.

¹⁰ See BMUB "Klimaschutzbericht 2016 – Zum Aktionsprogramm Klimaschutz 2020 der Bundesregierung," 2016. Available online.

Currently approved mines adequate for lignite-based electricity generation beyond 2030

This section provides updates on earlier calculations regarding the operating times of lignite mines and power plants.¹¹ We distributed the required reduction in lignite-based electricity production over all surface mines and power plants, accounting for both cost optimization and existing local transport infrastructure. Decisive changes in comparison to former calculations are compliance with the political emission reduction targets for 2030 of the Climate Action Plan 2050 and the implementation of the “Coal Reserve.”¹² Based on our assumptions about the operating times of power plants (Table 1) and other parameters (Table 2), we calculated the remaining amounts to be extracted from the approved mines by 2030, considering various maximum available carbon budgets.

The remaining amount of carbon or coal budget for the lignite industry will depend on a variety of variables. Based on a study by the Oeko-Institut and BET Aachen for the Federal Environmental Agency (Umweltbundesamt, UBA),¹³ we established the range of the amounts of coal that could still be used in line with the sector targets for the energy industry in 2030 contained in the Climate Action Plan (Figure 2).

A further scenario maps the “trend scenario” that the Oeko-Institut and Prognos created for the WWF¹⁴ to define the sectoral carbon budget that would comply with the 2°C target. In that degree Celsius scenario, significantly more lignite would remain in the mines than in all the UBA scenarios outlined above (Figure 2). It shows that the carbon emitted by burning lignite in the UBA scenarios is in line with the sector target of the Climate Action Plan 2050, but surpasses the budget of the international 2°C target.

¹¹ Clemens Gerbaulet et al., “Abnehmende Bedeutung der Braunkohleverstromung: weder neue Kraftwerke noch Tagebaue benötigt,” *DIW Wochenbericht* no. 48 (2012).

¹² Only the major power plants are presented here. In the Jänschwalde power plant, block F will enter the “Coal Reserve” on October 1, 2018, and block E will be added one year later. Each of the two will be shut down completely, four years after being transferred to the reserve. It is assumed that the pending renegotiations between the operators and the federal government directed toward attaining the climate protection targets will also lead to the shutdown of blocks C and D in 2020. Due to the high fixed costs of the Jänschwalde site, another assumption is that the latter two blocks and the strip mine, which will be almost completely depleted of coal by then, will all be shut down when the “Coal Reserve” expires on September 30, 2023.

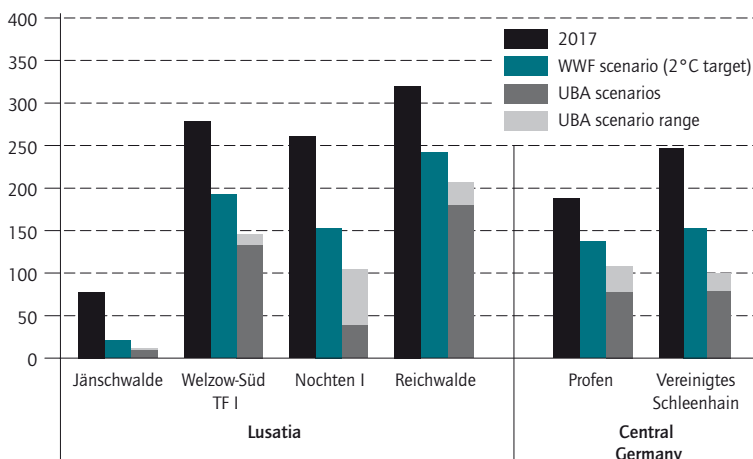
¹³ German Federal Environmental Agency, “Klimaschutz im Stromsektor 2030 – Vergleich von Instrumenten zur Emissionsminderung – Endbericht,” *Climate Change 02* (2017), (Study created by the Oeko-Institut and the Büro für Energiewirtschaft und technische Planung GmbH (BET Aachen)).

¹⁴ WWF Deutschland, “Zukunft Stromsystem – Kohleausstieg 2035 – Vom Ziel her denken,” (2017; Study created by Oeko-Institut and Prognos).

Figure 2

Remaining amounts of lignite in approved mines in Lusatia and Central Germany by 2030

In million tons



The figure shows the approved amounts of lignite to be extracted in the mines in 2017 and in different climate protection scenarios. The WWF scenario defines a sectoral carbon budget level that complies with the 2°C target. The scenarios of the Federal Environmental Agency (Umweltbundesamt, UBA) represent compliance with the sector targets for 2030 of the ‘Climate Action Plan 2050’. The hatched area represents the UBA scenario range.

Sources: Own calculations based on WWF Deutschland, “Zukunft Stromsystem”; and German Federal Environmental Agency, “Klimaschutz im Stromsektor”.

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The amounts of lignite to be extracted that are already approved are only partially required in the climate protection scenarios.

Climate target compliance would not fully deplete approved mines by 2030

In both scenarios presented, all mines would still contain significant residual amounts of coal, the removal of which was already authorized. Therefore, all of the new strip mines planned and expansion plans for existing ones are superfluous. For the Lusatia region, this means that Nochten 2, Welzow Süd Teilfeld II, Jänschwalde Nord, Bagenz-Ost, and Spremberg Ost do not need to be developed (see Box 1). In the Central German lignite region, the Vereinigtes Schleenhain strip mine does not need to be expanded, which also means that the village of Pödelwitz does not need to be destroyed.

New commission to design the coal phase-out

Compliance with the agreed upon sector targets in the Climate Action Plan 2050 implies a complete phase-out of coal between 2030 and 2050. When determining an optimal roadmap for the phase-out in individual regions, their later recultivation is a key issue.¹⁵

¹⁵ Before a new surface mine can be opened, the operator must present a feasible plan for the follow-up use of the tract that assumes all of the coal will

Table 1

Assumptions on operating times of lignite power plants in Lusatia and Central Germany

Power plant	Net Capacity (megawatts)	Commissioning	Shutdown year (if not operating in 2030)	Operator
Lusatia				
Klingenberg	164	1981	2017 conversion into gas-fired power plant	Vattenfall
Boxberg Q	857	2000	2030 in operation	LEAG
Boxberg R	640	2012	2030 in operation	LEAG
Boxberg N	489	1979	2024	LEAG
Boxberg P	489	1980	2025	LEAG
Cottbus HKW	74	1999	2030 in operation	Stadtwerke Cottbus
Schwarze Pumpe A	750	1997	2030 in operation	LEAG
Schwarze Pumpe B	750	1998	2030 in operation	LEAG
Jänschwalde F	465	1989	2018 (Coal Reserve)	LEAG
Jänschwalde E	465	1987	2019 (Coal Reserve)	LEAG
Jänschwalde D	465	1985	2020 (Shutdown to comply with 2020 targets)	LEAG
Jänschwalde C	465	1984	2020 (Shutdown to comply with 2020 targets)	LEAG
Jänschwalde B	465	1982	2023 (Shutdown of entire site)	LEAG
Jänschwalde A	465	1981	2023 (Shutdown of entire site)	LEAG
Central Germany				
Schkopau A	450	1996	2030 in operation	Saale Energie (EPH)
Schkopau B	450	1996	2030 in operation	Uniper
Lippendorf R	875	2000	2030 in operation	LEAG
Lippendorf S	875	1999	2030 in operation	EnBW
Chemnitz Nord II HKW C	91	1990	2030 in operation	Stadtwerke Chemnitz
Chemnitz Nord II HKW B	57	1988	2030 in operation	Stadtwerke Chemnitz

The power plant Buschhaus (Mibrag; EPH) has been in the "Coal Reserve" since October 1st 2016 and will be shut down in 2020.

Sources: Own depiction, based on own assumptions and data of BNetzA.

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The majority of power plants is owned by subsidiary companies of EPH or LEAG, respectively.

If all involved parties (political parties, civil society, academia, unions and companies) could develop a coal phase-out roadmap together, its level of societal acceptance would likely be increased. Given this context, the new Commission on Growth, Structural Change, and Regional Development (*Kommission Wachstum, Strukturwandel und Regionalentwicklung*) announced in the Climate Action Plan 2050 will have a key role to play. Along with its other duties, at the beginning of 2018 the commission will be tasked with drafting a coal phase-out roadmap that considers the impending societal changes in the lignite regions.¹⁶ The commission has another key task: safeguarding the financing of the lignite industry's follow-up costs.

be extracted from the mine. Therefore, partial extraction from strip mines is considered non-compliance with the previously agreed upon lignite plans and trigger additional authorization and verification procedures. For this reason, prohibiting the partial development of new surface mines is an effective instrument for preventing stranded investments.

¹⁶ For more on the possible effects of a lignite phase-out in eastern Germany, see Simon Franke et al., "Arbeitsplätze in der ostdeutschen Braunkohle: Strukturwandel im Interesse der Beschäftigten frühzeitig einleiten," *DIW Wochenbericht* no. 6+7 (2017).

Follow-up costs unknown; calculations of provisions murky

The operators of lignite surface mines are obligated to pay for the cost of recultivation after their mines are depleted. Each company implicated must build up sufficient provisions. This is stipulated in Section 55 of the German Federal Mining Act (*Bundesberggesetz*, BBergG);¹⁷ embedded in this section is the polluter pays principle. However, its practical implementation at present includes risks that could entail negative consequences for the general public. The mine operators themselves are responsible for estimating the future follow-up costs of recultivating the depleted mines, and it is difficult for the public to reconstruct or evaluate the sums they determine.¹⁸ The amount of money the surface mine operators hold as mining-related provisions is hence based on their own estimates.

¹⁷ See "Bundesberggesetz" (BBergG; German Federal Mining Act), as of November 30, 2016.

¹⁸ See Rupert Wronski et al., "Finanzielle Vorsorge im Braunkohlebereich Optionen zur Sicherung der Braunkohlerückstellungen und zur Umsetzung des Verursacherprinzips," (Potsdam/Berlin: Forum Ökologisch-Soziale Marktwirtschaft e.V. and IASS Potsdam Institute for Advanced Sustainability Studies e.V., 2016), 16 et seq.

Box 1

Overview of planned surface mine expansion in eastern Germany

Surface mine expansion has been planned for the Lusatia and Central German lignite regions, but the plans are at entirely different stages. In the Lusatia region, they involve the Nochten 2, Welzow Süd TF II, Jänschwalde Nord, Bagenz-Ost and Spremberg Ost surface mines. In the Central German coal region, the expansion of the surface mine Vereinigtes Schleenhain is being discussed.¹

The lignite mining expansion plan (*Braunkohlenplan*, referred to as "expansion plan" here) for Nochten 2 has already been approved and Vattenfall also applied for the required general operating plan. Preparations for resettling the approximately 1,500 residents of Rohne, Mulnitz, Schleife, Mühlrose, and Trebendorf, however, were halted in 2015. LEAG could reactivate the plan as long as it does not come into conflict with the current policy.

For the Welzow Süd TF II expansion, around 800 residents from Proschim and part of Welzow would have to be resettled, which has been approved in an expansion plan. The previous owner

Vattenfall, however, has not applied for the needed general operating plan for this new surface mine.

The mining site Jänschwalde Nord was supposed to supply a new lignite power plant with a carbon capture system at the Jänschwalde site. However, the power plant was canceled. The expansion of this surface mine would have meant resettlement of around 900 people living in the villages of Grabko, Kerkwitz, and Atterwasch. The expansion plan for this surface mine has not been approved yet, nor have the operators applied for an operational plan.

Bagenz-Ost and Spremberg Ost in Brandenburg are two more surface mines in the preliminary planning phase. The original idea was to have both of them begin extracting lignite in the 2030s. But the process for the expansion plan has not been initiated for either of them.

The village of Pödelwitz is planned for removal to allow for the expansion of the Vereinigtes Schleenhain mine in the Central German coal region. This will enable surface mine operator, MIBRAG, to extract around 20 million extra tons of coal and save the cost of the dust- and sound-proofing systems it would have incurred if the village were bypassed as originally planned.

¹ See Pao-Yu Oei et al., „Braunkohleausstieg – Gestaltungsoptionen im Rahmen der Energiewende,“ DIW Berlin (2014), Politikberatung kompakt 84; also see Grüne Liga Umweltgruppe Cottbus, „Drohende Tagebaue,“ (2017). Available online.

After the acquisition of Mitteldeutsche Braunkohlegesellschaft (MIBRAG) in 2010, the new owner, EPH, liquidated mining-related provisions of around 135 million euros and transferred the money to the "other retained earnings" section of the financial statement.¹⁹ In 2016, the German lignite economy's mining-related provisions amounted to slightly more than four billion euros. RWE's share of the total was 2.4 billion euros, Vattenfall/LEAG's was 1.5 billion euros, and MIBRAG's was 0.14 billion euros.²⁰

Mining-related provisions are carried as obligations in the liabilities column of corporate balance sheets. The companies can invest them further until payment is due.

¹⁹ The company referred to the 2009 German Accounting Law Reform Act (*Bilanzrechtsmodernisierungsgesetz*, BilMoG), which revalued the reserve, indicating that the reserve had not been "liquidated upon request of shareholder EPH, as claimed." Although both RWE and Vattenfall also showed reductions in mining-related reserves during the same period (15 percent for the former and 21 percent for the latter), they were significantly lower than that of MIBRAG (56 percent). See Wronski et al., *Finanzielle Vorsorge*, 22 et seq. and Mitteldeutscher Rundfunk (MDR), "Stellungnahme EPH" broadcast on September 22, 2016. Available online.

²⁰ Information as provided by the company in the *Federal Gazette (Bundesanzeiger)*.

Table 2

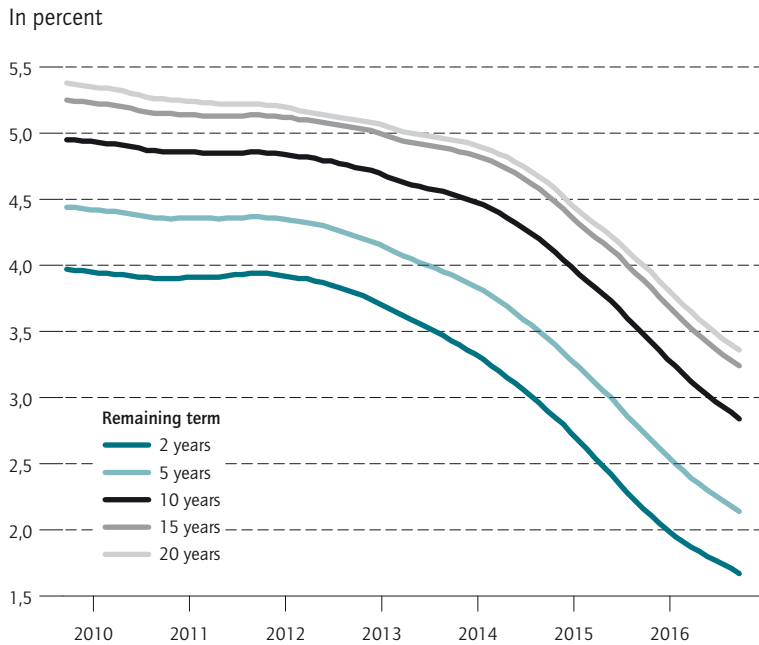
Additional assumptions to calculate remaining amounts of lignite

Remaining amounts of lignite for Lusatia and Central Germany for 2017-2030:	WWF scenario: Cumulated lignite consumption of the 'Trend scenario', which is in accordance with the 2°C target. UBA scenarios: cumulated lignite consumption for a linear reduction from 2017 onwards and in compliance with the 'Climate Action Plan 2050' sector targets for the year 2030 for different electricity market developments in six scenarios. Basic assumption that Lusatia and Central Germany together, according to their capacities in 2017, represent half of Germany's total lignite emission reductions.
Utilization of power plants:	The full load hours are being reduced from around 7500 in 2017 with a yearly proportional factor, such that the resulting amount of CO ₂ from electricity production in 2017-2030 does not exceed the lignite budget for the region. On average, there are 4.500 full load hours.
Share of lignite from the strip mine Reichwalde:	The share of lignite from the strip mine Reichwalde may not exceed 25 percent for the power plant Schwarze Pumpe and 35 percent for the power plant Boxberg.

Source: Own depiction.

Figure 3

Development of discount rates from 2010 to 2016 for different remaining terms



7-year averages are depicted.

Source: Bundesbank (available online).

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Discount rates decreased for all remaining terms, thereby provisions have to increase.

When the value of the assets the companies are carrying (e.g., investment in surface mining and coal- or gas-fired power plants) depreciates, the provisions also become less valuable. If the companies become insolvent, they may lose their provisions completely. This shows that the current mining-related provisions of German lignite mine operators are not insolvency-proof.

Varying estimates of the provisions required in the Lusatia lignite region

Mining-related company provisions should be equivalent to the present value of the future burden of payment caused by the obligation to recultivate depleted mines. Rising real cost estimates for the future recultivation of mining regions could increase the present value required, as could higher inflation rates, lower discount rates and/or shorter remaining service lives. The present value would decrease if any of these variables developed in the opposite manner. In recent years, the discount rates for all remaining terms have continuously fallen (Figure 3). As a consequence, the provisions should be raised due to interest rates.

The actual costs of recultivating eastern German lignite strip mines are uncertain. In the following section, we present rough estimations of the provisions that would be required in fiscal year 2016 to cover the cost of recultivating the lignite strip mines in the Lusatia lignite region for three scenarios with varying initial costs per hectare. For reasons of simplification, we assume that in the period from 2018 to 2040, an area of equal size will be recultivated each year and prices will change at a constant rate over time. The rate of price changes could also be negative if technical progress in recultivation or economies of scale/specialization overcompensate for inflation. In the case of low price increases and the resulting dominant discount factor, a longer recultivation period than assumed here (i.e., parts of the costs due after 2040) would reduce the required provisions. When the rates of price increase are high, the opposite effect will take hold, driving up the required provisions in 2016.

In the first scenario, we assumed average recultivation costs of 162,000 euros per hectare with 2015 as the baseline year.²¹ These values stem from the cost data of *Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft mbH* (LMBV) and reflect the cost of cleaning up the contamination from GDR surface mines. In comparison, the average costs for the mines that still exist today could be lower. For this reason, we assume recultivation costs of 75 percent of the LMBV value in the second scenario, and in the third one we set the level at 50 percent (Figure 4).

The three scenarios showed that for the Lusatia lignite region, the current provisions of 1.5 billion euros could only be adequate under specific conditions. This applies in particular to the third scenario, in which today's specific costs are only half of the historical LMBV value. And in the other scenarios, the provisions could be adequate if the rate of price increase is highly negative—due to technical progress and low inflation, for example. However, if we make less optimistic assumptions i.e., higher rates of price increase, if technical progress does not compensate for the general inflation in this sector, or more stringent regulatory requirements are applied to recultivation, shortfalls are the result. A further drop in the discount rate would push the present value curve upward in the direction of larger shortfalls as well. The new operator of the Lusatian mines must make up these shortfalls in the near future and transfer them to its provisions.

²¹ See Gerard Wynn and Javier Julve, "A Foundation-Based Framework for Phasing Out German Lignite in Lausitz," (Cleveland: Institute for Energy Economics and Financial Analysis (IEEFA)), 2016, 31.

LEAG, the successor to Vattenfall's lignite division

Vattenfall GmbH sold its German lignite division to Czech energy group EPH and PPF Investments (PPF-I), its financial partner, in September 2016. Since October of last year, the former Vattenfall lignite division has done business under the name of LEAG. Through various parent companies, both EPH and PPF-I own 50 percent of LEAG (Box 2).²² The Swedish government agreed to the sale, and after the EU Cartel Authority checked for any competition concerns the EU Commission also gave its stamp of approval.²³ Vattenfall saw considerable risks in the lignite business and decided to sell.²⁴ The Czech consortium of buyers was the last remaining bidder. According to Vattenfall, EPH acquired 1.6 billion euros in cash resources plus liabilities and provisions in the amount of approximately 1.9 billion euros.²⁵ Provisions for mining operations, other environment-related provisions and provisions for pensions amounted to 1.7 billion euros.²⁶ Of these, around 1.5 billion euros can be attributed to mining-related provisions.²⁷ The Czech consortium is not allowed to pay any dividends, liquidate its provisions or conduct similar transactions until three years after the sale. And it must honor the existing collective bargaining agreements, which prohibit layoffs until 2020.²⁸

Provisions at risk due to new operator

The state and federal climate protection targets outlined above have a marked influence on the business model of EPH, which owns virtually all of the eastern German lignite industry through various subsidiaries. The company is currently expanding its conventional electricity production business by buying up lignite and gas-fired power plants in different European countries.²⁹ However, low electricity prices and sharply falling carbon budgets

²² See LEAG, "Dr. Helmar Rendez übernimmt Vorstandsvorsitz des neuen Energieunternehmens," press release, October 11, 2016.

²³ EU Commission, "Mergers: Commission clears acquisition of Vattenfall Europe Generation and Vattenfall Europe Mining by EPH and PPF Investments," press release, September 22, 2016.

²⁴ See Vattenfall GmbH, "Vattenfall to sell German lignite operations," press release, April 18, 2016.

²⁵ See Vattenfall GmbH, press release, April 18, 2016.

²⁶ See Vattenfall GmbH, "Interim report January-June 2016". Available online.

²⁷ See Federal Bulletin, "Lausitz Energie Bergbau AG (vormals: Vattenfall Europe Mining Aktiengesellschaft) Cottbus Jahresabschluss zum Geschäftsjahr vom 01.01.2016 bis zum 31.05.2016," (report, Bundesministerium der Justiz und für Verbraucherschutz, Berlin, 2017). Available online.

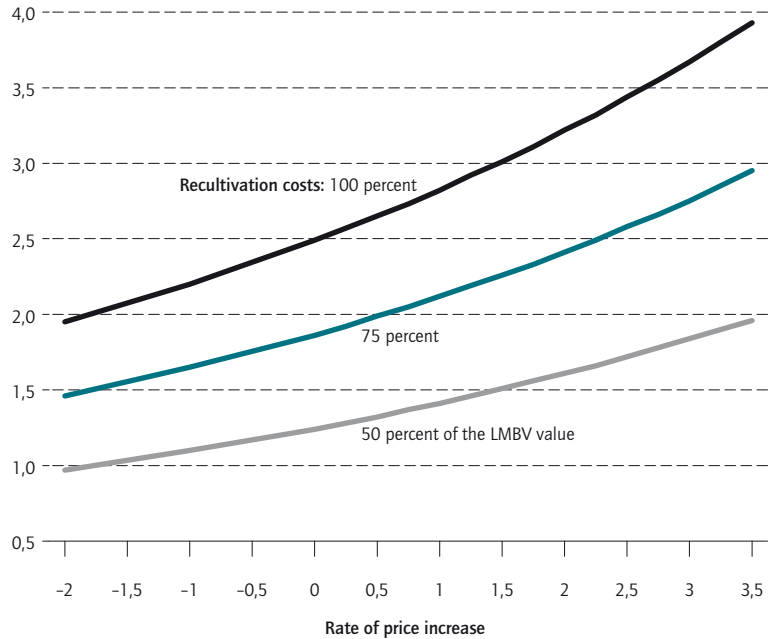
²⁸ See Vattenfall GmbH, press release, April 18, 2016.

²⁹ See Greenpeace, "Update: Schwarzbuch EPH - Bilanz nach 100 Tagen LEAG," (Greenpeace, Berlin, 2017), available online; and Greenpeace "Schwarzbuch EPH - Wie ein windiger Investor Politik und Wirtschaft zum Narren hält," (Greenpeace, Berlin, 2016). Available online.

Figure 4

Required amount of provisions for the Lusatia lignite region in 2016 under different assumptions

In billion euros



Specific recultivation costs relative to data from the Lausitzer und Mitteldeutsche Bergbau-Verwaltungsgesellschaft (LMBV). The rate of price increase can be negative for example because of technological progress in recultivation. A remaining term 2018–2040 and a discount rate of a 7-year average with valuation date end of 2016 for a remaining term of 23 years are assumed. Possible deficits would have to be earned in the coming years.

Source: Own calculations based on Gerard Wynn and Javier Julve, "A Foundation-Based Framework for Phasing Out German Lignite in Lausitz."

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Current provisions are sufficient only under optimistic assumptions regarding recultivation costs and price increases.

are threatening to progressively limit the full-load hours of the power plant fleet of Europe's third-largest carbon emitter. If the power plants' value depreciates accordingly, there is a risk that some of the subsidiaries will simply not have the required provisions to draw upon.

If companies are not financially able to make adequate provisions, their parent company is responsible for paying all recultivation costs due later—insofar as a control and profit transfer agreement exists. Under certain circumstances, parent companies can evade responsibility for the follow-up costs by terminating the contracts before the event or restructure under corporate law.³⁰ Their annual reports do not conclusively indicate

³⁰ Also see German Stock Corporation Act (*Aktiengesetz*, AktG) Section 303, version May 10, 2016.

Box 2

Corporate structure of the eastern German lignite industry

The founding of LEAG

LEAG developed from the former lignite division of Vattenfall. It has around 8,000 employees, an installed power plant output of approximately 8,000 megawatts (MW), and extracts around 60 million tons of lignite from its surface mines each year.¹ It consists of Lausitz Energie Kraftwerke AG (LE-K), which manages the power plant division (formerly part of Vattenfall Europe Generation AG) and Lausitz Energie Bergbau AG (LE-B), which is responsible for the surface mining division (formerly Vattenfall Europe Mining AG).² Holding company Lausitz Energie Verwaltung GmbH (LE-V), which has around 20 employees and is headquartered in Cottbus, is the parent company that owns 80 percent of the two companies.³ According to information provided by EPH, the remaining 20 percent is equally in the hands of two companies: EPPE Germany, a special purpose vehicle of EPH with headquarters in Prague, Czech Republic and Gemcol Ltd., a special purpose vehicle of PPF-I headquartered in Nicosia, Cyprus (see Figure 5).⁴

LE-V is run by members of the joint executive board of the two LEAG companies LE-B and LE-K. LEAG Holding a.s., which is headquartered in Prague and owns 50 percent each of the two special purpose vehicles, is its sole shareholder.⁵

EPH is now Europe's third-largest carbon emitter

EPH (*Energetický a Průmyslový Holding*) is a private energy supplier based in Brno, Czech Republic. It was founded in 2009 by J&T, the Czech financial group.⁶ The publicly traded company is active on a variety of stages of the energy supply value chain. In addition to lignite mining and hard coal- and lignite-based elec-

tricity production, it is also involved in the transport and sale of electricity, district heating and natural gas in various countries. And its business includes the Transgas Pipeline, which runs from Ukraine through Slovakia, the Czech Republic and Austria to Germany.⁷ EPH has been active in Germany since 2009, when it absorbed MIBRAG. Since 2012, it has held shares in the Schkopau power plant through Saale Energie GmbH and in 2013, EPH purchased the Helmstedt lignite region near Braunschweig from E.ON. It contains the Buschhaus power plant and the Helmstedt surface mine.

EPH CEO Daniel Kretinsky plans to raise his share of ownership from the current 37.17 percent to 94 percent in 2017.⁸ With the restructuring of the company, the remaining six percent of the shares would go to still unknown EPH managers.⁹ This makes EPH very different from many other coal-fired power plant operators in Germany (e.g., RWE, EnBW, Vattenfall, and Steag), which are all companies with government-owned shares.

PPF Investments—the invisible investor

PPF Investments (PPF-I) is a private equity group based in Jersey. Tomas Brzobohaty, a Czech citizen, is its majority stockholder.¹⁰ According to EPH, the Dutch PPF Group (PPF-G), which belongs to the Czech national Petr Kellner,¹¹ is holding financial resources at the ready for PPF-I in the Vattenfall deal. However, PPF-G is not a PPF-I shareholder.¹² Upon selling its lignite division, Vattenfall published a compliance statement in which Petr Kellner was designated as the ultimate owner of PPF. When asked whether it meant PPF-I or PPF-G, neither PPF-I nor Vattenfall did provide an answer.¹³

1 See LEAG, press release, October 11, 2016

2 The transport and freight forwarding company Schwarze Pumpe mbH (TSS GmbH) and the planning and service company GMB GmbH are also wholly owned subsidiaries.

3 See e-mail correspondence with Daniel Castvaj, EPH (available upon request).

4 See e-mail correspondence with Daniel Castvaj, EPH and Stefan Schröter, "Komplizierte Strukturen für die Lausitzer Braunkohle," (Online report in German only, Leipzig, November 2016). Available online.

5 See e-mail correspondence with Daniel Castvaj, EPH.

6 See EPH, "Annual Report 2015," (2015): 31. Available online.

7 See EPH, "EPH has completed the transaction for the purchase of Vattenfall's German lignite activities," press release September 30, 2016.

8 Kretinsky will hold 53 percent of the shares via EP Investment S.à.r.l. and 47 percent via EP Investment 2 S.à.r.l., which are headquartered in Luxembourg. See EPH, "EPH expects a change in its shareholder structure," press release October 17, 2016.

9 See e-mail correspondence with Daniel Castvaj, EPH

10 See PPF Investments, homepage (2017). Available online.

11 See PPF Group N.V., "Annual Report 2015," (2015): 12. Available online.

12 See e-mail correspondence with Daniel Castvaj, EPH

13 See Vattenfall, press release, April 18, 2016, Compliance Statement.

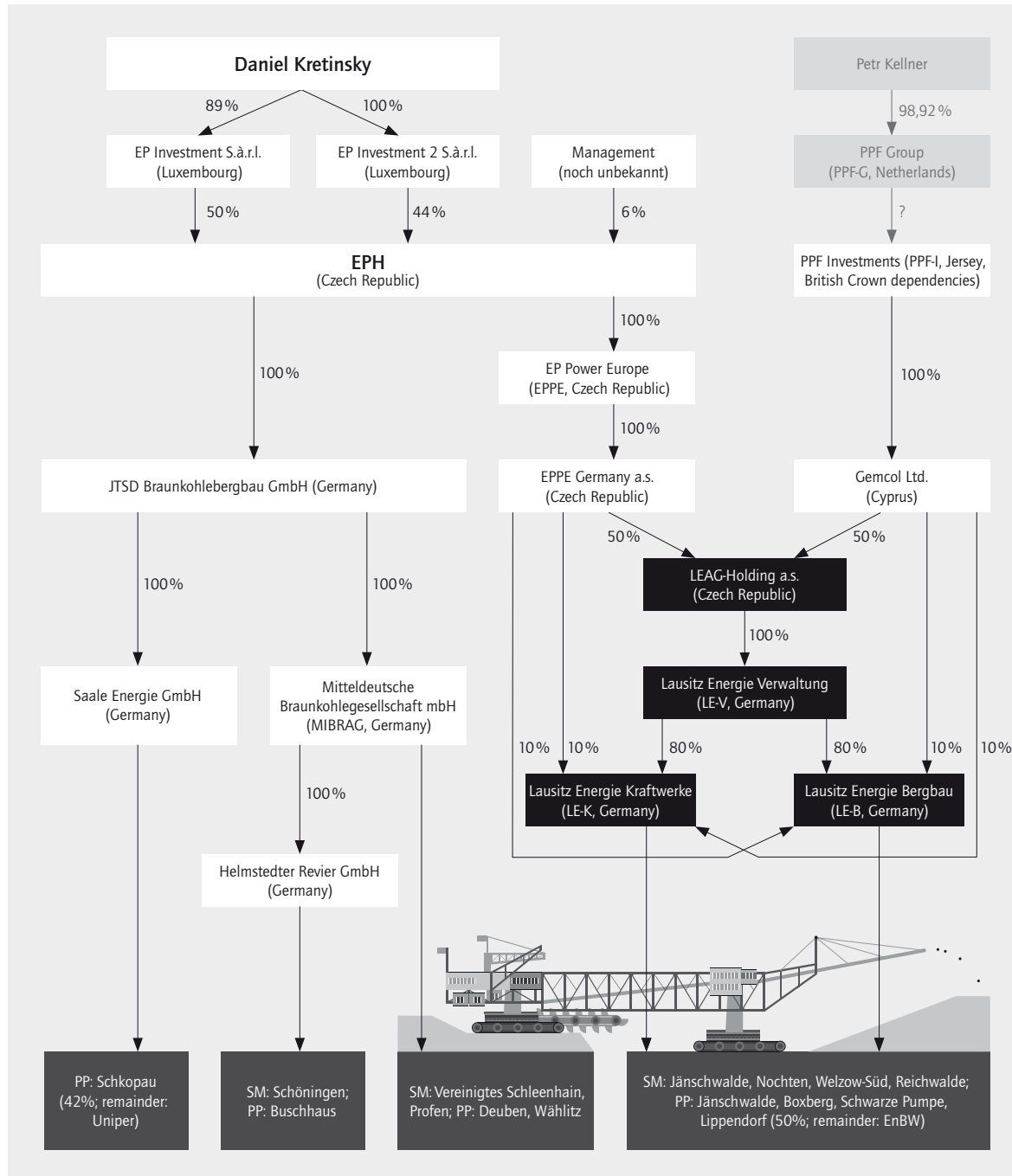
which EPH companies have controlling and profit transfer agreements with each other. And due to the many subsidiary companies involved, the extent to which EPH is directly or indirectly liable for financing the obligations of subsidiaries MIBRAG or LEAG in case of insolvency is not clear. Furthermore, it could be difficult to enforce

corporate liability in the case of international corporate structures such as those of LEAG's parent companies.³¹

31 See Wronski et al., *Finanzielle Vorsorge*, 34 et seq.

Figure 5

Corporate structure of the eastern German lignite industry



SM: Surface mines.
PP: Power plants.

Source: Own graph based on: e-mail correspondence with Daniel Castvaj; EPH; EPH press release October 17, 2016; PPF Group, "Annual Report 2015"; PPF Investments, homepage; Greenpeace "Update: Schwarzbuch EPH"; Information provided by the company JTSD in the Federal Gazette (Bundesanzeiger) 2014 and 2015.

The corporate structure raises the question to what extend parent companies can be held liable for possible insolvency of subsidiary companies.

Various options for assuring the provisions

A variety of measures can conceivably ensure that the polluter pays indeed for the follow-up costs of the lignite industry and rein in the risk to public budgets. In the following section, we have listed some possible measures in order of ascending degree of intervention. Some of the measures can be implemented in tandem.³²

Independent cost appraisals

To increase transparency and public control over the cost estimates and needed provisions, the federal government could commission an independent entity to carry out a cost appraisal (with the involvement of state governments as required). As in the case of the nuclear power industry, this would be the first step toward independent verification of the amount of provisions required.³³ Depending on the outcome, the necessity of further measures could be evaluated.

Act on follow-up liability

To ensure that the relevant parent company remains liable for the long-term follow-up costs in the case of insolvency or the restructuring of mine-operating companies, the German federal government could implement an “Act on follow-up liability” (*Nachhaftungsgesetz*). There is also a precedent for this in the German nuclear power industry.³⁴

Security as per the German Federal Mining Act

According to Section 56 of the German Federal Mining Act,³⁵ demanding security that is immune to mine operator insolvency is left to the discretion of the relevant mining authorities. Security can be provided in the form of an insurance policy, bank guarantee or a binding letter of comfort from the parent company. However, whether or not previously authorized surface mines can be subject to providing security must still be verified from a legal point of view.

³² See Wronski et al., *Finanzielle Vorsorge*.

³³ See Resolution of the German Bundesrat, “Gesetz zur Neuordnung der Verantwortung in der kerntechnischen Entsorgung,” *Drucksache 768/16* (Deutscher Bundesrat, Berlin, 2016, available online), Article 7: Transparency Act regarding nuclear power plant shutdown (*Gesetz zur Transparenz über die Kosten der Stilllegung und des Rückbaus der Kernkraftwerke sowie der Verpackung radioaktiver Abfälle*).

³⁴ See Resolution of the German Bundesrat, “Gesetz zur Neuordnung,” Article 8 “Follow-up liability act” (*Gesetz zur Nachhaftung für Abbau- und Entsorgungskosten im Kernenergiebereich*).

³⁵ See “German Federal Mining Act.”

Public fund or private foundation

A private foundation analogous to the RAG Foundation for Germany’s hard coal mines could also be established to safeguard lignite surface mine provisions, for example. The extent to which this type of solution is deemed necessary would greatly depend on the design of the financing concept. Alternatively, a public fund could be set up, and the government would be responsible for raising the money for it from mine-operating companies. Of all the measures on the list, this represents the highest degree of intervention. However, it could help protect the public from having to pay for the long-term follow-up costs of lignite mining and at the same time, provide high levels of insolvency protection and transparency.³⁶

Conclusions and implications for energy policy

According to the long-term climate protection targets of the German federal government, the energy sector must achieve significant emission reductions in the coming years. This implies a rapid phase-out of lignite-based electricity, which has already begun with the implementation of the “Coal Reserve” and should proceed accordingly. The pathway to phase-out needs to be structured.

Simulations show that if the targets in the Climate Action Plan 2050 were complied with, the strip mines currently approved in eastern Germany would not be fully depleted by 2030. This makes planning for new mines or the expansion of existing ones in the states of Brandenburg and Saxony superfluous. For the planning security of all the actors involved, policy makers should stop granting permits for additional surface mines. In the interests of local residents, mine employees and last but not least, power plant and surface mine operators, this should happen as soon as possible. Being currently in the middle of revising its own energy strategy for 2030, the government of the state of Brandenburg needs to take political action now. Brandenburg should—in collaboration with the state government of Saxony—not miss the opportunity to develop a reliable roadmap for the upcoming coal phase-out in the Lusatia lignite region.

It is also important to assure an adequate level of finances for the follow-up costs of lignite mining. Two key questions must be answered: are the companies’ provisions high enough, and are they immune to insolvency? In this context, the new ownership structures in the eastern German lignite industry have become a matter of importance. The Czech company EPH took over the lignite division of Vattenfall GmbH. The new owner’s business model and corporate structure indicate a need to

³⁶ See Wronski et al., *Finanzielle Vorsorge*.

question the extent to which provisions for recultivation costs can be permanently safeguarded.

The level of provisions required depends, for example, on the assumptions made about price increase rates. The current provisions of 1.5 billion euros for the Lusatia region are only sufficient to cover recultivation costs under optimistic assumptions. However, alternative scenarios show significant shortfalls. Commissioning independent cost appraisals and disclosing the current cost estimates would be the first steps toward increasing transparency—policy makers should take the initiative here.

Depending on the results, additional measures could be implemented as required. Establishing a public fund similar to the one for the nuclear industry comes with a relatively high level of intervention but also appears to be

a particularly effective measure. Set up accordingly, this measure would permanently protect taxpayers against being forced to take on the costs of recultivation.

The pros and cons of the various measures conceivable should be discussed among all involved parties, and policy makers should be entrusted with making the decision in the public interest. Outlined in the Climate Action Plan 2050 and planned for the beginning of 2018, the new Commission for “Growth, Structural Change and Regional Development” could ideally provide the framework for the discussion. The success of the commission hereby depends on its composition, mandate and terms of service. The commission must also consider the social consequences of the lignite phase-out in Germany, which is inevitable in view of the urgency of climate protection.

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Keywords: Coal, lignite, climate policy, Germany, liabilities, energy transition



Prof. Dr. Claudia Kemfert, Head in the Department of Energy, Transportation, Environment at DIW Berlin

SEVEN QUESTIONS FOR CLAUDIA KEMFERT

»In Germany, we need to phase out lignite step by step«

1. Mrs. Kemfert, what role will lignite play in the future of Germany's energy supply? In the future, lignite will have less of a role in supplying energy in Germany because we want to fulfill the international climate targets in this country. We aspire to an energy transition that has the goal of boosting renewable energy's share of production to at least 80 percent by 2050. This is why lignite's share will drop sharply in the coming years.
2. That means the agreed upon national and international climate protection targets cannot be achieved with lignite? That's right—lignite would prevent us from fulfilling the national and international climate targets. Of all the ways of producing electricity, lignite-fired power plants have the highest greenhouse gas emissions and other pollutants. This is why we need to phase out lignite step by step in Germany.
3. In this context, what do you think of Brandenburg's Energiestrategie 2030, the energy plan they are currently revising? With its revision of Energiestrategie 2030, the state government of Brandenburg has an excellent opportunity to establish a lignite phase-out compatible with the societal structures in the mining region. Brandenburg is already reliant on renewable energy to some extent and also aims to implement the transition to sustainable energy. The essential cornerstones of the new Energiestrategie 2030 would be to continue to develop renewable energy, while at the same time implementing a coal phase-out that would give the people employed in the industry job prospects.
4. In some areas of Germany there are plans to expand existing strip mines. This contradicts the phase-out strategy, doesn't it? Yes, it is contradictory. And we also have clear evidence that we do not need any additional surface mining capacity. The current strip mines certainly contain enough coal to guarantee coal-based electricity until 2030. For this reason, policy makers should adopt a plan to stop developing new strip mines.
5. Vattenfall GmbH sold its German lignite division to a Czech consortium of buyers (EPH) last fall. What consequences does the change in operator have for the lignite industry in Brandenburg? The key effect is that the financial risk will become greater because of lacking transparency, above all with regard to the issue of whether the consortium's reserve is adequate to cover the cost of the coal phase-out. This is why it is important to have an independent appraisal of how high the reserve levels are and actually have to be, and if they are safeguarded sufficiently. If not, measures must be taken to remedy the situation. We propose that policy makers investigate a variety of options—for example, within the framework of the new climate action commission. The point is to set up a legal framework for transparency with verification of the reserves at regular intervals. A fund or private foundation could be established, or security could be increased by other means, such as a binding letter of comfort or a law on follow-up liability.
6. Thousands of jobs are dependent on lignite. What would a socially sensitive phase-out of the lignite industry look like? As the state and federal governments draft the coal phase-out strategy, a structurally and socially sensitive lignite phase-out can be achieved by demanding they provide lignite industry employees with job prospects.
7. What time period are we talking about here? A maximum of 30 years. This is why it is important for policy makers to create a structurally aware phase-out that opens up a new future for those employed in the lignite industry—which goes hand in hand with qualifications for new jobs.

Interview by Erich Wittenberg
To hear the recorded interview in German, visit www.diw.de/interview

Construction sector: full order books, good growth prospects

By Martin Gornig, and Claus Michelsen

A significant rise in Germany's construction volume is expected for this year and the next, even if the growth is not as pronounced as it was in 2016. According to DIW Berlin's latest construction volume calculations, the sum of all new construction and building refurbishments will increase in real terms by 1.6 and 2.4 percent in 2017 and 2018, respectively, from a rate of 2.5 percent in 2016. New housing construction and public civil engineering are currently the primary growth drivers, but refurbishments are also likely to gain in prevalence.

Yet it is also becoming apparent that the construction industry is reaching the limits of its production capacities, with high utilization levels in many places. Government subsidization of construction investment is thus inappropriate in this context: given the full construction capacities, measures intended to promote new construction will only catalyze the price acceleration. The focus should instead be on approaches to stabilizing investment, which can be achieved through instruments for urban redevelopment or the creation of a reserve in public budgets for infrastructure investment.

According to DIW Berlin's annual construction volume calculations¹—which include non-value-enhancing maintenance in addition to construction investment²—the construction sector remains an important pillar of the German economy. Apart from the “construction industry” in the narrower sense, industries such as steel and light metal construction, prefabricated building manufacturing, smithery, planning services, and other services are also taken into account. Unlike the statistical offices, DIW Berlin also differentiates between new construction measures and refurbishments of the existing building stock.

In addition to calculating and documenting the construction volumes from the past few years, DIW Berlin forecasts the values for this year and the next. This prognosis (Box)—especially the projections concerning future investment activity—is integrated into DIW Berlin's economic forecast.³ As a supplement to the Federal Statistical Office's calculations, DIW Berlin's construction investment development estimates are now separated according to whether they pertain to new construction volumes or renovation volumes and residential or non-residential buildings.⁴ As well, the development of both the main construction industry and the finishing trades are projected.

¹ The construction volume calculations are funded by the Future Building Research Initiative (*Zukunft Bau*) of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB). For more on the term “Bauvolumen,” consult the DIW glossary (available online, in German).

² Martin Gornig et al., “Strukturdaten zur Produktion und Beschäftigung im Baugewerbe – Berechnungen für das Jahr 2015,” report commissioned by the Federal Office for Building and Regional Planning in the context of the Future Building Research Initiative (*Zukunft Bau*) of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety, final report, German Institute for Economic Research, Berlin (2016).

³ Ferdinand Fichtner et al., “Despite Weaker Job Market, Germany's Economic Upswing Continues,” *DIW Economic Bulletin* 50 (2016), 587–593.

⁴ Claus Michelsen and Martin Gornig, “Prognose der Bestandsmaßnahmen und Neubauleistungen im Wohnungsbau und im Nichtwohnungsbau,” BBSR-Online-Publikation no. 7 (2016).

Box

DIW Berlin's methodology for forecasting construction volume

Construction volume is calculated and projected in several steps. Calculations for renovations and new constructions are always made on an annual basis. The first step involves the calculation over the course of a year. The refurbishment volume is adjusted using a quadratic minimization¹ of the current quarterly volume of installation and other construction trades. To ensure consistency within the construction volume calculations, the volumes for new constructions are calculated as the difference between the total volume and the refurbishment volume. These series are then seasonally adjusted using the ARIMA-X12 method.

The second step involves now-casting the new construction and renovation series based on available synchronous indicators. Figures sourced from the monthly reports of the construction sector and its employees, as well as weather data, are used for this purpose.² Data for the year preceding the forecast period (in this instance, 2016) thus initially represents only a provisional estimate of the construction volumes. Final values are published in the following year, when the statistical offices report all relevant series in full.

The third step involves the prognosis of the individual series. The volumes for new constructions and for refurbishments are estimated separately using indicator-based statistical models. To this end, the desired parameter, e.g. the volume of commercial construction, is regressed to an autoregressive term and the

delayed values of the corresponding indicator. The resulting predictive equation corresponds to the following template:

$$y_t = \alpha + \sum_{i=1}^n \beta_i y_{t-i} + \sum_{j=1}^m \gamma_j x_{t-j} + \varepsilon_t$$

Here, y_t represents the projected value; x_t the indicator; and ε_t the statistical error term. The parameters α , β_i and γ_j are estimated. The optimal lag structures n and m are determined by means of the auto-correlation or cross-correlation function. In addition, the different specifications are evaluated according to information criteria. The approach has been shown to be effective for estimating a large number of individual models and applying the average value to the forecast. Up to 50,000 individual models are estimated for each individual series. Indicators include building permits, incoming orders, production, interest rates, credit volumes, and employment and income development, as well as surveys among construction companies and freelance architects. Capacity utilization is also considered in the estimates.³ The difference between total volume and the building volume is the expected civil engineering output.

In a final step, the results are translated to the template of the construction volume calculation. Here, demand-side development trends are favored while allowing for the idiosyncrasies of noninvestment construction services in the business cycle. The subdivided information on construction permits and order volumes enables further differentiation by structural characteristics, such as different development trends in East and West Germany or between producer groups like the main construction industry and the finishing trades.

¹ For more on this, see Denton (1974).

² For documentation of this methodology, see Michelsen und Gornig (2016).

³ Michelsen and Gornig (2016).

Housing construction remains construction industry's primary growth driver

After a decade of upward growth, housing construction remains the foundation of the construction industry. With the exception of a short-lived slump in 2013, growth rates have been especially strong since 2010.

Three factors have contributed to this development. Firstly, Germany is in a generally sound financial position, from a macroeconomic perspective: employment is growing steadily, capacities are mostly fully utilized, and household incomes have risen considerably.⁵

Secondly, interest rates on housing loans are at a historic low, and alternative investments are currently generating very low yields (Figure 1). Due to increases in real estate demand, the interest rate advantage is already clearly reflected in rising real estate prices (Figure 2); but since the U.S. Federal Reserve raised the benchmark this past December, there are concerns that further U.S. interest rate increases as well as rising European rates will create larger, medium-term problems with the follow-up financing of credit agreements, thus leading to an adjustment in real estate prices. That this is already an important factor for investors is evidenced by the fact that market capitalization of German real estate companies has been declining substantially since this past summer.⁶ In

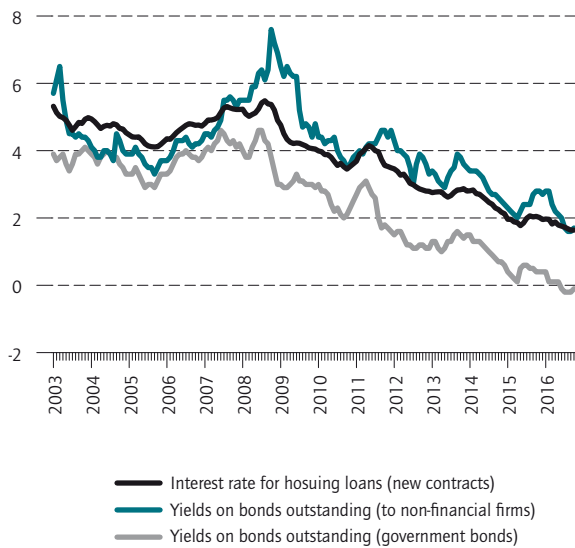
⁵ Fichtner et al. (2016), p. 1185.

⁶ For example, the stock market value of housing association Vonovia has dropped by just under 20 percent since mid-August 2016.

Figure 1

Interest rates and yields

In percent



Sources: Bundesbank, authors' own calculations.

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Interest rates are on an all time low.

the short term, however, the rising interest rates should continue to stimulate construction activity: contractors of already approved projects have a powerful incentive to build quickly so that they can spend their building funds in favorable conditions. A stimulus for investment in the existing building stock is also expected to arise from the interest rate developments. In the medium term, however, the rising interest rates will lead to a downturn in construction activity.

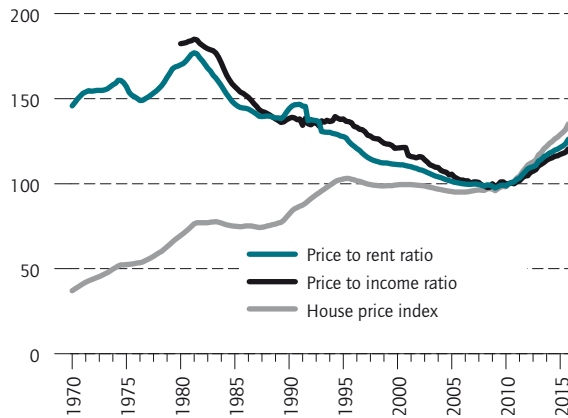
Thirdly, there has been a strong influx—mostly from abroad—into Germany's metropolitan areas in recent years.⁷ Large cities are thus experiencing significant housing market bottlenecks that will initially have to be addressed with the creation of additional apartments in multi-family housing over the next few years. With regard to renovation and modernization, the growth in the major cities has both a stimulating and dampening effect. On the one hand, the demand for residential property has risen sharply, and when a property changes ownership, there is usually a restructuring or at least a renovation. In the current interest rate environment, a full utilization of the modernization levy in the amount of eleven percent of the construction costs to increase comfort is accompa-

⁷ Konstantin Kholodilin, "Wanderungen in die Metropolen Deutschlands," Mimeo (2016).

Figure 2

House prices, price to rent and price to income ratios

Index 2010 = 100



Sources: OECD, authors' own calculations.

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House prices have gained momentum recently.

nied by relatively high yields in the rental sector. On the other hand, the situation allows landlords in tight housing markets to rent out lower-quality apartments with relatively high returns. The renovation incentive—and with it, a "filtering-up"⁸—is thus currently lower than it is in times in which many low-quality apartments are empty.

Overall, the housing construction volume is expected to increase by roughly 4.9 percent in the current year and nearly 5.7 percent in 2018 (Table 1), following an increase of just under five and a half percent in 2016.

Residential construction experiencing strong expansion

The most powerful growth is still taking place in residential construction: over the past five years, growth rates consistently exceeded five percent and recently surpassed the ten-percent mark (Figure 3).

But that high figure has also been influenced by one-time effects, and the momentum is expected to drop off somewhat over the course of the forecast period. The authorities' approval of an extraordinary number of new residential buildings in the first half of 2016 can be traced to a special development that resulted from the tighten-

⁸ Richard J. Arnott and Ralph M. Braid, "A filtering model with steady-state housing," *Regional Science and Urban Economics* 27(4) (1997), 515-46.

Table 1

Residential construction in Germany

	2010	2011	2012	2013	2014	2015	2016	2017	2018
	In billion euros at the respective year's prices								
New construction volume ¹	32.9	41.0	44.3	47.8	53.0	58.3	64.9	70.7	75.9
Construction on existing buildings ²	118.9	123.9	127.2	127.2	130.3	130.8	134.9	139.0	145.8
Total residential construction volume	151.8	164.8	171.5	175.1	183.3	189.2	199.8	209.7	221.7
	Change on the previous year in percent								
New construction volume ¹		24.6	8.1	7.9	10.9	10.0	11.2	9.0	7.3
Construction on existing buildings ²		4.2	2.7	0.0	2.4	0.4	3.1	3.0	5.0
Total residential construction volume		8.6	4.1	2.0	4.7	3.2	5.6	4.9	5.8
	Shares in %								
New construction volume ¹	21.7	24.9	25.8	27.3	28.9	30.8	32.5	33.7	34.2
Construction on existing buildings ²	78.3	75.1	74.2	72.7	71.1	69.2	67.5	66.3	65.8
Total residential construction volume	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1 Proxied using the estimated construction costs (construction activity statistics), plus surcharges for architects' services and fees, Exterior facilities and internal activities of investors.

2 Buildings and housing modernization (incl. conversion and extension measures) as well as repair services in the construction industry.

Sources: Federal Statistical Office, author's own calculations.

ing of the EnEV (Energy Saving Ordinance) that took place on January 1, 2016. Prior to this update, builders of private residences in particular were required to have submitted building applications by the end of each year in order to secure building rights. A correspondingly marked dynamic can also be found in high-rise construction, although the growth is still trending upward (Figure 4). The recently issued building permits are likely to be utilized in 2017, thus boosting construction activity.

Another sign that residential construction is on the rise is that the number of intake orders has increased overall (Figure 5). Order backlogs (Figure 6) also indicate a significant expansion in construction activity, with construction companies facing difficulty in handling the volume of incoming orders. This also corresponds with the data provided by the contractors—who maintain that most construction industry capacities are being utilized—as well as the freelance architects surveyed by the Ifo Institute (Figure 7), whose order books, measured in months, have reached record levels. The new construction activity amounted to around 11 percent in 2016; against this background, DIW Berlin projects that investment in new construction will grow by roughly nine percent in the current year and by another seven percent in 2018.

Renovations gaining in prevalence

The slightly lower projected growth rate for new construction in 2017 and 2018 will likely be balanced out by an increase in renovations to the existing building stock. Renovations had been declining in popularity, with a stagnation in 2013 and low rates in 2014 and 2015, after which the dynamic picked up once again. Energy costs, for one,

play a decisive role here: the sharp drop in oil prices over the past few years had led to considerable investment restraint in this area. But since positive signs emerged in 2015, when the volume of energy-related refurbishments picked up again slightly,⁹ this trend is starting to reverse, with the recent increase in energy prices making energy-related refurbishments even more attractive.

The reduced dynamic in new construction also plays a role, as it frees up capacities for renovations. Refurbishments of existing buildings are often smaller in scale¹⁰ and less lucrative than contracts in new construction. Restructurings and renovations are already common in property transfers, and the backed-up demand for them will be met more and more. Last year, the growth in refurbishments amounted to three percent; for 2017 and 2018, DIW Berlin projects an increase of three percent and a powerful five percent, respectively.

Non-residential construction: the government must address it

The growth in non-residential construction is much weaker: in the past, this was mostly due to minimal investment activity in commercial construction. Recently, public sector construction has been expanding power-

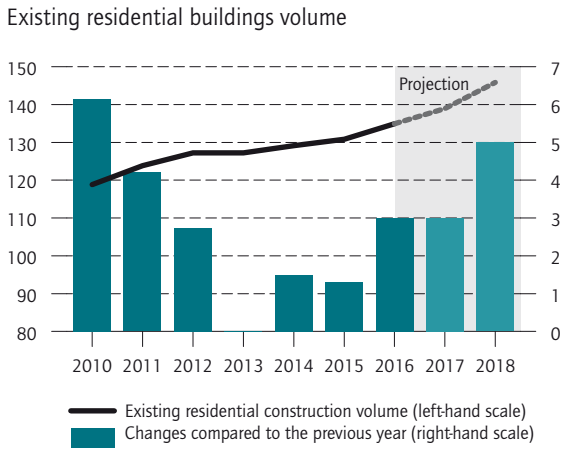
9 Martin Gornig et al., "Strukturdaten zur Produktion und Beschäftigung im Baugewerbe - Berechnungen für das Jahr 2015," study conducted on behalf of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB) as well as the Federal Institute for Research on Building; Urban Affairs and Spatial Development (BBSR) (2016).

10 Martin Gornig, Christian Kaiser, and Claus Michelsen, "German Construction Industry: Refurbishment Lacks Momentum, New Residential Construction Gets Second Wind," *DIW Economic Bulletin* no. 49 (2015), 639-648.

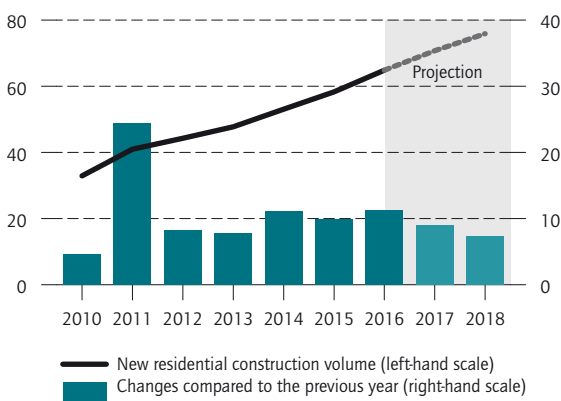
Figure 3

Volume of construction on existing residential buildings

Billion Euro in current prices; year over year changes in percent



New residential construction volume



Source: Author's own calculations.

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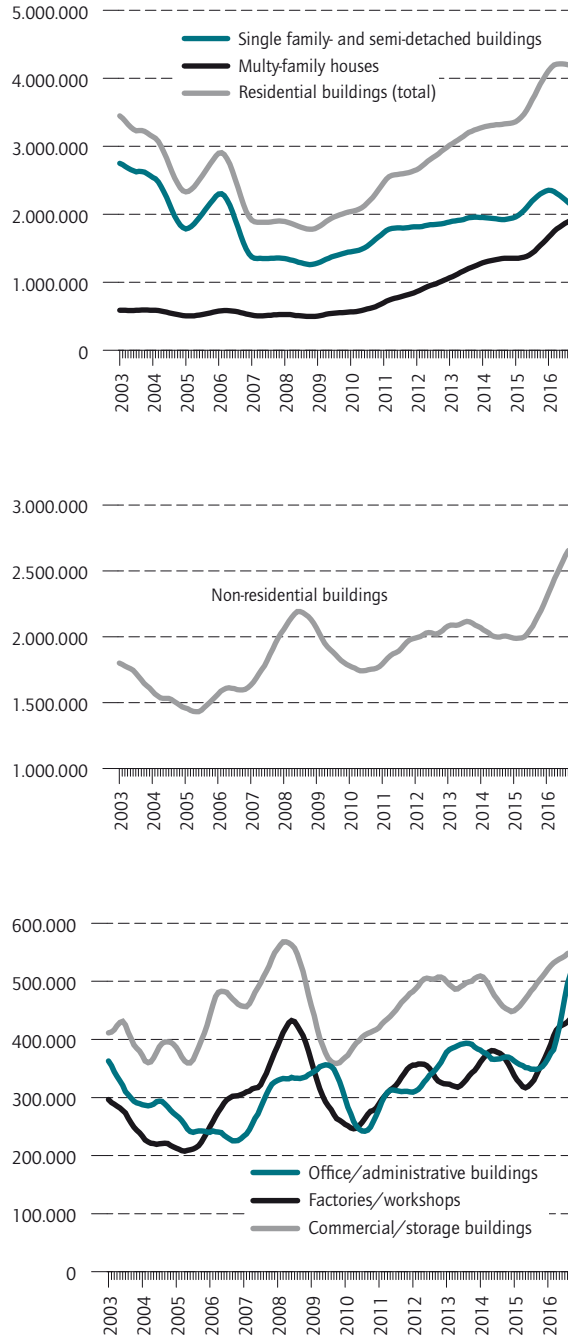
Residential construction expands strongly.

fully; various investment initiatives, such as the expansion of childcare offerings or the earmarking of funds for financially disadvantaged municipalities from the Municipal Investment Promotion Fund, have had a positive impact. As well, municipalities' financial situations have experienced a clear improvement in recent years.¹¹ At the same time, the government's net fixed investment in non-residential construction has continued to

Figure 4

Building permits

Monthly, in billion euros; trend components



Sources: Federal Statistical Office, author's own calculations.

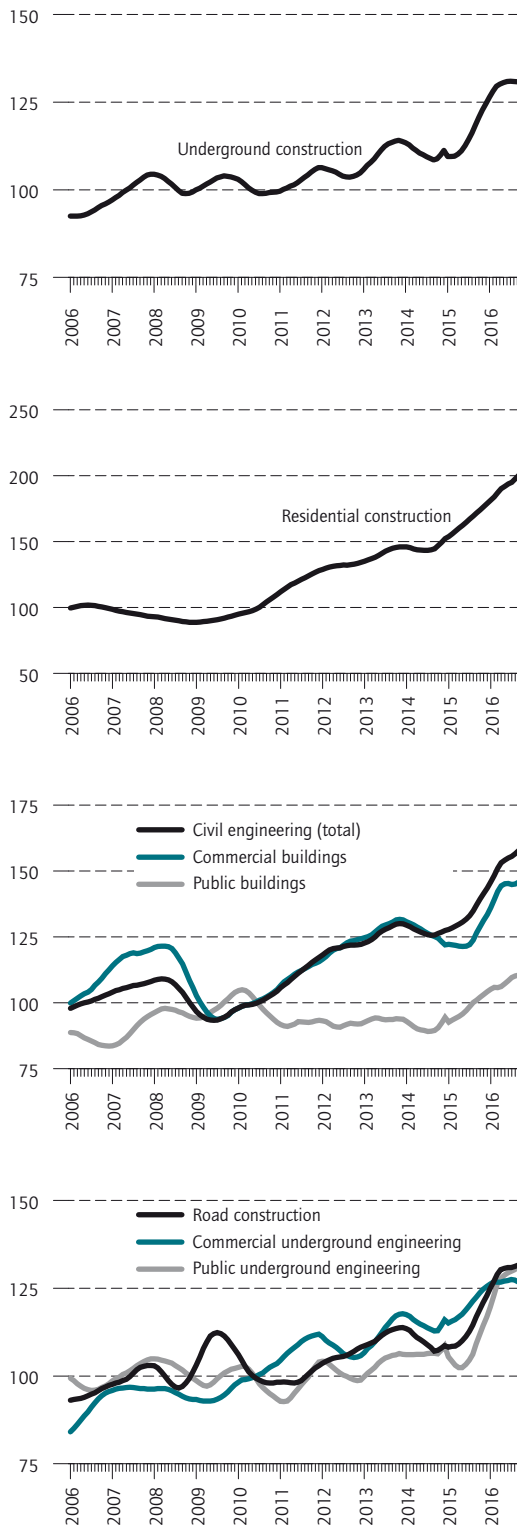
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Particularly in residential construction, building permits have increased substantially in the first half of 2016.

¹¹ Kristina van Deuverden, "Öffentliche Finanzen bis 2025: Nur auf den ersten Blick günstig," *DIW Wochenbericht* no. 50 (2016), 1193-202.

Figure 5

Incoming orders in core construction industry
Value index 2010=100, trend components



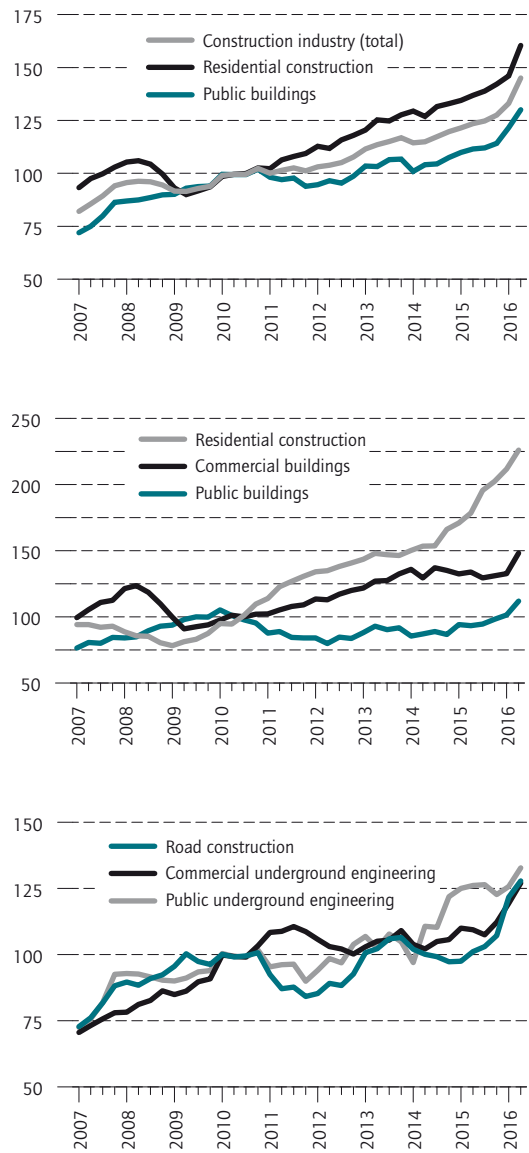
Sources: Federal Statistical Office, author's own calculations.

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The trend of incoming new orders has flattened recently..

Figure 6

Volume of orders in core construction industry
Value index 2010 = 100; trend components



Sources: Federal Statistical Office, author's own calculations.

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Volume of orders is increasing.

be negative,¹² which suggests that the attrition of existing infrastructure has yet to be halted.

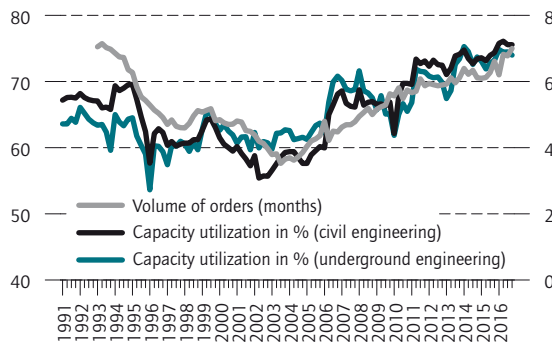
Companies are significantly more reluctant to expand their construction activity, which corresponds to the fact that investment in new plants and machinery has been

¹² Federal Statistical Office, national accounts, investments working paper, third quarter 2016, Wiesbaden (2016).

Figure 7

Capacity utilization on the construction industry

Capacity utilization in percent, volume of orders (month) seasonally adjusted



Sources: ifo Institut, author's own calculations.

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Capacity utilization is very high in historical comparison.

weak for some time. The overall economic capacities—especially the capacities of manufacturers—are well utilized according to both the output gap as well as the surveys conducted as part of the *ifo Konjunkturtest* (Business Survey of the Services Sector).

Nevertheless, companies keep putting off their investment plans. This is also likely due to the significant uncertainty characterizing the current commercial economy. Although domestic demand is high, sales prospects abroad continue to deteriorate. The Brexit decision from last June has given way to a higher degree of uncertainty; this is likely to significantly reduce companies' investment propensity,¹³ as will the political uncertainty surrounding the EU's political cohesion brought about by the recent referendum in Italy and the forthcoming elections in France.

This investment restraint affects more than just new construction projects: typically, the failure to retrofit or replace machinery and equipment also has a negative effect on the growth rate for renovations to existing buildings. Companies' wait-and-see attitude when it comes to investing in new machinery thus has a direct impact on renovation investment. Against this backdrop, DIW Berlin expects an expansion of the non-residential construction volume by just over two percent for the current year, after 2016's growth rate of just under 2.5 percent. A slightly higher dynamic will not emerge until 2018 (Fig-

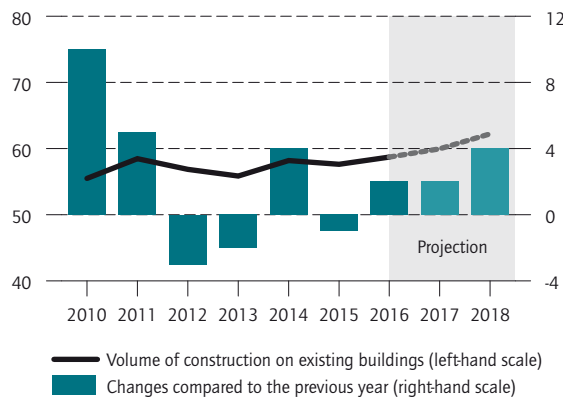
¹³ Malte Rieth, Claus Michelsen, and Michele Piffer, "Unsicherheitsschock durch Brexit-Votum verringert Investitionstätigkeit und Bruttoinlandsprodukt im Euroraum und Deutschland," *DIW Wochenbericht* no. 32-33 (2016), 695-703.

Figure 8

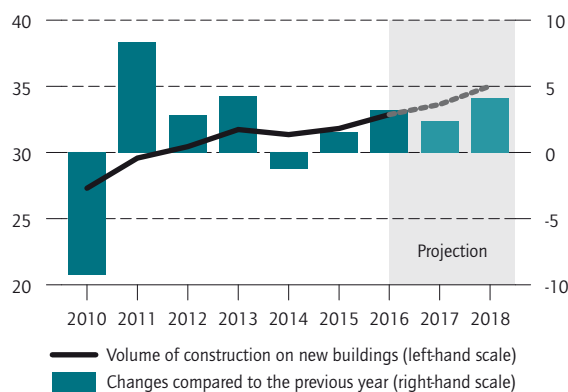
Volume of construction on non-residential buildings

Billion Euro in current prices; year over year changes in percent

Existing non-residential buildings



New non-residential buildings



Sources: Author's own calculations.

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New construction volume is also expected to rise.

ure 8 and Table 2), at which point an increase of almost four percent is expected.

New constructions: primarily commercial and office buildings

For new buildings, impulses should come primarily from sectors related to the domestic economy and public administration. This is evidenced by the significant increase in the number of issued permits for commercial and warehouse construction as well as offices and administrative buildings (Figure 4). For factory and workshop buildings, however, the number of new approvals has been on the decline. This development is only partially apparent in additional orders, which have been trending sideways. Nonetheless, order backlogs are extremely high, especially in non-residential commercial construc-

Table 2

Non-residential construction volume in Germany

	2010	2011	2012	2013	2014	2015	2016	2017	2018
	In billion euros at the respective year's prices								
New construction volume	27.3	29.6	30.4	31.7	31.4	31.8	32.9	33.6	35.0
Construction on existing buildings	55.6	58.5	56.8	55.8	58.2	57.6	58.7	60.0	62.2
Total construction volume ¹	82.9	88.1	87.3	87.6	89.5	89.5	91.6	93.6	97.2
	Change on the previous year in percent								
New construction volume		8.4	2.8	4.3	-1.2	1.5	3.2	2.4	4.1
Construction on existing buildings		5.2	-2.8	-1.8	4.2	-0.9	1.9	2.1	3.8
Total construction volume ¹		6.3	-0.9	0.3	2.2	0.0	2.3	2.2	3.9
	Shares in percent								
New construction volume	33.0	33.6	34.9	36.2	35.0	35.6	35.9	35.9	36.0
Construction on existing buildings	67.0	66.4	65.1	63.8	65.0	64.4	64.1	64.1	64.0
Total construction volume ¹	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

¹ Construction volume in commercial and public construction.

Sources: Federal Statistical Office, author's own calculations.

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tion. This also signals a growing shortage in construction companies' capacities.

At the same time, given the increase in the number of permits being issued, DIW Berlin anticipates growth in new non-residential construction. Expansions of almost two and a half percent and just under four percent are expected for the current year and the coming year, respectively (Figure 8).

Initially, a low growth rate for renovations

A more dynamic expansion of refurbishments in the commercial construction sector will only happen after investment has been made in new plants and machinery. The [current] political uncertainty,¹⁴ which has been weakening impulses, will subside only gradually—which means that stronger impulses will not materialize until 2018. In public building construction, the need for refugee housing has been creating additional demand, especially when it comes to refurbishments of existing structures. This is a one-time effect, however: when the refugee accommodations are completed, this kind of construction will no longer play a major role. It does mean, however, that administrative planning capacities will be freed up for pursuing and coordinating necessary measures for other buildings. According to KfW Municipal Panel (*KfW-Kommunalpanel*), municipal investment in schools and public administration buildings is way

too low.¹⁵ But given the good financial situation and the additional funds from the assets reserved for supporting financially disadvantaged municipalities, increased investment is expected in this area.

For refurbishments in non-residential construction, DIW Berlin expects a two-percent increase this year; for next year, that figure amounts to just under four percent (Figure 8).

Civil engineering: growth stabilizes

Over the past few years, the civil engineering construction volume has been subject to significant fluctuations (Table 3). For example, the strong growth of 2014—at over 6 percent—was followed by a stagnation of the nominal construction volume in 2015. In 2016, a moderate increase in the civil engineering volume amounted to 3 percent, with decisive impulses coming from public civil engineering.

Public civil engineering is likely to pick up momentum in 2017, primarily due to the significant growth in the incoming orders and backlogs related to road construction (Figures 5 and 6). Along with a slight increase in commercial civil engineering, 2017's total building construction volume is expected to amount to just under four percent (nominally).

In the following year, the civil engineering volume is expected to grow even more, with industrial civil engi-

¹⁴ Political uncertainty can be measured using the "Economy Policy Uncertainty" index, for example. See Scott R. Baker, Nicholas Bloom, und Steven J. Davis, "Measuring economic policy uncertainty (No. w21633)," National Bureau of Economic Research (2015).

¹⁵ KfW, "KfW-Kommunalpanel 2016," Frankfurt am Main, 2016.

Table 3

Civil Engineering in Germany

	2010	2011	2012	2013	2014	2015	2016	2017	2018
	In billion euros at the respective year's prices								
Commercial civil engineering	25.5	27.8	28.1	28.1	29.3	29.5	29.8	30.3	31.3
Public civil engineering	23.1	25.0	24.5	25.2	27.4	27.3	28.8	30.5	30.9
Total civil engineering volume	48.6	52.8	52.6	53.3	56.7	56.9	58.6	60.8	62.2
	Change on the previous year in percent								
Commercial civil engineering		9.0	1.0	0.2	4.3	0.7	0.9	1.8	3.2
Public civil engineering		8.0	-2.0	2.9	8.6	0.0	5.3	6.1	1.3
Total civil engineering volume		8.6	-0.4	1.4	6.3	0.3	3.0	3.9	2.2
	Shares in percent								
Commercial civil engineering	52.4	52.7	53.4	52.7	51.7	51.9	50.8	49.8	50.3
Public civil engineering	47.6	47.3	46.6	47.3	48.3	48.1	49.2	50.2	49.7
Total civil engineering volume	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Sources: Federal Statistical Office, author's own calculations.

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neering experiencing significantly more growth than public civil engineering. A further expansion of digital infrastructure, among other things, should create impulses. In public civil engineering, however, a tendency to consolidating the issuing volume is expected. Overall, the civil engineering volume is expected to grow by roughly two percent in 2018.

Growth in the construction industry continues—in real terms as well

According to DIW Berlin's building volume calculations, 2016's nominal construction volume rose significantly—to roughly 350 billion Euros, which represents a 4.3 percent increase over the previous year (Table 4). Despite the higher utilization levels in the construction sector—which have now exceeded that of the mid-1990s construction boom following Germany's reunification—there have only been moderate increases in construction costs. This is mainly due to fact that commodities prices are currently favorable, especially that of crude oil. All in all, prices are estimated to have risen by just 1.9 percent in 2016, which means that the real building volume will have been nearly 2.5 percent higher than in 2015. This represents the highest growth rate since 2011.

Positive developments are also expected for 2017 and 2018: the construction volume is expected to grow by more than four percent in the current year and by almost five percent next year, at which point it will exceed 380 billion Euros. At the same time, prices will probably start to increase. Firstly, this is due to the fact that commodities prices—especially energy prices—are on the rise again, on average. Standard wages have also started to

pick up noticeably. Secondly, increasing capacity utilization is expected to expand construction companies' pricing power. A price-increase rate of around 2.5 percent per year is expected for 2017 and 2018, respectively. The real construction volume is thus expected to rise by 1.6 percent in 2017 and 2.4 percent in 2018 (Table 4). The more restrained dynamic in the next two years is mainly due to the fact that there are fewer working days.

Growth in the current year will be driven by both public and residential construction with an expected increase of over four percent and roughly two percent, respectively. In commercial construction, on the other hand, the real construction volume is expected to keep shrinking. As in the preceding years, the decline is expected to amount to roughly one percent.

A slightly different growth pattern will emerge in 2018. The housing construction volume will continue to increase considerably: by more than three percent in real terms, while spending on public buildings, is expected to drop by roughly one percent. Commercial construction, on the other hand, could finally start to grow again: by more than two percent in real terms.

All construction categories will profit from the projected developments, primarily due to the expected growth in residential refurbishments. However, the 2016 construction industry growth rate was likely to have been significantly above the average, since companies in this sector were more likely to benefit from the growth impulses, primarily those that came from public civil engineering. In 2016, the construction industry's real building volume and finishing trades volume are thus expected to

Table 4

Key figures for development of construction volume in Germany

										Change on the previous year in percent							
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2011	2012	2013	2014	2015	2016	2017	2018
	In billion euros at the respective year's prices																
Total construction volume	283.30	305.73	311.38	315.92	328.36	335.49	349.93	364.12	381.19	7.9	1.8	1.5	3.9	2.2	4.3	4.1	4.7
By construction sector																	
Residential construction	151.77	164.84	171.54	175.06	183.29	189.16	199.80	209.67	221.74	8.6	4.1	2.0	4.7	3.2	5.6	4.9	5.8
Commercial construction	87.36	95.39	97.32	97.17	100.66	100.88	102.04	103.14	107.70	9.2	2.0	-0.2	3.6	0.2	1.2	1.1	4.4
Public construction	44.17	45.50	42.52	43.69	45.54	45.45	48.09	51.31	51.76	3.0	-6.5	2.8	4.2	-0.2	5.8	6.7	0.9
Price development										3.3	2.5	2.0	2.0	1.7	1.9	2.5	2.3
	real, chain index, 2005=100																
Total construction volume	106.58	111.47	110.76	110.12	112.20	112.70	115.46	117.27	120.05	4.6	-0.6	-0.6	1.9	0.4	2.5	1.6	2.4
By construction sector																	
Residential construction	103.44	108.64	110.21	110.16	112.22	114.44	118.62	121.21	124.98	5.0	1.4	0.0	1.9	2.0	3.7	2.2	3.1
Commercial construction	112.97	119.72	119.25	116.85	118.75	117.15	116.36	115.44	118.11	6.0	-0.4	-2.0	1.6	-1.3	-0.7	-0.8	2.3
Public construction	105.76	106.05	96.84	97.45	99.95	98.24	102.21	106.37	105.28	0.3	-8.7	0.6	2.6	-1.7	4.0	4.1	-1.0
By producer group																	
Core construction industry	99.63	107.32	107.32	108.02	112.55	112.81	116.51	118.63	120.98	7.7	0.0	0.7	4.2	0.2	3.3	1.8	2.0
Finishing trades	115.59	117.43	115.79	114.03	114.81	115.07	117.27	118.76	122.41	1.6	-1.4	-1.5	0.7	0.2	1.9	1.3	3.1
other producers	103.04	108.80	108.50	107.80	109.60	110.90	114.20	116.70	118.60	5.6	-0.3	-0.6	1.7	1.2	3.0	2.2	1.6

Sources: Federal Statistical Office, author's own calculations.

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have grown by 3.3 percent and 1.9 percent, respectively. Given the decline in demand for public builders later on in the forecast period—especially in civil engineering—growth is likely to shift more and more towards the development sector with the result that the ratio will be reversed in 2018: a real building volume increase of more than three percent is expected for the finishing trades, while the construction industry is expected to have just over two percent.

Conclusion

The construction industry's upward growth trend will continue throughout this year and into the next. At the moment, however, it is becoming clear that the limits of its production capacities are being reached. Evidence of this includes the increasing order backlogs as well as utilization levels within the individual construction sectors, as reported in surveys.

The expansion of the existing capacities is currently not keeping pace with the increased demand.

At the same time, construction demand is still high in many areas: according to estimates, 350,000 to 400,000 new homes would have to be built every year in order to

eliminate the housing shortage,¹⁶ but the current construction output only amounts around 270,000 completed apartments. This is not due to a lack of investors; rising real estate prices¹⁷ indicate that housing investment is still high. Rather, the lack of suitable construction sites is creating bottlenecks. Municipalities must therefore create more opportunities for investment in land for building.

Anticipated demographic changes in and influxes into Germany's large cities creates a need for practical new strategies for developing urban areas from within. The densification of certain neighborhoods, addition of new storeys to existing structures, and corresponding renovations to accommodate the elderly seem preferable to the rapid construction of new buildings on "green pastures." Given the fact that construction capacities are already fully utilized, comprehensive funding for new construction does not seem very expedient, and would likely accelerate the price increase.

¹⁶ Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (2015): "Bündnis für bezahlbares Wohnen und Bauen," Berlin.

¹⁷ Konstantin Kholodilin and Claus Michelsen, "Weiter steigende Immobilienpreise, aber keine flächendeckenden Spekulationsblasen," *DIW Wochenbericht* no. 49 (2015), 1164-73.

A less extensive yet targeted support from investment in the existing building stock, however, could create additional living space in sought-after locations; here, we could draw from the varied experiences gained from the district-oriented promotion of measures in redevelopment areas. It also makes sense to provide additional resources—at least partially—solely for the expansion of public housing construction.

Public infrastructure investment is still too low to compensate for the current level of attrition.¹⁸ Again and again, it has been reported that a significant number of capacities have been being reduced directly in the municipal building and planning offices over the past

few years, which is affecting the public sector's ability to execute plans. On the one hand, the use of central consulting capacities—for example, a municipal infrastructure company—would be helpful here. On the other hand, the earmarked funds should remain available in the longer term. The funds needed for preserving and renovating buildings could be sourced from an investment reserve,¹⁹ a possibility that has recently been under discussion. This would also provide planning security for construction companies and could accelerate the growth of capacities, which has been somewhat sluggish.

18 Martin Gornig, Claus Michelsen, and Kristina van Deuverden, "Local Public Infrastructure Showing Signs of Wear and Tear," *DIW Economic Bulletin* 42–43 (2015), 561–567.

19 Stellungnahme der Expertenkommission im Auftrag des Bundesministers für Wirtschaft und Energie, Sigmar Gabriel (2016): "Stärkung von Investitionen in Deutschland," Presented on December 12.

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