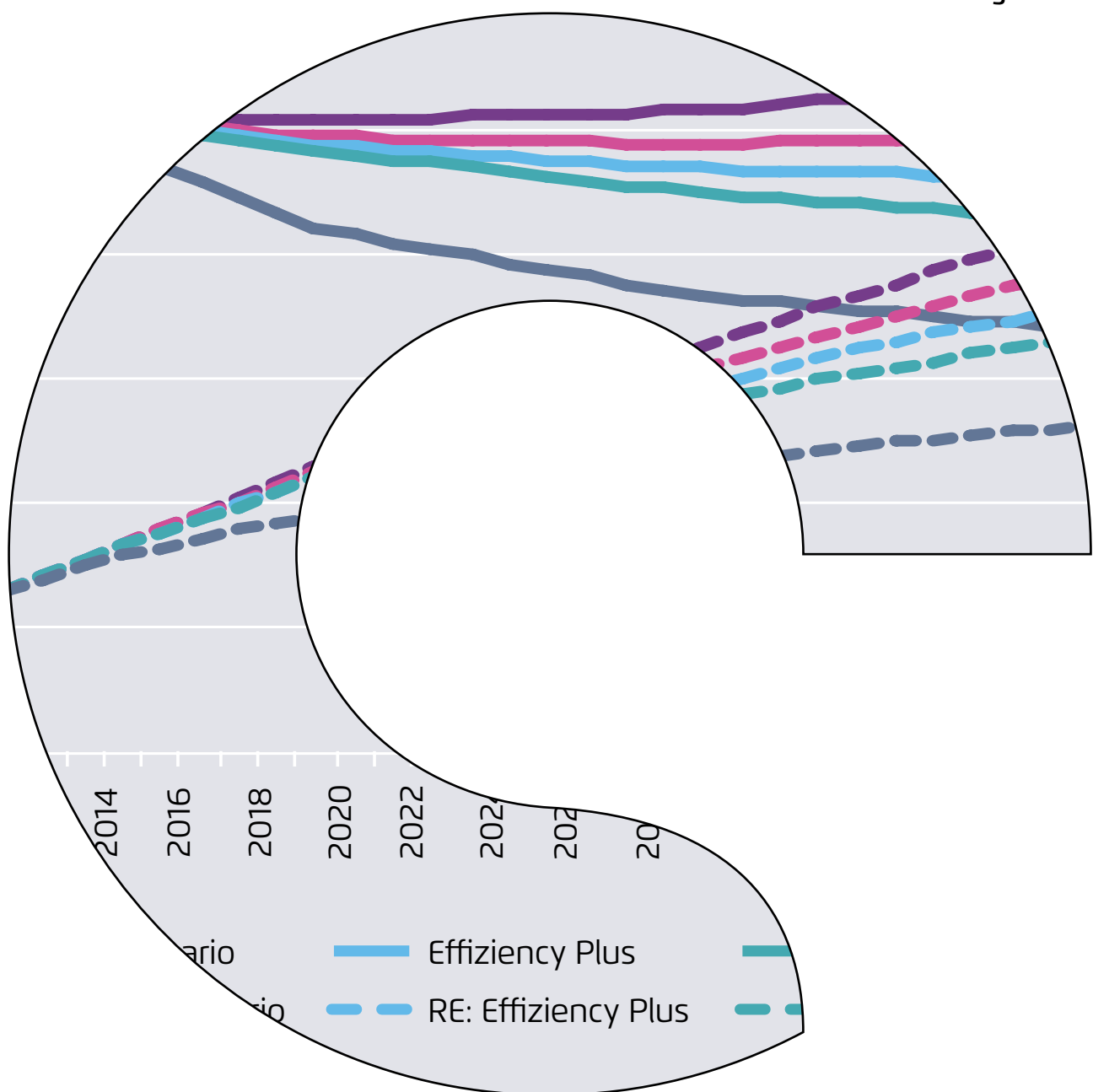


Benefits of Energy Efficiency on the German Power Sector

Summary of key findings from a study conducted by Prognos AG and IAEW

STUDY

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IMPRINT

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conducted by Prognos AG and IAEW

CREATED ON BEHALF OF

Agora Energiewende
Rosenstraße 2 | 10178 Berlin

Project Director: Alexandra Langenheld
alexandra.langenheld@agora-energiewende.de

Editor: Nikola Bock

European Climate Foundation (ECF)
Neue Promenade 6 | 10178 Berlin
Contact: Katrin Riegger, Huy Tran

The Regulatory Assistance Project (RAP)
Rosenstraße 2 | 10178 Berlin
Contact: Andreas Jahn, Meg Gottstein

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AUTHORS

Marco Wunsch (Project Coordination)
Ruth Offermann, Friedrich Seefeldt,
Karsten Weinert, Inka Ziegenhagen
Prognos AG
Goethestraße 85 | 10623 Berlin

David Echternacht, Julian Lichtinghagen,
Dr.-Ing. Ulf Kasper, Univ.-Prof. Dr.-Ing. Albert Moser
Institut für Elektrische Anlagen und
Energiewirtschaft (IAEW)
Schinkelstraße 6 | 52062 Aachen

CONSULTATIVE GROUP

We would like to thank the members of the consultative group for their input. The responsibility for the study and its results lies exclusively with Agora Energiewende, ECF and RAP as well as with the institutes involved.

The consultative group included representatives of:

- Federal Ministry for Economic Affairs and Technology
- Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
- Bundesnetzagentur
- Bundesverband der Deutschen Industrie e. V.
- Bundesverband Neuer Energieanbieter e. V.
- Deutsche Unternehmensinitiative Energieeffizienz e. V.
- Deutscher Industrie- und Handelskammertag e. V.
- Forum Ökologisch-Soziale Marktwirtschaft e. V.
- Verband kommunaler Unternehmen e. V.
- Verbraucherzentrale Bundesverband e. V.
- World Wide Fund For Nature (WWF)

Preface

Dear readers,

Public debate on the energy transition is dominated by questions surrounding costs. Yet with increased energy efficiency, the energy transition can be implemented much more cost effectively. This is a sorely neglected issue.

The value of savings that could be achieved through greater efficiency in the power sector has not been previously quantified. Accordingly, this issue was examined in detail in a recent study by Agora Energiewende, the European Climate Foundation (ECF), and the Regulatory Assistance Project (RAP). Specifically, the study shows the extent to which the costs of electricity can be reduced through greater energy efficiency in conventional and renewable generation as well as in transmission and distribution grids. In this report, we are pleased to present the remarkable and quite surprising findings of this study.

The new German government is faced with the task of implementing decisive policies to promote the energy transition. Especially in the case of energy efficiency, there

is pressure to take action in order to ensure the achievement of long-term goals: namely, to reduce primary energy consumption 50 percent by 2050 and to reduce power consumption 10 percent by 2020 and 25 percent by 2050.

Thus, the study should be understood in part as a plea to appreciate the importance of energy efficiency in the electricity sector, and as a call to grant efficiency a prominent role in the current energy policy debate.

With the implementation of the European Energy Efficiency Directive into national law and the announcement of the National Energy Efficiency Action Plan in Germany's coalition agreement, the need for greater attention to this issue is all the more pressing.

We hope you find this report both insightful and inspiring.

Yours

Patrick Graichen, Executive Director, Agora Energiewende
Johannes Meier, CEO, European Climate Foundation
Meg Gottstein, Principal, Regulatory Assistance Project

Key findings at a glance

1.

Improving energy efficiency would significantly lower the costs of the German electricity system.

Each saved kilowatt-hour of electricity reduces fuel and CO₂ emissions, as well as investment costs for fossil and renewable power plants and power grid expansion. If electricity consumption can be lowered by 10 to 35 percent by 2035 compared to the Reference scenario outlined in the study, the costs for electricity generation will be reduced by 10 to 20 billion euros₂₀₁₂.

2.

Improvements in the energy efficiency of the electricity sector can be achieved economically.

One saved kilowatt-hour of electricity would lead to reduced electrical system costs of between 11 to 15 euro cents₂₀₁₂ by 2035, depending on the underlying assumptions. Many efficiency measures would generate lower costs than these savings, and would therefore be beneficial from an overall economic perspective.

3.

Reductions in future power consumption mean a lower need to expand the power grid.

A significant increase in energy efficiency can significantly reduce the long-term need to expand the transmission grid: between 1,750 and 5,000 km in additional transmission lines will be needed by 2050, down from 8,500 km under the "business as usual" scenario.

4.

Reducing power consumption would reduce both CO₂ emissions and import costs for fuel.

Reducing power consumption by 15 percent compared to the Reference scenario would lower CO₂ emissions by 40 million tonnes and would reduce spending on coal and natural gas imports by 2 billion euros₂₀₁₂ in 2020.

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1 Summary

Objectives and scope of work

The aim of this study was to assess the economic benefits of different development paths for electricity consumption (referred to as "efficiency scenarios"). This assessment was performed by comparing various scenarios for the development of electricity consumption. In this connection, the overall costs of the electric power system were calculated and compared.

The costs of the electric power system are primarily attributable to three areas:

- conventional generation of electricity (including storage and load management)
- power generation from renewable energy sources
- electrical grids (all voltage levels from 400 V up to 380 kV)

The calculations for all scenarios extend from 2012 to 2050. Due to demographic changes and technological progress that will occur over this time frame, significant changes in consumption across several sectors can be expected.

Scenarios and models at a glance

Five different scenarios are examined in this study. In addition to the reference scenario (see also Prognos, EWI & GWS, 2011), we consider four additional scenarios with varying power consumption trends. Three of these scenarios assume that considerable efforts will be undertaken to reduce power consumption. The fourth scenario depicts the continuation of existing trends without any regulatory activism (i.e. the "business as usual", or BAU, scenario). Furthermore, this scenario assumes an increase in power consumption. In all scenarios the share of electrical power generated from renewable energy will rise to 81 percent by 2050.

The four comparative scenarios as well as the reference scenario were not newly developed for this study. They are

based on scenarios and associated assumptions previously developed and published by Prognos.

The Prognos Power Plant Model served as the basis for calculating the power generation from conventional sources that is required beyond the hourly feeding of electricity from renewable sources into the grid (i.e. residual load). The model simulates Germany's fleet of power stations and estimates the operation of power stations on an hourly basis according to merit order. This fleet of power stations is able to provide the generation capacity needed for the stability of the system at each moment. All scenarios consider an optimized use of load management in order to achieve a decrease in load peaks as well as the further expansion of electricity storage systems.

A specific transmission grid model developed by IAEW was used in order to quantify the necessity of expanding the electricity transmission grid. The applied transmission grid model covers both 220 kV and 380 kV lines, transformers as well as phase shifters. In total, the model consists of about 390 grid nodes and around 600 power line corridors. In order to determine the costs of transmission grid expansion, associated investment costs have been estimated.

As there are more than one million circuit kilometres and more than 860 grid operators to take into account, it is impossible to estimate how much the German distribution network needs to be expanded (as could be estimated for the transmission network). Accordingly, grid expansion was estimated by using a reference grid approach that relies on modelling five prospective grid types "dominated by strong wind", "dominated by wind", "mixed", "dominated by PV" and "urban".

Demand-side energy savings potential

The electricity savings projections detailed in this study are a result of many efficiency and savings measures in all sectors. To estimate the costs of implementing efficiency and

savings measures on the demand side, a further and more detailed analysis of the costs for these measures would be necessary. However, this was not the focus of the present study.

Thus, while data on specific measures are lacking, we can draw attention to studies that indicate there is still a high potential for economically feasible savings in the area of electrical power. Studies that examine the cost aspects of energy savings were taken into account in our analysis (e.g. the EMSAITEK study by IZES, BEI, Wuppertal Institute, 2011; BDI & McKinsey, 2007; IFEU, Fraunhofer ISI, Prognos, GWS, et al., 2011). These three studies show that potential energy savings are large enough to allow adherence to the consumption corridor for 2020 allowed by the WWF as well as the consumption reductions set forth for 2030 by the German government's Energy Concept. Taking the long-term view up to 2050, it must additionally be considered that starting from approx. 2020 or 2030, additional potentials for

economic efficiency will presumably be explored that are not yet apparent and were not part of the analysed studies. We assume that it will be feasible to implement the majority of savings projected in the scenarios in an economic manner.

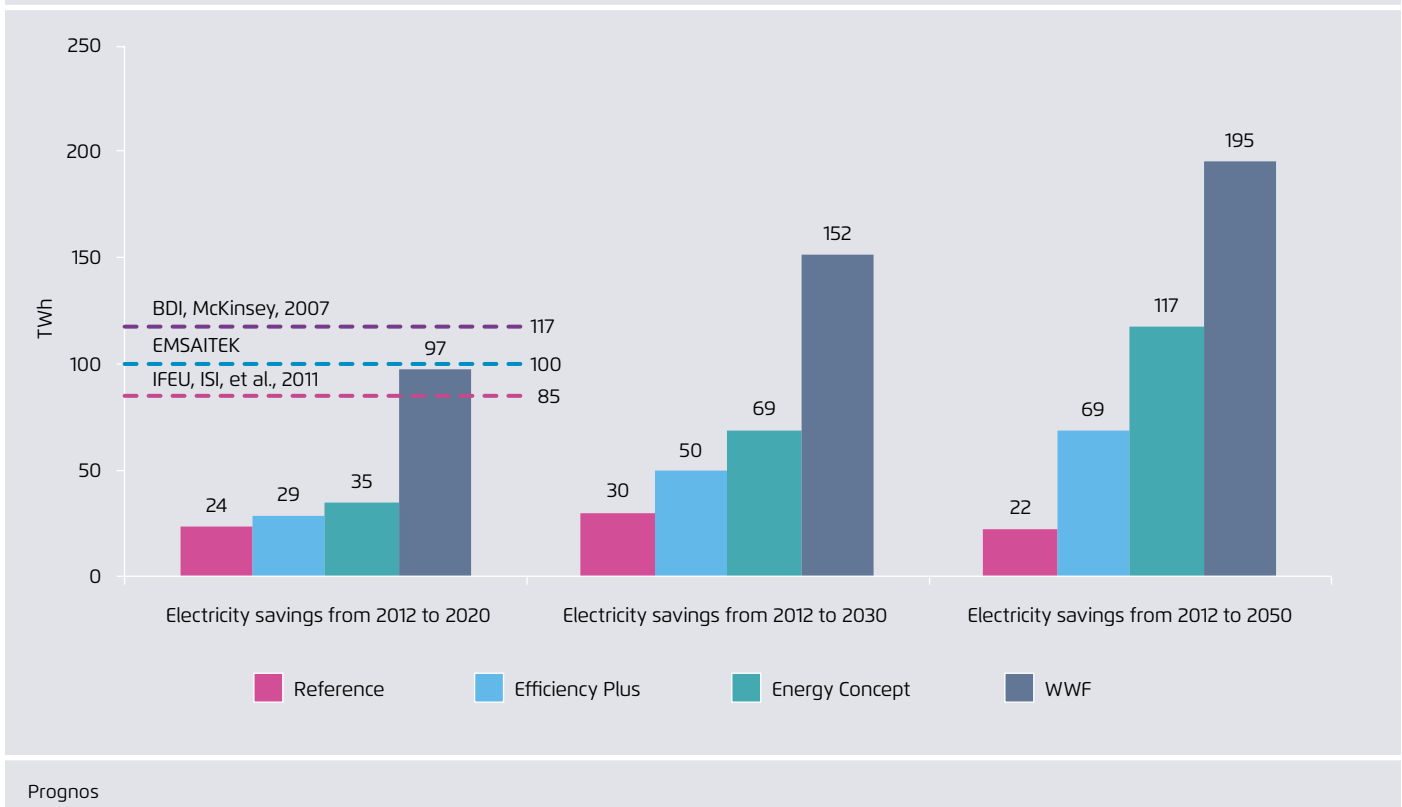
Costs of the power system: The results at a glance

In 2012 the costs for power generation and grid infrastructure amounted to approximately 50 billion euros₂₀₁₂. Depending on electricity consumption trends, these costs will rise or fall on a long-term basis. The modelling we conducted for the power market and power grid shows the following results:

- The BAU scenario exhibits the highest electricity consumption. Under this scenario, annual costs will rise up to 65 billion euros₂₀₁₂ by 2035 and up to 72 billion euros₂₀₁₂ by 2050.

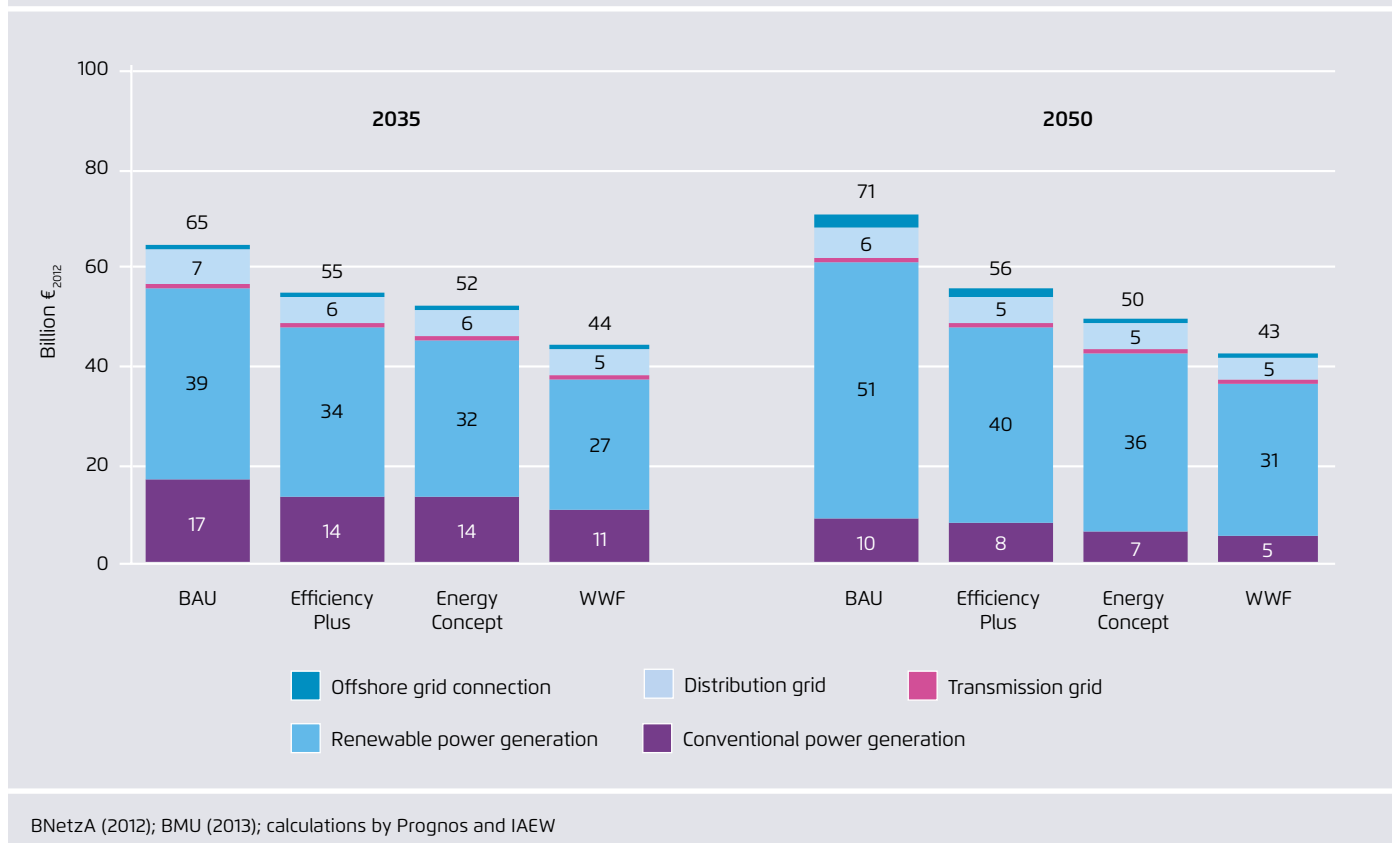
The energy savings potential from different studies, as well as electricity savings compared to the BAU scenario

Figure 1



Total costs of electricity generation and network infrastructure

Figure 2



- Under the Efficiency Plus scenario, which forecasts a drop in electricity consumption of 16 percent compared to today's figures on a long-term basis, the overall costs will be 55 billion euros₂₀₁₂ by 2035 and 56 billion euros₂₀₁₂ by 2050, a 10 percent increase over the present level (2012).
- Under the Energy Concept scenario, a 25 percent reduction in final electricity consumption is expected compared to 2012 figures. Here, the overall costs will be 52 billion euros₂₀₁₂ by 2035 and 50 billion euros₂₀₁₂ by 2050, and will thus be equivalent to the present level.
- With a successful reduction in electricity consumption of 40 percent by the year 2050, as expected in the WWF scenario, the overall costs of the power system will be lower than the present level on a mid- and long-term basis. Savings will amount to 6 billion euros₂₀₁₂ by 2035 and 7 billion euros₂₀₁₂ by 2050.

The above comparison shows that through a significant reduction in electricity consumption, the overall costs of the

power system – even with greater use of renewable energy – can drop on a mid- to long-term basis.

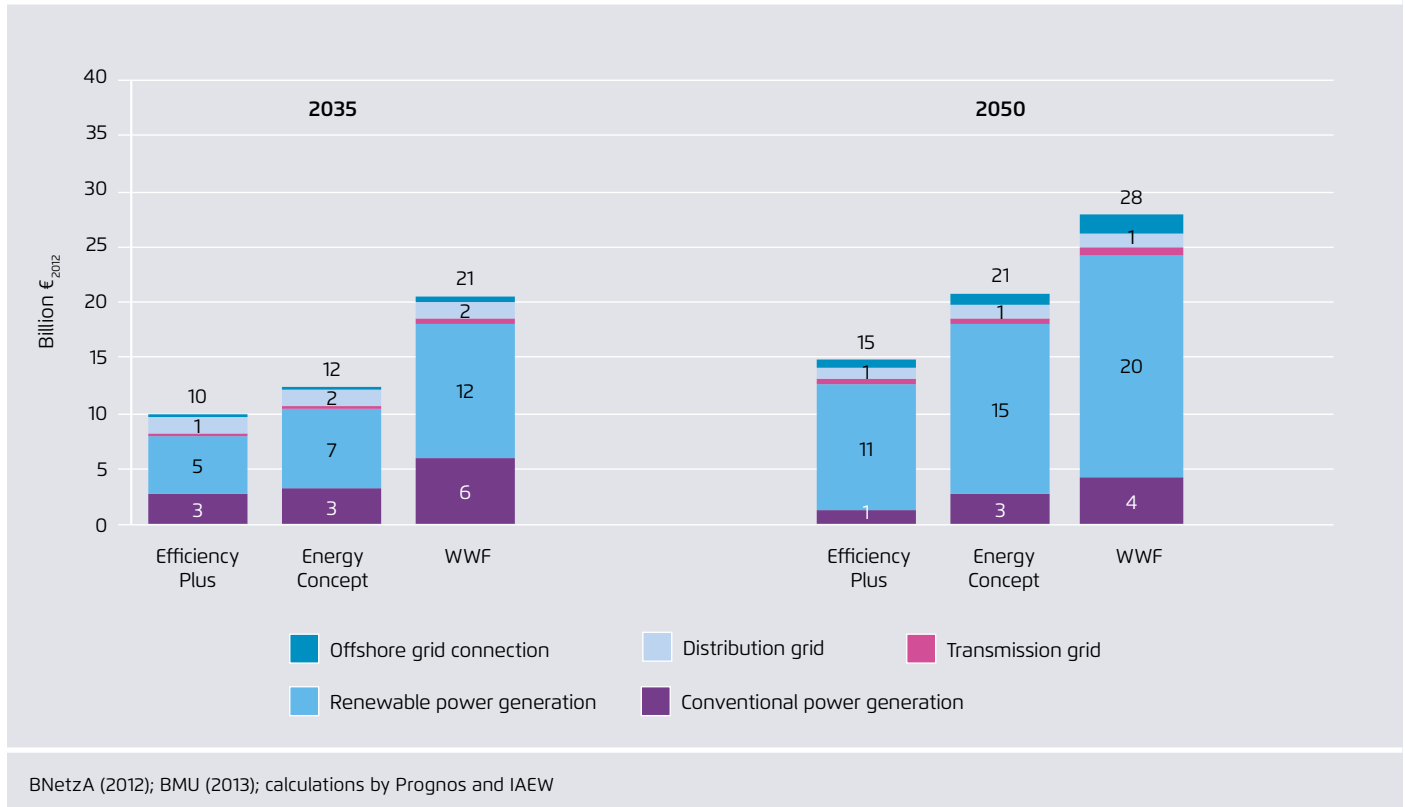
In the more efficient scenarios cost savings will be between 10 and 20 billion euros₂₀₁₂ by 2035 and between 15 and 28 billion euros₂₀₁₂ by 2050 compared to the BAU scenario. Power generation from renewable sources will contribute the largest share. Renewable energy is on a whole the biggest cost factor, but can be significantly minimized by improving efficiency. The generation of electricity from renewables will represent more than half of savings by 2035, and some 70 percent of savings by 2050.

Costs per MWh of generated electricity and grid infrastructure are about the same in all scenarios at 120 euros₂₀₁₂.

As expected, there are significant differences between scenarios regarding CO₂ emissions. Due to the high share of electricity from conventional sources in the BAU scenario,

Electricity generation and grid infrastructure savings compared to the BAU scenario

Figure 3



CO₂ emissions are the highest in the scenario over the entire period until 2050. By contrast, the lowest emissions can be found in the WWF scenario due to lower electricity needs. Under this scenario, CO₂ emissions, which are directly connected to the generation of power, will be 35 million tonnes less than in the BAU scenario by 2030. Emissions savings will represent 19 million tonnes in 2050.

Through a decrease in electricity consumption the import costs for hard coal and natural gas are lower in the scenarios with more efficient trends. In comparison to the BAU scenario, the WWF scenario forecasts that imports can be lowered by 2 billion euros₂₀₁₂ in 2020. On a long-term basis these savings drop to 1.8 billion euros₂₀₁₂ per annum.

The lower the electricity consumption in each respective scenario, the lesser the need to expand the power supply grid. Our calculations show that by 2050, the need to expand the transmission grid can be significantly reduced: grid expansion needs equal 8,500 km under the BAU sce-

nario, 5,000 km under the Efficiency Plus scenario, approximately 4,000 km under the Energy Concept scenario, and 1,750 km under the WWF scenario.¹

Beyond monetary savings, a reduction in electrical energy consumption leads to further benefits that have not been assessed in this study, including lower pollutant emissions by conventional power plants and reduced land use due to less development of renewable energy.

1 The method used in our study to determine network expansion requirements diverges from the method applied by Germany's transmission network operators within the scope of the Network Expansion Plan (NEP). Accordingly, the figures for network expansion requirements presented here should not be compared directly with the figures from the federal expansion plan.

2 Results

2.1 Results of the cost calculations

The total costs of the electricity system are the sum of the costs of conventional and renewable power generation as well as network costs.

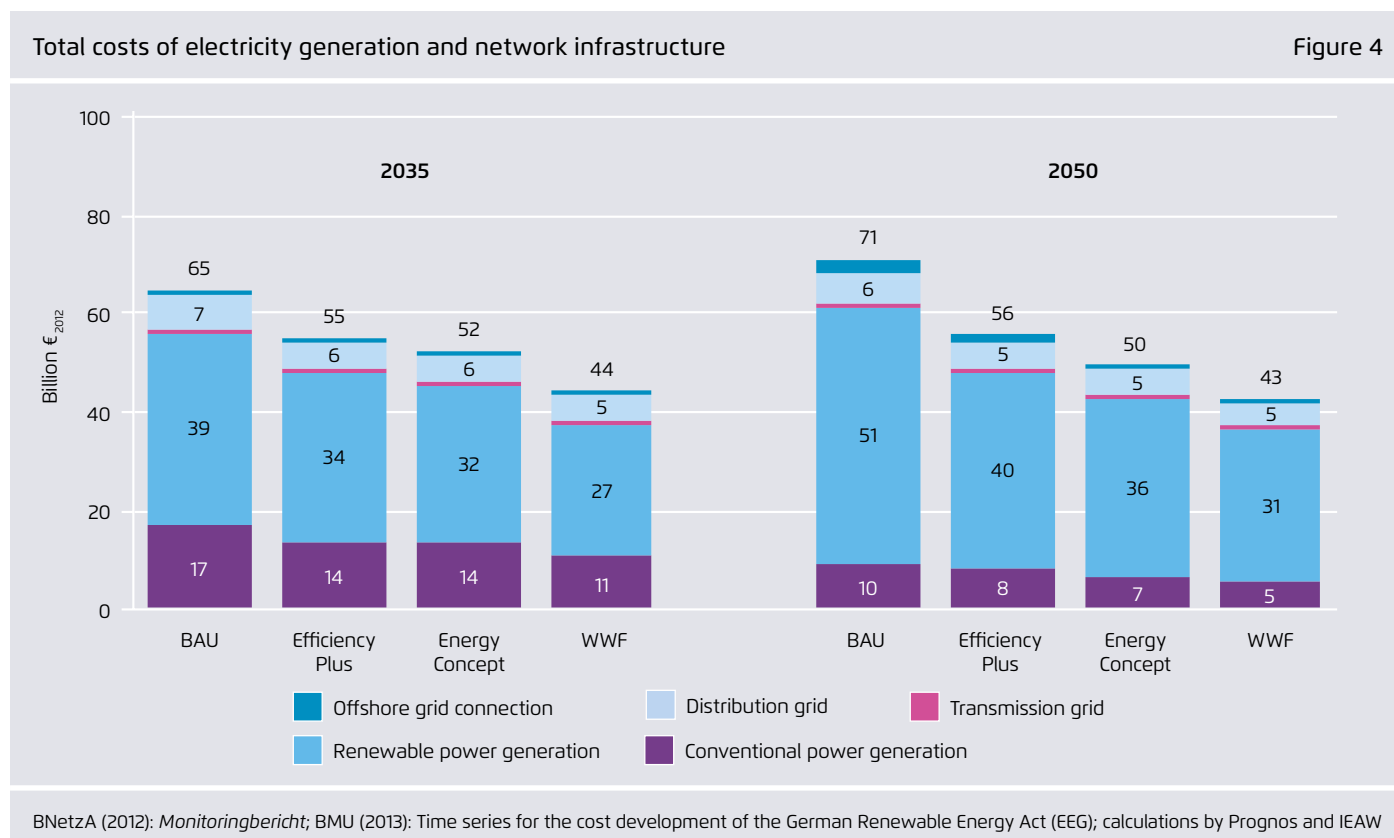
The costs of electricity generation and grid infrastructure were around 50 billion euros₂₀₁₂ in 2012. Depending on electricity consumption trends, these total costs will increase or decrease over the long-term:

- Electricity consumption is highest under the BAU scenario. Under this scenario, annual costs rise to 65 billion euros₂₀₁₂ by 2035 and to 72 billion euros₂₀₁₂ by 2050.
- Under the Efficiency Plus scenario, which forecasts a drop in electricity consumption by 16 percent compared to today's figures on a long-term basis, overall costs will

be 55 billion euros₂₀₁₂ by 2035 and 56 billion euros₂₀₁₂ by 2050, a 10 percent increase over the present level (2012).

- Under the Energy Concept scenario a 25 percent reduction in final electricity consumption is expected compared to 2012 figures. Under this scenario, overall costs will be 52 billion euros₂₀₁₂ by 2035 and 50 billion euros₂₀₁₂ by 2050, and will thus be comparable to present levels.
- With a successful reduction in electricity consumption of 40 percent by 2050, as expected in the WWF scenario, the overall costs of the power system will be below the present level on a mid- to long-term basis. Savings will amount to 6 billion euros₂₀₁₂ by 2035 and 7,000 billion euros₂₀₁₂ by 2050.

Our results show that through significant efficiency improvements, the total cost of the power system would be likely to fall in the medium to long-term, even with a strong expansion of renewable energy.



Electricity generation is responsible for the largest cost changes in the overall system in all scenarios. The further expansion of renewable energy and its increasing share in electricity generation (which is similar in all scenarios) result in increased total costs. In 2050, renewable electricity generation will account for 56 percent of total system costs under the WWF scenario, and for 61 percent of costs under the BAU scenario. Due to a decline in costs for conventional electricity, absolute costs decline, despite an assumed rise in fuel and CO₂ prices as well as the need to maintain a larger conventional power plant fleet. Today, fossil-thermal generation accounts for costs equal to some 19 billion euros₂₀₁₂. By 2050 the costs for conventional electricity generation will fall to 10 billion euros₂₀₁₂ (under the BAU scenario) or even to less than 5 billion euros₂₀₁₂ (under the WWF scenario).

The costs for electricity grid infrastructure differ only slightly in all scenarios, despite variation in expansion and investment demand. In 2035 infrastructure costs for the transmission network will be between 900 million euros₂₀₁₂ (BAU scenario) and 700 million euros₂₀₁₂ (WWF scenario). In 2050 these costs increase to between 1.4 billion euros₂₀₁₂ (BAU scenario) and 900 million euros₂₀₁₂ (WWF scenario). The costs of the distribution networks, which includes all voltage levels from 400 V to 110 kV, will be between 700 million euros₂₀₁₂ (BAU scenario) and 5.5 billion euros₂₀₁₂ (WWF scenario) in 2035. By 2050, the costs will decline slightly and will amount to between 6.3 billion euros₂₀₁₂ (BAU scenario) and 5 billion euros₂₀₁₂ (WWF scenario).

In addition, costs will arise for connecting offshore wind turbines to the grid. Once again, projected costs depend on the power consumption trends underlying each scenario. Higher power consumption will require greater expansion of offshore wind power. Consequently, offshore grid connection costs will also increase.

In 2035, offshore grid connection costs are expected to be between 600 million euros₂₀₁₂ (WWF scenario) and 1.3 billion euros₂₀₁₂ (BAU scenario). The further expansion of offshore wind turbines will result in a rise in annual costs by 2050 of up to 700 million euros₂₀₁₂ under the WWF scenario and 3.4 billion euros₂₀₁₂ under the BAU scenario.

Compared to the BAU scenario, savings can be achieved under the more efficient scenarios of 10 to 20 billion euros₂₀₁₂ by 2035 and 15 to 28 billion euros₂₀₁₂ by 2050. Renewable power generation is the largest contributor to these cost savings. Although this cost component is responsible for the majority of total costs, it can be significantly reduced by improving efficiency. Renewable electricity generation is predicted to account for more than half of cost savings by 2035 and more than 70 percent of cost savings by 2050.

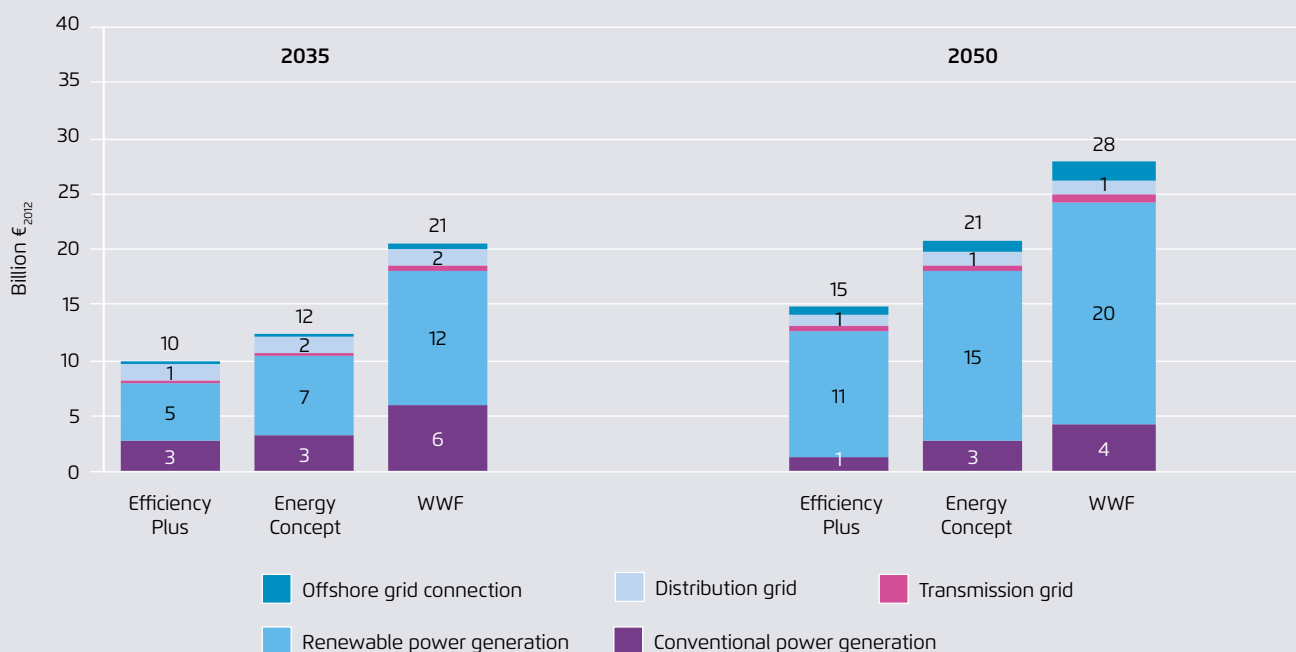
The unit costs per MWh for electricity generation and network infrastructure are roughly equal in all scenarios at around 120 euros₂₀₁₂ per MWh. This is because total costs are largely determined by the costs of electricity generation, which, in the long-term, are approximately the same in all scenarios per MWh. By contrast, grid costs differ strongly in each scenario, but account for only a small share of total costs.

Compared to the BAU scenario, specific savings by 2035 from forecasted consumption reductions are equal to 149 euros₂₀₁₂/MWh under the Efficiency Plus scenario, 133 euros₂₀₁₂/MWh under the Energy Concept scenario, and 114 euros₂₀₁₂/MWh under the WWF scenario. In 2050, savings per MWh in relation to the BAU scenario equal 130–140 euros₂₀₁₂ under the more efficient scenarios.

Compared to the BAU scenario, the biggest savings in CO₂ emissions are found in the WWF scenario. In 2020, avoided emissions will amount to 40 million tonnes. By 2050, these savings will decrease to 20 million tonnes. This is because electricity generated from renewable energy increases during this time frame in the BAU scenario to 81 percent, and power generation causes increasingly lower emissions. The Reference scenario, the Efficiency Plus scenario and the Energy Concept scenario all show lower emission savings than the WWF and BAU scenarios. In contrast to the WWF scenario, the amount of avoided emissions under these scenarios will increase by 2040, and reverses only slightly by 2050. In 2050, emission savings will be between 8 million tonnes (Reference scenario) and 13 million tonnes (Energy Concept scenario).

Electricity generation and grid infrastructure savings compared to the BAU scenario in billions of euros

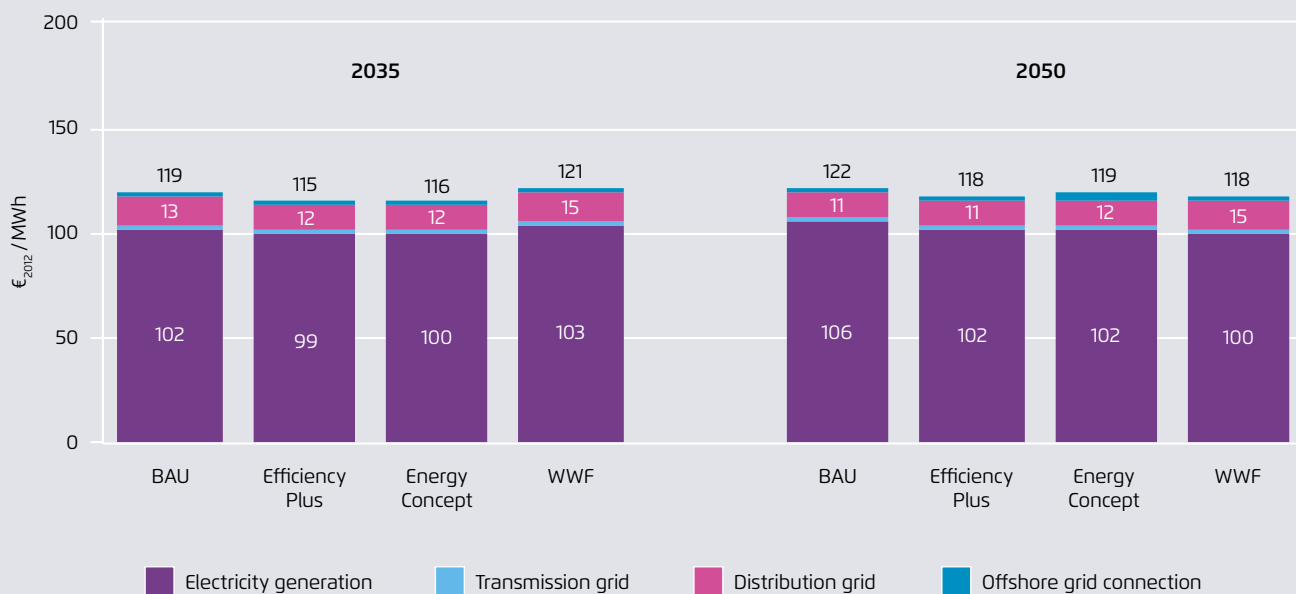
Figure 5



BNetzA (2012): *Monitoringbericht*; BMU (2013): Time series for the cost development of the German Renewable Energy Act (EEG); calculations by Prognos and IEAW

Specific costs of electricity and grid infrastructure

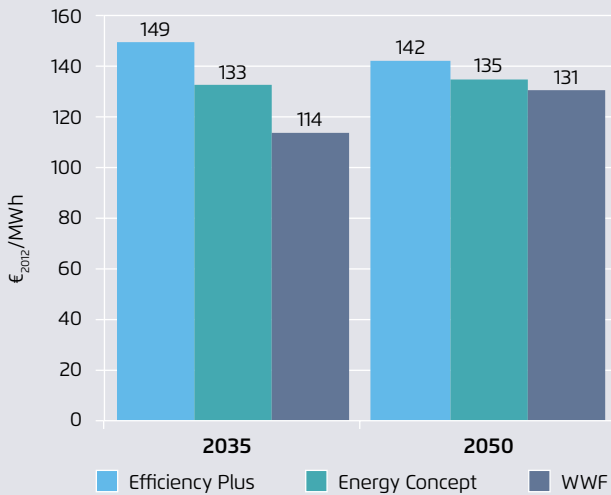
Figure 6



BNetzA (2012): *Monitoringbericht*; BMU (2013): Time series for the cost development of the German Renewable Energy Act (EEG); calculations by Prognos and IEAW

Specific cost savings in comparison to the BAU scenario

Figure 7



Calculations by Prognos and IAEW

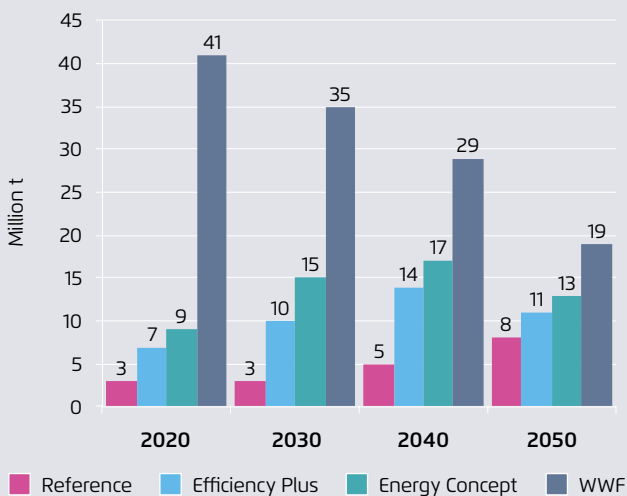
ditions for natural gas and hard coal, as less fossil-thermal power plants will be needed. In all scenarios, the avoided costs of imports are the highest in 2030. From 2030 to 2050 savings levels decline. This is because from 2030 onward, all scenarios will be impacted by the high share of electricity from renewables. In 2050, avoided import expenditures will range between 800 million euros₂₀₁₂ (Reference scenario) and 1.8 million euros₂₀₁₂ (WWF scenario) compared to the BAU scenario.

Because the fuel costs for conventional energy are already accounted for, the value of savings in this area is already included in the above totals. However, it is not clear to what extent power generation will become more independent of (increasingly expensive) imports.

Compared to the BAU scenario, significant electricity cost savings result under the Reference, Efficiency Plus, Energy Concept and WWF scenarios due to avoided import expen-

Avoided CO₂ emissions of the electricity generation in 2020, 2030, 2040, 2050 compared to the BAU scenario

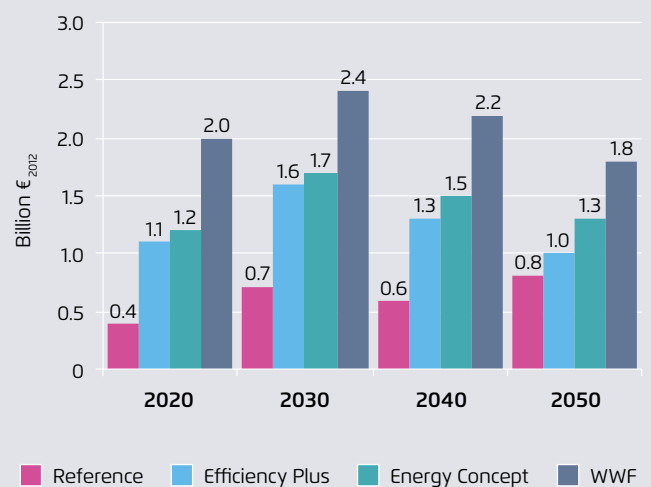
Figure 8



Prognos

Avoided import costs for natural gas and coal in comparison to the BAU scenario

Figure 9



Prognos

2.2 Assessment of the results

The aim of the study was to determine the future macroeconomic costs of electricity generation depending on varying electricity consumption trends. The above summary highlighted the forecasted costs for electricity generation and distribution under five different power consumption scenarios. The comparison of the different scenarios enables an estimate of the cost savings that could be achieved by reducing power consumption.

To assess what the saving of energy will ultimately cost, a further and more detailed analysis of energy saving measures would be necessary. However, this was not the focus of the study.

To assess these results in relation to other studies, in this section we briefly discuss other studies that have dealt with the cost aspects of power savings. The direct comparison of these studies is not possible because of the different assumptions underlying each of the studies. Indeed, there are several significant points of divergence between these studies, including, for example, whether the costs of efficiency measures are considered from a macroeconomic point of view or from a customer perspective.

The following three studies analyse, among other things, the costs of efficiency measures:

→ EMSAITEK (IZES, BEI, Wuppertal Institute, 2011)

This study determines the energy saving potential associated with about 70 different technologies, both from a customer as well as macroeconomic point of view until the year 2020. The considered measures apply to three consumption sectors (households, industry and commercial). The calculated economic electricity savings amount to 100 TWh by 2020. This corresponds to the consumption path of the WWF scenario.

→ Costs and Potentials of Greenhouse Gas Abatement in Germany (BDI, McKinsey, 2007)

This study determined the costs and potentials of measures to avoid greenhouse gas emissions in the sectors energy, industry, buildings, transport, waste management and agriculture. In total, the study looked at the costs of greenhouse gas avoidance for some 300 different measures from the perspective of investors. The implementation of the economic measures would mean a decline in gross electricity production of 117 TWh by 2020. This approximately corresponds to the path of the WWF scenario.

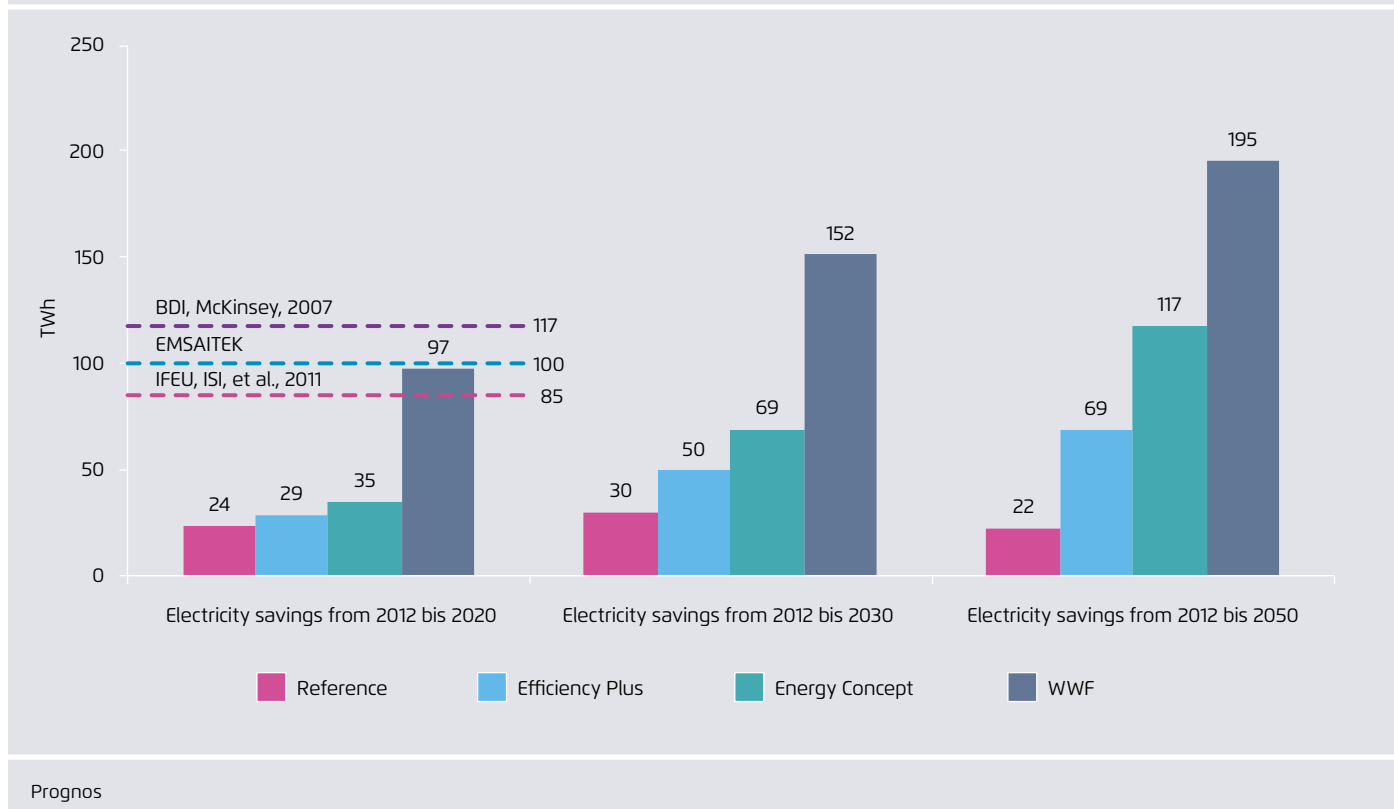
→ Energy efficiency: Potentials, economic effects and innovative action and support fields for the National Climate Initiative (IFEU, Fraunhofer ISI, Prognos, GWS et al., 2011)

This study analysed the potentials for achieving energy efficiency by 2030. To quantify this potential, 43 measures were examined. A promising potential (i.e. both economically feasible and realistic in terms of implementation) of 85 TWh in electricity savings was determined for 2020 and 123 TWh for 2030 compared to a "frozen efficiency" scenario. The "frozen efficiency" forecast is similar to the BAU scenario considered here. The savings come close to that found in the WWF scenario.

These three studies indicate that the potential for energy savings by 2020 and 2030 is large enough to allow adherence to the consumption corridor for 2020 allowed for by the WWF as well as the consumption reductions set forth for 2030 by the federal government's Energy Concept. Taking the long-term view up to 2050, it must additionally be considered that starting from approximately 2020 or 2030, additional potentials for economic efficiency will presumably be explored that are not yet apparent and were not part of the analysed studies. We assume that it will be feasible to implement the majority of savings projected in the scenarios in an economic manner.

The energy savings potential from different studies, as well as electricity savings compared to the BAU scenario

Figure 10



3 Conclusions

The main conclusions of this study are:

- The costs of converting the electricity system can be significantly decreased by increasing energy efficiency. The more energy consumption can be decreased based on increased energy efficiency, the lower the future costs of the power system. The Efficiency Plus scenario assumes a decline in electricity consumption of 16 percent by 2050 compared to today. In 2050 the costs of the power system will amount to 56 billion euros₂₀₁₂. By contrast, under the WWF scenario electricity consumption will drop by 40 percent and costs will be 43 billion euros₂₀₁₂. In comparison to the Efficiency Plus scenario, costs under the WWF scenario are 25 percent lower.
- Based on the underlying assumptions, an average annual rise in energy efficiency of 2.1 percent (as seen under the Efficiency Plus scenario) will result in savings of 10 billion euros₂₀₁₂ in 2035 and 15 billion euros₂₀₁₂ in 2050. The cost savings from energy efficiency diverge considerably from the BAU scenario, which assumes an annual efficiency rise of only 1.3 percent.
- If an annual increase in efficiency of 2.4 percent is achieved (as forecast by the Energy Concept scenario) cost savings compared to the BAU scenario will equal 13 billion euros₂₀₁₂ in 2035 and 21 billion euros₂₀₁₂ in 2050.
- If electricity consumption in Germany can be significantly lowered, the costs of the power system could be stabilised or even reduced despite increasing fuel and CO₂ costs and despite a growing share of renewable energy. Under the WWF scenario, which assumes an annual efficiency rise of 2.6 percent up to 2050, annual costs for power generation and distribution will be between 6 and 7 billion euros₂₀₁₂ lower compared to 2012 figures.
- Depending on the underlying scenario, one saved MWh of electricity will lead to a cost reduction of between 114 and 149 euros₂₀₁₂ per MWh in 2035 and between 130 and 140 euros₂₀₁₂ per MWh in 2050.
- By changing the structure of the power generation system, costs will shift in the direction of renewable energy. As the costs for the expansion of renewable energy are mainly driven by the capital-intensive technologies of wind and photovoltaic, these two technologies will largely determine the overall capital costs for the future power grid. In this connection, the weighted average ROCE will have a significant impact on overall costs.
- The lower the electricity consumption in each respective scenario, the lower the need to expand the power supply grid. The study's calculations indicate that improved energy efficiency can significantly reduce the long-term need to expand the German transmission grid: while the BAU scenario indicates a need for 8,500 km of additional transmission lines by 2050, expansion requirements are 5,000 km under the Efficiency scenario, 4,000 km under the Energy Concept scenario and just 1,750 km under the WWF scenario.
- The differences in infrastructure costs between the BAU and WWF scenarios (1.9 billion euros₂₀₁₂ in 2035 and 2.1 billion euros₂₀₁₂ in 2050) are relatively small compared to the differences in generation costs.
- Due to the high share of electricity from conventional sources in the BAU scenario compared to the other scenarios, CO₂ emissions are the highest in this scenario over the entire period until 2050. The lowest emissions can be found in the WWF scenario due to lower electricity consumption. Under the WWF scenario, CO₂ emissions, which are directly connected to the generation of power, will be 35 million tonnes less than in the BAU scenario. This difference will amount to 19 million tonnes by 2050.
- Scenarios with lower electricity consumption are associated with reduced import costs for hard coal and natural

gas. Compared to the BAU scenario, import costs in 2020 are 2 billion euros₂₀₁₂ lower in the WWF scenario. On a long-term basis these savings drop to 1.8 billion euros₂₀₁₂ per annum.

- Beyond monetary savings, a reduction in electrical energy consumption leads to further benefits that have not been assessed in the study, including lower pollutant emissions by conventional power plants and reduced land use due to less development of renewable energy.
- The electricity savings forecasted in the study are a result of numerous efficiency and saving measures across all sectors. However, an analysis of the costs of implementing efficiency and savings measures on the demand side was not a focus of the study. Nevertheless, the savings potential for electricity identified in various studies indicate that the majority of these savings can be achieved economically.

How do we accomplish the *Energiewende*?

Which legislation, initiatives, and measures do we need to make it a success? Agora Energiewende helps to prepare the ground to ensure that Germany sets the course towards a fully decarbonised power sector. As a think-&-do-tank, we work with key stakeholders to enhance the knowledge basis and facilitate convergence of views.



Agora Energiewende

Rosenstrasse 2 | 10178 Berlin | Germany

T +49 (0)30 284 49 01-00

F +49 (0)30 284 49 01-29

www.agora-energiewende.org

info@agora-energiewende.de

