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Shaping a Vision for Belgium's Power Landscape

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Shaping a Vision for Belgium's Power Landscape

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AT A GLANCE

The consensus among the vast majority of the business stakeholders that contributed to this report is that the current power policy in Belgium—indeed, throughout Europe—is unsatisfactory, potentially risking both Belgium's long-term security of electricity supply and the country's industrial competitiveness.

Significant Implications for the Country

Belgium's current direction—which emphasizes renewable energy sources and gas-fired generation—may have significant ramifications for the country, including sharp increases in power costs for both residents and industry, a steep increase in CO_2 emissions related to power generation, decreased energy independence, and the risk that Belgium becomes the default provider of reserve power-generation capacity for the rest of Central Western Europe.

Recommendations for Policymakers

Policymakers can take advantage of eight recommendations to enhance the course they set for Belgium's power landscape—giving particular consideration to the long-term implications of policy choices.

Power is a vital commodity, one that should be managed strategically and from a long-term perspective. Considerable thought should be given to the opportunities vis-à-vis the costs and tradeoffs. Policy rationale and ramifications should be transparent to all stakeholders.

For Belgium and its interconnected neighbors in Central Western Europe (CWE), power policies should also, ideally, be formulated at a regional level, if not a broader European level. Today, however, power-related decisions in Europe continue to be made at a country level, with a limited eye toward the impact on neighboring countries.

Our report therefore focuses on Belgium's options for its power landscape in light of Europe's current context. The report's time horizon extends to 2030, given the long-term investment cycle in power.

Problems with the Status Quo

Among the stakeholders that contributed to this study, a vast majority agree that Belgium's current policy for the management of its power landscape is not satisfactory. Problems with the status quo are evident on multiple fronts (to be fair, these problems are common to other European countries as well):

- Decisions are often made without a sufficient understanding of the full economic implications and costs to society, especially over the long term. The govern-

ABOUT THIS REPORT

This report was developed by The Boston Consulting Group for The Federation of Belgian Enterprises (FEB-VBO), which represents more than 50,000 enterprises from 52 sector federations and more than 80 percent of Belgium's private-sector employment. Our aim was to provide an objective basis for the development of a vision for power in Belgium. To develop the report, we complemented our own analysis with views from a variety of business stakeholders: industrial energy consumers, transmission and distribution companies, electricity generators and suppliers, and their respective federations. We have informed Belgian federal policymakers and national and regional regulators of our work.

ment's efforts to drive investment in solar photovoltaic (PV) energy in recent years, for example, already represent annual commitments of approximately €750 million in 2020 and €380 million in 2030. (See the sidebar "Support for Solar PV Varies Considerably Within a Small Region.")

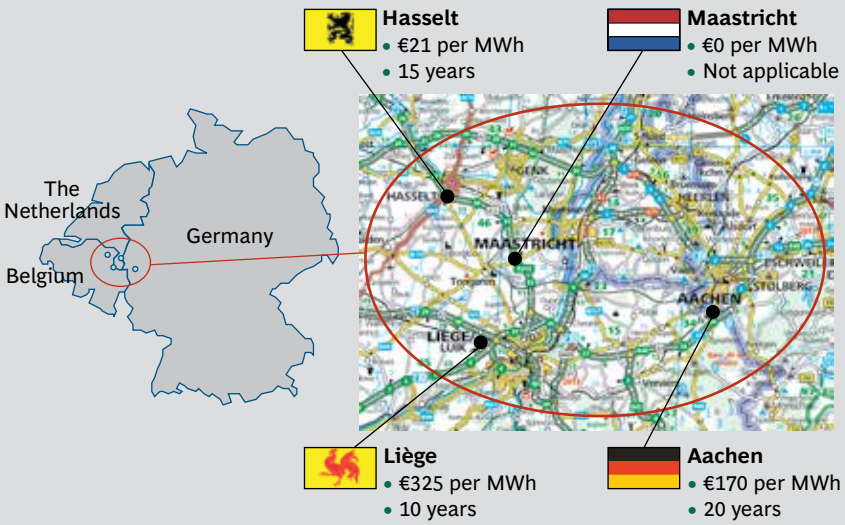
- The government's embrace of renewable energy, especially intermittent renewable sources that it considers "must run," such as solar PV and wind, has resulted in a host of complex challenges, including risks to the stability of the power supply in both excess and undersupply situations. The focus on renewables has also led to a deterioration of the operating conditions for conventional power plants, which are now called on to be more flexible and are burdened with fewer running hours as well as rising operational and maintenance costs.

- Regulation of the power sector is fragmented, and the rules of the game change frequently—Belgium has seen as many as 15 changes to the rules in one year—creating uncertainty among investors.

SUPPORT FOR SOLAR PV VARIES CONSIDERABLY WITHIN A SMALL REGION

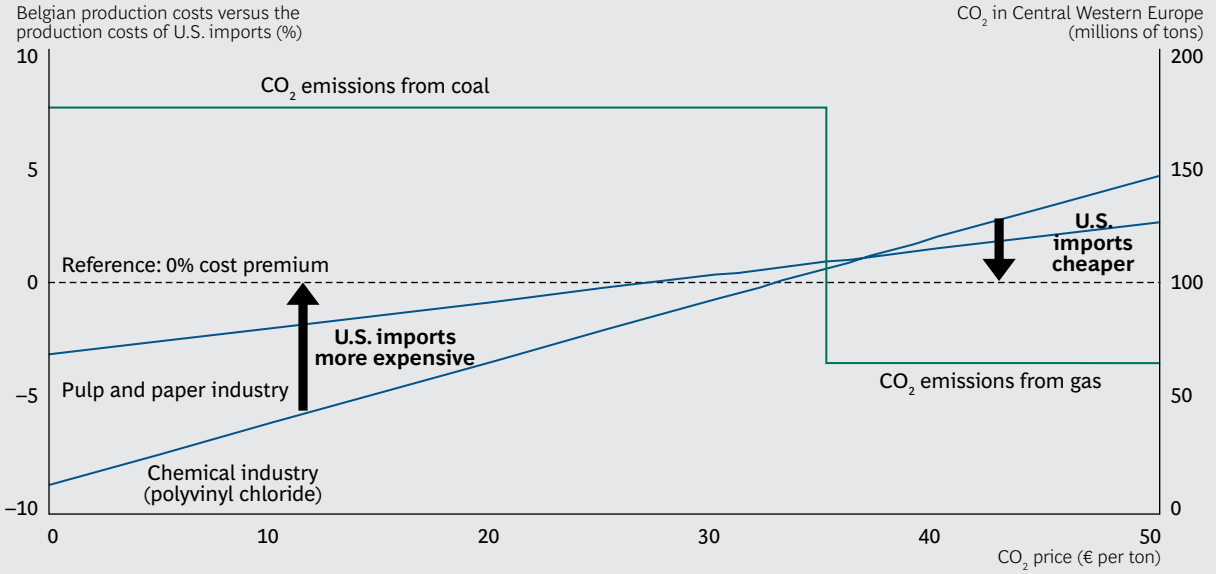
Within a range of approximately 40 kilometers around Maastricht, the support for new solar PV installations installed in January 2013 varied materially—from no subsidy at all to €325 per megawatt-hour. (See the exhibit below.) The installations deliver similar performance and could even be installed by the same suppliers.

Support for New Solar PV Installations in January 2013 Varied Considerably



Source: BCG analysis.

EXHIBIT 1 | Higher Prices for CO_2 Emissions Would Risk the Competitiveness of Belgian Industry



Source: BCG analysis.
Note: The difference in Belgium's production cost versus the costs of U.S. imports takes into account only the direct cost impact from CO_2 price increases on industrial processes and does not include potential carbon-leakage measures.

- The European Union's emissions-trading system (ETS), to which Belgium subscribes, is not promoting cleaner power-generation technologies over more-polluting ones, notably gas over coal. Nevertheless, ETS restrictions already pose a burden to Belgian industry. And were the ETS to take the necessary steps to promote gas over coal under current market conditions—namely, raising prices for CO_2 emissions to a minimum of €30 to €40 per ton—that burden would grow. It is unlikely that Belgian industry, and indeed European industry broadly, could survive unless other regions and countries globally adopted similar mechanisms and pricing. (See Exhibit 1.)

These problems make investors reluctant to commit money to Belgium's long-term energy projects, posing a risk to the country's long-term security of electricity supply. The problems also reduce the international competitiveness of Belgian industry, which is already being negatively affected by other global trends, particularly labor competitiveness and the U.S. shale-gas boom, which has driven down gas prices materially in the U.S. (Gas is now two to three times cheaper in the U.S. than in Europe, a trend that is not expected to change drastically over the coming years.)

Key Elements of Belgium's Current Course

Belgium's current course is centered on ensuring the security of the power supply in the near to intermediate term while simultaneously providing a longer-term direction. The most noteworthy elements of Belgium's current course are the progressive phaseout of nuclear capacity, the intention not to build new coal plants, the ongoing development of renewable energy sources, and the development of

sufficient gas-fired generation capacity to meet the country's "conventional peak" needs:[1]

- The country's nuclear phaseout will be completed by 2025. Compensating for this capacity loss will require the installation of up to 6 gigawatts (GW) of new conventional capacity.

- Belgian authorities seem to have ruled out the option of building new coal plants, mostly because of concerns over coal's damaging environmental impact. This suggests that the country's existing 0.9 GW of coal-based generation capacity will disappear in the course of the next decade as aging plants are decommissioned.

- Belgium aims to have more than 10 GW of installed renewable generation capacity (consisting of wind, solar PV, and biomass) in 2030, compared with approximately 4.6 GW today. The increase will be driven primarily by increases in wind (1.9 GW of offshore capacity as current commitments are realized, together with 1.7 GW of onshore capacity) and solar PV (an increase of 1.7 GW). Biomass will see only a slight increase (0.6 GW).

- Conventional power plants will provide the necessary capacity to offset the nuclear phaseout and compensate for the intermittency challenges posed by wind and solar. Authorities intend to put in place support mechanisms to ensure that sufficient new conventional capacity is built. We have assumed, on the basis of current indications, that all conventional new builds in Belgium will be gas-fired, increasing the country's gas-fired capacity from approximately 6.5 GW today to 13.5 GW in 2030.

Industrial customers would see a near doubling of the price they pay for power.

We estimate that pursuing this course will require up-front investments of €24 billion by 2030, of which approximately €10 billion will be needed prior to 2020 (both for new plants and grid development). The incremental cost to Belgian consumers of these investments and related operation and maintenance costs will be roughly €250 per year for the average household (in 2012 euro values, excluding value-added tax). Industrial customers would see a near doubling of the price they pay for power.

Constituents of a Vision for Power

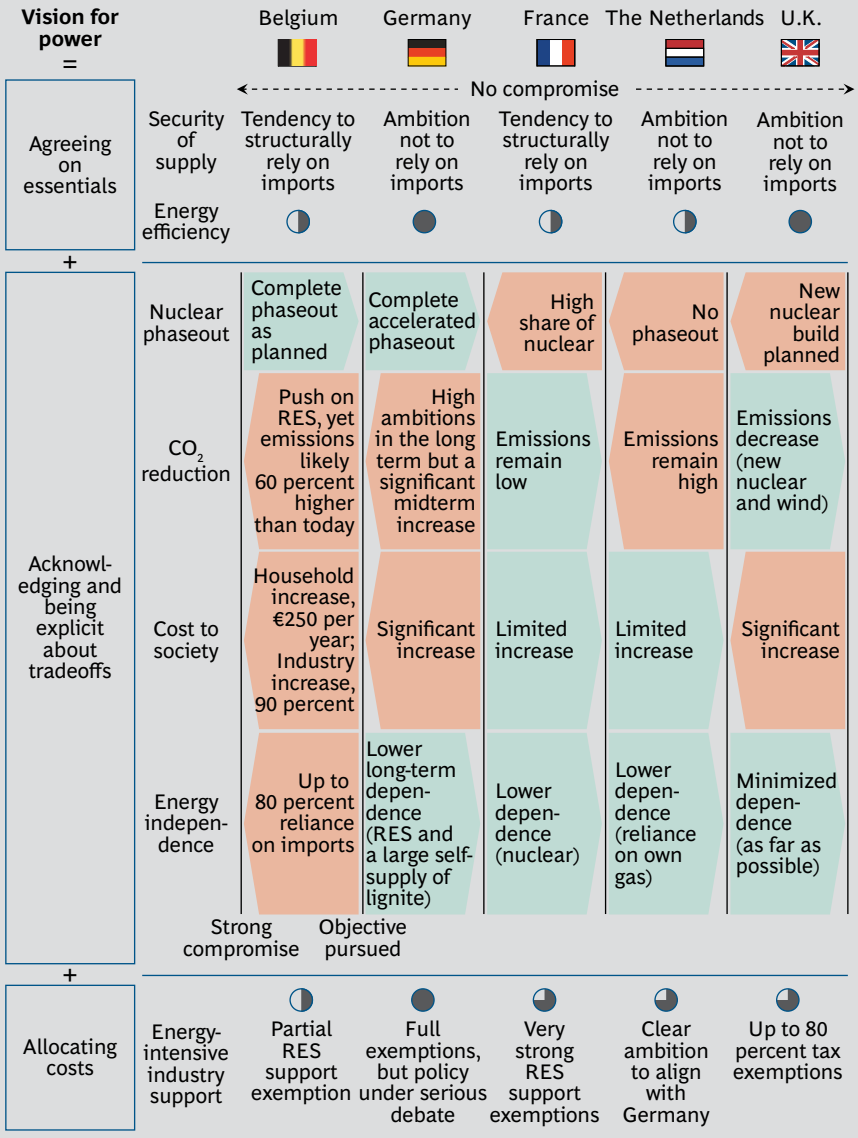
Although the course taken by Belgium provides a direction, it remains unclear in terms of its concrete objectives and, in particular, the tradeoffs that following the course will necessitate.

A country's energy policy can be oriented toward many different objectives. These include minimizing overall power costs, curbing CO_2 emissions, ensuring security of supply, reducing reliance on nuclear generation, increasing energy independence, boosting energy efficiency in electricity among consumers, fostering greater competition in power markets, and attracting investment for new power-generation infrastructure. Multiple objectives require tradeoffs, however. (See the sidebar "What Are Belgium's Neighbors Doing?")

WHAT ARE BELGIUM'S NEIGHBORS DOING?

Belgium's neighbors are pursuing a range of different courses regarding their power landscapes. The paths vary widely with regard to priorities, tradeoffs, and cost allocation principles. (See the exhibit below.)

Belgium's Neighbors Are Pursuing a Range of Different Courses with Regard to Power



Source: BCG analysis.
Note: For energy efficiency, the Harvey ball reflects the stated level of ambition. For energy-intensive industry support, it reflects the level of stated future exemptions. RES = Renewable energy sources.

In crafting a policy, Belgium must acknowledge that it cannot meet all of its goals at the same time. The country must thus focus on the following actions:

- *Agreeing on Essentials.* Essentials are basic requirements that either are too important to compromise on or have no adverse effect on policy goals.

- *Acknowledging and Being Explicit About Tradeoffs.* The implications of potential tradeoffs should be made explicit. For example, if reaching a high level of energy independence has an additional cost for society, this cost should be made transparent and openly communicated.

- *Allocating Costs.* The costs of the policy should be allocated across the different stakeholders—households, industry, and the tertiary (that is, service-based) sector—in a manner that is transparent and takes into account all critical ramifications, such as power costs for the most exposed consumers and industrial competitiveness.

Agreeing on Essentials

There are two essential elements for Belgium as it crafts a vision for its power landscape: security of supply and greater energy efficiency, including greater efficiency in electricity usage.

Security of Supply. A secure supply of power is essential for ensuring that Belgium can meet its power demands at all times. Security of supply therefore cannot be compromised. Whether this means that Belgium should be fully self-sufficient to supply its own peak demand remains subject to debate and has to be evaluated within the context of today's interconnected power markets.

Security of supply cannot be compromised.

Ideally, neighboring and interconnected countries in CWE would pool their reserve capacity and make it available to one another as needed. But such a reliance on imports could carry significant risks to Belgium in the long term, especially given the growing percentage of intermittent renewable capacity in Belgium and most surrounding countries and the high degree of correlation in availability of those sources. (The correlation for availability of wind between Belgium and its neighbors, for example, is estimated to range from 50 to 90 percent.) In addition, the European Network of Transmission System Operators for Electricity projects that available reserve capacity across CWE countries will decrease significantly overall in the coming years.

Therefore, we believe that, in the long run, Belgium should aim to be nearly self-sustainable in order to guarantee itself a secure electricity supply. This implies that, in extreme conditions of peak demand and unavailability of intermittent renewable sources, Belgium would not be in a position to export its own conventional-power production. The extent to which Belgium should pursue near self-sustainability, and the exact time frame, will depend on the evolution of the power landscapes in neighboring countries. It should be stressed that the realization of the more optimal alternative—that of pooling reserve capacities across Belgium and its interconnected neighbors—would be possible only through the creation of an integrated European power policy.

Demand-side management (DSM) could ease the strains on Belgium's power supply. We estimate that, by 2030, DSM could reduce Belgium's peak demand by approximately 0.3 GW by shifting demand—primarily from industry—to off-peak hours. A much larger decrease, especially in demand from small and medium enterprises (SMEs) and residential customers, is possible. But achieving this would require large investments; hence, a significant reduction in demand through DSM seems unlikely prior to 2030. Grid redundancies are another factor that could help reinforce the country's security of supply.

More-efficient electricity usage could provide important benefits to Belgian society.

Greater Energy Efficiency, Including Greater Efficiency in Electricity Usage. More-efficient electricity usage could provide important benefits to Belgian society in terms of both total cost and environmental impact. (This is why Germany, for example, has made greater efficiency a cornerstone of its vision for electricity for the coming decades.) We estimate that greater efficiency could ultimately reduce annual electricity demand in Belgium from 7 terawatt-hours (TWh) (our base case, which assumes realistic uptake of the current efficiency policies) to as much as 23 TWh (an ambitious target that assumes an extensive realization of power consumption reductions with a positive net present value).

In parallel with this focus on greater efficiency, however, certain forces will act to increase Belgium's power demand: economic growth (projected to be approximately 1 percent per year through 2030) and new uses of electricity (notably, the development of heat pumps and electric cars). Net-net, the country's annual power demand will likely rise slightly in the coming years, from about 83 TWh today to approximately 87 TWh in 2030. (See Exhibit 2.)

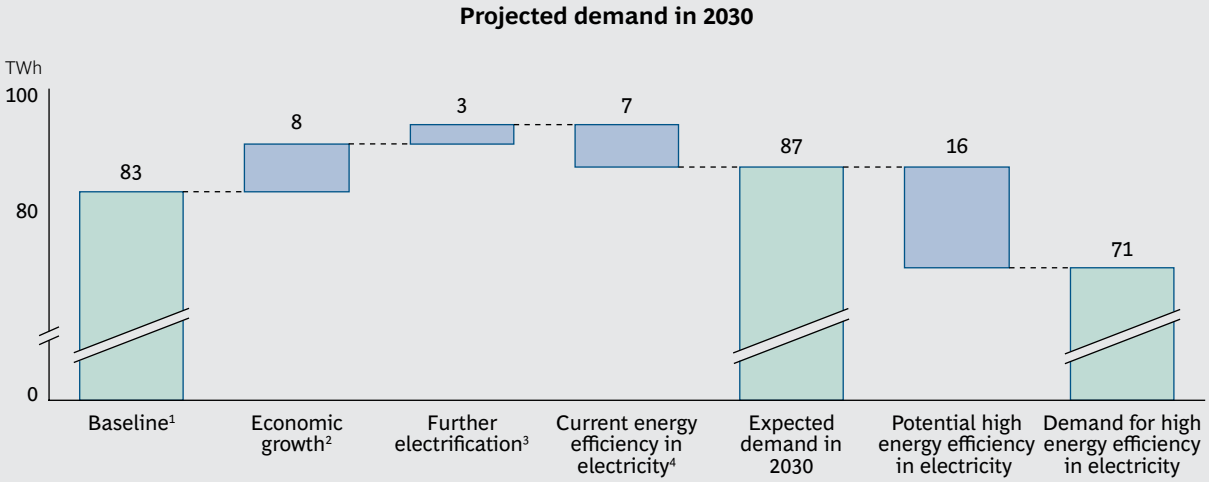
Achieving an annual 23-TWh energy-efficiency reduction by 2030 would require substantial investments—approximately €9 billion, with an average payback period of five years. (This amount is approximately two-thirds of what Belgium expects to invest in solar PV support over the same period.) Pursuing this ambitious scenario would, however, mitigate the increase of the average household's electricity bill by approximately €145 per year, lowering the increase from about €250 to about €105. The power price paid by industrial customers under this scenario would still increase approximately 90 percent, although this would be compensated, to a degree, by an average 18 percent reduction in consumption. Belgium's CO_2 emissions would be reduced significantly, rising 20 percent versus 60 percent under the base case.

Realizing this large gain in energy efficiency would require significant effort, given that investors are typically averse to the relatively long payback periods for efficiency initiatives. Attempting to foster a greater focus on efficiency through price signals is unrealistic, because it would require extremely high power prices for most users to make efficiency a priority. Authorities should thus consider a well-balanced approach of norms (residential power consumption has been reduced by banning incandescent light bulbs, for example) and adequate incentive schemes that help finance investments.[2]

Acknowledging and Being Explicit About Tradeoffs

Belgium's current course entails significant tradeoffs, particularly on four fronts: the phaseout of nuclear generation, CO_2 emissions, the total cost to society, and energy

Exhibit 2 | Belgium's Power Demand Will Be Slightly Higher in 2030



Sources: Synergrid; Fraunhofer Institute for Systems and Innovation Research; Belgium's Federal Planning Bureau; BCG analysis.
[1]The baseline is based on average final power demand (excluding losses) from 2010 through 2012. Demand in 2012 was low as a consequence of the ongoing economic crisis and cannot be considered a stable reference.
[2]The projection of increased power demand driven by GDP growth is based on regression analysis of power demand as a function of GDP from 2000 through 2010. Belgium's Federal Planning Bureau forecasts 1.4 percent GDP growth from 2013 through 2018 (*Economic Forecasts, 2013-2018,* May 2013). For our longer-term projections, we chose to moderate this growth rate to 1 percent.
[3]This estimate is based on moderate assumptions for new uses of electricity (for example, 5 to 10 percent penetration of electric vehicles and heating pumps by 2030).
[4]Estimated based on the Fraunhofer Institute for Systems and Innovation Research's *Study on the Energy Savings Potentials in EU Member States, Candidate Countries, and EEA Countries* (2009, commissioned by the European Commission) and updated to reflect recent policies.

independence. (See Exhibit 3.) The country should acknowledge these tradeoffs and be explicit about their implications.

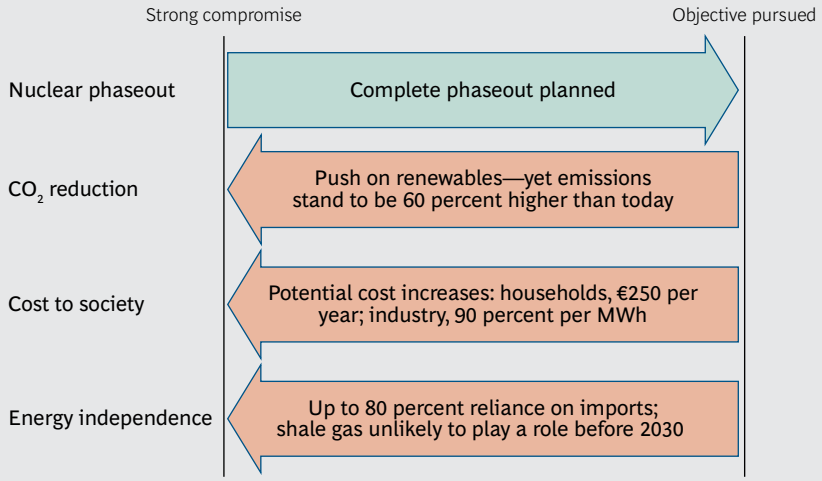
Nuclear Phaseout. Belgium has made a clear choice to phase out nuclear generation. However, decommissioning both nuclear plants and other conventional plants that have reached the end of their life cycle, together with the push to develop renewable energy, will require that the country develop approximately 17.4 GW of new generation capacity (taking into account upgrades of existing plants) by 2030.

CO_2 Reduction. Belgian authorities seem predisposed toward gas over coal as a replacement for the country's decommissioned nuclear capacity, a preference based on gas's more favorable environmental profile. Investments in renewable generation over the coming years, notably in offshore wind, will decrease CO_2 emissions from power generation by 20 percent by 2020 (compared with 2013 levels). In the longer term, however, the projected net increase of approximately 7.0 GW of gas-fired capacity by 2030 will increase the country's CO_2 emissions by approximately 9.1 million tons—a 60 percent increase over 2013 levels—despite the fact that a substantial part of this capacity will produce power only at times when renewable sources are not producing.

Cost to Society. As noted, building the new generation mix on the basis of renewables and gas plants will require approximately €24 billion in up-front investments (including investments for both plant installation and grid development) by 2030,

Exhibit 3 | Belgium's Current Course Entails Significant Tradeoffs

In phasing out nuclear energy, Belgium has had to compromise on other important fronts



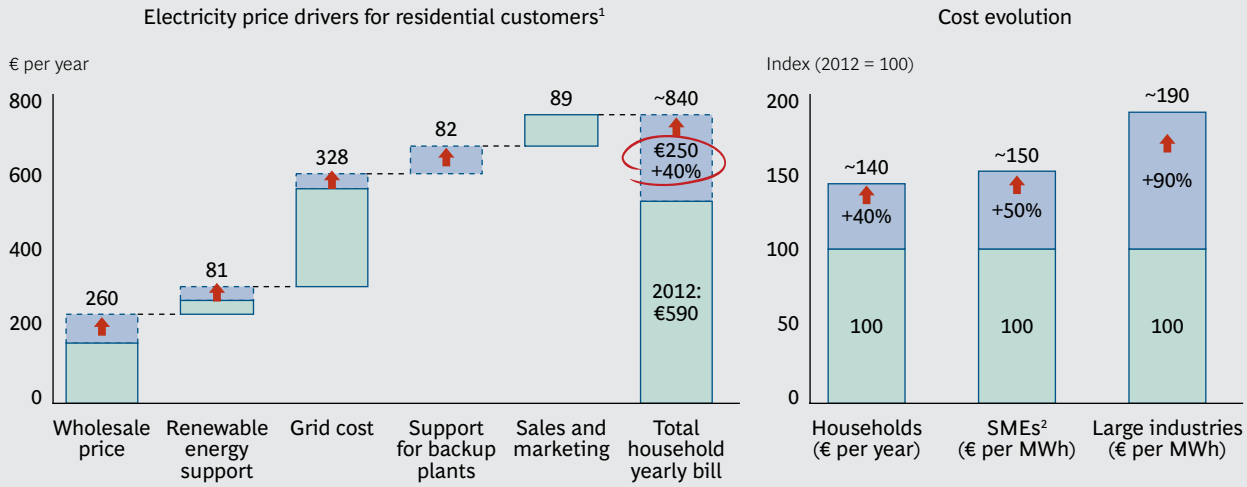
Source: BCG analysis.

of which approximately €10 billion will be required prior to 2020. These investments and the related operation and maintenance costs will trigger an incremental cost increase to consumers of approximately €250 per year for an average household (in 2012 euro values, excluding value-added tax). It will also nearly double the power price paid by industrial customers (a 90 percent increase in euros per megawatt-hour). This increase could have a major impact on the competitiveness of several industries in Belgium.

These estimates are based on current pricing mechanisms (excluding value-added tax), consisting of wholesale prices (based on short-run marginal costs), support for renewable energy (combining all green and cogeneration certificate costs applied to the projected renewable energy generation), and grid costs (at the transmission and distribution levels, taking projected future investments into account). In addition, we have added a new component, "support for backup plants," to reflect the support needed to ensure an attractive business case for conventional power plants that would operate for only a limited number of hours.[3] To date, such support has been allocated on a per consumption basis. Last, sales and marketing costs have been added and assumed stable compared with today. (See Exhibit 4.)

Energy Independence. The high percentage of gas in Belgium's power-generation mix will reinforce the country's dependence on conventional-gas-exporting countries or, alternatively, on power imports from neighboring countries. This implies that Belgium will be reliant on imports for as much as 80 percent of its future power supply. Overall, this will affect Belgium's trade deficit, as Belgium will import power while subsidizing its own plants. A potential mitigating factor—the development of shale gas in Europe—is unlikely to have a fundamental impact on Belgium's pursuit of energy independence, or on gas prices across the continent, before late in the next decade.

Exhibit 4 | Price Increases for Belgian Consumers in 2030 Will Be Driven by a Range of Underlying Factors



Sources: Federal Commission for the Regulation of Electricity and Gas (CREG); Frontier Economics; Vlaamse Regulator van de Elektriciteits- en Gasmarkt (VREG); Cwape; Elia; Synergrid; London Economics International; Eurostat; BCG analysis.
Note: We assume annual consumption of 3,500 kWh for an average household, 160,000 kWh for an average SME (distribution system operator connected), and 250 GWh for a large industry (transmission system operator connected). Prices in 2012 (excluding value-added tax) are €169 per MWh for households, €115 per MWh for SMEs, and €60 per MWh for large industries.
[1]Components for an average household (in € per year, excluding value-added tax) assuming current interconnections.
[2]Small and medium enterprises.

Within the European market context, this stance could result in other undesirable consequences for Belgium as well. CWE countries' increasing reliance on intermittent renewable power generation, coupled with their diverging choices on their future generation mixes, suggests that substantially more interconnection capacity will be needed across the region to ensure that markets remain coupled and price levels across countries remain relatively uniform. The required investment to build this additional capacity could be substantial: for Belgium alone, it could be as much as €1.5 billion.

Given that countries currently tend to make such choices independently rather than on a regional level, and given investors' current reluctance to commit to long-term investments in the power arena, there is some question about whether the needed interconnection capacity will ultimately materialize. If the additional capacity does *not* materialize, the cost to Belgium, as demonstrated previously, could be considerable, given that a shortage of interconnection capacity would result in increasingly divergent energy prices among countries. With its expected reliance on (relatively expensive) gas-fired power generation, Belgium would experience higher power prices than its neighbors. This would hamper the competitiveness of Belgian industry.

Belgium's heavy reliance on gas could work to its disadvantage even if sufficient interconnection capacity *is* built and markets stay largely coupled. Greater interconnection capacity would allow Belgium to import power, including possibly relatively cheap nuclear or coal-based power, which could lead to lower wholesale prices

for the country. But greater interconnection capacity might also result in Belgium's gas-fired power plants becoming the de facto reserve capacity for the entire region, called on to provide power during annual peaks in demand or to offset intermittent renewable production. In this role, these plants would operate for only a limited number of hours a year—likely not enough to ensure their financial breakeven. Therefore, these plants' operation would need to be financed in some way, potentially through a higher electricity bill or a different mechanism. Regardless, Belgium would have to pay for it.

Obviously, the power markets' precise evolution to 2030 will depend strongly on the evolution of global gas and coal prices. Gas-fired generation could ultimately become less expensive than coal-based generation, delivering sizable benefits to Belgium, though we consider such a scenario relatively unlikely. Therefore, we believe that Belgium should anticipate and address the potential negative consequences of the course it is taking.

Allocating Costs

Policymakers could opt for different cost-allocation mechanisms to pay for the plan. The challenge is to choose one that strikes an optimal balance in its impact on stakeholders, particularly industries and households. A significant electricity-price increase could weigh heavily on the competitiveness of Belgian industry, particularly for industries whose electricity costs represent an important share of total production costs and industries that can be delocalized or are competing in the regional or global markets. Allocating a higher share of the burden to all households, however, could raise social concerns.

A significant electricity-price increase could weigh heavily on the competitiveness of Belgian industry.

To understand the potential impact of higher electricity costs on Belgian industry, consider two power-intensive industries: chemicals and pulp and paper. Both would be materially affected by the projected price increase for electricity under Belgium's current plan. The chemical industry, which directly employs 91,500 people in Belgium, could see its production costs increase by about 17 percent by 2030, making U.S. imports roughly 4 percent cheaper.[4] The pulp and paper industry, which directly employs 4,000 people, would see a roughly 9 percent increase in its total cost of production, which would make local Belgian production approximately 3 percent less attractive than French imports and 6 percent less attractive than U.S. imports by 2030.[5] The pulp and paper industry would also face a disadvantage relative to its European competitors, particularly those in France, which have direct access to cheap nuclear-generated power.

Other CWE countries, it should be noted, are actively taking steps to ensure that their environmental policies do not negatively affect their industrial competitiveness. Two prominent examples are Germany and the U.K. (See the sidebar "Other Countries Are Taking Steps to Maintain Their Industrial Competitiveness.")

To limit the power cost increase for power-intensive enterprises to a level similar to that of Belgium's neighbors, Belgian authorities could allocate a greater percentage of the plan's cost to households. Were the government to limit the power bill increase of energy-intensive industries by 30 percent versus the current level—an increase estimated to be aligned with rising power costs for Belgium's neighbors—

OTHER COUNTRIES ARE TAKING STEPS TO MAINTAIN THEIR INDUSTRIAL COMPETITIVENESS

Among Belgium's neighbors, both the U.K. and Germany serve as examples of countries that are investigating measures to ensure that their power policies do not impede the countries' industrial competitiveness. In a jointly issued statement in 2012, the U.K.'s Right Honourable Vince Cable, MP, secretary of state for business, innovation, and skills and president of the board of trade, and the Right Honourable Edward Davey, MP, secretary of state for energy and climate change, said this:

> *In the absence of a global agreement to mitigate climate change, …unilateral EU and UK carbon pricing measures pose challenges for our energy intensive industries, which must remain internationally competitive as we drive down domestic emissions.*
>
> *These industries, of course, have an essential role to play in achieving our transition to a low-carbon economy as well as contributing to jobs and growth. Energy intensive manufacturing is central to strengthening our industrial base and rebalancing our economy.*
>
> *We have therefore introduced a £250 million package to limit the impact of our policies on such businesses.*

In Germany, the country's Federal Office of Economics and Export Control, in a law written in 2008 and revised in 2011, limited the German Renewable Energy Act (EEG) tax charged to energy-intensive manufacturing industries with high power consumption, a move intended "to reduce the power costs of these companies and so preserve their international and intermodal competitiveness." This exemption mechanism for industry is currently under serious debate, however, given that the electricity bill for German households has already significantly increased over the last five years.

Belgian households would see their bill increase by as much as €340 per year. The tertiary sector could experience a bill increase of approximately 65 percent.

This principle of limiting the electricity bill for industry would be similar to the principle that limits the rise of Belgium's labor cost to a rate in line with that of its neighbors, a principle incorporated into Belgian law.

Eight Recommendations for Policymakers

We encourage Belgian policymakers to integrate the following eight recommendations into the course they have set for the country's power landscape, giving particular consideration to the long-term implications of policy choices.

- *Be transparent about present and future tradeoffs and anticipate their implications.* Policymakers should engage in a transparent, constructive public debate on the

future of power in Belgium, with tradeoffs and their implications made explicit. All stakeholders should be aware of the economic and environmental implications of Belgium's emphasis on renewable energy sources and gas-fired generation, both of which are subsidized. An increase of approximately €250 per year in the average household's electricity bill, a potential near doubling of the power price for industry, a power-generation-related rise in CO_2 emissions of roughly 60 percent by 2030, and increased dependence on non-European gas imports are substantial implications for society. They should be acknowledged in a transparent way and anticipated by policymakers, business stakeholders, and the public.

- *Emphasize the preservation of Belgium's industrial competitiveness.* To avoid reinforcing the ongoing deindustrialization and related job destruction taking place in Belgium, policymakers should emphasize preservation of the international competitiveness of the country's electricity-intensive industries in the debate on the future of power. Neighboring countries, such as the U.K. and Germany, that are wrestling with similar challenges as they formulate new policies on power are considering putting in place exemptions to help preserve their respective industries' competitiveness; Belgium could do the same. Preserving the country's industrial competitiveness would, however, mean that households and non-electricity-intensive businesses would carry the lion's share of the bill for Belgium's power policy, increasing the importance of mechanisms to protect the most vulnerable households.

- *Focus on energy efficiency.* Enhanced energy efficiency has the potential both to mitigate upward pressure on the country's power bill and to reduce power-generation-related CO_2 emissions. A more aggressive push on energy efficiency in electricity could reduce the country's power demand by an additional 16 TWh per year. The measures required to reach this potential imply investments—for example, in new appliances or industrial equipment. However, these investments are business case positive, with a payback of approximately five years on average, and the required €9 billion investment represents only two-thirds of what Belgium expects to invest in solar PV support. Were these efficiency measures enacted, the expected increase in household electricity bills of approximately €250 per year by 2030 could be limited to about €105 per year. CO_2 emissions would still increase compared with today's levels (given partial replacement of nuclear generation with thermal units), yet by only 20 percent rather than 60 percent.

  Given the relatively long payback period on energy efficiency investments—most residential and industrial consumers shy away from investments with paybacks that are much longer than a year—policymakers might have to take steps to ensure that the necessary investments and efforts are made. To spur small consumers, for whom the savings in power costs might not be sufficiently tangible, policymakers might need to institute norms, potentially complemented by limited subsidies, to drive the necessary behaviors. For large consumers, policymakers might have to provide financial incentives and financing aid, potentially complemented with select norms, while taking steps to limit the impact on the country's industrial competitiveness.

Policymakers might have to take steps to ensure that the necessary investments are made.

- *Consider solutions of the future, not just the past.* As part of its vision, Belgium should consider integrating a number of innovative technologies that could potentially play game-changing roles in the country's power landscape. In contrast to its approach to renewables, Belgium should not shy away from making differentiated choices toward these new technologies: either invest in a field of expertise where the country has a genuine chance to develop a competitive edge that could be exploited commercially in an international attractive market or wait for others to push the technology down the experience and cost curve. Does Belgium believe it can ever develop a competitive edge in solar energy, for example? Or should the country instead focus its investment (and subsidies) on energy efficiency or possibly power storage or DSM?

Belgian policymakers must ensure that stable, harmonized regulations are in place.

- *Design adequate incentive policies and subsidies for technologies.* Any incentive scheme put in place by policymakers—for example, in support of differentiated choices regarding new technologies—needs to be embedded within a transparent, strategic logic that considers the maturity of the underlying technology, the technology's economic performance in a Belgian context, and the incentive scheme's potential impact on explicit tradeoffs. Adequate incentive mechanisms could include R&D support in the early stages of development if a technology is potentially game-changing (for example, storage), temporary aid to ensure adoption if a solution is genuinely expected to become economically viable (for example, onshore wind and energy efficiency measures), and aid to sustain the realization of an economically unattractive yet desired solution (for example, offshore wind) as long as this is made transparent. If none of these conditions is met, it is better to wait and potentially embrace the technology at a later stage.

- *Stabilize and harmonize the rules of the game.* To guarantee a secure supply of electricity, Belgian policymakers must ensure that stable, harmonized regulations are in place. Existing rules have failed to foster confidence among private investors, primarily because of the frequent, abrupt, and uncoordinated changes that have occurred recently. Harmonization will require close collaboration among authorities at all levels—European, federal, regional, and local—as well as solid competencies to understand the consequences of policy evolution.

- *Make explicit the design of the future power market.* The current direction taken by Belgium's policymakers will have profound implications for the market's design. The country's continued subsidy-driven development of renewables will now be complemented by additional intervention, as the state has announced its intent to subsidize new gas-fired power plants. This injects another element of uncertainty in the eyes of investors. To quell investors' concerns, Belgian authorities need to be clear on whether they remain confident that a liberalized structure can ensure a secure supply of electricity going forward. If they do believe so, policymakers should act urgently to restore confidence among private investors and avoid a scenario where only state-guaranteed investments remain. If policymakers do not believe so, they should be explicit on how they plan to turn back the clock on liberalization.

- *Continue efforts to pursue policies at a European level.* Belgium and its neighbors are interconnected, and choices made by one country have an impact on the

others. Policies regarding power should therefore ideally be formulated at the CWE level, at a minimum, and expanded to the rest of the EU as interconnections among the countries are further developed. Thus, policymakers should continue their efforts to federate decision making across countries in order to help establish a power policy at a European level. If they determine, however, that these efforts would not lead to such an integrated policy, policymakers should recognize that Belgium has no other choice than to pursue its own course while avoiding any undesirable consequences vis-à-vis the objectives pursued by its neighbors and global trends.

NOTES

1. Conventional peak is the necessary supply to be delivered by conventional power plants to cover the gap between demand for electricity and the supply provided by renewables and other must-run sources (for example, cogeneration).

2. The higher credit risk associated with energy efficiency investments owing to the less tangible nature of their returns remains a hurdle to securing sufficient investment. Germany, however, has managed to counter this to an extent in the case of SMEs. The government helps SMEs identify energy efficiency opportunities and provides subsidized loans to help SMEs fund the implementation of the identified measures.

3. We have assumed at this stage that this "strategic reserve" cost would be paid for by consumers through their power bill. However, other mechanisms—including those currently under consideration by Belgian authorities—might be applied as well in the future.

4. This projection is based on Nexant ChemSystems' data for a nonintegrated polyvinyl chloride producer. The cost advantage that integrated U.S. producers enjoy as a result of cheaper ethane feedstock due to U.S. shale-gas developments can amount to up to several hundred dollars in today's market environment; this has not been taken into account for this comparison.

5. This projection, based on Confederation of European Paper Industries and RISI data, considers only the direct impact of higher power and CO_2 prices. This sector could also experience an increase in production costs as a result of a rise in the price of wood, because wood will be in demand as a source of biomass fuel. It could also experience an increase in the price of the chemical products used in its production process, given that these products will be affected by an increase in power prices. Note that BCG's estimate is based on industry averages and that the effect could differ significantly among plants.

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