EU ENERGY UNION: A CRITICAL VIEW

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The Vision and the Project

This paper discusses the Energy Union project of the current European Union (EU), as manifest in the 2018 *Clean Energy for All*.[1] The focus is on energy policy objectives in relation to wider political ambitions, using energy policy to further convergence and integration of member countries, centralizing authority, and strengthening Brussels' authority. Emphasis is on the interaction between France and Germany as the historical driving force.[2] The discussion will focus on policies and performance since the finance crisis in 2008–2009. The overriding objective is to reduce greenhouse gas emissions by 85 to 90 percent by 2050 from their 1990

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The author would like to thank Dag Harald Claes of the University of Oslo, Thierry Bros of the Oxford Institute for Energy Studies, and Olivier Massol of IFPEN in Paris. They have provided constructive criticism, but have no responsibility for the views expressed in the paper.

levels.[3] Indeed, from that perspective, the EU energy policy is to a large extent about climate.

The EU's ambition is to be in the forefront of a worldwide energy transition from fossil fuels to renewables is apparently based on two propositions:

1. Climate concerns cause limitations on the use of fossil fuels, including oil and natural gas.
2. Supplies of fossil fuels are limited, causing oil and natural gas prices to rise.

These assumptions are mutually contradictory. Apparently, EU policy assumes *both too little and too much oil and natural gas* are available.

The theory of man-made global warming postulates that there is too much fossil fuel, also oil and natural gas, available with cheap oil and natural gas dominating. Constraints are on the uses and demand, not on supplies. The proposition is that thorough and early decarbonization will strengthen EU industrial competitiveness when other regions will belatedly wake up and emulate the EU. By moving ahead of the rest of the world in the preference for renewable energy, the tacit assumption is that a short-term cost drawback will turn into a long-term competitive advantage.

The Peak Oil theory postulates that there is too little oil and natural gas in the world. Constraints are on supplies, not on demand. The proposition is that looming oil and natural gas scarcity will make decarbonization economically sensible and investment in renewable energy a profitable business. Oil and natural gas prices will rise to a level where non-carbon energy will be competitive

The combination seems contradictory. Implicitly, EU policy makers are choosing a double bet: using oil and natural gas will be progressively more damaging because scarce supplies will be increasingly expensive and effects will be ever more harmful to the climate. Neither theory has been proved or disproved; both are subject of scientific dispute.

Therefore, the vision behind the EU energy and climate policies rests on considerable uncertainty that is pertinent to the economy. Simply put, the level of carbon dioxide (CO_2) emissions is a function of economic activity multiplied by carbon intensity, set by technology, called the Kaya Identity.[4] In this context, it means that the balance between decarbonization policy ambitions and reductions in carbon intensity, set by technology gains, will determine the room for economic growth.[5] For decarbonization *not* to slow economic growth, carbon intensity must recede at a higher rate. In the contrary case, if carbon intensity stagnates or falls at a lower rate, economic growth will suffer or decarbonization targets will not be met, or a combination of two missed goals. The carbon coefficient can a useful concept in this context, meaning the relationship between economic growth and the growth of CO_2 emissions; the lower the carbon coefficient, the higher the potential for cutting emissions without compromising economic growth.

The EU is on track in meeting the *"20-20-20"* targets set in 2007 for 2020; a 20-percent reduction in greenhouse gas (GHG) emissions from their 1990 levels, 20 percent of EU energy from renewables, and a 20-percent improvement in energy efficiency. However, the EU has *no* targets for employment or income; economic stagnation helps the EU reach the 2020 climate and energy targets. In the EU, climate and energy policy objectives apparently have priority over economic and social objectives. The EU has shown that economic austerity is a method for curbing CO_2 emissions. In the absence of major technological breakthroughs, accelerated decarbonization will have an economic and social cost.

So far, the experience does not match policy ambitions.

> The goal of a resilient Energy Union with an ambitious climate policy at its core is to give EU consumers—households and businesses—secure, sustainable, competitive and affordable energy. Achieving this goal will require a fundamental transformation of Europe's energy system.[6]

This points to a comprehensive understanding of sustainability, balancing economic, environmental, and social objectives.[7] In practice, however, energy and climate policies are often elaborated and enacted with little or no regard for their economic impact, let alone their social cost or their potential for provoking a political backlash.[8] This is apparently the case in the EU, whose climate and energy ambitions are not matched by economic and social considerations.

The Record

Supply security, prices, and emissions are yardsticks. The ambition of competitive and affordable energy supplies contrasts with reality; EU electricity prices

Table 1
ELECTRICITY PRICES FOR INDUSTRY AND HOUSEHOLDS, 2009 AND 2017
(in U.S. dollars/megawatt hour)

	Industry		Households	
	2009	**2017**	**2009**	**2017**
France	107	109	160	187
Germany	140	143	318	344
Italy	203	177	291	263
United Kingdom	134	128	191	206
Japan	158	150	239	227
United States	68	69	115	129

Source: International Energy Agency (IEA) database.

are two to three times those paid by U.S. consumers, whether industry or households (table 1).

An independent study, ordered by the European Commission, concludes that the burden of EU energy policy largely falls on households.[9] In general, EU wholesale energy prices are equal to or lower than those in many other regions, but retail prices are much higher. This is especially the case for households but, to a lesser extent, for industry. On a weighted average, EU households pay more than twice the prices than their counterparts in the other G-20 countries for electricity and at least 50 percent more for natural gas. The difference is largely due to taxes, including the value-added tax levied on EU consumers. Special taxes imply that consumers pay a politically determined surcharge for energy, above world market prices.

The issue is the purpose of the surcharge and the eventual success in meeting the target. European countries have a historical record of taxing oil products, at first in order to curb demand and imports, then to finance road construction, and, finally, to fund public budgets. The explicit target of EU energy policy is to reduce CO_2 emissions by promoting and subsidizing renewables as well as enhancing energy efficiency and limiting energy demand growth. It represents an additional reason, or some would even argue pretext, to make energy more expensive for consumers than justified by the market alone.[10]

Historically, motivations for taxing energy have shifted, but the low price elasticity of domestic and commercial energy demand represents a constant temptation for politicians and governments to impose taxes for fiscal purposes. In the case of oil, the concern about resource depletion—implying a looming scarcity—has yielded to a concern about global warming, implying an abundance, which justifies intervention and taxation.[11]

Because capital and labor cannot entirely substitute for energy, energy price increases not compensated for by energy efficiency gains or other measures, risk compromising economic activity.[12] Briefly, energy taxes can have a deflationary effect, harmful to economic growth and employment. In Europe, high energy costs have compounded the deflationary effects of the euro zone austere budgetary policy.[13] Austerity can appear as a politically imposed reduction in wages, prices, and public budgets in order to restore competitiveness.[14] As practiced by the euro zone since the financial crisis of 2008–2009, cutting energy use and CO_2 emissions has been an outcome, if not an intentional one. Thus, economic failure is the reverse side of a perceived successful energy policy.

High electricity prices have *not* helped the European Union make more progress than the United States on energy efficiency, measured as energy consumption *in relation to economic growth*. That is also the case with CO_2 emissions. In spite of much higher electricity prices, Germany has performed *less well* than the United States on both energy consumption and CO_2 emissions. Among the major EU countries, the United Kingdom had the best record (table 2).

Table 2
ENERGY CONSUMPTION AND CARBON DIOXIDE (CO_2) EMISSIONS, 2009 AND 2017

	Energy Consumption (in million tonnes of oil equivalent)			CO_2 Emissions (in million tonnes)		
	2009	2017	2009 - 2017 Growth	2009	2017	2009 - 2017 Growth
France	248	238	-4 %	356	320	-10 %
Germany	315	335	6 %	751	764	2 %
Italy	170	156	-8 %	405	344	-15 %
United Kingdom	208	191	-8 %	513	398	-22 %
European Union	1,711	1,689	-1 %	3,839	3,542	-8 %
Japan	472	456	-3 %	1,111	1,177	6 %
United States	2,159	2,235	3 %	5,296	5,088	-4 %

Source: BP, *BP Statistical Review 2018* (London: BP, 2018).

From 2009 to 2017, the EU economy grew by 13 percent, measured in constant prices, while primary energy consumption fell by 1 percent. During these years, Germany had an economic growth of 19 percent, while energy consumption increased by 6 percent and CO_2 emissions rose by 2 percent. By comparison, the United States had a real economic growth of 19 percent and an increase in primary energy consumption of 3 percent, with much lower energy prices. Japan performed even better, with a real economic growth also of 13 percent and a decline in primary energy consumption of 3 percent. In relation to economic performance, as shown in table 3, the strongest reduction in CO_2 emissions took place in the United Kingdom, followed by the United States, and France. In case of Brexit, the remaining EU-27 will face challenges to meet collective targets.

Table 3
ECONOMIC GROWTH AND CARBON DIOXIDE (CO_2) EMISSIONS, 2009 AND 2017

	CO_2 Emissions (in million tonnes)		Gross Domestic Product (GDP) (in constant prices in billions of local currency)		Carbon Coefficient
	2009	2017	2009	2017	
France	356	320	2,026	2,249	0.81
Germany	751	764	2,472	2,929	0.86
Italy	405	344	1,578	1,595	0.84
United Kingdom	513	398	1,716	2,002	0.66
European Union	3,839	3,542	11,885	13,426	0.82
Japan	1,111	1,177	472,229	531,642	0.94
United States	5,296	5,088	15,209	18,051	0.81

As shown in table 3, despite high ambitions, high energy prices and high expenditure on renewable energy, Germany has underperformed on energy and carbon efficiency gains compared to the United States. The U.S. score on improving energy efficiency and reducing CO_2 emissions is related to its higher point of departure. In 2009, the United States had *much* greater energy use and CO_2 emissions in relation to economic performance than France, Germany, Italy, or the United Kingdom. By 2017, the difference had diminished. Apparently, in Germany high energy prices have not been a *sufficient* condition for energy efficiency while in the United States they have not been a *necessary* condition. Prices may not always be the most efficient tool in energy policy, at least not alone. (An overview of EU member countries economic indicators, energy consumption, and CO_2 emissions is given in the Appendix.)

From 2009 to 2017, the European Union had lower economic growth than the rest of world, with the euro area having the lowest score. Germany stands out with an economic growth rate almost twice the euro zone average. Germany had higher economic growth and a poorer score on energy conservation and emissions reduction than France.

Dynamic Ambitions

From the 2011 launch of *Energy Roadmap 2050* to the 2018 *A Clean Planet for All*, the emphasis is increasingly on climate, governance, and monitoring member states' progress on required integrated national energy and climate plans.

Table 4
ECONOMIC GROWTH, 2009–2017

	Average Annual Economic Growth Rates 2009–2017
India	7.5 %
China	6.1 %
ASEAN-5	5.0 %
Sub-Saharan Africa	4.3 %
Middle East and North Africa	3.3 %
Latin America and the Caribbean	1.9 %
Russia	1.7 %
United States	1.6 %
Germany	1.3 %
European Union	1.0 %
France	0.8 %
Euro Zone	0.7 %
World	3.4 %

Source: International Monteary Fund (IMF) Database.

The 2018 *A Clean Planet for All* explicitly presents energy policy as a tool of a climate strategy. The 2016 *Clean Energy Package* emphasized energy efficiency, leadership in renewable energy, as well as "a fair deal for consumers." Like the predecessor, the European Coal and Steel Community's (ECSC) objectives are also political, using energy policy to achieve closer institutional integration of the EU member states:

> The new policy framework brings regulatory certainty, in particular through the introduction of the first **national energy and climate plans**, and will encourage essential investments to take place in this important sector.
>
> It empowers European consumers to become fully active players in the energy transition and fixes two new targets for the EU for 2030: a **binding renewable energy target of at least 32% and an energy efficiency target of at least 32.5%** —with a possible upward revision in 2023. For the electricity market, it confirms the **2030 interconnection target of 15%**, following on from the 10% target for 2020. These ambitious targets will stimulate Europe's industrial competitiveness, boost growth and jobs, reduce energy bills, help tackle energy poverty and improve air quality.[15]

The ambition seems to be that the Energy Union will be a solution to multiple issues, not only clean, secure, and affordable energy supplies, but also economic welfare, employment, and industrial restructuring, while climate concerns override energy policy. Realism is debatable. A pertinent comment on the wish list is that:

> The Energy Union means making energy more secure, affordable and sustainable. It will facilitate the free flow of energy across borders and a secure supply in every EU country, for every European citizen. New technologies and renewed infrastructure will contribute to cutting household bills and creating new jobs and skills, as companies expand exports and boost growth. It will lead to a sustainable, low carbon and environmentally friendly economy, putting Europe at the forefront of renewable energy production, clean energy technologies, and the fight against global warming.[16]

However, social costs receive little attention. From 2009 until 2017, the world economy grew at an average annual rate of 3.4 percent, with an accumulated growth of 35 percent; the figure for the European Union was 1.6 percent, with an accumulated growth of 14 percent. Some member countries, such as France and Italy, by 2017 had high unemployment, around 10 percent of the labor force, whereas for nations, such as Germany and the United Kingdom, the figure was around 4 percent, like the United States. Moreover, high energy costs add to the strains that the euro has inflicted on southern Europe.[17]

Integrating energy and climate policies of the member states, the Energy Union project appears as part of a supranational endeavor.[18] The overriding political aim is integration and convergence of EU member states, even more

than meeting the actual energy challenges. The EU Energy Union is a tool of a visionary climate policy that hopes to be socially equitable and cost efficient. Key references are the International Panel on Climate Change (IPCC), and the Paris Climate Agreement, as well as the United Nations (UN) Sustainable Development Goals.

The IPPC produces many documents. Its *Assessment Reports* and their annexes present the scientific findings, with a thorough discussion of the issues and uncertainties, balancing different views, and reservations. The *Fifth Assessment Report* published in 2013–2014 highlighted insufficient insight on key issues. Reservations were expressed by Working Group 3 on "Integrated Risk and Uncertainty Assessment of Climate Change Response Policies."[19] In the section "Climate Responses to Greenhouse Gas (GHG) Emissions, and their Associated Impacts," the text states:

> The large number of key uncertainties with respect to the climate system are discussed in Working Group I (WGI). There are even greater uncertainties with respect to the impacts of changes in the climate system on humans and the ecological system as well as their costs to society. These impacts are assessed in WGII.

The section "Stocks and Flows of Carbon and Other GHGs" reiterates the reservations:

> The large uncertainties with respect to both historical and current GHG sources and sinks from energy use, industry, and land-use changes are assessed in Chapter 5. Knowledge gaps make it especially difficult to estimate how the flows of greenhouse gases will evolve in the future under conditions of elevated atmospheric CO_2 concentrations and their impact on climatic and ecological processes.

Ahead of the *Assessment Reports*, the IPCC publishes a *Summary for Policy Makers*. Most of the intermediary IPCC special reports are brief, simple, and widely read. The *Summary Reports* get the attention of journalists, policy makers, and academics, more than the lengthy and more balanced *Assessment Reports*. The part of the *Working Group 3* assessment of the scientific uncertainty, quoted above, is *not* included in the *Summary for Policymakers*. Many readers interpret likelihood as certainty, making the messages stronger and politically more potent than the more balanced and measured scientific texts. Evidently, the major texts are not widely read, even by policy makers.

The various EU documents rely on the IPCC summaries and brief reports. Taking the most alarmist statements at face value and discarding uncertainty and doubt, their discussion of climate issues, at times, appears predisposed and categorical, with a political purpose. A tempting question is to what extent the EU authors deliberately present a more pessimistic outlook in order to provoke political action and mute the more critical voices. Referring to the 2015 Paris

Agreement, the recent EU energy reports do not take into account the departure of the United States nor the problems of funding and implementation.[20]

The climate vision is to prevent global temperatures from rising more than 1.5°C above pre-industrial levels, but that figure is arbitrary, not based on science.[21] There is no discussion of historical climate complexity, variations over time, or differences between regions. The EU documents are oblivious to any discussion of eventual positive effects of rising atmospheric content of CO_2, as on agricultural productivity.[22] The lack of historical references to climate changes is remarkable.[23]

Supranational ambitions are manifest in the *Governance of the Energy Union*, mandating integrated 10-year national energy and climate plans (NECPs) starting with the period from 2021 to 2030. The purpose is to ensure that policies are consistent with the Paris Agreement and the IPCC. The Commission may issue recommendations and/or take additional measures to ensure that EU countries' contributions, as reflected in the NECPs, sufficiently contribute to collectively reaching the energy union objectives, and that long-term EU GHG emissions commitments are consistent with the Paris Agreement. The monitoring proposed in *Governance of the Energy Union* prepares for a centralized control of energy policies. The scheme is to transfer energy policy and energy taxation competence from the national capitals to Brussels.[24] This would require a revision of the treaties currently in force. Any transfer of competence to Brussels on such matters is likely to hurt strong national interests, not the least in Poland, where almost 80 percent of power generation is based on coal.

The state of affairs in the energy sector is *not* the outcome of spontaneous, anonymous market forces, but the result of political intervention and regulation, as well as the strategic choices of vested interests, private, and public powers.[25] One challenge is the need to safeguard consumer interests against a potential energy scarcity *and* the propensity for energy suppliers to extract a surplus profit by monopolizing grids (pipelines and power lines).

The Energy Union appears as a strategic design in a process of political engineering.[26] The limited influence of the European Parliament on Commission proceedings means that EU policy is made by an independent technocracy largely sheltered from democratic control.[27] Insufficient democratic control makes the EU technocracy more susceptible to the views of interest groups and freer to follow its own agenda, whether ideologically motivated as may be the case with climate and energy, or in expanding its own competence and power, as may also be the case.

So far, energy policy and taxation have been exceptions to EU majority rule due to the mandatory unanimous vote and *de facto* national veto rights. The change proposed for energy taxation—qualified majority voting based on population—would abolish national veto rights, strengthening the EU Commission and especially Germany's influence on EU energy policy. To sum up, the energy union breaks with the principle of subsidiarity enshrined in the Maastricht Treaty.

The euro project is a precedent; it is a straightjacket for financial policy, but incomplete without transfer mechanisms, due to Germany's refusal.[28] Likewise, lacking references to nuclear power is remarkable for an energy policy aiming at decarbonization.[29] This may be due to German influence. The energy union also risks remaining incomplete because the needs of households as well as smaller and medium-sized companies are neglected.[30]

The enduring academic debate over the alleged democracy deficit in the EU institutions and policy making has been exacerbated by the persistent austerity policy and ensuing unemployment in the euro zone.[31] A common argument is that policies are set by an elite and do not reflect the needs of the general public. Indeed, the alleged democratic deficit of the EU institutions seems manifest in energy policies that give low priority to the interests of households and small businesses. The Energy Union is, however, not about households and small businesses; it is about a comprehensive and accelerated energy transition that some contend is conceived by an elite.[32] It is likely to centralize power and decision making, driven by the ambitions of the elite, adding to the democratic deficit.

The Social Cost

Energy poverty is a major challenge across the EU.[33] Energy costs do not hit household consumers in an equitable way. Even if with rising income, energy consumption tends to increase, the proportion of a household budget spent on energy tends to decline. For high-income households with comfortable budgets and a high savings rate, consumption of electricity and motor fuel is not much affected by prices. Their economic situation permits them to weather eventual price increases by reducing savings and eventually also to purchase more efficient equipment that cuts energy costs.

By contrast, the purchasing power of low-income households with tight budgets and little or no savings are more severely affected by energy prices. As a rule, their equipment for using energy is older and less efficient, whether household tools, heating systems, or cars, and they have less money to buy new equipment. Here, energy consumption has the highest price elasticity, as energy prices take a comparatively greater share of household budgets.[34] Insofar as the energy transition will involve higher costs to consumers, it will exacerbate energy poverty in the EU.

Consequently, policies for expensive energy have anti-social effects, regardless of the environmental justification, accentuating income inequality.[35] The distribution of energy expenditure usually is more even than that of incomes.[36] Because household energy demand generally is more income elastic than price elastic, with rising incomes energy costs take a diminishing share of household budgets. High unemployment has restrained EU energy demand, but depressing economic activity

and leaving able people out of work is an expensive way of limiting energy consumption. Millions of unemployed EU citizens represent a potential increase of energy demand. Millions of young people in the EU, especially in southern Europe, cannot afford their own homes.[37] With their own living quarters, they would have used more energy for lighting, heating, and cooking.

High energy costs contribute to the current economic and social predicament in large parts of the EU. Compromising industrial competitiveness, high energy costs hamper investment, economic growth, and employment. Low energy costs are an important factor in restoring U.S. industrial competitiveness and raising employment. A simple comparison of the economic performance of the EU and the United States since the financial crisis indicates that high energy costs kill jobs, whereas low energy costs foster them. That is the industrial perspective. For most EU manufacturing, energy is a minor cost item, the exception being refineries, as EU industries for historical reasons are less energy intensive than those of North America or Russia.

Within the EU, the case of Germany is significant. High electricity prices and levies to finance renewable energy combined with price reductions for large firms represent a transfer of income from households to industry, with a special burden on low-income households. Not surprisingly, energy poverty, meaning that households cannot afford even minimum use of energy without outside assistance, essentially from public sources. In this sense, fuel poverty is an issue even in prosperous countries such as Germany and the United Kingdom. In southern Europe it is widespread. In 2016 the EU Commission estimated that energy poverty affected 23 million households.[38]

The intention is to incite a more efficient use of energy and technical change through high energy prices, but with consumers being the most severely affected hardly have the resources to buy new, more efficient capital equipment, whereas those with financial resources to do so are less severely hurt and less inclined to adapt quickly. Low-income households tend to have a less modern and less efficient capital stock than high-income households. Also, in relation to energy, it is costly to be poor.

EU policy documents specify energy targets but are evasive on economics. Costs are hardly mentioned. Definitions of competitiveness, security, and sustainability are vague. The 2018 *Clean Energy for All* envisages strong climate measures and carbon neutrality within a profound restructuring of energy supplies and uses. It is accompanied by a comprehensive study of possible actions.[39]

The amount of energy required to produce one unit of the gross domestic product (GDP), measured in constant prices, has declined markedly in all developed societies over the past 30 years, but energy consumption nevertheless increases. Energy savings have permitted a stronger economic growth than otherwise would have occurred and that more prosperous societies and consumers hit back by demanding more energy. Hence, the incremental consumer surplus

emanating from energy savings contributes to a higher level of economic activity and incremental energy demand. This is the rebound effect of energy conservation programs that is overlooked by a static conception of consumer behavior, but which is a reality in dynamic energy markets.[40] Therefore, efficiency gains make a double-edged sword.[41] The airline industry is a prime example. One solution might be to increase energy prices, eventually by taxation, to accompany end-user efficiency gains.

Both business firms and households seek to minimize the total cost of what they do, whether producing goods or services for a market or performing services for themselves, not the energy costs alone.[42] Improved technology reduces the cost of energy as an input factor, providing incentives to substitute energy for labor and capital.[43] Thus, energy savings increase the consumer surplus, as well as providing gains in service. For example, it has been estimated that in the United States economy between 1920 and 1969, the input of energy increased three times as fast as the input of labor.[44] Most likely, the trend is similar for households, although that is more difficult to measure. Improving efficiency is invariably beneficial, but it generally has an investment cost that can more easily be assumed by high-income parts of society than by those with lower incomes.

Historically, technological changes that cause a more efficient use of energy have often caused a rise in energy use.[45] The reason is simply that efficiency gains make energy a less costly input factor and, insofar as the savings benefit, the users getting incremental resources to expand energy use. This observation is as pertinent to households as to business firms. In the United States, for example, the households' use of electricity for appliances has been increasing steadily.[46]

At least part of the energy savings due to price increases and technological improvement seems to be subsequently cancelled out by a higher level of economic activity and higher incomes, causing more energy to be used by richer consumers with more efficient technologies.[47] This rebound effect is caused by businesses fulfilling a rising demand for their goods and services as well as by households whose patterns of energy use change over time with rising incomes and changing technology. Generally, business firms have been much more responsive to energy price changes and to the technological improvement enhancing the potential for energy conservation than have households.[48] Households tend to realize a better quality of life through electricity, using appliances as well as heating and cooling living spaces.[49]

Structural Change

Energy transitions imply a structural change in the supply and use of energy.[50] The historical trend has been the movement toward more efficient, cleaner, compact, and ultimately cheaper energy technologies, as societies become more educated and prosperous. Capital is invested in machinery in order for energy to

substitute for labor.[51] Historically, energy has replaced manual labor and modern technology allows energy also to replace mental labor, changing the modus operandi of the service sector.[52] Consequently, electricity supplies become more crucial, implying a need to limit the use of land and to find solutions with a high rate of power density.[53] The issue is to what extent and, eventually, how are promoting energy efficiency and emissions reductions compatible with securing affordable and stable energy supplies as well as competitiveness, economic growth, and employment.[54]

The past four centuries have seen a gradual transition into ever more efficient and cleaner energy, from wood and dung into coal, then into oil and subsequently natural gas, as well as hydro, and recently into nuclear and renewables.[55] The process is complex as new energy sources represent an addition as much as a substitution. The need is for more energy and for competition between energy sources in terms of costs, convenience, cleanliness, and supply security, as well as government intervention to safeguard consumer interests.[56]

Many changes are *not* irreversible; energy transitions are not simple, one-way movements. From 1965 to 2017, world energy consumption increased by a factor of 3.6, from 3,731 million tonnes of oil equivalent (mtoe) to 13,511 mtoe. Coal consumption almost tripled, oil consumption tripled, and natural gas consumption more than quintupled. Consumption of nuclear and renewable energy have increased by a factor of several hundred albeit their growth was from a much smaller base. As oil and coal *volume demand* grew, both lost *market share* to nuclear power and natural gas. A *relative* decline of fossil fuels is not necessarily an *absolute* one. In power generation, new investment tends to add to capacity rather than replace incumbent plant.

Even with high annual growth rates in power generation from renewable sources such as solar, wind, and biomass, absolute progress is slow.[57] Growth in solar and wind has been offset by the decline of nuclear. The world's dependence on fossil fuels (natural gas, oil, and coal) has been fairly constant since 1990, in spite of wide swings in energy prices. Experience indicates that fossil fuels are technically and economically robust energy sources. That is not the case for solar and wind power in so far as intermittency and infrastructure costs are taken into account.

Measured by volumes consumed and market shares, the world is *not* out of the coal age, oil remains a robust energy source, and natural gas is making headway. Investors remain bullish on oil.[58] Annual worldwide CO_2 emissions tripled from 11,291 million tonnes in 1965 to 33,444 million tonnes in 2017; those of Europe at 3,301 million tonnes in 1965 were only 7 percent higher in 2017, at 3,542 million tonnes in 2017. [59] In the meantime, Europe had risen and fallen in relative economic terms. In 1980, the current EU represented 34 percent of the world economy; by 2009 the figure had fallen to 28 percent; in 2017, it was 22 percent. The weight of the present EU in the global energy balance has diminished from 27

percent in 1965 to 13 percent in 2017. Its share of global CO_2 emissions has fallen from 29 percent in 1965 to 11 percent in 2017. Such is the global context for European energy policy.

After the financial crisis, from 2009 to 2017 world total energy consumption *increased* by 17 percent; however, in the EU it *declined* by 1.5 percent. Coal use fell by 12 percent. The combined solar and wind power consumption tripled. Part of the reason is the economic transition in Central and Eastern Europe and the consequent decline of heavy industry, but energy conservation policies also have had an effect, such as the United Kingdom phasing out coal in power generation. The most salient structural change is the decline of coal. In 1965 coal accounted for more than one-half of energy consumption in the present EU; by 2017 the share was down to 14 percent. The volume was more than halved. This was largely due to the United Kingdom's reduced power generation from coal. Oil demand grew modestly. By contrast, natural gas consumption increased more than 10 times, becoming the second most important EU energy source, with a market share of 24 percent. Nuclear power peaked in 2004 and has had a declining market share since.

The consumption of renewables, essentially solar and wind power, is rising and their market share is approaching that of nuclear power. Remarkably, CO_2 emissions in the present EU countries were 3,301 million tonnes in 1965 and 3,542 million tonnes in 2017, with a trajectory of at first rising quickly until 1979, as coal replaced oil in power generation, then subsiding slowly until a minor surge in 2017. From 2009 to 2017, CO_2 emissions fell by 9 percent, slightly rising again since 2015.

The 2008–2009 financial setback was more severe in the EU than worldwide and recovery in output and employment has been weaker. Even with large differences between member states, the EU—Germany in particular—has some of the world's highest electricity prices. In northern Europe, expensive energy does not seem to harm economic activity, as is the case in Denmark and Germany. However, Denmark has an economy largely based on services while in Germany large industrial firms benefit from reduced electricity prices paid for by high household consumer prices. The cross-subsidy from households to industry has been decided by the German government without any consultation with EU authorities; the legal basis may be doubtful. The subsidy improves German industrial competitiveness without which it might be more similar to that of Italy. Expensive energy may be one of several factors to blame for economic stagnation in southern Europe with the euro, and European Central Bank's (ECB) austerity policy also being held responsible.[60]

Coal remains the black spot in EU energy policy, representing 26 percent of power generation and 80 percent of CO_2 emissions in 2017. The United Kingdom managed to reduce CO_2 emissions by 28 percent from 2000 to 2016; policy tools were a price floor for carbon at £18/tonne and promotion of nuclear power. The coal share in power generation fell from 66 percent in 2000 to 7 percent in 2016.

Germany offers a contrasting case, with a reduction of CO_2 emissions by 10 percent during the same period, mostly in the initial phase, at a cost of at least €150 billion. In spite of high ambitions and extensive support for renewable energy, emissions reduction in Germany was a modest 7.5 percent or 61 million tonne of CO_2 on an annual basis. With 16 percent of the EU population and 21 percent of the economy, Germany accounted for just 8 percent of emissions cuts. In absolute terms, the largest cuts took place in the United Kingdom, followed by Italy, Spain, and France.

The EU annual greenhouse gas emission targets concern emissions from most sectors not included in the EU Emissions Trading System (EU ETS), such as transport, buildings, agriculture, and waste. The aim is to reduce emissions from these sectors by 30 percent by 2030, from a 2005 baseline. The EU (including the U.K.) population is expected to grow from 460 million in 2005 to 524 million in 2030, an increase of 14 percent. The targeted emissions reduction is 30 percent during the period, meaning a cut per capita of 39 percent from 9.2 to 5.6 tonnes.

The Core: France and Germany

Europe has a long record of politically motivated energy initiatives. The European Coal and Steel Community, ECSC, was established in 1951, encompassing Belgium, France, Germany, Italy, Luxemburg, and the Netherlands. It established a common market for coal and steel, overseen by a supranational body. The initiative came from France with the dual purpose of eliminating conflicts over access to resources and the risk of war. By facilitating intra-group steel trade, it permitted major savings. By contrast, the ECSC had little impact on the company structures of the coal and steel industries. France opted for nationalization; in Germany, the large private groups prevailed.

In recent years, EU legislation has made both France and Germany open up their gas and power markets. The French former state monopolies were unbundled and partly privatized. In Germany, most of the historically integrated companies have been unbundled, but the law permits minority shareholding of producers in transmission companies. The EU directives following the Third Energy Package have been transposed into French and German law.

In France, the resulting energy industry structure is fairly simple with a clear division of functions; in Germany it is complex, partly due to the federal constitution, with a multitude of companies at different levels. In both countries, the gas and power industries are dominated by a few large companies with considerable market power. In France, the government remains a major stakeholder in both gas and electricity; in Germany cross-ownership, especially in regard to gas storage facilities and local distribution, in practice implies a high degree of vertical integration.[61]

Historically, France has been an initiator for institutionalizing European integration, aimed at drawing Germany into closer cooperation as a counterweight to the United States and the United Kingdom. Germany has responded selectively, embracing some French proposals, like the monetary union, while rejecting complements such as a banking or a fiscal union, as well as transfers within the euro zone. Institutional shortcomings make the common currency an impediment to growth and employment, also to the detriment of Germany.[62]

Apparently, Germany has made a successful transition into renewable energy. In 2017, it had the world's highest share of renewable electricity (essentially solar and wind power) at 30.3 percent, against 20.5 percent in the European Union and a world average of 8.7 percent. Whereas the EU CO_2 quota price was around € 3 to 4/tonne, wind power subsidies have had an implicit cost of € 50/tonne of carbon saved; for solar power the implicit cost has been up to € 500/tonne.[63] In the autumn of 2018, Germany's Federal Court of Auditors, *Bundesrechnungshof*, delivered a broad critique of energy and environmental policies.[64] The charge is that the Economy Ministry has lost the overview and control, that large sums have been spent on measures that have not been properly assessed, with little or no effect, and that results in no way have matched expectations. The energy transition, *Energiewende,* is described as expensive and a burden on public budgets, in addition to the costs for household consumers and most businesses through high electricity prices. The question is whether German politics will allow trimming costly support for renewables as the gradual downscaling of the coal industry has been decided, also with costs to the taxpayer. Nevertheless, aversion to nuclear power and strong environmental lobbies are constants in German energy politics.

The costly effort to promote solar and wind power has not been matched by a corresponding success in improving energy efficiency and curbing overall energy use.[65] Germany's primary energy consumption fell in the aftermath of the 2008 financial crisis, but has increased again since 2014. In 2017 the energy consumption level was the same as in 2008 and CO_2 emissions were 1 percent higher. In 2017, Germany's GDP, measured in local currency, was 12 percent higher than in 2008. Even in a sluggish economic environment, energy demand is robust, helped by moderate oil prices. Consequently, the issue is whether the policy objective of phasing out all fossil fuels by 2050 is realistic.

Even if the price increase of 39 percent over 10 years has not been sufficient to curb demand growth, negative consequences are apparent. High electricity prices have been blamed for slowing digitalization and harming the service sector. German industrialists consider high electricity costs their major competitive disadvantage.[66] Household electricity consumers pay on average 55 percent of the bill in taxes. In this way, German electricity pricing represents a regressive income redistribution.[67]

Coal use and coal mining in Germany are to terminate by 2038. As the rationale to maintain capital stock and operations is weakened by the approaching deadline,

one argument is that the end might come sooner.[68] On the other hand, the long time frame of 20 years may have been motivated by a hope of technological breakthrough in electricity storage that would make solar and wind power more economical. It is questionable to what extent Germany will implement a quick transition from coal to gas, following the U.K. example. In the meantime, as witnessed by the Nord Stream 2 pipeline, the preference is for natural gas to replace some coal. Moving out of both coal and nuclear power implies more natural gas because intermittent renewables cannot take up the slack. Remarkably, facing an economic setback, the German government in the autumn of 2019 announced ambitious energy policy measures that may turn out to be more costly than effective.[69] German energy policy largely relies on legislation and regulations rather than taxes, such as a CO_2 tax. In 20 years, German energy law has expanded from about 200 to 13,750 regulations. Consequently, the new energy program will boost employment among lawyers.[70]

Historically, France has favored nuclear power, which in 2017 accounted for 38 percent of primary energy consumption and made up 88 percent of domestic electricity generation. France is the world's nuclear leader, in 2017 representing 15 percent of total nuclear power generation. France is also a major exporter of nuclear technology.

France is determined to further reduce energy consumption.[71] It has adopted a low-carbon energy strategy aiming at carbon neutrality by 2050, hopefully to be adopted by the entire EU.[72] Policies are highlighted in the draft Multiannual Energy Programme, *Programmation pluriannuelle de l'énergie* or PPE, for the years 2023 to 2028.[73] One might conclude that its objectives are single-minded. Total primary energy demand is to decline by 14 percent between 2019 and 2028, consumption of coal to be cut by 80 percent, that of oil by 35 percent, and that of natural gas by 20 percent.

The plan is to promote the development of biomass and biogas, in addition to hydrogen, solar, and wind power. Hydrogen will be introduced on a larger scale as a vehicle fuel. The current park of windmills will be modernized and expanded. Large solar facilities are envisaged in the countryside. The electricity sector will be restructured, aiming at a renewable share of 36 percent by 2028. Limiting nuclear to 50 percent of power generation will be deferred to 2035.

The bill presented to the French parliament in the autumn of 2019 aims at a renewable share of 40 percent of power generation by 2030 and 33 percent of final energy consumption. Remarkably, the plan is also to reduce the research effort in nuclear power, signaling a political intention to replace both fossil fuels and nuclear by renewables.[74]

Critical issues are the costs, the social effects, and the political acceptance of the ambitious French energy program. The government promises that the program will lead to savings, higher economic growth, *and* more jobs.[75] Any intention to replace energy by labor through less efficient technologies would mark a reversal

of the historical trend.[76] A cost-effective energy transition would *not* need public expenditure or subsidies; the private sector would do it at a profit. The program will require massive public investment; it explicitly envisages rising prices for electricity, natural gas, and oil products. To alleviate the burden on their budgets, the current scheme of electricity support to needy families will be extended. It is an open question whether this will be sufficient to save the program.[77] Moreover, lagging investment raises serious concerns about the security of electricity supply in Germany.[78]

In France in late 2018, a fuel tax increase in a context of widening economic and social disparity triggered widespread unrest; it may indicate social limits to energy policy. The official reason for the fuel tax increase was climate protection but was probably motivated by the need to offset the preceding cut in the wealth tax.[79] The proposed electricity price increases will severely hit low-income households, as the regulatory authority has alerted.[80] Energy policy appears to favor investor interests at the expense of low-income groups as a way to re-distribute income from the poor to the rich.[81]

France has high energy policy ambitions, possibly inspired by Germany's transition, the *Energiewende,* with the difference that France currently has a much weaker economy than Germany had a decade earlier. The French plan gives priority to self-sufficiency, at a high cost, and possibly energy austerity, using higher taxes to curb demand. The issue is to what extent the new French energy plan is coherent and realistic.

German insistence on concluding the Nord Stream 2 gas deal indicates an interest in strengthening bilateral trade with Russia, under German control rather than general liberalization of gas imports. In the winter of 2019, France voted against Germany in the deliberations on the new gas directive, supporting the EU wish to apply common rules to the new pipeline.[82] By contrast, France has a propensity for protectionism, as expressed by French president Macron.[83] France and Germany are entering the energy union on different premises. Energy Union disharmony is demonstrated by the contrasting preferences of the two leading members, France choosing nuclear power that Germany will not accept.

On balance, from the European Coal and Steel Community in the early 1950s, to the monetary union, and currently the Energy Union, integration has strengthened Germany's position, reinforced by the reunification; correspondingly, France's position has weakened. The sudden change in the French position on Nord Stream 2 in February 2019 seems motivated by a more general intention to enforce EU rules on Germany.

Germany has accepted *some* of the French initiatives as a means to strengthen its own position. The common currency, the euro, was launched by French president Mitterrand as a means to tie reunited Germany to France; it has enabled Germany to take control of euro zone monetary and financial policies without a counterpart in reciprocity.[84] Through strict rules on budget deficits, Germany

imposes austerity but disregards limitations on current account surpluses. Germany resists any banking union or common euro zone budget that would transfer funds to poorer member states. In the winter of 2019, the German government has been preparing a bank rescue with methods denied to other EU member states.[85] French President Macron's appeal for greater European unity and new common institutions has not been met with approval in Germany.

The difference, nevertheless, provides for complementarity. Germany's retreat from coal potentially enlarges the baseload market for French nuclear power. Likewise, Germany's development of gas power, as implicit in the Nord Stream 2 deal, potentially provides more flexibility to balance intermittent solar and wind power, also in France. Eventually, within an open electricity market, France may become the major provider of base-load electricity and Germany the major provider of flexible electricity in the EU. The Energy Union might provide the framework for such a division of tasks and market segments. This perspective might explain the French decision *not* to scale down nuclear power until 2035 and to accept the German decision to buy more gas from Russia. Russian gas to Germany could open up sales of French nuclear power. The issue is to what extent French electricity prices would rise, perhaps to German levels.

French willingness to comply with Germany's interests may be due to ambitions to establish the EU as a world power next to China and the United States.[86] Conditions are economic performance and competitive energy costs. The promise is that renewables will provide inexpensive energy, but so far, electricity prices in the EU seem to only go up. The risk is that rising prices will coincide with supply problems in a crunch caused by weather.

Limits to Renewables

EU energy policy promotes renewables, especially sun and wind power, but any policy of promoting intermittent power needs to address the design and organization of the electricity market.[87] With current technology, solar and wind power will need back-up energy sources for periods when the sun does not shine and the wind does not blow. The need is for low-cost, flexible back-up equipment. In spite of major progress in recent years, the full fixed costs of solar and wind power are not yet competitive when infrastructure investment is included, because operations and revenue are not continuous. So far, the cost of large-scale battery storage of electricity is prohibitive. When the sun does not shine and the wind does not blow, low operational costs do not help solar and wind make money to depreciate capital investment.[88] Therefore, they require protection and subsidies. By contrast, when the sun shines and the wind blows, marginal costs are minimal, electricity prices decline, and revenues fall for *all* power producers.

With rising market shares, the value of solar and wind power will decline.[89] Sun and wind power can "cannibalize" itself, destabilize the electricity market, and

depress investment, unless protection and subsidies are enhanced, also for the back-up capacity. Intermittency simply means that solar and wind power needs to be supplemented by flexible capacity based on fossil fuels. To the extent that solar and wind power at times floods the market, depressing prices, the back-up capacity also will need protection and subsidies.

Solar and wind power requires heavy capital investment, but variable costs are low. Intermittency distorts the depreciation of the capital investment. The remedies are direct subsidies, guaranteed sales prices, and preferential market access. The back-up, fossil-based power has lower capital costs and higher variable costs. Competition from solar and wind power, often with preferential market access, means that fossil-based power stations cannot run continuously either. Nevertheless, electricity demand in periods with insufficient sun and wind power requires back-up capacity. The outcome is then that both renewable and fossil-based electricity is subsidized within a framework that is neither a plan nor a market, but based on arbitrariness and bargaining power, as seems to have been the case in Germany.

One study has asserted that from an economic perspective, the optimal electricity market share in Germany for wind power would be 20 percent and for solar power zero.[90] Because gas and petrol turbines have lower investment costs and are more flexible than coal and nuclear, at least with currently available technology, they are the most efficient back-up.[91]

"Phantom Current" is a concept of importance not only in the German electricity market but is also of relevance to other countries. This concept refers to kilowatt hours *not* generated or consumed, but appearing on power company accounts that are charged to and paid for by consumers to compensate producers for electricity that *could* have been produced and sold by windmills that have been switched off because of grid saturation or insufficient demand.[92] The case shows a remarkable lack of administrative coordination. In order to placate Germany's strong "green" lobbies as well as the electricity industry, regional governments have given generous incentives to solar and wind power investors but neglected the required corresponding infrastructure investment as well as the market. The bill is passed on to consumers, largely households and small businesses. In terms of political economy, the arrangement shows the power of electricity generators over consumers and their ability to get paid whether they sell or not.[93]

In the United Kingdom, electricity generators that are told by the grid to occasionally supply less than the contracted volumes receive compensation. For the National Grid, the arrangement reduced the need to invest in infrastructure. Like in Germany, the bill is passed on to consumers, again, essentially households and small businesses.[94]

The most pressing issue is redesigning European electricity markets to accommodate rising volumes of solar and wind power and coexistence with back-up capacity. The need may be more regulation to offset the current anomaly of rising

power supply when demand is low, a situation that distorts price signals to investors in renewables as well as back-up capacity.[95] The challenge calls for a common approach at the EU level. One solution might be single buyers for defined areas in order to stop "cannibalization," meaning that surpluses would not find buyers. Another solution might be an obligation for electricity companies to provide power services continuously so that solar and wind power generators would have to internalize the cost of back-up power. A common solution would be required to prevent the sudden dumping of intermittent power surpluses across regions and borders compromising the economics of back-up power providers, but such measures would compromise free trade.

The emerging logistical curve in solar and wind investment on a global basis, where the historical exponential growth transforms into an incipient stagnation and possibly a subsequent decline, might also apply to the EU, dependent on costs and subsidies.[96] The space requirements of solar and wind provoke public resentment, limiting expansion; literally a straw in the wind.[97]

The U.S. Connection

Historically, since the end of World War II, the United States has been actively involved in European energy politics, at first encouraging the ECSC as part of the reconstruction effort. U.S. companies had a large share of West European oil markets. Later, around 1980, the United States tried to prevent France and (then) West Germany from contracting large volumes of natural gas from Urengoy in the former Soviet Union. The U.S. argument, in brief, was that French and West German dependence on Soviet gas would invite political pressure and that the gas revenues would finance Soviet arms efforts. At the same time, the United States was selling wheat to the Soviet Union, but that was seen as politically correct because it took money *from* the Soviets. In spite of U.S. sanctions, the deal was made and Soviet gas entered the French and West German markets in 1984.

In hindsight, the Urengoy deal was an important factor in terminating the Cold War. It contributed to Soviet export revenues at a time when oil prices were collapsing, demonstrating to the Soviets that good relations with Western Europe were economically beneficial. The ensuing political confidence was helpful; a few years later, the Berlin wall fell and Germany could peacefully reunite.

The United States had strong energy interests in post-Soviet Russia in the 1990s under the Yeltsin regime in designing the petroleum regime and in private investment. The turnabout arrived in 2003-2004 with the nationalization of Yukos by the Putin government. At that time, the prospect that the United States would need to import large volumes of natural gas caused an interest in the Barents Sea Shtokmanovskoye field. The subsequent shale development in the United States made that project redundant.

The deals between Rosneft and ExxonMobil announced between 2011 and 2014 indicated an interest in U.S. oil industry. The agreements aimed at making ExxonMobil a junior partner for Rosneft in Russia, in return for reciprocity for Rosneft in the rest of the world. For pragmatic reasons, Henry Kissinger had favored U.S-.Russian cooperation, in order to avoid a closer alliance of Russia and China.[98] The appointment of ExxonMobil's CEO Rex Tillerson as Secretary of State raised hopes in Moscow for a reset of relations with the United States. The deals never materialized. The attempted reset was thwarted by strong forces in the United States. In early 2018 the deals were officially cancelled. In the meantime, relations had deteriorated in the wake of the Ukraine conflict.

Since then, the United States has been actively opposing an expansion of Russian gas exports to Europe. The first direct gas pipeline from Russia to Germany, Nord Stream, opened in 2010–2011, and was not politically controversial. The successor, Nord Stream 2, following the same route, is considered harmful by the United States and some East European countries. The U.S. argumentation is reminiscent of the fight over the Urengoy deal around 1980. This time, however, the political interest of the United States to keep control of Europe through energy trading coincides with commercial and financial interests.

Europe is surrounded by natural gas suppliers; the world market is awash with natural gas. Russia reasonably invests in pipelines in order to make money, not to make trouble, regardless of U.S. assertions. In the European gas market, Russia has a cost advantage through pipeline connections as opposed to more costly maritime transportation from the United States. Consequently, there is a good economic case for Nord Stream 2. Insofar as the United States should succeed in halting Nord Stream 2, it would be an important step in making Europe dependent on U.S. energy supplies and in asserting U.S. control of Europe. In the contrary case, Nord Stream 2 would strengthen Europe's dependence on Russian energy. With an economic slowdown, Germany needs to reopen the Russian markets: Nord Stream 2 would help.[99]

As an exporter, the United States has its own interests in the European gas market as a competitor to Russia. Some East European countries risk losing a good bargaining position due to transits of Russian gas to markets further west. Poland has concluded an import deal for U.S. gas, at comparatively high prices. The United States has an evident interest in restricting the access of Russian gas to the European market, disguising commercial interests behind security policy concerns, threatening companies that take part in the project.

The United States also has strong vested interests in European oil trading. Since the dollar was decoupled from gold in 1971, its international position has largely been based on oil, the world's most important traded commodity. Most international oil transactions are done in dollars; since oil is paid for in dollars, oil demand creates a demand for dollars. Dominance in oil trading has bolstered the position of the dollar as the key currency in world trade and as the primary reserve

currency. The willingness of foreigners to use their savings to purchase U.S. debt is contingent on the international reserve currency status of the U.S. dollar.[100] Foreign financing has enabled the growth of defense budgets and military expenditure abroad. This arrangement is essential to U.S. economic power and the ability to consistently run current account deficits.[101] Until 2018 practically all international crude oil transactions were settled in U.S. dollars. The EU is the largest buyer in the world oil market and, consequently, the largest source of oil-based dollar demand. Consequently, the United States has an interest in the EU continuing to buy oil in dollars. Correspondingly, the United States has an interest in selling oil and gas to the EU, payable in dollars.

The dollar hegemony in oil trading is under pressure from at least two different angles; China and, indirectly, the United States itself. The Shanghai Oil Futures Exchange launched in March 2018 after years of preparation is a first and so far a modest challenge to dollar oil-price formation and trading. By the summer of 2019, China's yuan oil transactions accounted for perhaps 12 percent of international trade. Russia benefits from a facility to exchange yuan into gold. Secondary sanctions signify the use of commerce as a coercive weapon and it risks backfiring.[102]

Proliferating U.S. sanctions encourage other countries to price and trade oil in other currencies, such as the yuan or euro. Iran and Venezuela are examples of such cases. Circumventing U.S. sanctions reduces demand for dollars. With secondary sanctions, these figures are likely to rise, representing a mounting risk to the U.S. dollar hegemony in world trade. With selective tariffs and restrictive trade measures, the United States has chosen to enter into an economic conflict with several countries. Indeed, through selective sanctions against targeted countries and secondary sanctions on others that do not follow the U.S. primary sanctions, the United States arguably has opened a Pandora's Box of escalating, reciprocally hostile measures. The potential rebound from secondary sanctions on third parties represents an uncalculated risk.

Europe has been unable to save the Joint Comprehensive Plan of Action Agreement (JCPOA) with Iran. In 2018–2019, the U.S. escalation of the conflict with Iran, with extensive secondary sanctions, has met a meek European response so far. INSTEX, a special trading body to facilitate Iranian purchases of food and medicine is of minor help. Iran's hope that INSTEX would allow sales of large volumes of oil has been derailed by Europe's fear of U.S. retaliation. Russia has offered to join INSTEX proposing to include oil, thereby dodging U.S. sanctions.

In the meantime, China, India, Malaysia, and Turkey have defied U.S. sanctions and continue to buy Iranian oil. Russia is willing to assist Iran export oil and to circumvent banking sanctions by processing payments.[103] However, the current U.S. government's objective is to halt all Iranian oil exports.[104] One motive may be to shut in oil from Iran (and Venezuela) in order to open markets for its own shale oil.[105] The U.S. energy sector also needs high prices to sustain shale investment.[106]

By August of 2019 the United States had not fully succeeded in terminating Iran's oil exports; the issue is to what extent it would apply secondary sanctions on China, India, Russia, and Turkey. Europe is in a squeeze.

Paradoxically, as China launches yuan oil trading, the United States through sanctions policies actively discourages dollar oil trading. By forbidding any dollar transactions with major oil exporters, such as Iran and Venezuela, and by imposing trade sanctions on others, such as Russia, it encourages new solutions to circumvent the sanctions. Although the intention is to reduce the oil export volumes and revenues of the countries concerned, the outcome is the emergence of oil trading circuits that bypasses U.S. banks and evades the U.S. dollar. In the longer run, it undermines the international position of the U.S. dollar. In the summer of 2019, Russia offered to cooperate with the EU in circumventing U.S. sanctions on Iran. The U.S. response was that any non-compliance with sanctions, on Iran or any other country, would result in exclusion from the dollar system.[107] Thus, weaponizing the dollar potentially creates a double-edged sword for the United States.

In 2017, the U.S. current account deficit amounted to $449 billion; the EU import bill for crude oil and refined products was €191 billion, corresponding to $216 billion. Assuming that the amount were entirely invoiced and paid for in U.S. dollars, the value of EU oil imports corresponded to about one-half of the U.S. current account deficit. From this perspective, the United States is crucially dependent on the European Union for sustaining international dollar demand and financing its deficits because European oil buyers at first have to acquire dollars. By comparison, in 2017 Japan's crude oil and products imports amounted to $77 billion, presumably all paid for in U.S. dollars.

Insofar as Europe should not succeed in establishing an oil trade facility with Iran, Russia might act as an intermediary. The issue is whether leading EU members would be willing to circumvent U.S. sanctions on Iran by using Russia as a middleman. Reasonably, this trade should not be conducted in U.S. dollars, but in euros. Eventually, that would be an important step in the de-dollarization of international trade. Advancing de-dollarization of the oil trade would reduce incentives for oil exporters to place their surpluses in U.S. dollars, although no other financial market can match that of the United States.[108]

Experience since 2017 is that the European Union is vulnerable to external pressure that limits sovereignty in commercial, financial, and political matters. The situation allows other powers to impose their preferences, encroaching on the economic freedom of individuals and companies as well as the diplomatic freedom of governments.[109] The immediate threat is identified as the United States under the Trump administration. China and Russia also are seen as risk factors, but over a longer time horizon. The central position of the United States in the international financial system permits the use of the dollar for political purposes, infringing upon the sovereignty of other countries.[110] The issue is the risk of secondary

sanctions eventually also being imposed on trade with China and Russia based on the pattern of the Iran sanctions.

U.S. interventions in European energy politics have been erratic and opportunistic, driven by short-term considerations and perceptions of immediate self-interest rather than by analysis, principles, and strategy, with little understanding of European interests or respect for international law. The EU and Japan together just by their crude oil and products purchases in U.S. dollars match about two-thirds of the U.S. current account deficit. This points to a U.S. dependence on key allies and trade partners and, correspondingly, to their potential leverage with the United States.

The U.S. withdrawal from the JCPOA and imposition of secondary sanctions harm European economic interests and show their limited sovereignty in relation to the United States.[111] Secondary sanctions are a political tool for the United States and a critical challenge for Europe. Europe is weak because of an asymmetric interdependence with the U.S. economy, especially due to the global role of the U.S. dollar, limiting the freedom of choice of EU foreign and trade policies. The challenge for the EU is to develop protective measures against secondary sanctions to defend European interests and to prepare countermeasures against countries that impose them. In practical terms, the task is to bolster the international use of the euro in order to partially replace the U.S. dollar.

Indeed, a strong international currency is a requisite for Europe asserting its power on a world stage.[112] The U.S. secondary sanctions are facilitated by the limited role of the euro.[113] European companies have to obey U.S. commands because they cannot afford exclusion from dollar circuits.

The EU aims at promoting the international use of the euro.[114] Most EU energy imports are not contracted in euros, although they originate in Russia, the Middle East, North Africa, and Norway. Paying for oil in U.S. dollars implies a currency risk, in addition to the oil price risk, and an additional hedging cost for non-U.S. buyers. As any risk represents a cost, for the EU paying for oil in euros would reduce costs, enhance price stability, and facilitate the integration of energy deals with other trade deals.

Any move by the EU, currently the world's largest importer, to purchase oil in euros, would represent a challenge for the dollar as well as a major political setback for the United States. Strained relations between the United States and important energy exporters provide prospects for trading alternatives to the U.S. dollar. Disagreement with the United States over Iran policy and eventual trade conflicts might induce the EU to cross U.S. interests on oil trading. Brexit would facilitate measures counter to U.S. interests.

Nevertheless, euro trading in energy is a possible starter. That would be welcomed by many energy exporters, not the least Russia, and strengthen the international position of the euro but risk conflict with the United States.[115] Time may be ripe for a European oil futures exchange, trading in euros, but it is an open

question whether the EU would do it. The prospect of the oil-based dollar hegemony being challenged by both China and the EU represents a major risk for the United States. Moreover, wider international use of the euro, to the detriment of the dollar, would affect exchange rates and competitiveness. Therefore, EU financial ambitions may conflict with industrial interests, as has been the U.S. experience.

Short-circuiting EU hesitations, in August of 2019 Rosneft announced it would invoice refined oil products export sales in euros instead of U.S. dollars.[116] Since the bulk of products contracts are settled by tenders, the change implies establishing an oil products exchange in Russia that would operate in euros. The proposal to use a dollar/euro currency swap means that price formation will take place with an implicit dollar reference, but actual payments will be made in euros. The move is motivated by Russian fears of new sanctions by the United States. Since 2014 Rosneft has been on a U.S. sanctions list. The risk of unpredictable U.S. measures might incite Russia also to invoice crude oil exports in euros. The impact might be a further erosion of the oil-based dollar hegemony, strengthening demand for the euro.

The EU Alone?

The Energy Union plan embodies an autarky vision, an EU that is to be not only a zero net emitter of greenhouse gases, but also a zero net importer of energy (or almost). This is a recipe for self-marginalization in world affairs. The EU is the world's third largest energy market, after China and the United States, and the largest energy importer, but its weight is diminishing as energy demand shifts to Asia. Energy trade, whether coal, oil, or natural gas, increasingly targets Asia. Shale technology changes the basic economics of the petroleum industry, boosting U.S. competitiveness through lower energy prices.

"Peak Oil" theory is suspended. The world has plenty of oil. Supply shortfalls and price rises are essentially due to political issues, not resource scarcity. "Global Warming" is *not* universally accepted as a concern more serious than the economy. With a few exceptions, the rest of the world is unwilling to sacrifice much for carbon reductions. Most of the developing world relies on gas, oil, and even coal in increasing quantities. As the EU represents barely 10 percent of global emissions, any EU effort alone will have little impact, regardless of costs and eventual successes. The Paris Agreement explicitly permits developing countries to increase CO_2 emissions until 2030. This provision encourages the transfer of energy-intensive industries out of the EU, which will import the products instead of making them. The move makes a difference for EU statistics, but not for global realities.

The EU imports more than one-half of the energy consumed, with an import dependency of 90 percent for crude oil and about 75 percent for natural gas.[117] These figures exclude Norway, which through the European Economic Area (EEA), on most accounts is part of the EU internal market. Since the early 1970s Norway has been a reliable supplier of oil and natural gas to the EU, accounting for about one-fifth of EU energy imports, with the gas invoiced in euros. In 2017, Norway's oil extraction of 89 million tonnes was well above the EU figure of 69 million tonnes. Excluding Norway, EU self-sufficiency in oil was 11 percent; including Norway it was 25 percent. Norway's natural gas exports to the EU in 2017 amounted to 114 billion m^3, close to the EU output of 118 m^3, bringing the rate of self-sufficiency to 50 percent. In the United Kingdom, Norwegian gas has a market share of almost 50 percent and has facilitated the transition away from coal in power generation.

The supply risk attached to EU natural gas imports from Russia receives much attention, but little mention is made of crude oil and products imports; in 2017 they represented about one-third of EU consumption. Thus, dependence on Russian oil products has not been a problem.

EU energy policy has provided Europe with falling carbon emissions as well as the world's costliest electricity and a rising supply risk, insofar as renewable energy should not cover demand and conventional power generation capacity should be insufficient. Focusing on self-sufficiency and carbon emissions abatement, the underlying vision is of a renewable energy autarky, isolated from the outside world, and at high cost if necessary. Implicitly, the EU energy technocracy signals aversion to Middle Eastern, North African, and Russian oil and gas, in spite of their cost competitiveness.

Europe's neighbors in the Middle East, North Africa, and Russia need energy export earnings. If Europe moves out, others, especially China, will move in, gaining trade opportunities as well as political influence in Europe's immediate neighborhood, where Europe risks losing market shares and export earnings, as well as power and influence. The option is to achieve secure energy supplies, affordable prices, and environmental gains through trade and open, competitive markets.

Europe needs open energy markets, where electricity and natural gas flow freely across borders, ensuring competition and an optimal use of resources, both renewables and hydroelectricity, but that is difficult to combine with promoting intermittent solar and wind energy. With open access and free flows, the market risk would diminish, especially for natural gas. This has been achieved by the United Kingdom. Availability of natural gas imports from new sources, not the least the United States, checks the market power of incumbent suppliers and transporters, facilitating open, competitive markets.

For the other member countries, the energy union entails a risk that electricity prices will converge to German levels, harming competitiveness for both industry

and services. Rising energy bills and unemployment would have little effect on the world's climate, as Europe makes itself increasingly irrelevant. The major risk is that costly energy supplies will further compromise EU economic performance.[118] In spite of abundant and competing supplies, in the EU technocracy as in the major capitals there is a strong political aversion against opting for natural gas.[119] Motivations are decarbonization, distrust of Russia, and respect of U.S. interests.

The hazard is that the effort will be associated with unpopular austerity policies, undermining EU cohesion, making energy policy more controversial, more divisive, and less effective. High energy costs represent a threat to economic growth and EU unity. Insofar as the priority to decarbonize is not matched by advances in electricity storage, and the aversion to natural gas persists, the default outcome is likely to be more austerity and stagnation, protracting the EU record since the financial crisis, intensifying political instability, and eroding consensus. The supranational aim of the Energy Union to integrate energy and climate policies of the member states could be missed.[120]

Finally, Germany is pivotal as the member state most able to influence EU politics *and* to escape the common rules, as is evident in climate and energy policies. In the short run, this is politically convenient. In the longer run, Germany runs the risk of being the target of ire over expensive energy as well as economic austerity, undermining EU cohesion from which it benefits. Indeed, the euro currency union in practice appears as a device for Germany to control financial policies of the other euro partners, imposing austerity as part of the "Germanification" of Europe.[121]

The German precedent of households and smaller businesses subsidizing big industry through electricity prices could become standard in the energy union. Insofar as the energy union should fail to provide affordable energy and alleviate energy poverty, it would become a threat to EU cohesion. Performance on budgets, energy demand, and emissions show that Germany is perceived in other member states to *both* sway policy on important matters *and* to disregard common rules.

The populist wave in European politics has been triggered by discontent among groups experiencing diminishing purchasing power and that their discontent is ignored by incumbent politicians. In this respect, energy prices are crucial. France is critical**.**

The outcome of the May 2019 European elections marks the decline of the traditional center-right and center-left parties to the benefit of right-wing populist and green parties. In prosperous Germany, enjoying full employment, the socialist vote diminished to the benefit of the centrist Greens, a party for a liberal, well-educated, and well-off middle class that does not worry about jobs or income and instead has resources to be concerned about the environment and global climate.[122]

In France, by contrast, the populist right-wing *Rassemblement National* emerged as the winner, marginally ahead of the president's LREM party. In the

run-up to the elections, President Macron managed to present himself as the only alternative to the far right, but doing so he also brought about a polarization of French politics that could pave the way for a right-wing victory at the next presidential elections in 2022.[123] France has been suffering from endemic unemployment and persistent deficits; many voters do worry about jobs and income. The traditional French left is in disarray, with the Green party gaining.

Climate is a new cleavage factor, reshaping the old conflict between left and right. In Europe, the class struggle has got a climate dimension. In our traditional political vocabulary, policies that enhance economic and social inequalities qualify as right-wing and policies that reduce inequalities as left-wing.

From that perspective, EU climate and energy policies appear as right-wing with opposition to them as left-wing. Against this backdrop, Marine Le Pen's score among French workers should not be a surprise. Because of less savings and less discretionary purchasing power, her supporters are more sensitive to energy price rises than are those of President Macron. Like low-income voters everywhere, they experience climate-motivated costs as assaults on their purchasing power and living standards.

Energy taxation is only efficient and sustainable if maximizing overall welfare, balancing environmental gains against economic costs.[124] Safeguarding income distribution and competitiveness is equally important. In spite of costly promotion of solar and wind power, Germany is a laggard in abating emissions, paying a heavy price for having no impact on global warming. Germany is not alone in the EU, but the EU is alone with a radical and costly decarbonization policy. In China, renewables are a complement to fossil fuels; in the United States, one fossil fuel, natural gas, is replacing coal, another fossil fuel. The EU aims to emerge as a world leader in decarbonization, but the costly effort seems to be insufficient.[125] Insofar as the rest of the world will not share the EU concerns about global warming and will not follow its example in energy policy, risks are that the Europe will lag behind in income and employment.

Indeed, the experience is not enticing. As part of the energy transition Europe has *deliberately* equipped itself with the world's highest electricity prices. Since the financial crisis of 2008–2009, Europe has experienced lower economic growth than *any other* continent, except Antarctica. Europe is marginalizing itself, with a diminishing impact economically, politically, *and* in climate matters.[126] Critics point out that the French energy transition project is useless, costly, and unfair.[127] The issue is why EU politicians doggedly pursue energy policies that are criticized as being neither effective nor just.

One reason is a genuine concern among many people that global warming caused by fossil fuels is dangerous and needs to be halted. This concern in some cases mutates into a categorical ethical imperative: the use of fossil fuels is an evil to be avoided. Decarbonization becomes a matter of principle, no longer a question of costs and benefits. This can transform into ideology, a moral conviction

that the EU needs to lead a global crusade against evil fossil fuels, even if the EU itself is responsible for only a small part of the world's greenhouse gas emissions. It nevertheless includes a considerate political use of the message to rally support from voters, helped by a scary narrative that dramatizes an urgent need for action. The message is spread by media, often in simplistic and vivid language that leaves no room for doubt or even questions.

Indeed, there is an element of groupthink, a common view not properly based on reality.[128] Since it is not based on facts, it qualifies as a belief. Since it cannot be challenged by facts, some believers elevate it to an ideology that is supposedly morally superior.[129]

Another reason may be more prosaic; climate change is business, offering new opportunities for private investors on the condition of public regulations and public money, financed by consumers and tax payers. For people used to high taxes, fashionable climate concerns can legitimize environmental fees and duties to finance public budgets as well as private profits. However, such indirect taxes are socially regressive with the heaviest burden falling on those with the lowest income.

Due to a successful nuclear program, France scores on low CO_2 emissions and, so far, moderate electricity costs. The French government, nevertheless, intends to replace some nuclear power with renewables, at a much higher cost, with a risk of exacerbating social discontent.

In the United Kingdom, remarkably, after a successful transition away from coal, the outgoing Prime Minister Mrs. May, after a not very successful premiership, leaves a commitment to decarbonize at a high cost. Affordable energy seems to have a low priority as do economic growth, incomes, and jobs. It is an open question whether that is politically sustainable.

The German decision to quickly abandon nuclear power is hardly rational in a context of decarbonization policies. The rationality of energy policies, whether at the EU level or in the member countries, is not evident in all cases. Business investment goes elsewhere, strengthening Europe's effort at self-marginalizing on the world stage, further compromising employment and income. There is also the risk that an unexpected surge in economic activity would cause electricity shortages and further raise power prices.

To sum up, the energy union project in its current version entails many risks and challenges. The litmus test will be the ability to provide energy at affordable prices that could sustain industrial competitiveness, employment, and incomes. A success on these criteria would strengthen the EU economy and its political legitimacy. This would also strengthen the EU on the world stage and make the EU a more equal partner and competitor for the United States and more able to stand up against U.S. measures that harm Europe's economy. In this way, an assertive energy union could bolster EU integration.[130] The risk is that the EU Commission will go on expanding its unaccountable power, delegitimizing the EU in the eyes

of the population.[131] The *concept* of anthropogenic global warming, whatever the scientific base, is being used for political purposes, to scare the population of an impending catastrophe that justifies restrictions and costs. The scare is also useful to divert political attention away from more immediate issues, such as employment, health care, education, infrastructure, and the local environment where politicians often are responsible for *not* taking effective action, to the more elusive question of climate, where effective action with measurable results is unlikely within a life-time.

EU energy policy has had the ambition to be a model for a "green transition" in the rest of the world and profit from sales of renewable energy technology. The experience is not enticing. High energy costs, a stagnant economy, and high unemployment make the EU rather an example of which energy policies *not* to follow. Meanwhile, China has taken the leadership in production and sales of solar technology.

Brexit should be a warning to the EU. The democratic deficit and the operational mode alienates citizens not only in the United Kingdom. Italy is but one example. With a hard Brexit the EU risks that the United Kingdom, or possibly England, will become a bastion for the United States in Europe, undermining the cohesion of the remaining EU, possibly with different economic and energy policies.[132]

The change of the guard in the EU and the selection of Ursula von der Leyen as president of the EU Commission indicate French influence and a persistent centralization of decision making. The political process behind the selection of the new president, who had not even been a candidate, was essentially an opaque backroom deal with no pretense of democratic transparency. It confirmed the democratic deficit of the EU. The EU technocratic rulers have been accused of considering elections a necessary formality, no more.[133] Some contend that the new president was chosen not because of her popularity or even competence, but because of her connections and loyalty to the established order.[134] European voters did not go for that. According to some observers, it is likely to weaken the EU.[135]

Significantly, in her inaugural speech, the new EU president promised a "Green New Deal," a vision of making Europe the world's first "climate neutral continent."[136] Climate appears to have priority before the economy; fighting emissions seems more important than fighting unemployment and poverty. The French influence is evident as the EU seems set for more centralization, costly energy, low economic growth, and further marginalization in world affairs. The issue is the robustness of EU energy policy in case of stronger economic adversity, escalating the challenge to combine energy reform and economic growth. Combining the ambitious energy policy with economic growth would require a lower carbon coefficient, meaning technical progress and more investment.

So far, the vision of the EU Energy Union has only been partly realized. The EU has made progress in providing cleaner energy, but at a high economic and

social cost. It is still far from giving EU consumers—households and businesses—secure, sustainable, competitive, and affordable energy.

Conclusion: Policy Matters

The initial vision of EU energy policy embedded a comprehensive vision of sustainability, resting on the three pillars of the environment, the economy, and social acceptance, the record so far is a priority on the environment to the detriment of the economy and jeopardizing the social acceptance. Politicians and policy makers should have a better understanding of causes and effects, of how their economies and societies will react to energy and climate policies over a longer time.

In the developing world, climate change and climate policies are often seen as threats, enhancing their vulnerability because of their limited ability to pay for renewables, reach CO_2 targets, and pay for the impacts of climate change.

In the industrial world, especially in Europe and North America, the immediate challenge is to conduct a tempered, reasonable debate focusing on sensible and moderate policies that practically can be enacted at limited cost and with social acceptance, proposed by researchers, scientists, and experts on the subject.

Instead, the debate is increasingly polarized and dominated by demagogues and celebrities on the right and the left that are promoting their zero-sum agendas based on apocalyptic visions.[137] In some circles, climate alarmism has the allure of a substitute for religion; belief matters and critical questions are not wanted. Celebrities and businesses promote themselves in the public debate, displaying more opinion than insight. In Europe, the climate cause also has become a business, where competition is about attention and audience. Many politicians follow up; in climate rhetoric, extremism seems to be rewarded, so far.

Consequently, moderate, achievable, and pragmatic policy approaches are discarded, often at a high social cost, undermining political acceptance. In the United States, the Trump administration has reversed achievements in environmental protection made over decades. A successor government is likely to overturn many of these policies; however, banning fossil fuels and promoting austerity lifestyle programs are unlikely to gain social acceptance. In Europe, the austerity policies have contributed to reductions in employment and emissions, are not sustainable, and could backfire economically and politically. Thus, the sustainability mantra has been hijacked and now only means climate issues. As an alternative, there are feasible policies to support both economic and environmental goals, but that would require a more moderate approach based on insight.[138]

Europe could have the opportunity to be the leader on policies that balance economic, environmental, and social objectives, but politically that would require a more flexible, decentralized approach, with an emphasis on subsidiarity rather

than centralization, and lower costs, enhancing economic growth, and employment. But, the climate issue has led to a climate of fear that distorts rational thinking and balanced decision making, as well as largely symbolic measures with more cost than effect. *"Fear is irrational. Reason should prevail."*[139]

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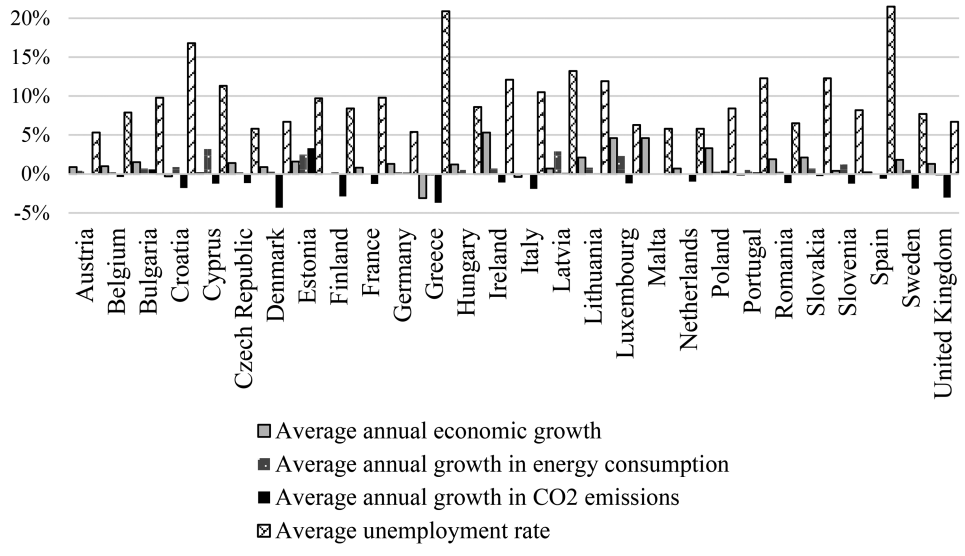
APPENDIX

Table A1
COUNTRY OVERVIEW, 2009–2017

	Average Annual Economic Growth	Average Annual Growth in Energy Consumption	Average Annual Growth in CO_2 Emissions	Average Unemployment Rate
Austria	0.90 %	0.40 %	-0.08 %	5.30 %
Belgium	1.00 %	0.20 %	-0.37 %	7.90 %
Bulgaria	1.50 %	0.70 %	0.57 %	9.80 %
Croatia	-0.30 %	0.90 %	-1.81 %	16.80 %
Cyprus	0.10 %	3.20 %	-1.24 %	11.30 %
Czech Republic	1.40 %	0.20 %	-1.19 %	5.80 %
Denmark	0.90 %	0.30 %	-4.33 %	6.70 %
Estonia	1.60 %	2.50 %	3.31 %	9.70 %
Finland	0.00 %	0.20 %	-2.90 %	8.40 %
France	0.80 %	-0.10 %	-1.28 %	9.80 %
Germany	1.30 %	0.20 %	0.19 %	5.40 %
Greece	-3.10 %	-0.20 %	-3.69 %	20.90 %
Hungary	1.20 %	0.50 %	-0.09 %	8.60 %
Ireland	5.30 %	0.70 %	-1.08 %	12.10 %
Italy	-0.40 %	-0.10 %	-1.91 %	10.50 %
Latvia	0.70 %	2.90 %	0.15 %	13.20 %
Lithuania	2.10 %	0.80 %	0.09 %	11.90 %
Luxembourg	4.60 %	2.30 %	-1.20 %	6.30 %
Malta	4.60 %	n.a.	0.00 %	5.80 %
Netherlands	0.70 %	-0.10 %	-0.97 %	5.80 %
Poland	3.30 %	0.30 %	0.42 %	8.40 %
Portugal	-0.10 %	0.50 %	0.19 %	12.30 %
Romania	1.90 %	0.30 %	-1.16 %	6.50 %
Slovakia	2.10 %	0.70 %	-0.27 %	12.30 %
Slovenia	0.40 %	1.20 %	-1.25 %	8.20 %
Spain	0.20 %	0.00 %	-0.59 %	21.50 %
Sweden	1.80 %	0.50 %	-1.86 %	7.70 %
United Kingdom	1.30 %	-0.20 %	-3.04 %	6.70 %

Figure A1
COUNTRY OVERVIEW, 2009–2017



Sources: International Monteary Fund (IMF) Database and BP, BP Statistical Review 2018 (London: BP, 2018).