Chapter 1

The EU's Energy Portfolio

Energy policies encompass crucial public policy decisions over the production, distribution, and consumption of energy, from incentives, taxes, and regulations to the establishment of strategic national security goals. Every decision affects specific interest groups differently and can significantly affect a country's economy. Politicians, lobby and interest groups, environmental activists, and also industrialists argue over which resource to use, as well as whether, when, and how to switch to alternatives. Governments order their citizens to change their energy-use habits, buy new light bulbs, and drive cars that are more fuel-efficient. Determining the optimal policies to deliver the best possible political and economic outcome is no easy task. Should governments just leave energy prices to the markets or tax energy use and invest the receipts in alternative resources and technologies in the hopes of strengthening domestic markets and reducing dependency on external supplies? Even if one uncovers the best approach for a particular state, can one also conclude that the approach is equally valid for a group of nations as diverse as the European Union?

Despite explicit declarations and titles, energy policies often tend to be rather vague and diffuse. Relevant decisions largely have an internal focus, just like most other policy areas, but unlike most other policy areas, internal energy choices carry serious external implications because they directly affect national and economic security. It is, therefore, no surprise that the EU's energy portfolio consists of a mixed bag of complex, interrelated, and sometimes contradictory policy dilemmas.

In its broadest sense, EU energy policy can be described as the pursuit of comprehensive energy security. To achieve this, the EU pursues three broad objectives: mitigating climate change (known commonly as sustainability), guaranteeing that energy is affordable for European customers, and achieving security of supply. Its methods to achieve these three objectives are, respectively: reducing

carbon dioxide emissions and increasing energy efficiency; enhancing competitiveness through a functioning internal energy market; and building an infrastructure of intra-European interconnections, while diversifying both internal and external suppliers and reducing the negative consequences of import dependency on third parties, through solidarity and cooperation.

As the EU is the third largest consumer of energy worldwide, behind China and the US, (13.8% of global inland consumption), its economic prosperity depends on market forces that are largely beyond its control. However, those market forces are not beyond its influence. The Union took many measures over previous decades to reduce demand for particular fuels and increase demand for others. It achieved this through legislative and regulatory measures that prioritized efficiency, environmental concerns, and cooperation. According to the European Commission, for example, EU energy efficiency standards introduced as part of its 20-20-20 targets in 2008 (European Commission 2008) played a role in reducing overall EU energy consumption by 3.8% between 2005 and 2010 (European Commission 2013). Yet the actual role of EU targets in this process remains open to debate: economic cycles, the downsizing of global economy, the closure of energy-intensive industries – especially in Eastern and Central Europe – and mild winters also heavily affect energy consumption. Furthermore, the EU's energy policy may be having some significantly negative strategic consequences. As Dieter Helm (2012a) notes, 'Europe has been deindustrializing too, and this has also encouraged energy-intensive production to move overseas'. In other words, Europe may be consuming less energy and producing fewer emissions, but in the process is simply pushing that production and pollution to other parts of the world. In fact, it appears that the US is moving past Europe in environmental terms, largely because it has eschewed a top-down energy policy and left the market to determine the optimal path to sustainability instead.

The EU's energy agenda is not static: it expands as new issues arise, and some of the issues are quite contentious. For example, the EU is split over long-standing questions about national vs. community-wide energy mixes, its huge dependence on foreign suppliers for natural gas – Russia in particular – and the continued use of nuclear power. These debates manifest themselves in national policy choices that often lead to contradicting results. For instance, despite its policy to become greener and less dependent on external

suppliers, Germany decided to phase out its nuclear power facilities only to experience a sharp rise in both its coal consumption as well as its dependence on Russian gas. Likewise, despite the clear environmental focus of the EU, supporters and critics of fracking expose the perennial dilemma between the aim to reduce external dependency and the need to secure the environment.

Less contentious issues are no easier to resolve. While the EU has successfully exported energy norms along its periphery, it has been less successful maintaining unity on energy relations with Russia or on developing alternative southern routes around Russia, the flagship project being the abandoned Nabucco pipeline project. Because energy security is no less a national concern than it is a Union matter, almost every attempt by the Commission to secure jurisdiction over any aspect of external energy policy runs into conflict with member-state interests. Increasing external policy coordination is a tough sell, whether it is presented as developing and sustaining a coherent, multilateral negotiating position or enacting supranational oversight. For example, discussions about a possible consultation role for the Commission in bilateral energy-supply agreements (European Commission 2011g, 2011j) – something that would exemplify European solidarity and coordination – stirred up traditional member-state concerns about sovereignty (de Jong 2012). In short, energy is a touchy subject, and the EU's energy portfolio is crowded with important, complex, and controversial issues that sometimes scratch at the political heart of the European Union. Indeed, regardless from which angle one looks at energy politics, political decisions are extremely complex, involve a high number of variables, and are based on very long timelines.

This chapter introduces readers to the key energy policies and debates in the European Union, what we call the EU's energy portfolio, and lays out a typology to organize and analyse them. We begin by introducing a typology of policy areas, a framework in which we distinguish between internal, external, and multidimensional domains. After a brief handling of each of the aforementioned domains, we derive key policy areas or policy groups within which we can position the most important energy-related policies. These policy groups form the EU's energy portfolio. We follow with an in-depth look at the collective and overarching goal that both exemplifies and defines the EU's energy portfolio, namely the notion of comprehensive energy security.

This chapter also serves as a launching point for more detailed explanations found in later chapters. Within the EU's energy portfolio, one can find such diverse matters as the use of nuclear power (specifically discussed in this chapter), the building of a common internal energy market (Chapter 5), the coordination of overall greenhouse gas emissions (Chapter 6), and the exporting of EU rules and norms about energy contract transparency (Chapter 7).

A typology of the EU's energy policy

Analysing EU energy policies requires that we first understand the context of the stages on which they play; the EU is after all a collection of independent sovereign states operating under a series of treaties that transfer jurisdiction in certain areas to a supranational centre. No aspect of an energy policy can be considered entirely internal or external; in most cases, choices in one area have a significant effect on the other. Still, issues such as regulatory politics or drilling and mining rights are clearly more internal than external, just as coordinating supply contracts with third parties is more external than internal. Hence, we need to distinguish between those policies that are primarily internal, those that are primarily external, and those that span both categories. Table 1.1 presents a broad typology of the EU's energy policies as described above. The typology serves to organize and simplify the complex set of issues that constitute the EU's energy portfolio.

Using the EU energy-policy typology is a good way of thinking about these issues. It provides a framework for allowing students and researchers to understand how each element of EU policy relates to others, and helps us to identify and select critically important policy areas, the choices within which involve substantial debates. Internally, there are three areas of focus: the building of a common internal energy market, debates over the status of and support for nuclear power, and the search for substitute fuels through research and development. Externally, the EU focuses on developing and coordinating a common external energy policy through rule export and energy diplomacy. It struggles with contentious pipeline politics, debates over the construction and development of LNG ports and facilities, and the enormous task of reducing its extreme external energy dependence. Finally, the internal and external policy dimensions coalesce in the area of climate change, an area that has served as both a tool and a goal to achieve its

Table 1.1 *EU energy policy typology*

Internal	*External*
Establishing the internal energy market - Common market principles - Liberalization - Deregulation and re-regulation - Intra-EU networks and infrastructures - Harmonizing energy taxes - Subsidies *Nuclear power politics* *Developing new energy technologies* - Research funding - Subsidies, feed-ins, etc.	*Common external energy policy* - Reducing external dependency - Ensuring secure energy supplies from abroad (energy supply security) - Diversifying suppliers/ supplies - Pipeline politics and LNG ports - Rule export/energy diplomacy
Multidimensional	
Reducing greenhouse gas emissions (climate change)	

internal and external energy policy goals. Each of these policy areas is addressed in subsequent chapters of this book.

The most well-known and tested policies fall within the internal domain. Every European consumer is familiar with the debates around the use of nuclear power, fuel efficiency standards for automobiles, power efficiency standards for light bulbs, and the price effects of increased renewable electricity production. The success of these policies depends in part, however, on the success of other key policy goals that largely lie outside the control of the EU and its member states. These include: ensuring secure energy supplies from abroad (energy supply security); diversifying the roster of suppliers (supplier diversity); reducing greenhouse gas emissions (climate change); developing new energy technologies through research funding (substitution); continuing the discussion on the costs, merits, and risks of nuclear power; and coordinating a common external energy policy.

Likewise, reducing dependence on external energy suppliers is not a matter of external energy policy alone. Changes in efficiency standards and the increased use of renewables, as well as the use of nuclear power sources and advances in technology, also play important roles in reducing demand for key imported fossil fuels, oil and gas. Structural changes in the international energy market can change the dynamics of internal demand and supply. The maturation of the shale oil and fracking industries in the United States and a boom in natural gas transportation (LNG) could 'push oil to a structurally lower price' (Riley et al. 2012: 29) and, thus, sap much of the economic demand for alternative fuels similarly to how cheap and abundant coal ate into natural gas' share of electricity production in Germany in 2013 (Burger 2013).

The phenomenon of global warming creates added pressure to find alternatives to fossil fuels, particularly in the EU where greenhouse gas emissions 'increased by 33% during the period 1990 to 2007' (European Commission 2014: 14). Besides inciting Europe to seek reductions in its CO_2 emissions by almost 20% of its 1990 levels by 2020 and 40% by 2050, climate-change concerns are leading the EU to act both directly through legislation and indirectly through member-state research budgets. The European Commission's *Energy 2020 – A strategy for competitive, sustainable and secure energy* (2010a) and its *Energy Roadmap – 2050* (2011b) highlight these priorities. Thus, Europe is working diligently on a wide range of energy-saving or alternative-energy projects, including among others wind power, carbon sequestration, safer nuclear power plants, new forms of hydroelectric energy production along riverbeds and coastal planes, and photovoltaic and solar-thermal power generation plants.

The internal dimension

The internal dimension of energy policy engages a diverse set of actors, institutions, processes, and instruments. Many of these are spatially and temporally specific to the political–economic structures and conditions of the member states. The single most important and established policy area is the creation of a fully functioning internal energy market. Already underway, the completion of such a market includes diverse policies such as promoting common-market principles, implementing programmes of liberalization, national deregulation and supranational re-regulation, developing

intra-EU energy networks and infrastructures, and harmonizing energy taxes and subsidies. These are policy areas in the EU energy portfolio that one can claim are within the control of the EU or at least within the control of its member states.

The external dimension

The external dimension is less complicated in terms of the number of factors involved, but is an area where it is much more difficult to reach consensus between competing national interests, historical relationships, and respective geographic positions. The external dimension of EU energy policy can be summarized as the pursuit of a common external approach to reduce the Union's dependence on foreign suppliers. Its substantial imports from a limited number of suppliers for most of its oil and gas create vulnerabilities to external supply shocks, disruptions, price swings, and political agendas, all of which negatively affect solidarity among member states and economic prosperity within them.

The multidimensional domain

Some policy areas naturally span both the internal and external dimensions. The most important one is climate policy, which focuses on the Union-wide reduction of greenhouse gas emissions and the environmental sustainability of industry and the economy. Because energy production, transmission, and consumption create negative externalities that transcend borders, it is impossible to successfully implement environmental policies solely by internal legislation and regulations, or even externally by multilateral treaty. For environmental strategies to work, changes in energy and industrial production must be universal: international agreements and coordination are required. For these reasons, EU climate policy constitutes a special multidimensional area.

One may even consider EU climate policy as the central pillar of EU energy security, because if the member states collectively meet their ambitious greenhouse gas targets, the EU could achieve the delicate balance between economic prosperity and environmental sustainability for which it is searching. The most obvious manifestation in policy terms of the EU's climate policy is not, however, the targets its sets for reduced greenhouse gas emissions per se, but it is rather the combined effect of reduced external dependence through

the increased use of renewables, increased efficiency of appliances, and greater integration of the member-states' energy infrastructures at competitive prices.

The real target: Comprehensive energy security

The ultimate measure of success for the EU energy policy is the realization of comprehensive energy security (CES), namely that affordable supplies of energy in whichever form they are required, meet current and expected demands from household consumers and industry alike, with enough built-in redundancy, alternatives, and substitutes to minimize the negative effect of disruptions irrespective of the cause. The formula to achieve this was laid out by the Commission in a 2006 Green Paper that identified sustainability, competitiveness, and security of supply as the three pillars of EU energy policy (European Commission 2006). It was later established as policy through a Commission Communication called *An Energy Policy for Europe*, in which the issue of collaborating to achieve these three pillars was described as a project that would return the EU 'to its roots' and initiate a 'new industrial revolution' (European Commission 2007: 3–5). At the heart of achieving these bold strategic goals was the establishment of a 'real internal energy market', one where security of supply is achieved as energy supplies and services move seamlessly between member states and are delivered promptly and efficiently anywhere within the Union where they are needed. One group of EU energy policy observers has described the EU's approach in terms of three 'mantras' attached to key events: the green issue tied to Kyoto, the market issue tied to the Lisbon Treaty, and the security of supply issue tied to Moscow and Europe's considerable dependence on Russian gas supplies (Glachant et al. 2010). For purposes of consistency and clarity, we will use the EU's language of pillars to elucidate the categories and details of its energy portfolio.

The underlying logic of the three-pillar policy is sound in itself. Real competition should lower energy costs for citizens and businesses and stimulate investment. Tough environmental legislation and the emissions trading system, both of which aim at limiting greenhouse gas emissions, should make economic expansion and the delivery of the necessary energy services more sustainable over time, by promoting increased use of renewable energy technologies, combined heat and power and microgeneration, and other

non-conventional supplies. Finally, security of supply should protect European consumers from some of the negative consequences caused by international price volatility (in oil in particular), as well as avoiding economically crippling brownouts and blackouts in the electricity sector. Together, these three pillars, if implemented in their entirety, would create a functioning internal energy market. That market in turn would be competitive, robust, redundant, and interconnected. It could increase or reroute excess electricity during hot summers to affected areas and would contain enough strategically positioned oil and gas storage facilities, both in quantity of installations and volumes of storage, to respond to emergencies. It would also be able to offset interruptions in supplies, e.g. gas from Russia or oil from the Middle East, through an interconnected infrastructure that could move the necessary energy resources from any unaffected area in the Union to where it was needed at short notice.

The Commission's focus on competitiveness as a key aspect of comprehensive energy security is rooted in three key concerns that increase the risk of shortages and keep prices high. Specifically, these include overexposure to price volatility in international energy markets, the uneven concentration of the EU's external oil and gas providers, and internal oligopolistic control of energy generation and distribution. Increasing competitiveness, essential to a functioning internal energy market, should lead to a stronger investment climate, and this in turn should lead to job creation. The resulting combination of increased investments, jobs, efficiency in consumer appliances, and energy generation and distribution should not only reduce energy costs but also enhance both living standards and quality of life for the average European citizen.

Parallel to its approach on competitiveness, the Commission continues to profit from its long experience in using environmental legislation to drive its energy policy. Ever since adopting the *United Nations Framework Convention on Climate Change* (the Kyoto Protocol) in the late 1990s, the EU has struggled to find a balance between achieving its emission reduction goals and maintaining industrial growth and competitiveness. The EU positions itself as world leader in the drive to respond to and mitigate the effects of climate change. Yet, structural changes in the international energy market, particularly the increased availability and use of cheap coal for electricity generation in Europe, have eaten into the legitimacy of that claim, as its carbon consumption was on the rise in late 2013 (Helm 2013).

The EU's goal of achieving collective reductions of just above 5% (of 1990 levels) by 2012 led to the establishment of the EU Emissions Trading Scheme (ETS). In 2007, the Commission proposed, and in 2009 passed, its *2020 Climate and Energy Package*, known as the 20-20-20 plan (European Commission 2008a), the targets from which became binding through the *Renewable Energy Directive* of the Third Legislative Package. The plan, which set the goals to reduce greenhouse gas (GHG) emissions by 20%, increases the share of renewables by 20% and enhances its energy efficiency by 20% all by 2020, and quickly became the motto of EU energy policy. The package was intended to move Europe to a so-called low-carbon economy and promote green growth and jobs by promoting four pieces of complementary legislation. It began by reforming the EU-ETS: with the start of the third trading period in 2013, the EU introduced a single EU-wide cap on emission allowances to replace the less efficient system of national caps, and intended to cut the cap annually in order to reduce emission levels to 21% below the 2005 level by 2020. Existing plans include introducing a system of auctioning, beginning with the power generation sector, to replace the original system of free allowances. As the ETS only covers circa 40% of EU emissions, the member states also agreed, under the *Effort Sharing Decision* (European Parliament and European Council 2009) to binding reduction targets for sectors not covered by the ETS, including agriculture, waste, and the essentially important transport sector. Interestingly enough, the latter originally excluded the aviation industry, but it too joined the fold in 2014. Unfortunately, no agreement has been reached on emissions from land use and forestry. Still, the Commission claims that member-state obligation to report annual emissions under a newly instituted EU monitoring mechanism is reason for optimism. It believes that this obligation will increase the likelihood that the EU will achieve its targets. However, few of the member states are on course to meet their own national targets (Helm 2005; Helm and Hepburn 2010).

Through its *Renewable Energy Directive*, the EU set binding national targets increasing the share of renewables in their energy mix (EP/Council 2009). This step should not be underestimated given the enormous resistance that member states have shown historically against any supranational limitations on their energy mixes. Resistance was overcome by setting different targets for member states based on their starting points and potential: for

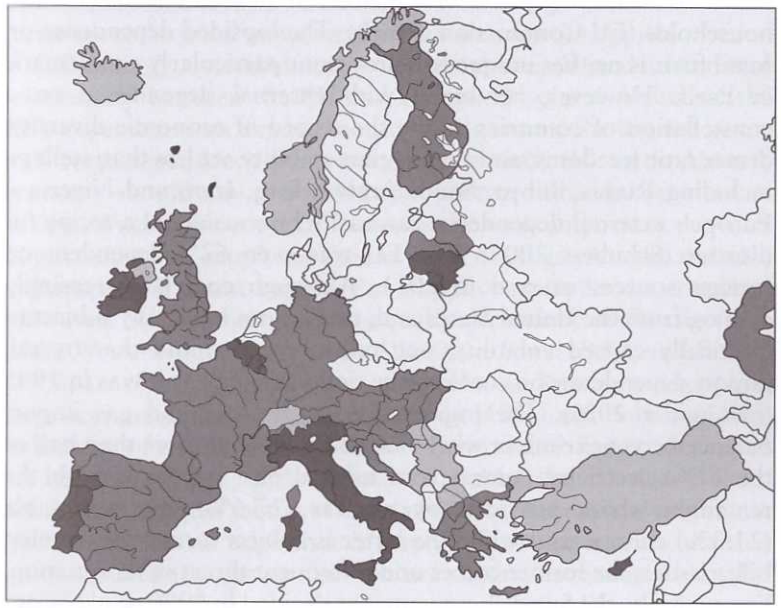
example, Malta has a target of 10%, whereas Sweden's is set to 49%, both by 2020 (see Figure 6.1). The final element of the climate and energy package included establishing a legal framework for carbon capture and storage (CCS) technologies (EP/Council 2009i).

The third pillar of the EU's approach, namely security of supply, remains its weakest link. In a November 2000 Green Paper, *Towards a European Strategy for the Security of Energy Supply*, the European Commission painted an alarming picture of the future. It predicted that '[i]f no measures are taken, in the next 20 to 30 years 70% of the Union's energy requirements, as opposed to the current 50%, will be covered by imported products'. Calling the economic consequences of this dependence 'heavy', it recognized that the EU lacks 'the means to change the international market' (European Commission 2000). In 2003, the EU again noted that the need to reduce its dependence on imported energy was essential to the security of energy supply in the medium and long term (EP/Council 2003a) and reconfirmed that message in a 2007 Energy Policy Communication (European Commission 2007).

Little changed in the decade that followed the Commission's initial warnings; indeed, it worsened. Between 2002 and 2013, the EU's dependence on imports grew: from 47.5% to 53% for all fuels, from 33% to 44% for solid fuels, from 76% to 87% for oil, and from 51% to 65% for gas (Eurostat 2015). Denmark was the only country that exported more energy than it consumed over the period, but nonetheless saw its independence, or more accurately energy autonomy (i.e. its positive overall energy balance), drop from almost 42% in its favour in 2002 to less than 4% in 2012. Simply stated, despite all its efforts and plans, the EU, both as a whole and in its parts, grew more dependent in the first decade of the twenty-first century (see Figure 1.1).

Insofar as one considers external dependence a measure of energy insecurity, Europe's heavy dependence on external energy supplies constitutes a serious risk to its domestic economic and social welfare. This increasing dependence raises the stakes and risks associated with commercial disputes, as was the case involving Russian gas over disputes with Ukraine, or political unrest and uncertainty, as has been the case in Nigeria, Algeria, and the Middle East. Even if the EU were to strengthen its external energy relations protecting Europe from transit-related disputes, build up new networks of pipelines from Russia or Central Asian and Middle Eastern sources via Turkey, increase its LNG-import capacity, and link up its own

Figure 1.1 *EU energy dependence on all products, by per cent (2012)*



Source: Data from Eurostat (2015a)

national and regional oil and gas networks with externally sourced import lines, accidents or technical failures on a major import pipeline would still have severe consequences. The recognition of this problem explains in part why the Commission is increasingly arguing for the controversial position that there should be community-level coordination to diversify both suppliers and transit routes as well as to take an active role in contracts.

To put the EU's energy import dependence into context, it is helpful to compare which fuels are used and by which sectors in Europe. Of all the energy consumed in 2011, 40.3% came from oil, another 21.9% from natural gas, 4.4% from solid fuels, and 21.6% from electricity; just a little over 7% came from renewables, 4.4% from derived heat, and 0.5% from industrial waste. Meanwhile, the

transportation (33%), industrial (26%), and service (12.7%) sectors accounted for roughly 72% of all energy consumed in the EU in 2011, leaving just over a quarter of all final consumption to households (EU Commission 2013b). The lopsided dependence on fossil fuels is neither unique to Europe nor particularly problematic in itself. However, combined with external dependence on a constellation of countries where the record of economic diversity, democratic freedoms, and even regime stability are less than stellar – including Russia, Libya, Saudi Arabia, Iraq, Iran, and Nigeria – Europe's external dependence can easily be considered a recipe for disaster (Schubert 2007). The EU was even 62%-dependent on foreign sources of coal in 2011. Although coal is increasingly coming from the United States and, thus, is not especially subject to politically caused volatility, one must bear in mind that overall import dependency on coal is three times as much as it was in 1995 (just under 20%). The importance of the coal and gas import balance becomes evident when one considers that more than half of the EU's electricity comes from natural gas and coal, with the remaining share provided by nuclear (27.6%) and renewable (21.3%) energy; and while the latter is subject a number of reliability issues, the former comes under frequent threat of termination. For example, the Swedish government decided in 1980 to phase out nuclear power, only to repeal this policy in June 2010. Likewise, the German government, under a Social Democratic and Green coalition, decided in 2000 to phase out nuclear power by 2022, then put it on hold in 2010, before recommitting to the phase-out a year later in the wake of the Fukushima disaster.

The EU's considerable dependence on external energy resources points to two of its largest challenges lying ahead: mediating a stable supply of fossil fuels, and finding technological alternatives and substitute energy sources. However, its dependence is not a one-sided affair: many of the EU's current suppliers need the EU's financial power, and in the case of oil, its concentrated refining capabilities. In fact, the OECD's 30 members provide more than half of the world's oil refining capacity; almost a third of the world's refining capacity, that is the ability to turn oil into useable fuel, is located in the United States (18%) and the EU (16%). Despite being massive producers and exporters of oil, Russia and the remaining states of the former Soviet Union lack substantial refining capacity (6.2% and 2.2.%, respectively, or less than 9% of global capacity) (BP 2013). Thus, the negotiating power inherent in the imbalance

between oil producers and consumers is largely offset by the global imbalance in refining capacity and leaves both supplier and importer inextricably bound in a relationship of interdependence; and that turns out to be good news for the EU's security of supplies.

Still, energy overwhelmingly defines the trade and investment relationship between the EU and Russia. Despite a decline in the EU's dependency on external sources for gas over the last ten years, its foreign dependency poses a strategic security risk to the Union's economy should any major disruption occur either by accident or design. Within this context, Russia is the most important provider of gas to the EU, supplying around 30% of all gas bought and sold in Europe, and about a quarter of all gas consumed in its economy. However, EU members are not equally dependent on Russian gas: while Western states such as the UK (0%), Spain (0%), and France (17%) are either not at all or less dependent on Russian gas supplies, large economic players such as Germany (40%) and Poland (54%), and many of the newer and smaller Central and Eastern members are between 50 and 100%-dependent, making the EU vulnerable to divide-and-conquer tactics in its relations with its eastern neighbour. Yet the EU has an edge that is rarely talked about, and one that quite significantly changes the nature of the discussion about EU dependence on Russia when taken into context. EU purchases of Russian gas 'are vital to the ruling Russian elite' (Ratner et al. 2013). Most EU trade with Russia in terms of the flow of Euros is in the fuels sector, and FDI data reveal that the EU is investing far more in Russia than vice versa. As a result, while approximately half of the EU is dangerously dependent on the stable flow of Russian gas supplies, Russia is economically dependent on EU investments and trade, with the EU accounting for some 34% of all imports into Russia and 45% of its export revenues in 2012, giving leverage to the Union, if it can act as a united force (European Commission 2013b). Indeed, concerns that Russia's influence is increasing appear to be unwarranted, at least as far as overall supplier diversity is concerned. Russia's share of overall EU member natural-gas imports has been declining: in fact, Russian imports were 10% below their 2011 level in the first quarter of 2013 and, by comparison, '[p]hysical flows from Russia remained below the volumes registered in the first half of 2011' (European Commission 2013c: 1). Understood in the context of the EU's increased use of gas to generate electricity, its addition of LNG terminals, and effective efficiency measures, the EU has successfully implemented a process towards

diversifying its natural gas suppliers, albeit more as a result of using alternative sources, including coal and deindustrialization.

The energy relationship between Russia and the EU is therefore as much a story of interdependence as dependence, and this fact is pivotal in understanding the stability and strategic nature of EU–Russian relations. The fact is, despite their vastly different approaches, both share the common interest of maintaining reliable supplies, and, overall, Russia has proven to be a reliable supplier.

Interdependence is, nevertheless, no remedy for the depth of the EU's external energy dependence. Its member states and the Union as a whole are actively engaging in projects to expand and secure their access to existing oil and gas resources, and the logistical challenges are considerable. From the building of new pipelines, such as TANAP/TAP or South Stream/Turkish Stream, to the construction of huge ports for the landing of liquefied natural gas (LNG) that is transported over thousands of kilometres of increasingly unsafe international waters, the EU's need for fossil fuels force it to consider the complexities of international politics and national sovereignties (i.e. to face and overcome numerous geopolitical challenges). Related decisions, particularly those over investments in energy infrastructure have enormous geostrategic implications: for example, winning the race over the exploitation of new gas fields in the Caspian region is a precondition to the construction of new transport lines, just as finding and exploiting new deposits in the Norwegian Sea or Arctic Circle exposes the EU to Russia's territorial claims in the region. So far, the EU has performed surprisingly well. Notwithstanding the Nabucco controversy and the failure to reach acceptable transit terms with aspiring EU member Turkey, extensive energy diplomacy by the Commission and member-state governments led to the signing of a supply agreement with Azerbaijan in 2013, an improvement in communications with Russia over its gas supplies, and helped foster a fledgling international spot market for LNG.

Still, EU policymakers struggle with the need to strike a delicate balance between calls for change and the need for stability. The goal of reducing external energy dependence, or at least diversification of external suppliers and routes, is constrained by the politically risky nature of determining exactly how, when, and where energy security is to be realized. When one calculates the relative weakness of the third pillar of the EU's energy security plan, one must admit that comprehensive energy security is not only a moving target but

also a very distant one. Ephemeral as real energy security may be, having it as a target – just like achieving an environmentally sustainable and largely carbon-free economy, and building a smoothly functioning and competitive internal energy market – provides a goal set that allows for a broad portfolio of activities which in the end may well lead to a more robust, if not quite autonomous, energy game plan.

Unfortunately, as sound as the logic of the three-pillars approach to comprehensive energy security may be, the EU did not have its key component in place, the functioning internal energy market, by the beginning of 2014. This is not to say that significant progress has not been made. Competition increased in the first years of the twenty-first century as member states implemented, at least in part, the so-called *Gas Directive and Electricity Regulation* of 2003 and the establishment of the unbundling regime (i.e. the 2009 Electricity and Gas Directives (EP/Council 2003, 2003c, 2009a, 2009b). Most European citizens can now choose between different electricity and gas providers. However, the 'unbundling' between generator/producer and service delivery has not yet been universally implemented across the Union. Very important for the consumer, prices of oil, gas, and electricity still vary significantly from one member state to another: for example, in the first semester of 2013, household consumers who cooked with or heated their water or homes with natural gas in Austria paid €0.767 per kWh (including taxes), while just over the border in Hungary, consumers paid only €0.432 for the same product and use; and electricity consumers in the United Kingdom pay €0.174 per kWh, whereas the same consumer in France paid just over €0.147 per kWh. Location always matters, but in the EU, political borders still seem to matter more than geography. Despite increasing its LNG imports substantially since 2002 (making up almost 20% of all EU gas imports in 2012) and reducing Russian gas' share of the import market (Russian gas accounted for only 23% of total EU gas supplies in 2012), dependence on Russian gas in several of the Central and Eastern member states (as well as Germany) remained high. Furthermore, Germany, the bastion of environmental austerity and cheerleader of sustainability, actually increased its consumption of coal for electricity generation between 2012 and 2013, simply because US coal had become so abundant and cheap as a result of its shale gas boom, illustrating the energy economics' equivalent of Mark Twain's aphorism, 'principles have no force, except when one is well-fed'.

The discussion so far demonstrates that security is the operative term in the EU's energy portfolio. The term is ubiquitous throughout the EU's energy-related legislation, from its directives and regulations on gas and electricity supply and distribution to the Commission's Communications on diversification, the increased use of renewables, or climate change. For most energy consumers, energy security translates into the stable supply and price of energy services required on a daily basis, specifically fuel for transportation and electricity and heat for homes, businesses, and industrial facilities. Energy is vital to economic and political stability, a fact that politicians ignore at their political peril. In Europe, where most states need to import primary resources such as oil and gas, failure to deliver such stability can risk government legitimacy in the eyes of their citizens and, either through unrest or electoral politics, endanger their hold on power. The security of supply and stability of price are thus central components of domestic politics and, as a logical extension, a central point of contention and concern for EU member states. Likewise, governments and businesses in supplier countries that are rich in energy resources, such as Russia, Norway, Algeria, and Qatar, require access to consumer markets, upstream investments, and price stability in order to secure and plan their deliveries.

The nuclear portfolio

Looking at the EU's three-pillar approach, one can easily identify key policy areas that are implicitly included or, for political expediency and Community organization, excluded. As the discussion above illustrates, for example, there is little mention of nuclear power, despite its continued important role. Nuclear power is a special case in the EU energy policy (Nuttall 2010), one that places it partially outside the box of the EU's broader energy portfolio while concurrently focusing the Commission's activities and efforts on issues of safety and non-proliferation. In principle, 'It is for each member state to decide whether to use nuclear power' (European Commission 2010c) and, according to the Commission (2006), decisions relating to nuclear energy 'can have very significant consequences on other member states' as relates to EU climate goals and dependence on imported energy. Thus, while the member states 'are neither obliged nor prevented from using nuclear energy' (Koranyi 2011: 195), the Commission tacitly backs member states in their

choice to use nuclear energy, it just simply cannot afford to promote it, irrespective of how relevant it may be in meeting emissions' targets, maintaining reliable supplies of electricity, or balancing the EU's overall energy mix.

According to Eurostat's regularly updated online *Energy Trends* (2014), nuclear 'accounted for the highest share in primary energy production in EU-28 in 2012 (29 %)' well ahead of renewables (22 %), solid fuels (21 %), and gas (17 %). Given the obvious importance of nuclear power in its energy mix, one would expect a fairly high level of interest, even focus, on nuclear power as an alternative to fossil fuels for electricity generation. However, the Commission does not distinguish between nuclear and other sources in applying its regulatory framework for the single market in electricity (Nuttall and Newberry 2010). The difference is where completion and environmental sustainability play essential roles in shaping EU energy policy: in the nuclear domain the equivalent instruments were safety regulations on working conditions, hazardous materials, and non-proliferation (Housiadas and Dimitriou 2013).

The quiet and rather cautious position of the Commission on the nuclear portfolio is understandable. Nuclear energy is controversial: divisions – legal, practical, and most importantly political – prevent unity between the member states. Some member states, such as Ireland and Austria, adamantly avoid its use, while others, such as France and the UK, remain fully committed. Also, because the salience of electricity security varies across the EU, some member states, particularly the Central and Eastern European ones that are highly dependent on Russian energy imports, see greater benefit in adding nuclear power to their energy mixes than do others (Nuttall and Newberry 2010). Many of the states that oppose nuclear do so on political grounds (Helm 2012), or are already sufficiently diversified in their electricity generation sources as not to need it.

Nevertheless, the member states do agree on the need for extremely tight safety standards and the security of radioactive supplies. That has been and remains the focus of the Commission's attention. EU rules governing nuclear safety integration, harmonization, and use for energy production exist within the framework of the European Atomic Energy Community (Euratom), founded in 1957 as one of the two Rome Treaties (Chapter 3). The history of nuclear governance in Europe followed a parallel but separate path to the rest of the integration process. According to the Euratom

treaty, the Community is supposed to 'Establish uniform safety standards to protect the health of workers and of the general public'. Building upon earlier secondary legislation on informing the public in the event of emergencies (Council 1989) and protecting outside workers who could be exposed to radiation (Council 1990d, 1997), several additional directives have been passed since the late 1990s, including: ones on safety standards and radiological protection of workers (Council 1996) and safety at nuclear installations (Council 2009a), which have strengthened the rules laid out in Article 30 of the Euratom treaty; the *Waste Directive* (EP/Council 2008a), obliging member states to deliver national plans to the Commission (the first by August 2015); and the more general transportation of spent fuels and waste and other dangerous goods (Council 2006). The two latter directives followed the passing in 2003 of a related directive on the management of waste (Council 2003) and a Commission recommendation on nuclear plant safety (European Commission 2004a; see also Council 2003a), which stemmed from a 2002 Commission Communication (European Commission 2002). The most important of these is by far the *Nuclear Safety Directive*, which for the first time established European-wide requirements and made IAEA safety fundamentals binding on the member states, but most importantly left the implementation to the member states, which at least in part explains the limits of EU nuclear policy. Several directives were repealed and replaced in 2013 when the Council issued a new directive on safety standards that established 'uniform basic safety standards for the protection of the health of individuals subject to occupational, medical and public exposures against the dangers arising from ionising radiation' (Council 2013a).

In practice, responsibility for the safety of nuclear installations, as well as the systems of licensing and supervision, lie with the member states, and nuclear plant operators (i.e. licence holders) bear responsibility for disasters. Member-state reporting on implementation only began in 2014 and should continue every three years hence (Housiadas and Dimitriou 2013). In the wake of the 2011 Fukushima nuclear accident in Japan, the Commission cooperated with the European Nuclear Safety Regulators' Group (ENSREG), an independent body of senior officials from related nuclear and energy regulatory bodies, to carry out voluntary stress tests. Those tests revealed that there was room for improvement and that there were 'significant differences in the national approaches' to nuclear

safety (European Commission 2013h). In October 2013, the Commission moved to change the existing EU framework on nuclear safety by proposing a *New Nuclear Security Directive*. Their proposal included enhancing the regulations to the latest technical standards, giving national authorities greater independence from their governments, allowing for the setting of EU-wide safety objectives, and establishing a system of peer reviews to verify compliance (run through the Commission). Two additional measures included opening up the industry to public scrutiny and requiring public disclosures by licence holders and regulators (i.e. creating the opportunity for citizens to participate in the licensing process) (European Commission 2004, 2013i).

The EU formally amended its *Nuclear Safety Directive* (Council 2014a) in July 2014, and full implementation (transposed into national legislation) should occur by 2017. The final consolidated version of the new directive included most of the Commission's proposals, specifically: strengthening the independence of national regulatory authorities from their national governments; implementing the Commission's proposal for a system of peer reviews of national safety assessments, the findings of which will be made public; requiring safety re-evaluations of all nuclear power plants no less than once every 10 years; and formalized requirements that operators release information to the public (both in normal and crisis times).

The Commission also collects data on the member states' nuclear installations and practices as part of its oversight role. For example, a 2009 Commission recommendation (European Commission 2009d) impels users and holders of nuclear materials to keep records on the flow, processes, and stocks of their materials, and declare them to the Commission. Inspectors under the employ of the Commission travel to all operating reactors, collect data, and publish annual safety reports. On the external front, DG Energy communicates regularly with nuclear authorities around the world, promotes global standards, and participates in related forums, such as the European Nuclear Energy Forum (ENEF), a platform for discussions between stakeholders in the nuclear field. Yet, almost all of these activities, internal and external, revolve around safety issues.

For the EU, the nuclear portfolio is a matter of how to go about it rather than whether to do so. This is quite explicitly revealed in the Commission's Communications on nuclear policy. Officially, the EU supports a framework for nuclear energy in those member

states that choose to use it, as long as they do so 'in conformity with the highest standards of safety, security and non-proliferation as required by the Euratom Treaty' (European Commission 2007b). Nevertheless, it is clear that there is support for nuclear energy as part of the EU's overall energy mix, particularly in light of the climate change issue. It is particularly telling that in the Commission's 2007 Communication, *An Energy Policy for Europe*, it dedicated less than 600 words to the nuclear question and chose to describe nuclear in a rather positive light as 'one of the cheapest sources of low carbon energy', 'less vulnerable to fuel price changes than coal or gas', and 'one of the ways of limiting CO_2 emissions' (European Commission 2007). Still, recognizing nuclear energy's benefits for the larger goal of building a low-carbon economy is a far cry from actually placing a stamp of approval on the matter or accounting for its economic sustainability, which as Helm (2012) points out, is questionable. Even the most visible EU-backed project in the nuclear field, the International Thermonuclear Experimental Reactor (ITER) is a distant possibility. Given its costs to the EU (over €1 billion between 2012 and 2013) and its very long timeline, it is reasonable to ask whether or not EU funds could be better spent on infrastructure for its fledgling internal energy market.

In addition to all these points, nuclear has clear military (France and the UK operate nuclear weapons programmes) and profoundly serious health implications, which separate it policy-wise from other primary energy fuels. The military dimension is clearly a subject and prerogative of the two member states involved, an 'unquestioned core of the defence postures of both France and the United Kingdom' (Jasper and Portela 2010), and there is no serious discussions at the EU level of integrating member-state nuclear forces in any future plans for coordinated or common defence forces under the rubric of the EU's evolving *Common Security and Defence Policy* (CSDP). In the area of health and safety, on the other hand, there has been a significant amount of cooperation between the member states for many years, particularly in the area of safety and emergency response. Thus, in addition to the legal framework in place, 'there is a "non-binding acquis" that is built on fundamental common principles' (de Esteban 2002).

This was not always the case. Nuclear installation safety and waste disposal were not particularly important to the original signatories of Euratom, and for much of the history of the EU well into the 1970s, there was virtually 'no Community activity directly

dealing with nuclear installation safety' (de Esteban 2002). By the time safety became an issue (following the Three Mile Island incident in the US and later the Chernobyl disaster), Europe's nuclear industries were prospering economically, but following very different paths with different set-ups and regulation schemes in the respective member states. Since then, harmonization was made easier merely by the fact that the treaty basis (Euratom) for such cooperation had long been in place, if unused. Nevertheless, the nuclear industry in Europe faced, and continues to face, serious obstacles, the most important of which being the combined effect of public concern and national politics.

There simply is no consensus on the use or future of nuclear power in Europe by the member states, and certainly not by the population. As Dieter Helm (2012: 124) observed, opposition to nuclear power is 'an ideological position for most; a matter of faith rather than a question open to debate and discussion'. What is more, the member states themselves have changed their positions on nuclear power over time. In Sweden, for example, a 1980 referendum called for a phase-out of nuclear power, a decision which, though never fully implemented, was reversed 30 years later. In Germany, once one of the biggest supporters of nuclear power in Europe, Chancellor Gerhard Schroeder's government, which included the Green Party, decided in 2001 to forgo all new construction and close all of its nuclear power plants by 2020. Although Angela Merkel's government later took a less harsh line at first, it moved swiftly after the Fukushima disaster to close eight power plants, promising the decommissioning of its nuclear facilities within a decade (Helm 2012). Meanwhile, Finland and France are expanding their use of nuclear energy, while the Netherlands, Poland, Sweden, the Czech Republic, Lithuania, Estonia, Latvia, Slovakia, the UK, Bulgaria, and Romania are each actively debating their respective nuclear energy policies. Even if the Commission were to fully engage itself and take sides in the nuclear debate, it would have to overcome not only the opposition of some of the member states but also face off against a public that is extremely sceptical about nuclear power (European Commission 2010c).

Finally, as climate change became more pressing of an issue, hopes for a nuclear renaissance rose. Indeed, Europe's growing concerns about climate change should have been 'heaven-sent for the nuclear industry' (Helm 2012: 121): after all, nuclear energy generates low-carbon electricity without producing much CO_2 and,

historically, was relatively cheap in comparison to early wind and solar power. However, the Fukushima disaster brought back old fears, and the US shale gas revolution in the mid-2010s 'pulled the economic rug from under nuclear's feet' (Helm: 21). Therefore, although there were 132 nuclear power plants operating in 14 member states in June 2013, nuclear power was as controversial as ever in January 2014.

Parallels and paradoxes

There is yet another, more critical way to understand the EU's approach to comprehensive energy security and, thus, the components of its energy portfolio. Whereas the three-pillars approach aptly describes the EU's energy portfolio as the Commission frames it, one can also observe the EU taking three parallel, and sometimes contradictory, approaches to achieve energy security (Pollak et al. 2010) that focus on reducing demand internally, expanding its supply options, and exporting rules externally. First, it is actively pursuing the reduction of overall energy demand by increasing efficiency (also known as reducing energy intensity) and the share of renewable fuels in its energy mix. Demand reduction, in turn, serves at least two other purposes. Hypothetically, this should reduce the need to import fossil fuels from outside the Union, hence mitigating the negative geopolitical consequences of external dependence by shrinking the security-of-supply issue to the internal matter of the (un)reliability of renewable sources of electricity. The end result of this approach is that it also reduces greenhouse gas emissions and, thus, enhances environmental sustainability. The focus of these actions matches elements of the internal and multidimensional rubrics of our energy policy typology. Second, the EU is supporting private commercial projects to build new pipelines and LNG terminals that increase natural gas-import capacity, diversify import routes, and expand the roster of natural gas suppliers. Combined with a reduction in demand, new sources of traditional fossil fuels enhance the stability of supplies flowing to Europe. The downside of that approach, however, is that it may also reduce the impetus to invest in alternative or substitute fuels, by keeping fossil fuel prices low enough to prevent alternatives from becoming competitive. The only way to overcome this dilemma is to support the price of alternative fuels until the scale of their production is such that they can compete with oil, gas, and coal. Unfortunately, while such an approach meets the requirements to transform Europe into a less carbon-intensive economy, it also flies in the face of decades of liberalization, privatization, and efforts to eliminate subsidies and other unfair market practices. This policy set, as one can see, is complex and fits all three rubrics of our energy policy typology. Third, the EU is using diplomacy and rule export to incorporate bordering regions into a standardized set of operating rules and regulations. In other words, the EU is exporting European standards of governance in the energy sector, and is doing so with quite some success. The best example of this is the Energy Community, an international organization established by treaty in 2005 (in force since 2006) that brings the EU together with its regionally close suppliers and partners from South-East Europe and the Black Sea region (as well as key global partners) in an attempt to standardize rules and protect energy flows to Europe while securing its foreign, direct investments in the energy sectors of its supplier states. This clearly falls under the external dimension of EU energy policy.

These approaches cannot be understood merely as separate pillars as such because each operates concurrently with varying effects on the other. On the demand side, the EU has set some mighty goals, some of which are binding. Its plans to raise the share of renewables in its total primary energy supply, including raising the share of renewable energy (use of biofuels, hydrogen, etc.) in the transport sector by 2020 (EP/Council 2009d), and its ever-increasing emission reduction targets point to an active approach to fundamentally change how energy is consumed in the EU. In January 2014, the Commission added new objectives for 2030, including reducing emissions to 40% below 1990 levels, increasing the share of renewables in overall consumption to 27% (up from 13% in 2012), and strengthening the EU-ETS market. For the latter, it proposed adding a market stability reserve in 2021 that would adjust the supply of 'auctioned allowances downwards or upwards based on a pre-defined set of rules and would improve resilience to market shocks and enhance market stability' (European Commission 2014: 8).

Yet the Commission backtracked between 2003 and 2009 on biofuels as it became clear that some fuel products could have substantial negative impacts on biodiversity and land use, leaving many investors and supporters of alternative fuels in the lurch. Similar retreats occurred in the German biodiesel market when the German government pulled the plug on subsidies, and when the

Spanish government arbitrarily changed the feed-in tariffs for small-scale photovoltaic power generation. Despite such backtracking, the EU's overall approach of setting targets for reduced emissions has been good for Europe's environment and its long-term security. The bad news is that those same targets may prove to be a disaster for Europe's shorter medium-term energy security, because it sometimes moves against the natural flow of the market and inflates energy prices.

In two of the most significant energy sectors, electricity and heating, reducing CO_2 emissions has its largest impact on coal-generated power and heat. Coal is by far the most CO_2-intensive of all the primary energy sources. Since member states retain sovereignty over their own energy mix, they must come to an agreement about which of them are going to switch from coal to alternatives and at what rate, if the member states are to reach their collective goals. However, the market generally drives decisions over specific national energy mixes and, in Europe, it is cheaper to generate electricity with coal than with gas. According to energy market observer Platts (2013), for example, the profitability gap between coal and gas in Germany 'widened to Eur26/MWh based on year-ahead contracts for power, coal, gas and carbon emissions' in 2013. As a result, Germany, the champion of the shift away from coal, started using more of it; in large part because US coal surpluses hit the market as a result of its development of shale gas resources. And it is the US, the previous champion of coal, that was actually reducing its emissions at a faster rate because its newly added and cheap shale gas surpluses were increasingly being used in its energy mix. The fuel mix issue remains a problem for Europe, but it is one that member states seem least likely to agree upon.

Nevertheless, discussions over which fuels will be used by the Union remain a necessary, if rather controversial, policy area for the Commission. Renewables such as wind, solar, geothermal, and hydropower are the most obvious alternatives to coal for electricity and heat generation. Europe's renewable share may even eventually climb beyond the 20% level with technological advances and some hefty investment. However, given the current state of technology, the efficiency of conversion processes, and the availability of reliable renewable options, most of the savings up to 2020 will not come from an increased use of renewables.

Reducing reliance on coal and oil and switching to natural gas for electricity and heat generation is a key component of EU strategy

to reduce its carbon footprint. To meet its goals, the EU will, therefore, have to increase its foreign dependency on this resource. In essence, the EU is trying to win energy security in the long run by significantly degrading it in the short run, like sprinting to win a marathon. Given this dilemma, the EU has taken specific steps to enhance its security. A Council directive (EP/Council 2004a) created a legal framework to safeguard gas supplies in the case of supply disruptions by establishing a Gas Coordination Group to liaise between the Commission, the member states, industry, and consumers. In 2006, the European Council endorsed the Network of Energy Security Correspondents to provide an early warning system for potential threats to the EU's energy supplies. In November 2008, a Commission Communication (European Commission 2008c), *Second Strategic Energy Review – An EU energy security and solidarity action plan*, identified key infrastructure projects targeted for support, including the southern gas corridor, LNG import and storage facilities to secure a diverse LNG supply for Europe, new interconnections to the Baltic region, the Mediterranean Energy Ring, and key north–south gas interconnections within Central and South-East Europe. This was rounded off by a 2010 regulation that required the competent authorities in each member state to conduct risk assessments, and establish both a Preventive Action Plan and an Emergency Plan to guarantee that all 'necessary measures are being taken to ensure [...] continuous [gas] supply, particularly in case of difficult climatic conditions and in the event of disruption', and to prepare 'measures to be taken to remove or mitigate the impact of a gas supply disruption' (EP/Council 2010a).

The EU's dual, and sometimes contradictory, goals of decarbonizing its economy and enhancing its energy security has been made all the more difficult to achieve in light of the US shale gas boom, as illustrated by the German example. Some member states, such as the United Kingdom and Poland, are hoping to follow the US lead. Although the Commission deems the EU's shale gas reserves 'to be significant' according to a January 2014 Communication on the subject, so far the results have been poor and controversial, as many Europeans oppose those efforts and fear the negative environmental consequences of the water–intensive, horizontal-drilling method known as hydraulic fracturing, or fracking. As of January 2014, the technique was legal and being deployed in Denmark, the Netherlands, Poland, and Romania. It was also legal in Ireland, but no wells were yet developed, and it was de jure legal in Germany

but de facto not, as Berlin imposed a moratorium in 2013 until further research could be undertaken. The Commission issued recommendations in January 2014 (European Commission 2014b) accompanied by a Communication on 'the exploration and production of hydrocarbons (such as shale gas) using high volume hydraulic fracturing in the EU', in which it recognized that 'shale gas can be a possible substitute for more carbon-intensive fossil fuels, an indigenous source of natural gas reducing dependency on non-EU energy suppliers, as well as a possible driver of jobs, economic growth and additional source of public revenues' (European Commission 2014a).

The debates over nuclear power and hydraulic fracturing (fracking) in the EU are good examples of the difficult policy choices faced by the Commission. On one hand, the Commission has championed environmental protection; on the other, it cannot ignore the possibility that Europe may be able to replace external gas supplies with indigenous fossil fuel resources, or substantially reduce its carbon footprint and external energy dependence on gas through increased use of nuclear power. While the former is a battle that is just beginning and will increasingly find its way into the EU's energy portfolio, the latter has oscillated between a panacea and political hot potato.

Concluding remarks

EU Energy policy is not easy to define. European Union Energy Commissioner Andris Piebalgs broadly defined it in 2007 in economic terms as 'a common energy market that works under particular investment conditions' (Euractiv 2007). The difficulty is not limited to EU politics either. While some consider it 'too complicated to be left to the politicians' (Frank 2006), former US President William Jefferson Clinton called energy policy 'the key to national security', 'fighting global warming', and 'more jobs and higher incomes'. (CNN 2008). Whichever way one categorizes energy policy and whichever issues one includes, one thing is certain, there is precious little consensus over precisely what issues do or do not fall into an energy policy portfolio.

This is because energy issues are not mere matters of resources, services, or the environment; energy itself is a political commodity. When it is available and cheap, economies grow rapidly (as was the case in the post-war boom years in Europe) and the price of food

and mobility are low. When supplies run out, are interrupted, or prices spike, the economic fallout on households and businesses can be disastrous. Therefore, no policymaker who cherishes his or her job can afford to ignore energy; it is a proverbial bread-and-butter issue. As any student of political science will attest, policymaking is an imperfect and complex process that involves many actors and forces, each driven by different, competing, and often contradictory interests. Both the array of issues and the constraints on policymakers increase when one considers not a single national energy policy, but rather a conglomerate set of national policies organized and, to an increasing extent, coordinated at a supranational level.

This chapter began by organizing energy policies into a typology of three dimensions, an internal, an external, and a multidimensional. Among the most notable policies that fit into these dimensions are: the establishment of a functioning internal energy market and all that comes with it (liberalization, deregulation and re-regulation, subsidies, integrating network infrastructures, and harmonizing taxes and prices); continuing debates over controversial new technologies (fracking) and old ones (nuclear power); reducing external dependency (through diversification of suppliers, building new pipelines, energy diplomacy and rule export, and reduced demand through increased efficiency); and finally, making energy use environmentally sustainable by addressing vital reductions in energy-related greenhouse gas emissions. Throughout the course of the chapter we show how each of these issues fall within the EU's energy portfolio, which the Commission organizes into three pillars: sustainability, competitiveness, and security of supply.

The EU wants to move to a new industrial age, a new green economy that promises economic growth, jobs, and a clean environment, but it faces very difficult challenges. In order to implement its three-pillar strategy, the EU is taking concerted, but limited, action. However, the goals it has and the approaches it is taking are in many ways implicitly contradictory. It is difficult to guarantee fair competition in the energy sector: suppliers are unevenly distributed in location and number, and companies need long-term guarantees to justify expanding their infrastructure, neither of which fits well with a competitive market or allowing third-party access to a company's infrastructure. It seems obvious that the best way to decarbonize Europe's economy is to reduce coal consumption for electricity generation and petroleum for transportation. That explains in part why, in a 2011 Transport White Paper, the

Commission set a goal of reducing emissions in the transport sector by 60% from 1990 levels by 2050 and by around 20% from 2008 levels by 2030 (European Commission 2014: 14). However, replacing either too quickly only increases prices and stress on consumers. Indeed, pairing the aims of competitiveness with its climate goals often seems to be a Sisyphean task.

Reducing the EU's external energy dependence is another problem fraught with contradictions. Although the Central and Eastern parts of Europe are overly dependent on Russia for natural gas, Russia is just as dependent on Europe for its investments and technologies, especially in the LNG sector. Meanwhile, developing new indigenous gas resources, which would not only help reduce foreign dependence but also create jobs and help expedite decarbonizing the economy, is opposed by many for its very real negative environmental consequences. Finally, by decarbonizing the economy, and raising the costs associated with industrial production, Europe is in many ways not only decarbonizing but also implicitly deindustrializing, pushing traditional economic opportunities for manufacturing and labour out of Europe to places where environmental conditions and emissions' controls are weaker.

Meeting together in Messina, Italy in 1955, the six founding members of the EEC declared that '[p]utting more abundant energy at a cheaper price at the disposal of the European economies constitutes a fundamental element of economic progress' and all 'arrangements should be made to develop sufficient exchanges of gas and electric power capable of increasing the profitability of investments and reducing the supply costs' (Messina Declaration 1955). The EU has come a long way since Messina and its energy portfolio has grown substantially. At one point or another, the EU has taken up each of the issues described in this chapter (and many more), in some cases resolving matters, and where not, setting bold goals and targets, many of which continue to elude EU policymakers.

Before exploring in detail the changing nature of EU policy and its theoretical underpinnings, we need to review some of the fundamental principles of energy economics, particularly its end uses and how the global energy balance shapes and conditions policy choices.

Chapter 2

Principles of Energy, End Uses, and the Global Energy Balance

This chapter introduces readers who do not have a background in energy to the key information that they need to make sense of this policy area. It begins by explaining some of the fundamentals of the economics of energy, thereby building upon the foundational principles of energy laid out in the Introduction – that energy comes in two forms, kinetic or potential; that energy can be converted from one to another; and that a variety of energy-carrying resources store energy unequally and are either finite or not. With a firm grasp of energy's unique and distinguishing economic concepts in hand, we proceed to examine its three main end uses: electricity, heating, and transportation. Keeping in mind the definitive goal of comprehensive energy security, we identify how these end uses drive policymakers to incorporate internal, external, and multidimensional policies. We conclude by contextualizing these end uses in terms of the global balance of supply and demand for the most widely used finite energy resources (oil, gas, coal, and uranium).

Basic principles of energy economics

Appreciating how energy is used requires at least a basic understanding of the terminology, actors, markets, and forces at play, or as in politics, the who, what, when, and where of the energy business. Energy concepts are not easy and analysts tend to thrive on special terminology that often leads the layman to misunderstanding, in many cases significantly, what is being referred to.

Primary energy production refers to any kind of extraction of energy products from natural sources into a usable form. Primary production occurs when natural sources are exploited, no matter whether that source is a coal mine, crude oil field, hydropower plant, wind farm, solar array, or the fabrication of biofuels.