South East Europe
Sustainable Energy
Policy



SOUTH EAST EUROPE:
THE EU ROAD OR THE ROAD TO NOWHERE?

An energy roadmap for 2050: A guide to the future

SEE 2050 ENERGY MODEL

SEE 2050 CARBON CALCULATOR

JUNE 2016

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*According to the UN, Kosovo is "under the United Nations Interim Administration Mission in Kosovo (UNMIK) established pursuant to Security Council Resolution 1244." In this publication it is referred to as "Kosovo".
**According to the UN, the official name for Macedonia is "The former Yugoslav Republic of Macedonia"

South East Europe Sustainable Energy Policy

With approximately 25 million potential new EU citizens in South East Europe, who are all energy consumers, energy is perhaps one of the most complex issues which is facing the region. It has inter-related and far reaching impacts on several areas, including society, the economy and the environment, particularly as South East Europe faces the imminent deregulation of the market in a less than ideal governance environment.

The South East Europe Sustainable Energy Policy (SEE SEP) programme is designed to tackle these challenges. This is a multi-country and multi-year programme which has 17 CSO partners from across the region (Albania, Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro and Serbia) and the EU, with SEE Change Net as lead partner. It is financially supported by the European Commission.

The contribution of the SEE SEP project is to empower CSOs and citizens to better influence policy and practice towards a fairer, cleaner and safer energy future in SEE.

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FOREWORD



Solar-powered aircraft Solar Impulse 2 / Photo: Solar Impulse (CC BY-NC-SA 2.0)

If you want to innovate, be a pioneer!

I never have enough of flying the Solar Impulse, or seeing it fly. Because, when you see those 4 electrical motors, that put the plane in the sky, with no noise, and no pollution, it's like a jump into the future. Thanks to new technologies, the future is already today.

The world cannot continue on combustion engines, badly insulated houses, and incandescent light bulbs, old, outdated systems to distribute the energy. This is last century. So it's not only about protecting the environment, it's a lot about making money, new industry or markets, economical development, profit, job creation...

These clean technologies, like the one we have on Solar Impulse, can be used for electrical mobility, LED lamps, smart grids. So maybe Solar Impulse is a way to try to overcome the resistance of the dinosaurs who have not yet understood where the future is.

I tell naysayers, be really careful because innovation does not come from inside the system. It's not the people selling candles who invented the light bulb. Because, what you are doing now will be replaced and if you want to innovate, be a pioneer, you have to change the way of thinking - dinosaurs disappeared although they were the strongest ones, but they were the less flexible ones to adaptation.

If an aircraft is able to fly days and nights without fuel, propelled only by solar energy, let no one claim that it is impossible to do the same for motor vehicles, heating and air-conditioning systems, and computers.

The South East Europe 2050 Roadmap voices the conviction that a pioneering spirit with political vision can together change society and bring about an end to fossil fuel dependency in our region.



Prof. Dr. Bertrand Piccard, Initiator, Chairman and Pilot of Solar Impulse / Photo: Solar Impulse

Signed by

Prof. Dr. Bertrand Piccard, Initiator, Chairman and Pilot of Solar Impulse

New York, United States of America, June 6 2016

EXECUTIVE SUMMARY

The Paris Agreement aims to limit global temperature rise to well below 2°C, while pursuing efforts to keep below 1.5°C. The UN member countries[1] of South East Europe – Albania, Bosnia and Herzegovina, Croatia, Macedonia, Montenegro and Serbia – have pledged to join the rest of the international community in reducing their greenhouse-gas emissions as soon and as ambitiously as possible. The countries of the region are also committed to meeting European Union targets on renewable energy, energy efficiency and greenhouse-gas emissions reductions.

Unfortunately, energy policy in the region is not keeping up with these aspirations. Current plans for new coal and lignite plants will lock in carbon-intensive energy infrastructure for decades. This will take the countries of South East Europe further away from EU and UN goals, putting them at an economic, technological and political disadvantage. They will also exacerbate social and environmental disasters that are already unfolding far from the media headlines: from energy poverty, to many premature deaths from air pollution, to the impacts of climate change.

South East Europe needs a clear and ambitious energy vision that will shape policy, guide investment and inspire citizens across the region. To support this vision, SEE Change Net and SEE SEP partners have modelled two scenarios for the region:

- The "Road to Nowhere" – based on continued reliance on fossil fuels, with a heavy focus on new coal power stations, and unambitious efforts to tackle energy efficiency.
- The "EU road" – a pathway to a sustainable, efficient renewable energy system, enabling countries to meet their EU goals and international climate commitments.

Following the EU road will bring multiple environmental, social and economic benefits – including better air quality and more jobs. And taking the clean energy pathway – while, of course, a challenge – will not be more expensive than current proposals: in fact, countries are likely to save money as a result of improved energy efficiency and reduced pollution-related costs.

UNTAPPED POTENTIAL

Because of the widespread use of hydroelectricity and firewood, the countries of SEE currently use a higher proportion of renewable (though not necessarily sustainable) energy than the EU average. But with large amounts of dirty lignite and coal being burnt and energy wasted, relative greenhouse-gas emissions are higher – and the gap is growing.

Current policies and investments will lead to most SEE countries being left behind by the EU in the transition toward clean energy. But it's not too late for the region to catch up. SEE has a wealth of renewable energy resources, only a fraction of which have so far been exploited. Investing in sustainable renewable energy (notably rooftop solar PV and wind power), smart electricity grids and more efficient buildings and technology offers huge potential to improve quality of life, increase energy security, reduce carbon

[1] *Kosovo is not a member of the UNFCCC and therefore did not sign the Paris Agreement.*

emissions, and align SEE economies with their EU peers.

CHALLENGES

Leaving the Road to Nowhere and getting on the EU pathway presents a number of challenges. Key issues to address include:

- **Increasing energy efficiency**
  SEE countries urgently need to make much more aggressive efforts to improve their low levels of energy efficiency: saving a unit of energy is 1,000 to 10,000 times more cost effective than generating a new unit of energy.

- **Ending coal**
  It's imperative that SEE countries reassess plans for new coal plants. Going ahead with new constructions will lock in high-carbon energy infrastructure for years to come: it will be impossible to use all the planned new coal plants to their full capacity and still meet EU carbon targets.

- **Ramping up renewables**
  To date, development of sustainable renewable energy sources – especially solar and wind – has been very slow. These large potentials need to be developed rapidly to provide an alternative to coal power.

- **Limiting hydropower expansion**
  Hydropower provides SEE with almost a third of its electricity, and hundreds of new dams, large and small, are planned for the region. However, further expansion of hydropower could have serious social and environmental impacts, and needs to be planned and assessed very carefully.

- **Getting transport on track**
  By 2050, electric cars and plug-in hybrids should become the norm. But countries should also prioritize a shift from private cars to other forms of transportation, to deliver huge reductions in energy use and emissions.

- **Tackling corruption**
  Historically, large-scale energy projects in the region have often been marked by corruption. This raises costs, creates unpredictability in the business environment and drives away reputable investors. Tackling systemic corruption will be crucial if the countries of SEE are to enjoy the benefits of a clean energy future.

- **Mobilizing finance**
  Renewable energy can save money in reduced fuel costs and environmental and social externalities, but investment costs are high. Similarly, improving the energy efficiency of buildings, transport systems and industry will require significant investment before the savings take effect.

A CLEAR PATHWAY FORWARD

Over the next 10 years, almost 90% of the lignite-based energy infrastructure in the region is due to be closed or rehabilitated. Crucial decisions on how to replace this capacity need to be made urgently. With a development period of around 5-8 years, and a lifespan of 40-50 years, energy investments must be guided by clear long-term goals. South East Europe will lose its way and be left behind unless it adopts a consistent, forward-thinking strategy to guide long-term decision-making. The energy roadmap offers this vision.

INTRODUCTION



Neretva River / Photo: © Michel Gunther WWF-Canon

On Earth Day 2016 in New York, all the UN member countries[2] of South East Europe (SEE) signed the Paris Agreement. The deal aims to limit global temperature rise to well below 2°C, while pursuing efforts to keep below 1.5°C. Having ratified the agreement, the countries of the region are required to begin reducing their greenhouse-gas emissions as soon as possible and pursue the highest ambition that they can achieve. Far and away the most important factor in the region's greenhouse-gas emissions is the way we produce and use energy.

[2] *Ibid*

While striving to meet these global commitments, the countries of the region also need to prepare for joining the European Union. Croatia became the EU's 28th member state in 2013, and Albania, Bosnia and Herzegovina, Macedonia[3], Kosovo[4], Montenegro and Serbia have ambitions to follow over the coming years. One significant implication of joining the EU is that they will also need to meet EU targets on renewable energy, energy efficiency and greenhouse-gas emissions reductions, which go beyond their existing obligations for 2020 under the Energy Community Treaty. EU Member States have made the following commitments for 2030:

Reduce emissions by 40%
compared to 1990 levels



Increase the share of renewable energy to at least 27% of energy consumption



Increase energy efficiency by at least 27%

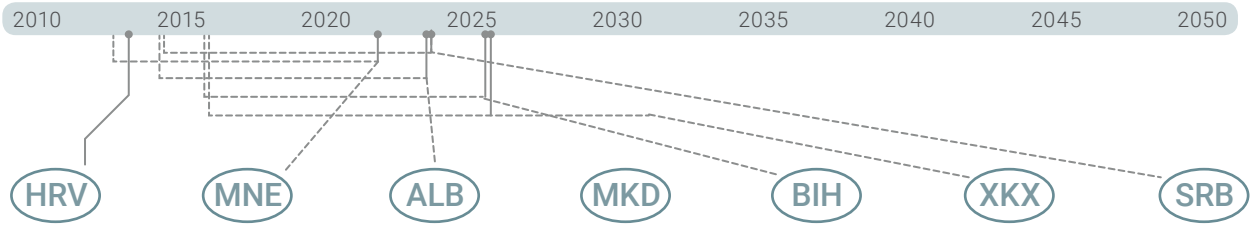


More stringent targets will need to be introduced to have a reasonable chance of achieving the universally agreed ambition of limiting temperature increases to 1.5°C in line with climate science. The EU's long-term goal is to reduce greenhouse-gas emissions to 80-95% below 1990 levels by 2050, which effectively requires the complete decarbonization of the energy system; research suggests a target of reducing domestic emissions by 55% by 2030 is needed for the EU to be on track to meet this goal.[5] Since 1990, EU countries have been successful in decoupling energy and emissions from growth, reducing emissions by 19% while increasing GDP by 45%,[6] as shown in Figure 2.

The direction of travel should be clear. Countries hoping to join the EU must shift toward sustainable, renewable sources of energy and significantly improve energy efficiency. And because investments in energy infrastructure have a long timeframe – typically 20-60 years[7] – they need to start now. Continuing to invest in fossil fuel infrastructure, particularly coal, is incompatible

Figure 1

STATUS OF EU ACCESSION OF SEE COUNTRIES



HRV Croatia is a member of the EU since 2013

MNE Montenegro began accession negotiations in 2012*

ALB Albania gained candidacy status in June 2014*

MKD Macedonia has candidate status but the accession process is "at an impasse"

BIH BiH submitted its application to join the EU in February 2016*

XKX The Stabilisation and Association Agreement between the EU and Kosovo entered into force in April 2016*

SRB January 2014: Initiation of Serbia's accession negotiations. Opening of Chapters 32 and 35 took place in December 2015

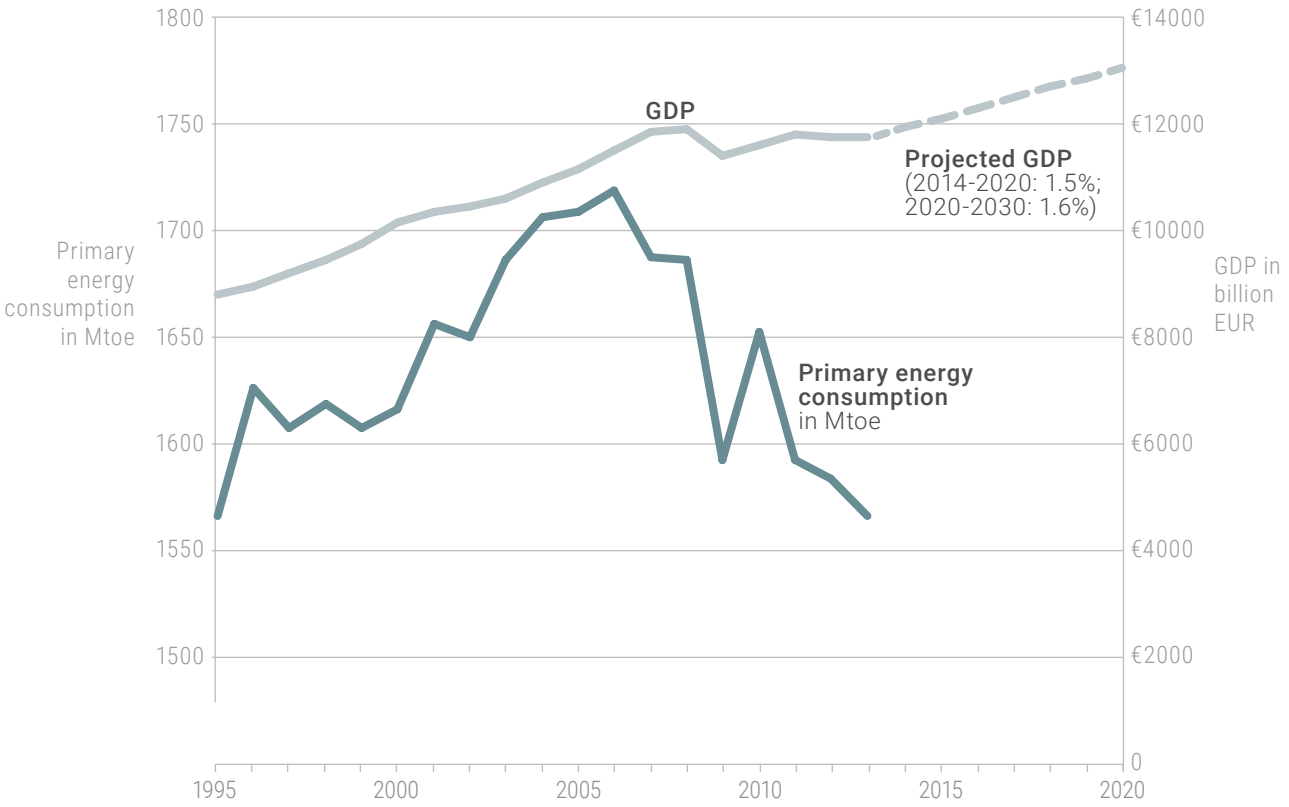
**Average time for the completion of accession process is 10 years*
SOURCE: http://ec.europa.eu/enlargement/countries/check-current-status/index_en.htm

[3] *According to the UN, the official name for Macedonia is "The former Yugoslav Republic of Macedonia".*
[4] *According to the UN, Kosovo is "under the United Nations Interim Administration Mission in Kosovo (UNMIK) established pursuant to Security Council Resolution 1244."*
[5] *Ecofys. 2013. The Next Step in Europe's Climate Action: Setting targets for 2030. Available from: www.ecofys.com/files/files/greenpeace-ecofys-2013-next-step-in-eu-climate-action.pdf*
[6] *Scrieciu, S. 2015. Setting 2050 goals and intermediate targets: Lessons from EU's energy-related policy experience. European Commission/DG Energy. Presentation at EU Sustainable Energy Week, 17 June 2015.*
[7] *Ibid.*

Figure 2

DECOUPLING OF GROWTH FROM ENERGY CONSUMPTION IN THE EU

EU 28 - Primary Energy Consumption in Mtoe and GDP in Billion Euro



SOURCE: Presentation by Paul Hodson, DG Energy, June 18 2015

with international commitments: a new study suggests that all new electricity generation needs to be zero carbon from 2017 to have a 50% chance of avoiding temperature rises of 2°C.[8]

Unfortunately, SEE is still looking the wrong way. The countries of the region may have signed up to the Paris Agreement, but their Intended Nationally Determined Contributions (INDC) are woefully unambitious, with some allowing for large increases in greenhouse-gas emissions.

This lack of ambition and strategic thinking can be seen most clearly in the energy sector. The most recent official publication at the regional level – the 2012 Energy Community Regional Energy Strategy – envisaged nearly €30 billion of investment in new energy infrastructure by 2020,[9] with approaching half (43.5%) of planned new electricity capacity set to run on coal or lignite. Not only are these the most carbon-intensive energy sources, but they also have huge external costs: a new study puts the public health cost of air pollution from existing coal plants in the Western Balkans at €8.5 billion per year, with high rates of premature death, chronic lung disease, heart conditions and asthma.[10]

Yet elsewhere, the amount of electricity generated by coal

[8] *Pfeiffera, A., Millara, R. and Hepburn, C. 2016. The '2°C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy. Applied Science – in press.*

[9] *This figure includes Moldova. Energy Community. 2012. Regional Energy Strategy.*

[10] *HEAL. 2016. The unpaid health bill: How coal power plants in the Western Balkans make us sick. Health and Environment Alliance (HEAL). www.env-health.org/IMG/pdf/factsheet_eu_and_western_balkan_en_web.pdf*

is falling. Increasingly strict EU environmental legislation, the Emissions Trading Scheme (ETS) and falling costs for renewable energy technologies make coal increasingly uneconomic. It will become even more so as measures are taken to fix carbon markets, which currently price carbon too low. For example, a recently approved EU mechanism will, from 2019, begin removing some excess pollution permits from the ETS every year.

Current policies that lock in carbon-intensive energy infrastructure will take the countries of South East Europe further away from EU and UN goals, putting them at an economic, technological and political disadvantage. They will also exacerbate social and environmental disasters that are already unfolding far from the media headlines: from energy poverty, resettlement and the many premature deaths from air pollution, to climate change and the extreme weather events, food and water shortages, migration and other consequences it brings.[11]

South East Europe needs a clear and ambitious energy vision that will shape policy, guide investment and inspire citizens across the region. SEE Change Net, in partnership with 17 other civil society organizations as part of the SEE SEP (South East Europe Sustainable Energy Policy) project, is leading the development of an energy roadmap for the region, as well as for each of the seven countries involved in the project, to enable better choices about our energy future.

The roadmap is informed by the South East Europe 2050 Energy Model,[12] based on the 2050 Calculator – a tool developed by the UK Department for Energy and Climate Change, which has been used successfully by numerous countries.[13] Drawing on extensive existing studies as well as numerous stakeholder meetings and an online Call for Evidence, the model makes it easy to explore a wide range

ENERGY MODEL
Development Timeline

2013 Jan
Feb — Beginning of work on the **energy models** for 7 South East Europe countries
Mar
Apr
May — Beginning of the **sectoral analysis** and collection of data
Jun
Jul
Aug
Sep
Oct
Nov
Dec

2014 Jan
Feb — Beginning of **technical consultation meetings** with relevant stakeholders
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

2015 Jan — **Consolidation and integration** of supply with demand
Feb
Mar — Online **public consultations** (Call for Evidence) on energy models
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov — Model **launched online** on two web tools: www.see2050carboncalculator.net and www.see2050energymodel.net

[11] *See for example the following studies on health costs (www.env-health.org/IMG/pdf/141215_ir_fact_sheets_balkans.pdf), energy poverty (http://rs.boell.org/sites/default/files/uploads/2014/09/stadtmueller_2014_understandingthe_link_between_energy_efficiency_and_energy_poverty_in_serbia.pdf), climate change (www.unep.at/documents_unep/ENVSEC/Climate_Change/Climate-change-west-balkans.pdf)*

[12] *www.see2050carboncalculator.net; www.see2050energymodel.net*

[13] *Countries that have created 2050 Calculator energy models include United Kingdom, Belgium, China, South Korea, South Africa, India, Japan, Taiwan, Mexico, Colombia, Bangladesh, Vietnam, Thailand, Indonesia, Nigeria, Switzerland, Austria and Australia. Countries in the process of creating their 2050 Calculator energy models include Algeria, Brazil and Hungary.*



SEE 2050 Energy Model / http://bit.ly/SEEenergymodel

of energy scenarios. It also encourages many stakeholders to participate: to date, partners have held more than 500 consultations. The model is transparent and accessible; all the sources it uses and assumptions made are clearly outlined. It has different levels of complexity suitable for technical experts, decision-makers and interested members of the public, making it ideal for opening up debate and enabling people to make sensible choices about their energy future.

Using this model, SEE Change Net and SEE SEP partners have developed two scenarios for the region. The "Road to Nowhere" follows the worst trajectory in terms of climate impacts: continued reliance on fossil fuels, with a heavy focus on new coal power stations rather than new forms of renewable energy, and unambitious efforts to tackle energy efficiency.

By contrast, the "EU Road" shows how the region can move to a sustainable, efficient renewable energy system, enabling countries to meet their EU goals and international climate commitments. The goal is to reduce emissions by 80% by 2050, compared to 1990. Achieving this will bring multiple environmental, social and economic benefits – including better air quality and more jobs. And taking the clean energy pathway will not be more expensive than current proposals: in fact, countries are likely to save money as a result of improved energy efficiency and reduced pollution-related costs.

This report gives a brief overview of these scenarios; full details are published in our accompanying technical report. It outlines some of the benefits of following the EU energy roadmap – but also acknowledges the significant challenges that need to be overcome if we are to move toward a cleaner, fairer, sustainable and more efficient energy system.

The choice facing SEE is clear. We can take the EU Road, to a clean and sustainable energy future, or the Road to Nowhere. Even without the imperatives of EU accession and the Paris Agreement, the EU Road is the path that any government that wants the best for the health and prosperity of its people would take. Changing direction will require strong political will and commitment, long-term economic thinking, innovation from business and engagement by civil society. But, as our model shows, shifting to an efficient, renewable and sustainable energy future is both possible and necessary.

GUIDING PRINCIPLES

Saving a unit of energy is many times more cost effective than generating a new one.

Cleaner, sustainable energy is better for us, our children, the environment and the climate.

Energy policy must have a proactive, forward-looking, social dimension, including creating sustainable local jobs and eradicating energy poverty.

GOING BEYOND THE EU GOAL

Following the EU policy framework is an obligation for countries joining or seeking to join the EU. As this report shows, reaching EU climate and energy goals in the SEE region is technically and economically feasible, and will bring significant additional benefits. The key challenge is a question of political will – and this is not a factor to be underestimated. This is why we present a scenario corresponding to the key political aim of the region: EU integration.

However, EU targets are not a panacea, and are insufficient to meet the Paris Agreement's goal of keeping global temperature rise well below 2°C and pursuing 1.5°C. Countries should be ready to go beyond the proposed scenario and strive to reach zero emissions from fossil fuels and a 100% sustainable renewable energy system by 2050. Organizations including WWF and Greenpeace have already developed scenarios showing that it is possible to have a world powered by 100% renewable energy sources.[14] While there are significant challenges to overcome in sectors such as transport and heavy industry, the EU Road presented here should be seen as a route toward that destination.

[14] *WWF. 2011. The Energy Report: 100% Renewable Energy by 2050. http://wwf.panda.org/wwf_news/?202855/energy-roadmap-2050-long-road-no-clear-direction; Greenpeace. 2015. Greenpeace Energy Revolution. www.greenpeace.org/international/en/publications/Campaign-reports/Climate-Reports/Energy-Revolution-2015*

THE EU ROAD



1. BUILDINGS: INNOVATE AND RENOVATE

All new buildings are near-zero energy from 2025: they are well insulated, use highly efficient heating, cooling and lighting, and generate power from rooftop solar panels which is fed back into the grid. Retrofitting of existing buildings ramps up – starting with significant improvements like wall and loft insulation and super-glazing, but reaching energy cuts of 90% or more after 2030.

2. SWITCH ON TO EFFICIENT TECHNOLOGIES

Everyone switches to efficient fluorescent bulbs and, increasingly, LED lighting by 2030 – part of a general shift to energy-efficient technology. Improvements in efficiency of household appliances means higher standards of living don't increase electricity consumption.

3. A TIGHTER GRID

Improvements to infrastructure, management and law enforcement mean less electricity is lost in the transmission and distribution network. By 2030, transmission and distribution losses are cut from the regional average of 22%* to 10% – the standard currently set by Croatia, which has the lowest distribution losses in the region**.

4. CLOSE DOWN COAL

Most of the region's coal power plants are reaching the end of their life. Retrofits are made on existing plants so they meet the EU Industrial Emissions Directive, and all plants close once they are 50 years old.† A total of 39 units are closed by 2050, and no new plants built.††

5. WIND WHERE IT BLOWS BEST

There's a large but managed expansion of wind power, focused only on the best locations – outside protected areas – where the largest proportion of power can be generated. More than 5,000 wind turbines of 2.5 MW each are installed by 2050.

** Regional average (excluding Croatia) for year 2014, according to Energy Community Annual Implementation Report, 2015; http://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3872267/23B450386A075E64E053C92FA8C0F69F.PDF*

*** Distribution and transmission losses in Croatia in 2014, Croatian energy regulatory agency (HERA), 2014 annual report: www.hera.hr/hr/docs/HERA_izvjesce_2014.pdf p.35-36*

† This is 10 more years than usual plant lifetimes; with the increasingly poor economics of coal, they may not all be kept in operation this long. However, the reality in the region is that many plants are already more than 40 years old: closing coal plants at 40 would mean that 90% of units would need to be closed between 2018 and 2023.

†† Stanari in Bosnia and Herzegovina, which is currently under test operation, runs for its full foreseen lifetime.

10 milestones on the road to a fairer, cleaner, sustainable and more efficient energy system in South East Europe



Sunny roofs | A drive toward electric vehicles | Hydro: a steady flow | Different modes of transport | Grow biomass responsibly

6. SUNNY ROOFS

Solar panels are installed on half of all suitable rooftops. Total output in 2050: 50 TWh, a little more than the 47 TWh generated by coal in the region in 2010. Total cost: between €5.97 billion and €7.75 billion. Added to this, $3m^2$ of solar thermal installations per household help to meet hot-water demand.

7. A DRIVE TOWARD ELECTRIC VEHICLES

Electric cars become the norm, reducing emissions and dependence on predominantly imported oil. Following expected trends in the EU, where the vast majority of the region's cars originate, 80% of cars will be electric or plug-in hybrids by 2050. Cars in the region also catch up with continually improving EU efficiency standards.

8. HYDRO: A STEADY FLOW

Existing plants and those that were under construction in 2010 remain in operation. Proposed plants go ahead provided they are not in protected areas or river stretches of outstanding quality, and are built following sustainable hydropower development guidelines.

9. DIFFERENT MODES OF TRANSPORT

There's a shift away from car travel, particularly in urban areas. The proportion of passenger kilometres travelled by car falls by at least 30% compared to a 2010 baseline, but there's an increase in cycling, and rail travel returns to the level it enjoyed before 1990. While investment is needed into public transport, cycle networks and urban planning, by 2050 capital costs and fuel costs are lower than if car travel continues to increase.

10. GROW BIOMASS RESPONSIBLY

The use of solid biomass – mainly for domestic heating – increases by 20%, and wood stoves are made cleaner and more efficient. Biomass use is based on efficient, sustainable forest management and reforestation, and none of the wood is imported.

ENERGY IN SEE: TODAY'S PICTURE, TOMORROW'S OUTLOOK



Miners at work in coal pit "Stara jama" in Zenica coal mine, Bosnia and Herzegovina / Photo: Velija Hasanbegović

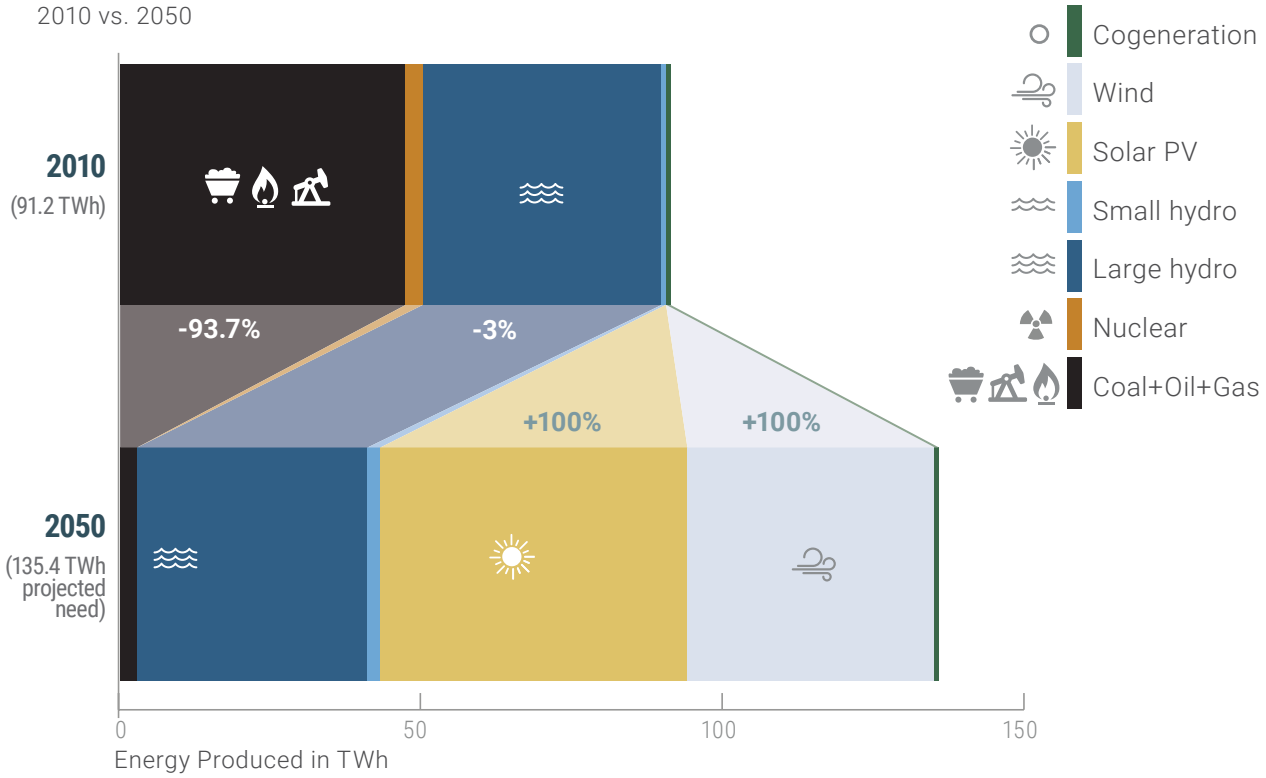
Because of the widespread use of hydroelectricity and firewood, the countries of SEE currently use a higher proportion of renewable energy[17] than the EU average (though neither firewood nor hydropower are necessarily produced sustainably). But with large amounts of dirty lignite and coal being burnt and energy wasted, relative greenhouse-gas emissions are higher – and the gap is growing.

[17] *Of course, for wood to count as a source of renewable energy, the forests from which it comes must be renewed through sustainable management, which is not always the case in the region.*

Figure 3

SEE REGION ELECTRICITY SUPPLY (TWH)

2010 vs. 2050



SOURCE: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net)

Investing in sustainable renewable energy, smart electricity grids and more efficient buildings and technology offers huge potential to improve quality of life, increase energy security, reduce carbon emissions, and align SEE economies with their EU peers.

TODAY'S ENERGY MIX…[18]

Fossil fuels dominate the total energy mix in the region. Coal is the largest source, accounting for 38.7% of primary energy supply. Another 8.2% comes from oil, with gas providing 5.2%. Renewable sources – predominantly hydroelectricity – make up 8.6% of total primary energy supply while biofuels and waste make up 7.5%. For many households, biomass is the main source of energy: a 2012 study found that 94% of households in Kosovo and 82% in Bosnia and Herzegovina use biomass (mainly wood) for their daily needs.[19] To be sustainable and low carbon, biomass needs to come from a local, well-managed source.

The countries of South East Europe generate more of their electrical energy from renewables (40%) than the EU average (27%).[20] However, this comes almost entirely from hydropower, which brings its own legal, environmental and social problems. The use of other sources of renewable electricity is negligible in SEE: by contrast, EU electricity generation includes 7.2% wind, 2.6% solar and 4.8% biomass.[21]

Meanwhile, the remainder of the region's electricity comes almost entirely from coal/lignite (56.7%) – much of it from old, inefficient and highly polluting

[18] *Unless otherwise stated, data is from the International Energy Agency for 2013, the most recent year for which full figures were available at the time of writing. See www.iea.org/statistics/statisticssearch/report/?country=WORLD&product=balances&year=2013*

[19] *Center for Renewable Energy Sources and Saving. 2012. Study on the Biomass Consumption for Energy Purposes in the Energy Community. Energy Community. https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/2514178/0633975ABC6B7B9CE053C92FA8C06338.PDF*

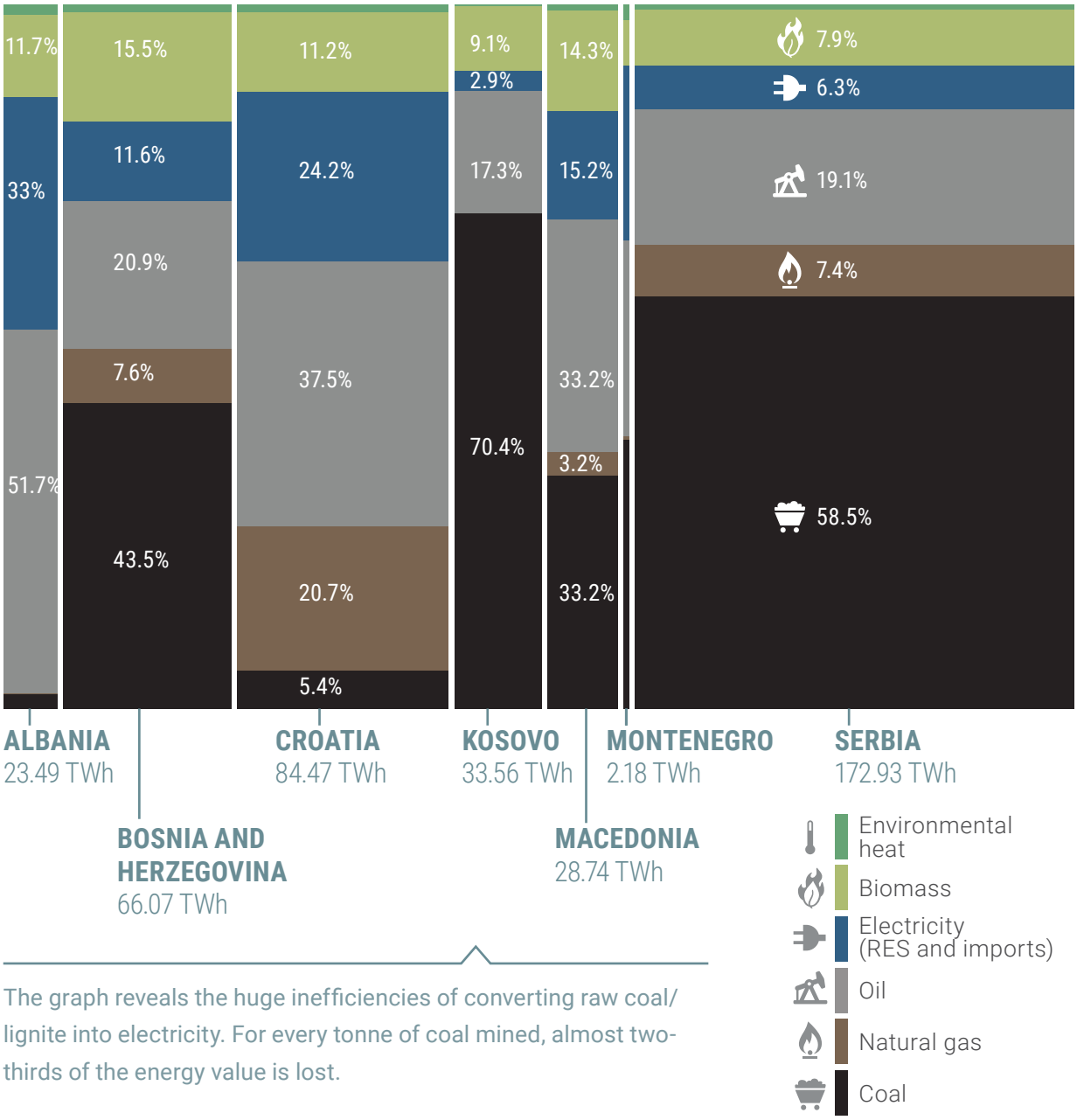
[20] *http://ec.europa.eu/energy/sites/ener/files/documents/PocketBook_ENERGY_2015%20PDF%20final.pdf*

[21] *Ibid.*

Figure 4

PRIMARY ENERGY SUPPLY PER COUNTRY & TECHNOLOGY

TWh, 2010



The graph reveals the huge inefficiencies of converting raw coal/ lignite into electricity. For every tonne of coal mined, almost two-thirds of the energy value is lost.

SOURCE: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net)

plants. In contrast, the share of coal electricity generation in the EU is 26.7% (2013) and falling.[22] Outside of Croatia, the countries of SEE use almost no natural gas for electricity generation, compared to 16.6% in the EU; while gas is sometimes promoted as a way of reducing emissions in the medium term, this would be an unhelpful diversion in SEE, which lacks gas infrastructure and would be reliant on imports. The EU also generates large amounts of nuclear power (27%), which is almost absent in the SEE region.[23]

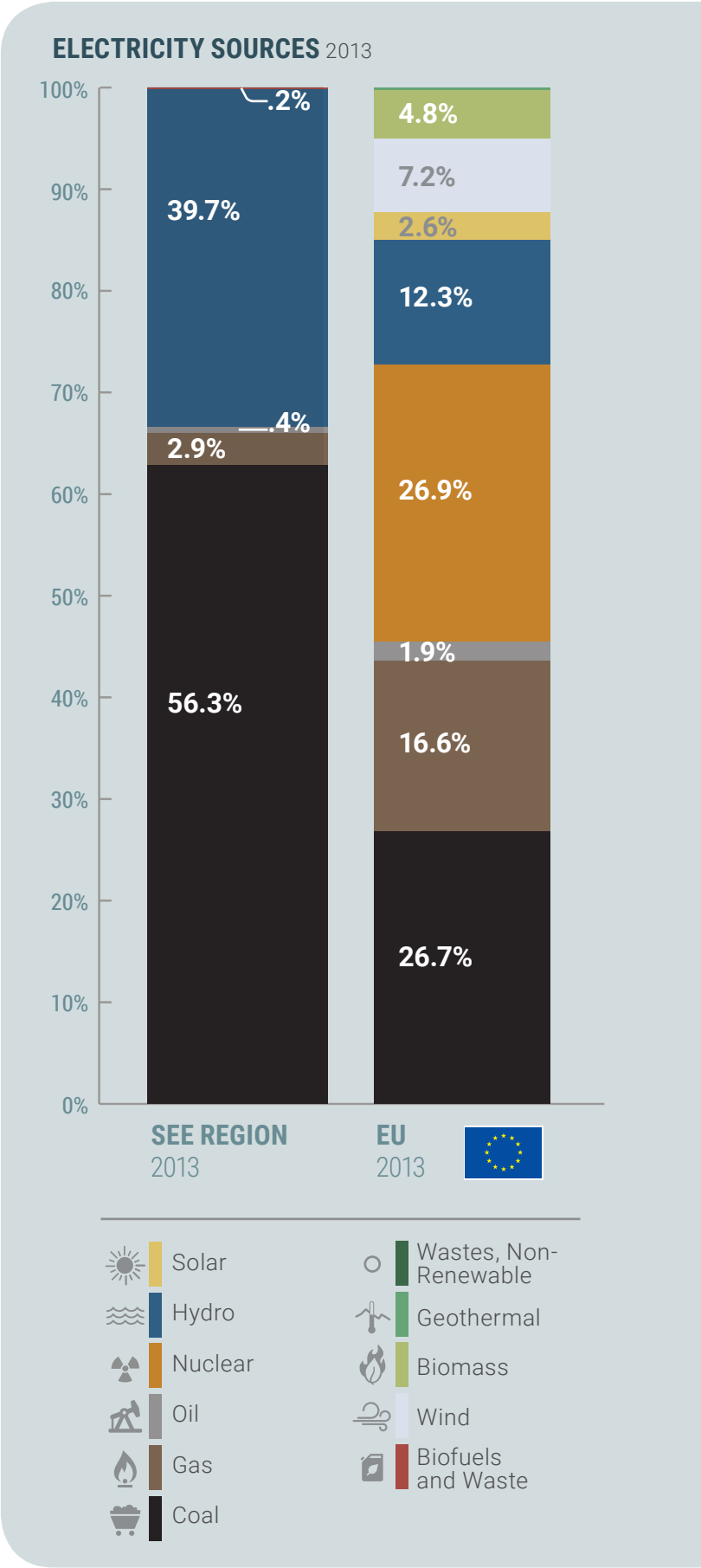
Without a significant change of direction, coal (supported by hydropower) will continue to dominate energy supply in SEE over the coming decades. Many coal plants are reaching the end of their life and need to be replaced. Yet instead of using this opportunity to leap into a clean energy future, the countries of SEE are lumbering along the same old road. Of around 13 GW of new planned power capacity in the

Energy Community's strategy for 2012-2020 (excluding Ukraine), 45% is lignite (brown coal), 39% hydropower and 9% gas. Non-hydro renewables account for just 7%.[24]

This flies in the face of European and global trends. From 2003 to 2013, the amount of renewable energy produced within the EU28 increased by 84.4% – an average growth of 6.3% per year.[25] During 2015, the EU added 21.2 GW of wind and solar power. It put into operation 6.6 GW of new coal and gas power stations, but removed 12.3 GW of older fossil-fuel plants.[26] Analysis by UBS suggests that output from coal/lignite-fired power plants in the EU could fall from 760 TWh in 2012 to 539 TWh in 2020.[27]

Renewable energy has now overtaken fossil fuels for providing new electricity capacity globally. In 2013, the world added 143 GW of renewable electricity capacity, compared with 141 GW in new plants that burn coal, gas or oil, and that trend has continued.[28] Bloomberg New Energy Finance expects new installed capacity from renewables to outnumber fossil fuels by 4:1 by 2030. The price of solar and wind energy is falling fast, and is now cheaper than coal in many parts of the world. Although solar power makes up just 1% of global electricity supply today, the International Energy Agency

Figure 5



SOURCE: SEE 2050 Carbon Calculator (see2050carboncalculator.net)

[22] *http://ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_and_heat_statistics*

[23] *Croatia half-owns Krško nuclear power plant in Slovenia, originally intended to operate until 2023, but now planned to run until 2043. The model allows either possibility to be selected, but due to the controversial nature of nuclear power and technical/safety uncertainties around operating plants beyond their planned lifetime, the EU Road scenario assumes that Krško closes in 2023.*

[24] *Energy Community. 2012. Regional Energy Strategy. While investments on the ground are nowhere near to reaching this level, the strategy gives an indication of governments' thinking, which has not changed much in the few years since the strategy was adopted.*

[25] *ec.europa.eu/eurostat/statistics-explained/index.php/Renewable_energy_statistics*

[26] *EWEA. 2016. Wind in power: 2015 European statistics. European Wind Energy Association. www.ewea.org/fileadmin/files/library/publications/statistics/EWEA-Annual-Statistics-2015.pdf*

[27] *Parkinson, G. 2015. UBS: closures coal and gas fired power plants in Europe accelerating. Energy Post 4 May 2015. www.energypost.eu/ubs-closures-coal-gas-fired-power-plants-europe-accelerating*

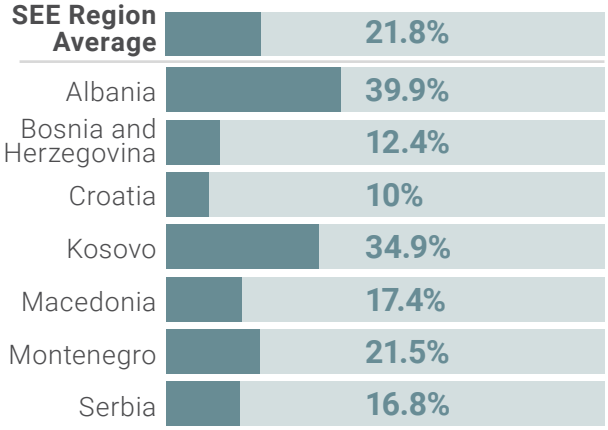
[28] *Randall, T. 2015. Fossil Fuels Just Lost the Race Against Renewables. Bloomberg.com 14 April 2015. www.bloomberg.com/news/articles/2015-04-14/fossil-fuels-just-lost-the-race-against-renewables. Randall, T. 2016. Solar and Wind Just Did the Unthinkable. Bloomberg.com 14 January 2016. http://www.bloomberg.com/news/articles/2016-01-14/solar-and-wind-just-did-the-unthinkable*

(IEA) projects that it will be the largest single electricity source by 2050. SEE has huge potential for solar and other sources of renewable energy, which are discussed below.

Globally, more new coal plants are cancelled than completed due to increasing competition from renewables, policy changes and citizen opposition. Between 2010 and 2014, 356 GW of new coal-fired power plants came online, but 624 plants – with a planned capacity of 493 GW – were scrapped. In Europe, the failure rate was 7:1.[29] Even in China, where most new coal plants are being added, coal power may have already peaked: consumption fell by 2.9% in 2014 and a further 3.7% in 2015, even as the economy grew.[30] The collapsing price of coal companies on the bond markets is the latest sign that investors are rapidly losing confidence in an industry in decline.[31]

Figure 6

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION
2014



SOURCE: Energy Community Annual Implementation Report, 2015 (www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3872267/23B450386A075E64E053C92FA8C0F69F.PDF)

WASTED ENERGY

Although per capita energy consumption in SEE countries is well below the EU average, they use energy very inefficiently. The average annual electricity consumption per person in the region is 3.7 MWh[32], compared to 6.03 MWh across the EU.[33] But energy intensity – which measures the units of energy needed to produce a unit of GDP – is several times higher than in the EU. Serbia, the most energy-intensive country in the region, used the equivalent of 649 kg of oil to generate €1,000 of economic output in 2013; the EU average was 125 kg.[34]

Large amounts of energy are lost – or stolen – from the transmission and distribution system. In Kosovo in 2014 35% of power produced never reached the final paying consumers. Electricity transmission and distribution losses are also high in Albania (40%), Montenegro (22%), Macedonia (17%), Serbia (17%) and Bosnia and Herzegovina (12%).[35] In Croatia, by contrast, losses are 10%: achieving this level across the region could save 14 TWh of electricity, enough to power more than 2 million homes. The cost of losses due to inefficient electricity infrastructure are also high: in Serbia alone, losses have been estimated at €215 million.[36]

Meanwhile, there are significant opportunities to save energy at the consumption end – from improving insulation in buildings, to applying higher efficiency standards for industrial machinery and consumer appliances, to investing in public transport systems that provide a viable alternative to cars. EU countries are aiming to increase energy efficiency by 20% – that is, to use 20% less energy than projected – by 2020, and to at least 27% by 2030. SEE countries

[29] *Yeo, S. 2015. More coal plants are being cancelled than built. The Carbon Brief 16 March 2015. http://www.carbonbrief.org/more-coal-plants-are-being-cancelled-than-built*

[30] *Yeo, S. 2016. Analysis: Decline in China's coal consumption accelerates. The Carbon Brief 29 February 2016. http://www.carbonbrief.org/analysis-decline-in-chinas-coal-consumption-accelerates*

[31] *In the second quarter of 2015, coal bond prices fell by an unprecedented 17% – the fourth consecutive quarter of price declines and easily the worst performance of any industry group. Bond markets are where coal companies raise money for large investments such as opening new mines and environmental clean-ups. See Randall, T. 2015. The Latest Sign That Coal Is Getting Killed. Bloomberg Business 13 July 2015. www.bloomberg.com/news/articles/2015-07-13/the-latest-sign-that-coal-is-getting-killed*

[32] *IEA. Indicators for 2013. www.iea.org/statistics/statisticssearch/report/?country=ALBANIA&product=indicators&year=2013*

[33] *IEA, EU-28. Indicators for 2013. www.iea.org/statistics/statisticssearch/report/?country=EU28&product=indicators&year=2013*

[34] *Energy Community Annual Implementation Report. 2015. www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3872267/23B450386A075E64E053C92FA8C0F69F.PDF*

[35] *Ibid.*

[36] *Climate Change: Time for the Energy Community to Take Action: http://bankwatch.org/sites/default/files/EnCom-strategy-climate-action.pdf*

finally adopted the same 20% target for 2020 in October 2015,[37] and will need to make significant efforts to close the gap on their EU neighbours.

Reducing energy consumption is generally the simplest and cheapest way of securing energy supplies and reducing emissions: saving a unit of energy is 1,000 to 10,000 times more cost effective than generating a new unit of energy.[38] SEE countries urgently need to make much more aggressive efforts to improve energy efficiency. Failure to do so will be costly, increase energy poverty, damage the economy and make the process of EU integration significantly more challenging.

ENERGY USE AND EMISSIONS

More than half of the SEE region's CO2 emissions come from generating electricity and heat. While per capita greenhouse-gas emissions in SEE countries are well below the EU average, emissions per unit of energy produced are high. In Serbia and Macedonia, CO2 emissions per unit of electricity generated are almost double the EU.[39] These differences will become still more pronounced as the use of dirty coal continues in SEE, while falling in the rest of Europe.

WHAT IS LIGNITE? Lignite, often referred to as brown coal, is a soft brown combustible sedimentary rock formed from naturally compressed peat.

WHY IS IT SO BAD? It is considered the lowest rank of coal due to its relatively low heat content. It has a carbon content around 25-35%.



Photo: Prissantenbär (CC BY-SA 3.0)

ENERGY PRICES

Electricity prices in SEE countries are less than half the EU average.[40] However, this "social pricing" is an illusion. SEE citizens are already paying the full costs of an unsustainable energy system – it just doesn't show up on their electricity bill. These costs include subsidies paid for through taxation, loss of income due to corruption, and huge health and economic costs due to pollution from outdated dirty coal plants. Although no-one knows the true figure, a UNDP report estimates that fossil-fuel subsidies make up 5-11% of GDP in most SEE countries, and even higher in Kosovo.[41] People will also have to pay for a lack of investment in energy infrastructure and energy efficiency, and for environmental costs – not least the costs of adapting to and coping with the impacts of climate change. Current artificially low prices also hinder the uptake of energy-saving measures and renewable energy installations.

In 2014, **21%** of SEE citizens reported that they had trouble keeping their house warm in the last year. The figure rises to **38%** in Albania.[42]

[37] *Ministerial Council of the Energy Community, with the Decision D/2015/08/MC-EnC, incorporated the Energy Efficiency Directive 2012/27/EU into the Energy Community on 16 October 2015. This establishes a framework for the promotion of energy efficiency within the Energy Community, setting a 20% target by 2020, and paving the way for further improvements beyond.*

[38] *Laponche, B., Jamet, B., Colombier, M. and Attali, S. (Eds). 1997. Energy Efficiency for a Sustainable World. ICE, Paris.*

[39] *IPCC 2006 and IEA, Electricity and Heat for 2013: BiH, Macedonia, Serbia, EU-28*

[40] *ec.europa.eu/eurostat/statistics-explained/index.php/Electricity_price_statistics*

[41] *Kovacevic, A. 2011. Fossil Fuel Subsidies in the Western Balkans. United Nations Development Programme.*

[42] *Balkan Opinion Barometer, December 2014. www.rcc.int/seeds/results/2/balkan-opinion-barometar*



Photo: Joshua Brown (CC BY-SA 2.0)

COMFORT, SPEED AND SAFETY

Unlike South East Europe, in many European countries the growth in rail use over the past decades has been remarkable. Improved comfort, punctuality and speed offer many advantages over alternatives – they enable large numbers of people to travel in style and safety, from city centre to city centre, with less congestion than roads, much less pollution than planes, and lower costs.

The EU Road assumes long-term political commitment to railways and increasing passenger numbers.



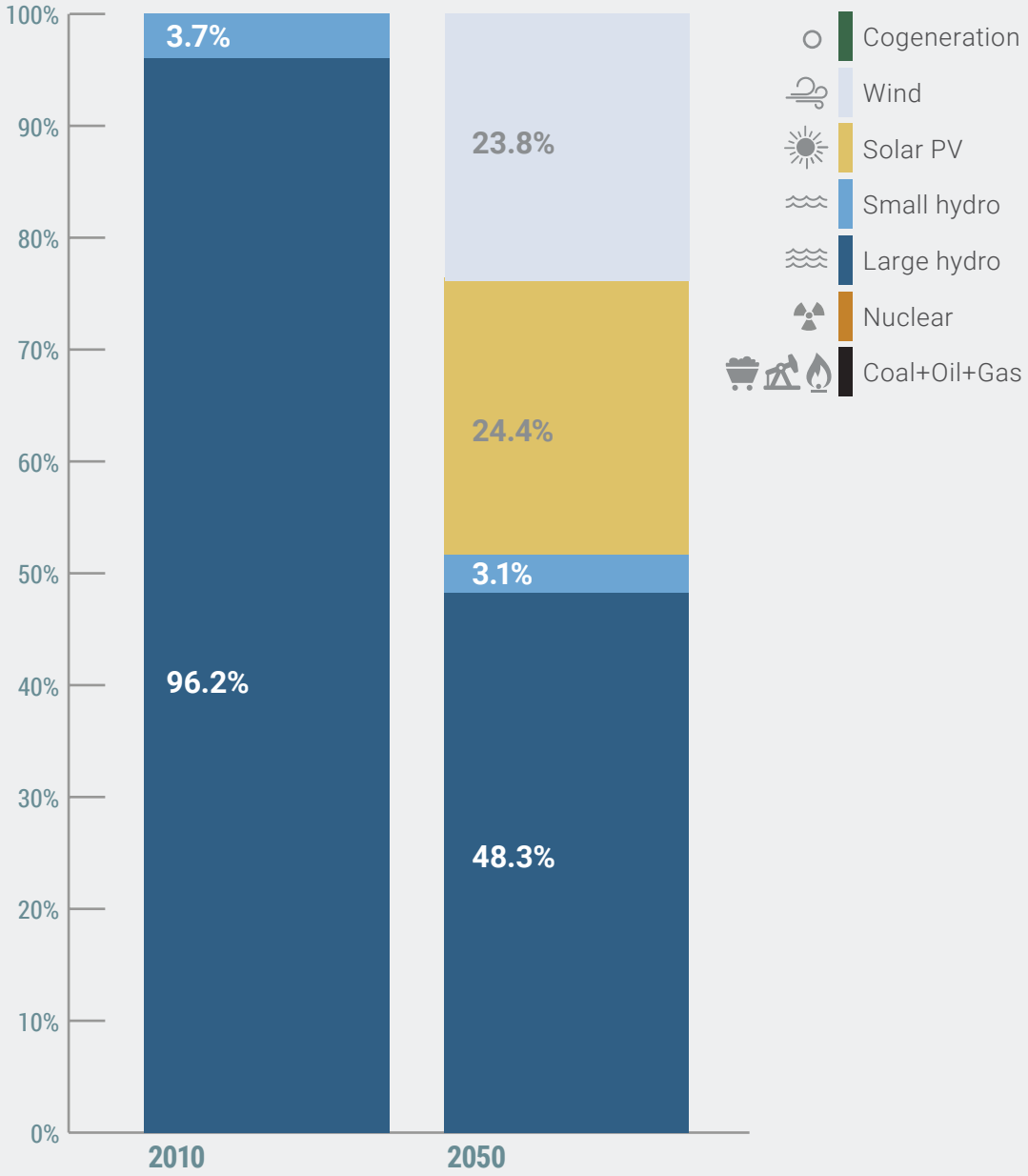
ALBANIA

ALB



POPULATION 2.9 million (2014, World Bank)
CAPITAL Tirana
GDP $13.2 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2014



WHY POLLUTION HAS TO STOP

THE ECONOMIC COST OF DEATHS DUE TO POLLUTION



IS EQUAL TO **16.9% GDP**

WHICH IS EQUIVALENT TO **USD$ 4,572 MILLION**

SOURCE: World Health Organization, Annex: Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP, WHO European region, 2010 (http://www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

ALBANIA CURRENTLY HAS NO COAL PLANTS

SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

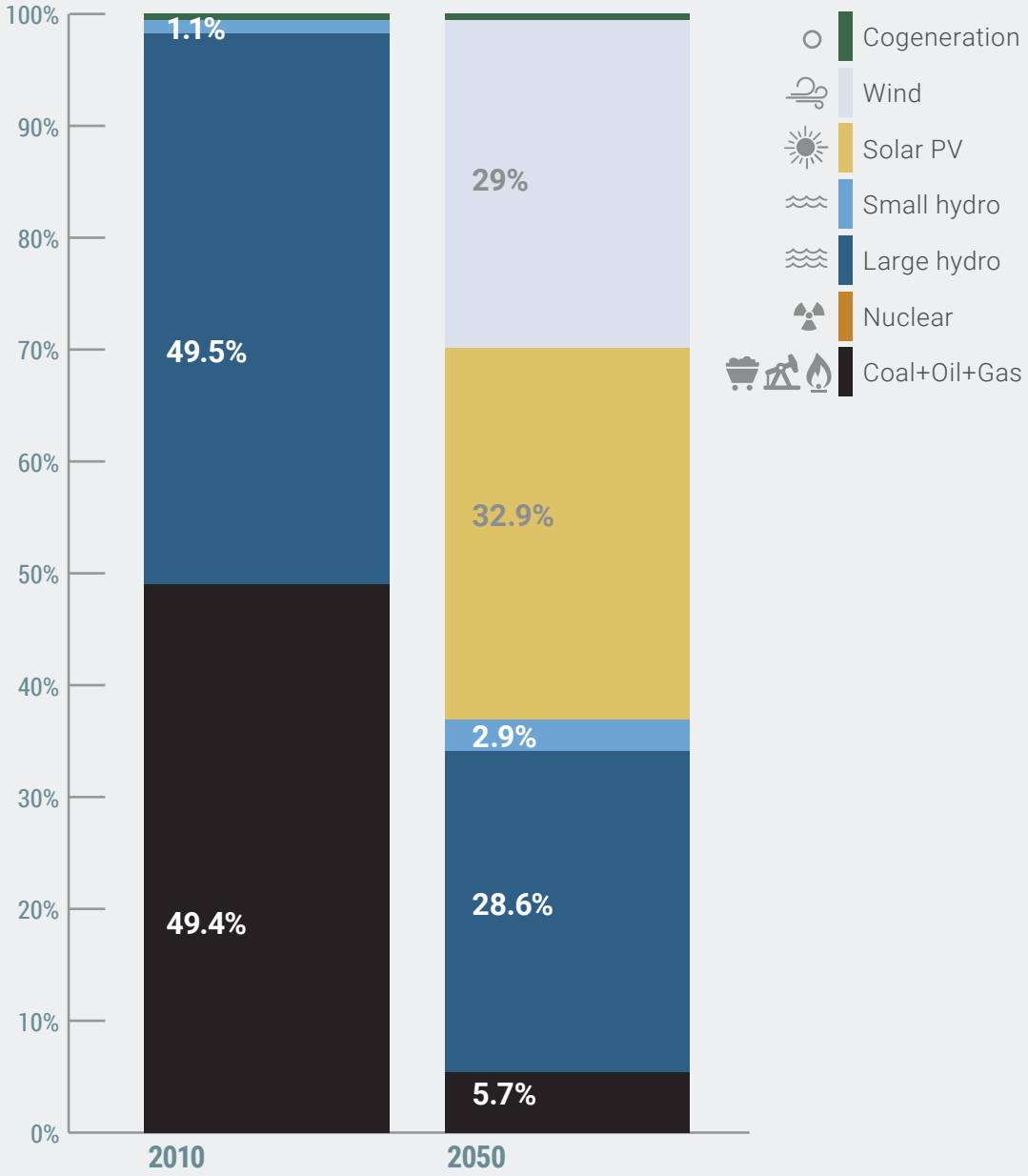
BOSNIA AND HERZEGOVINA

BIH



POPULATION 3.8 million (2014, World Bank)
CAPITAL Sarajevo
GDP $18.5 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2014



WHY POLLUTION HAS TO STOP

BIH **PREMATURE DEATHS** DUE TO POLLUTION: **2564** PER YEAR

COAL IS A MAJOR POLLUTER

THE **ECONOMIC COST** OF THESE **DEATHS**



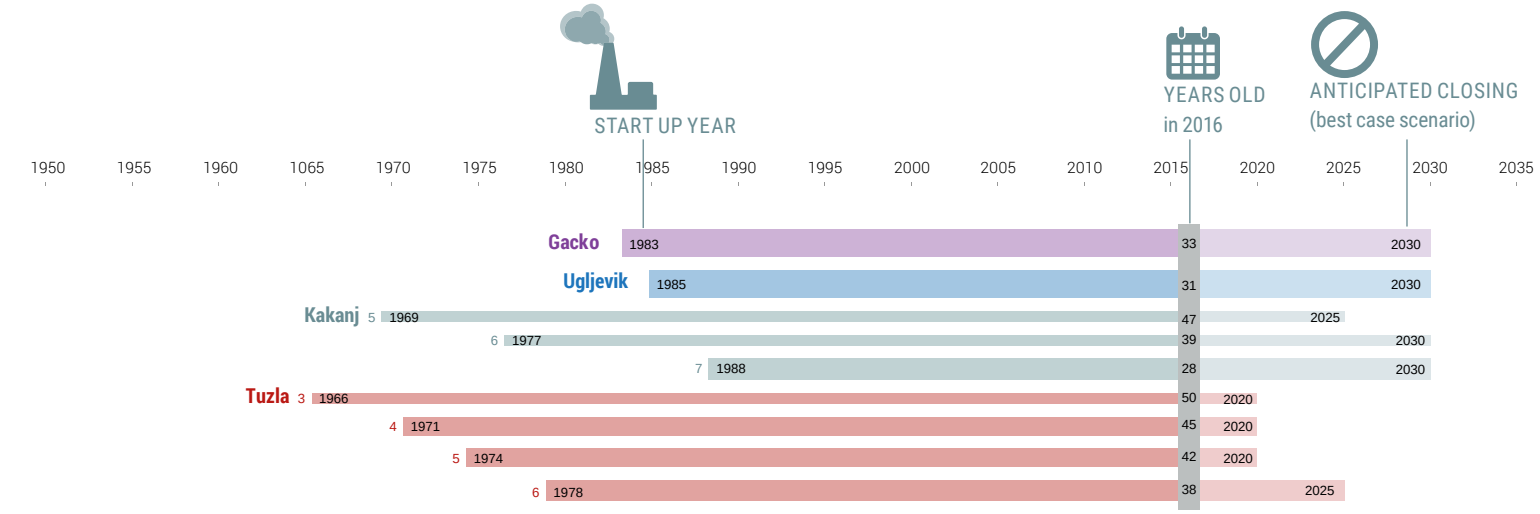
IS EQUAL TO **21.5%** GDP

WHICH IS EQUIVALENT TO **USD$ 7,228 MILLION**

SOURCES: The Unpaid Health Bill: How Coal Power Plants in in Bosnia and Herzegovina Make us Sick, Health and Environment Alliance (HEAL), 2016 (http://env-health.org/IMG/pdf/factsheet_bosnia_en_lr.pdf) World Health Organization, Annex: Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP, WHO European region, 2010 (http://www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

THE LIFESPAN OF THE COUNTRY'S COAL PLANTS (width of lines indicates installed capacity MW)

Coal infrastructure is aging. The lifespan of a coal plant is generally around 40 years.



SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

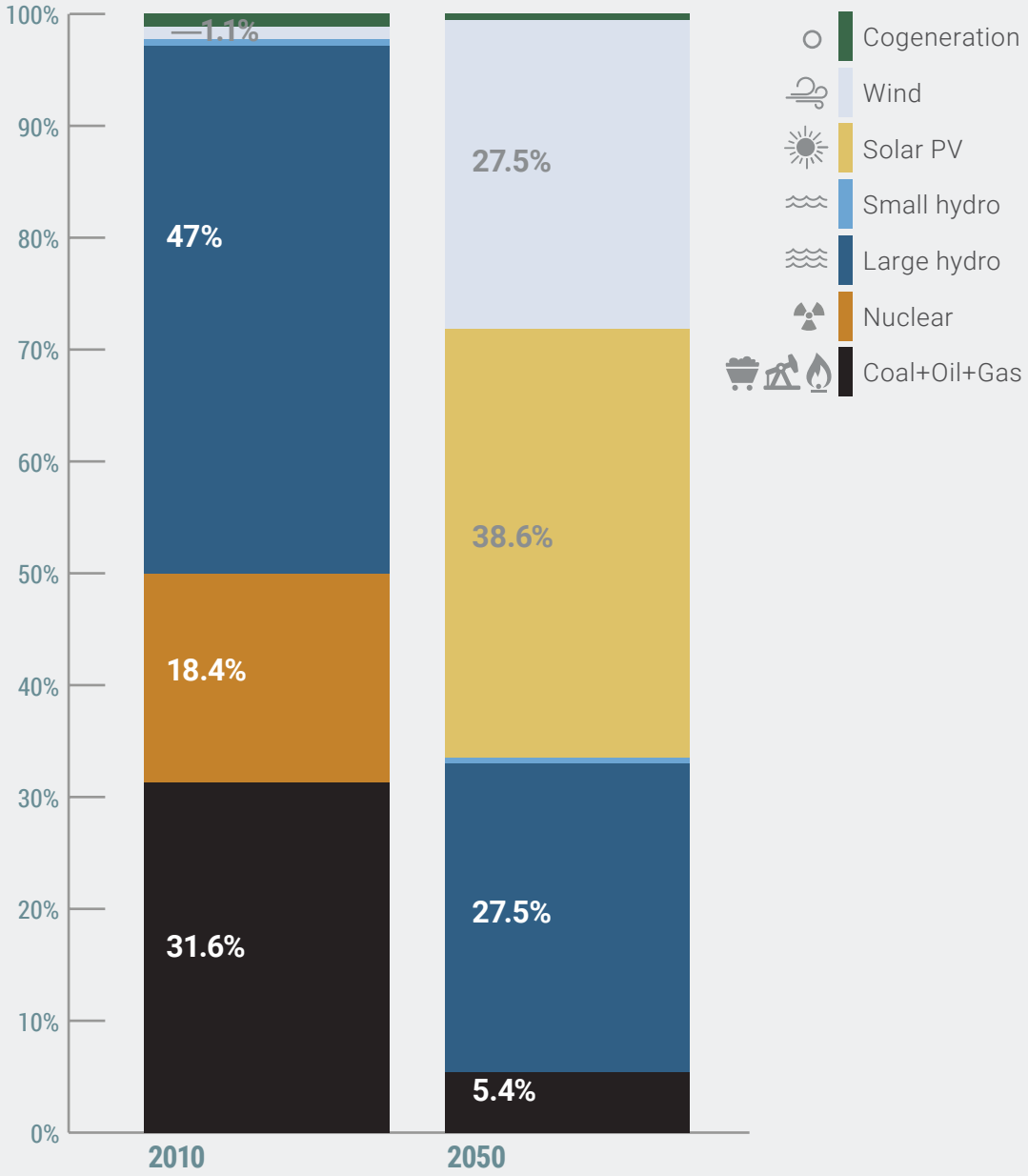
CROATIA

HRV



POPULATION 4.2 million (2014, World Bank)
CAPITAL Zagreb
GDP $57.1 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2012



WHY POLLUTION HAS TO STOP

THE ECONOMIC COST OF DEATHS DUE TO POLLUTION



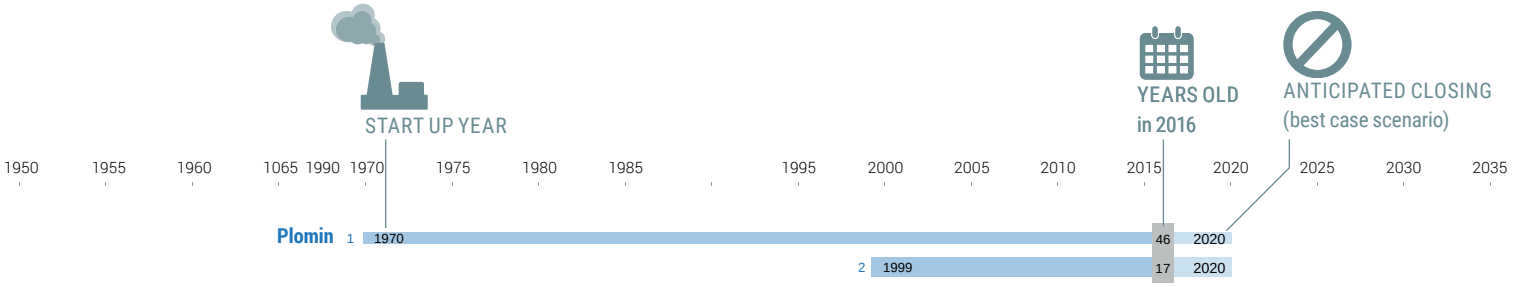
IS EQUAL TO **10.8% GDP**

WHICH IS EQUIVALENT TO **USD$ 9,035 MILLION**

SOURCE: World Health Organization, Annex: Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP, WHO European region, 2010 (http://www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

THE LIFESPAN OF CROATIAN COAL PLANTS (width of lines indicates installed capacity MW)

Coal infrastructure is aging. The lifespan of a coal plant is generally around 40 years.



SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

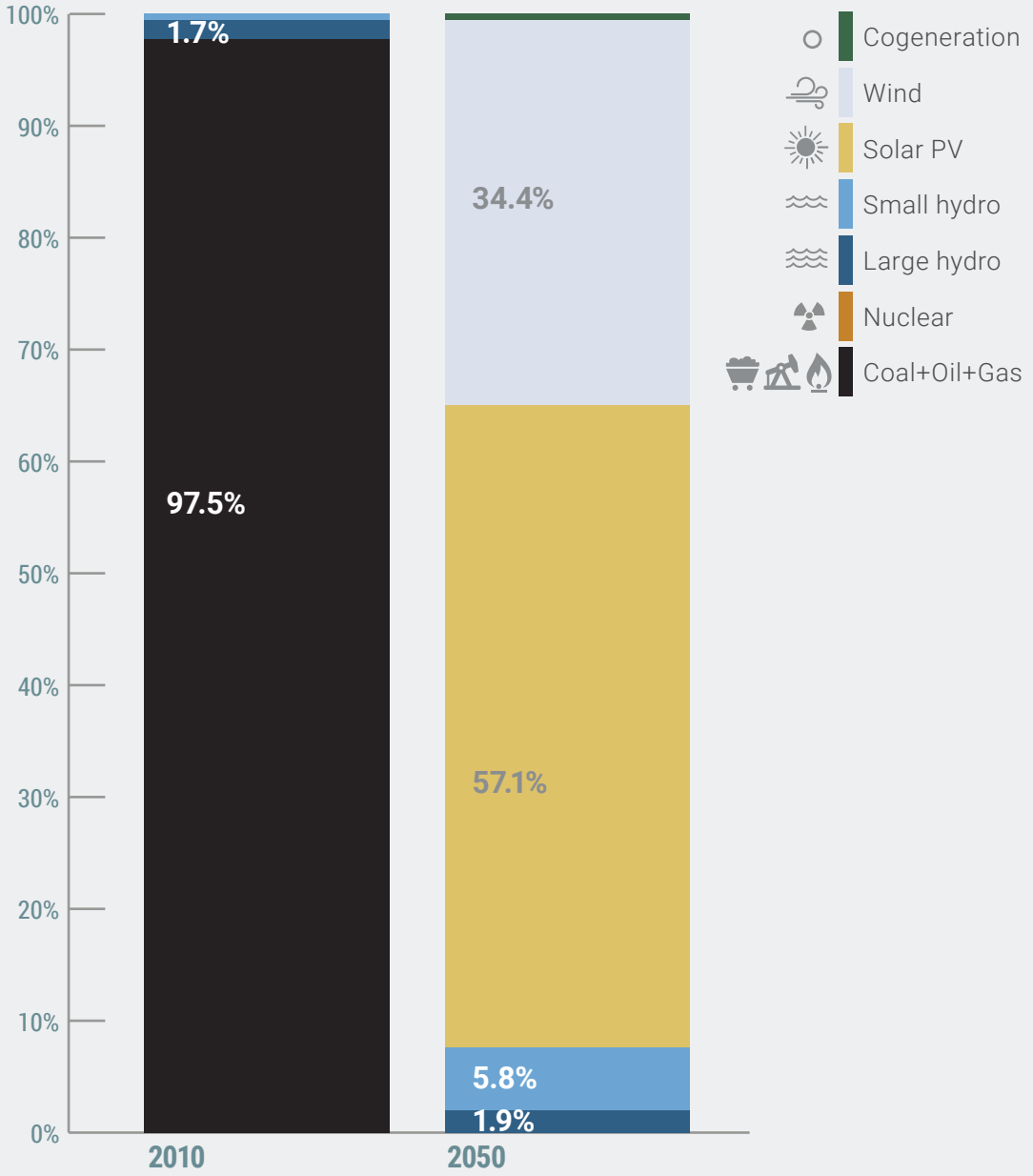
KOSOVO

XKX



POPULATION 1.8 million (2014, World Bank)
CAPITAL Pristina
GDP $7.4 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2014

XKX **34.9%**

WHY POLLUTION HAS TO STOP

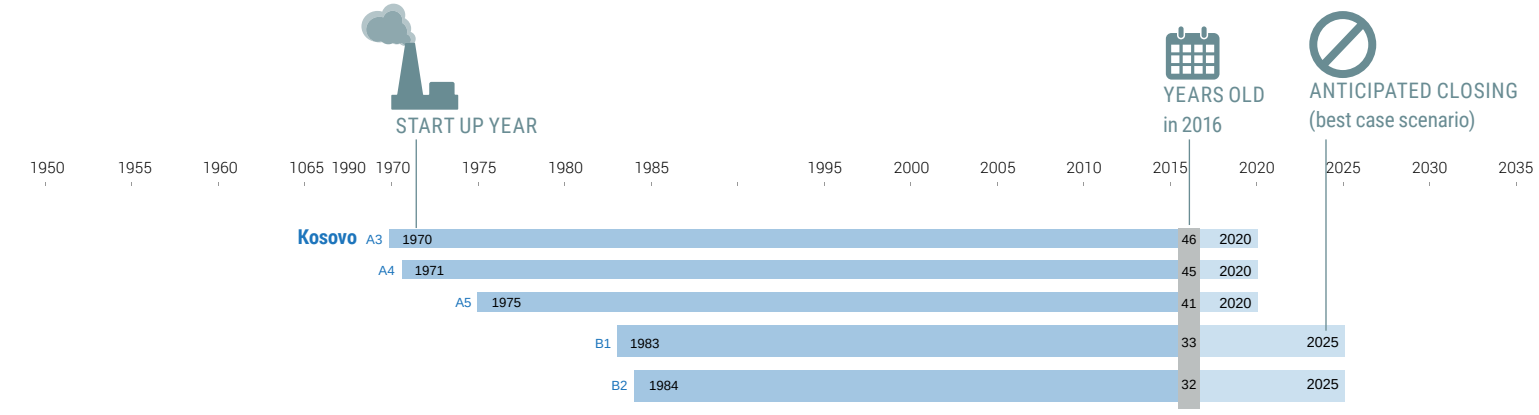
XKX **PREMATURE DEATHS** DUE TO POLLUTION: **370** **PER YEAR**

COAL IS A MAJOR POLLUTER

SOURCES: The Unpaid Health Bill: How Coal Power Plants in Kosovo Make us Sick, Health and Environment Alliance (HEAL), 2016 (http://env-health.org/IMG/pdf/factsheet_kosovo_en_lr-2.pdf)

THE LIFESPAN OF THE COUNTRY'S COAL PLANTS (width of lines indicates installed capacity MW)

Coal infrastructure is aging. The lifespan of a coal plant is generally around 40 years.



SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

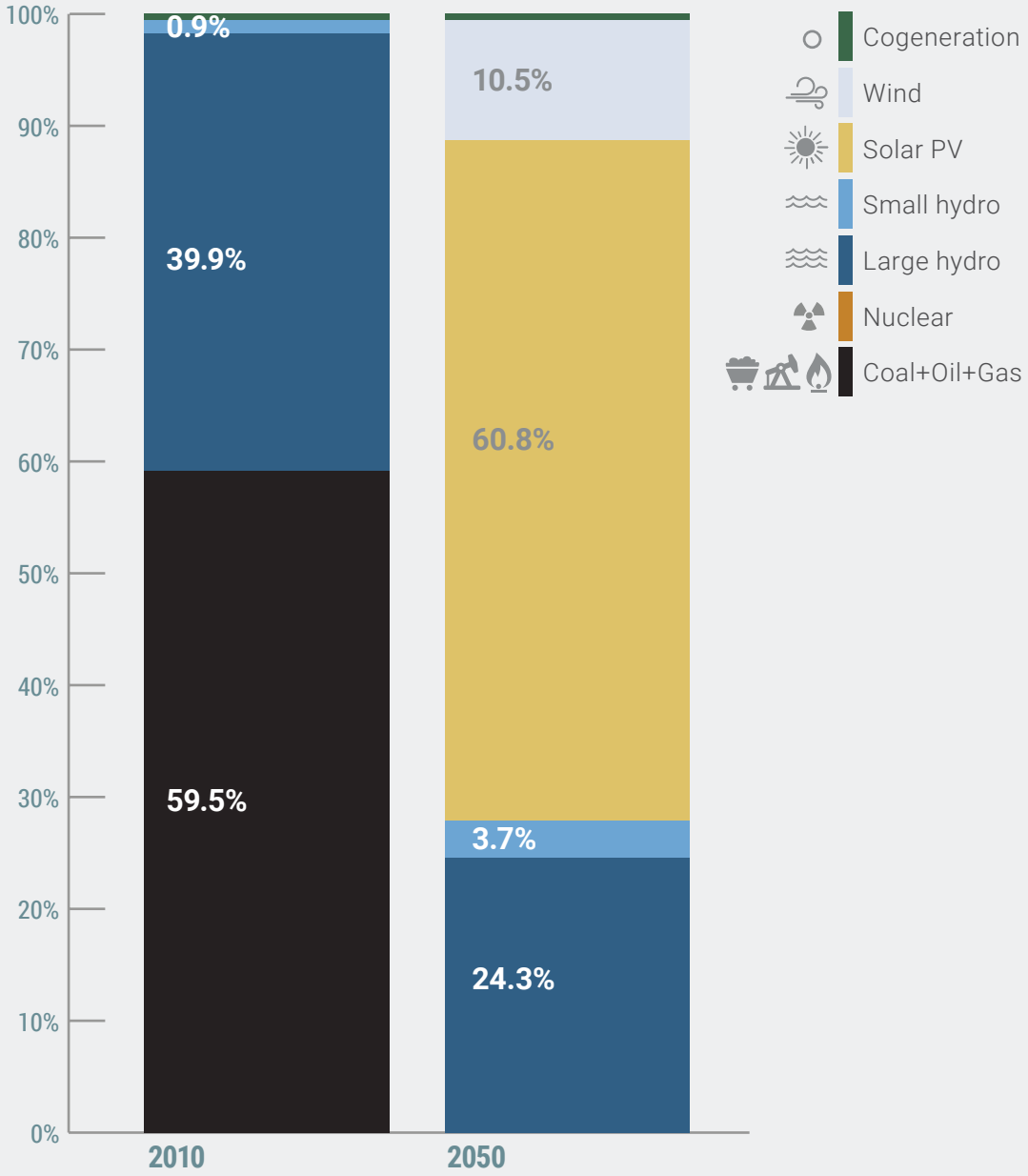
MACEDONIA

MKD



POPULATION 2.1 million (2014, World Bank)
CAPITAL Skopje
GDP $11.3 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2014



WHY POLLUTION HAS TO STOP

MKD **PREMATURE DEATHS** DUE TO POLLUTION: **640** PER YEAR

COAL IS A MAJOR POLLUTER

THE **ECONOMIC COST** OF THESE **DEATHS**



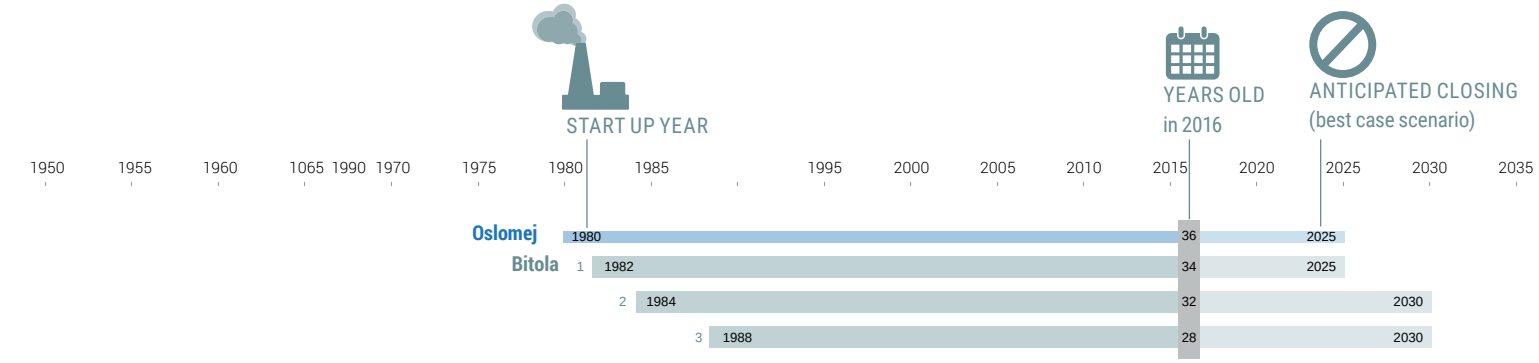
IS EQUAL TO **19.9%** GDP

WHICH IS EQUIVALENT TO **USD$ 4,755 MILLION**

SOURCES: The Unpaid Health Bill: How Coal Power Plants in Macedonia Make us Sick, Health and Environment Alliance (HEAL), 2016 (http://env-health.org/IMG/pdf/factsheet_macedonia_eng_lr.pdf) World Health Organization, Annex: Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP, WHO European region, 2010 (http://www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

THE LIFESPAN OF THE COUNTRY'S COAL PLANTS (width of lines indicates installed capacity MW)

Coal infrastructure is aging. The lifespan of a coal plant is generally around 40 years.



SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

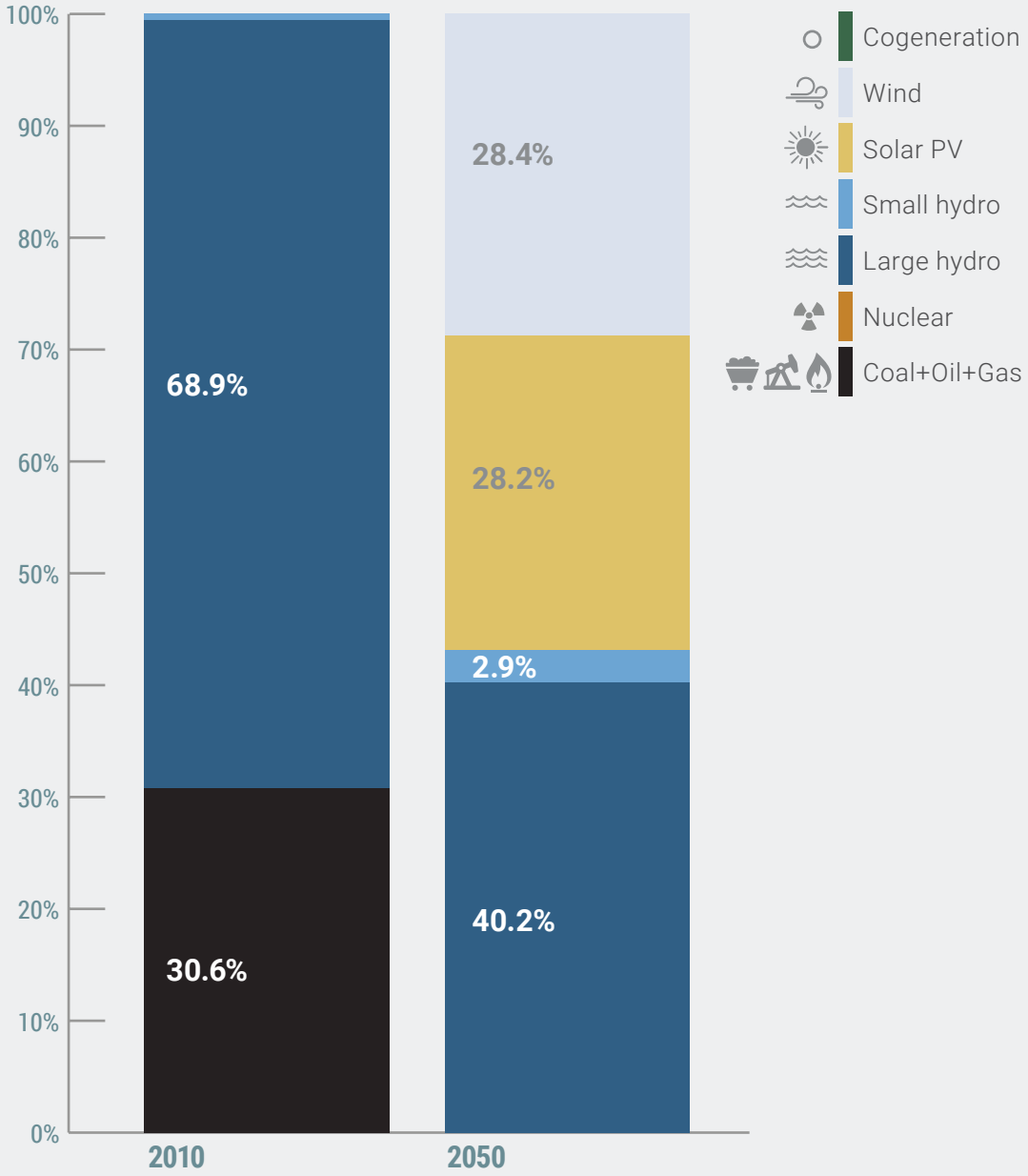
MONTENEGRO

MNE



POPULATION 600,000 (2014, World Bank)
CAPITAL Podgorica
GDP $4.6 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2014



WHY POLLUTION HAS TO STOP

MNE **PREMATURE DEATHS** DUE TO POLLUTION: **240** PER YEAR

COAL IS A MAJOR POLLUTER

THE **ECONOMIC COST** OF THESE **DEATHS**



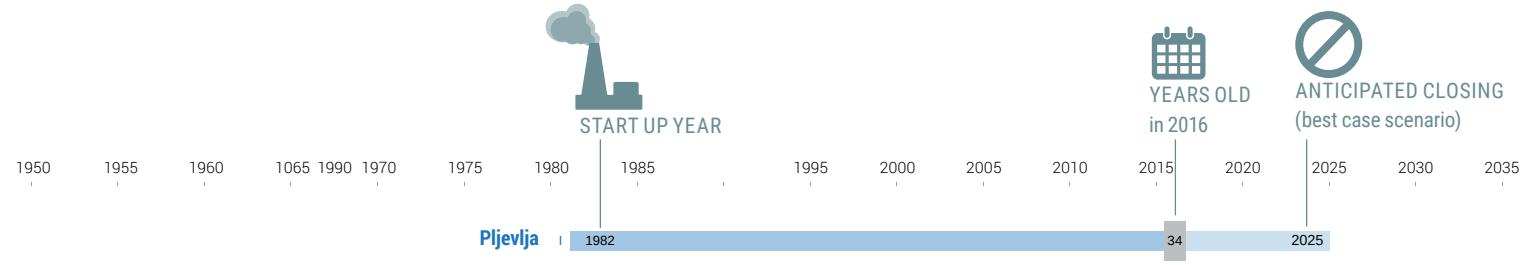
IS EQUAL TO **14.5% GDP**

WHICH IS EQUIVALENT TO **USD$ 1,202 MILLION**

SOURCES: The Unpaid Health Bill: How Coal Power Plants in Montenegro Make us Sick, Health and Environment Alliance (HEAL), 2016 (http://env-health.org/IMG/pdf/factsheet_montenegro_en_lr.pdf) World Health Organization, Annex: Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP, WHO European region, 2010 (http://www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

THE LIFESPAN OF THE COUNTRY'S COAL PLANTS (width of lines indicates installed capacity MW)

Coal infrastructure is aging. The lifespan of a coal plant is generally around 40 years.



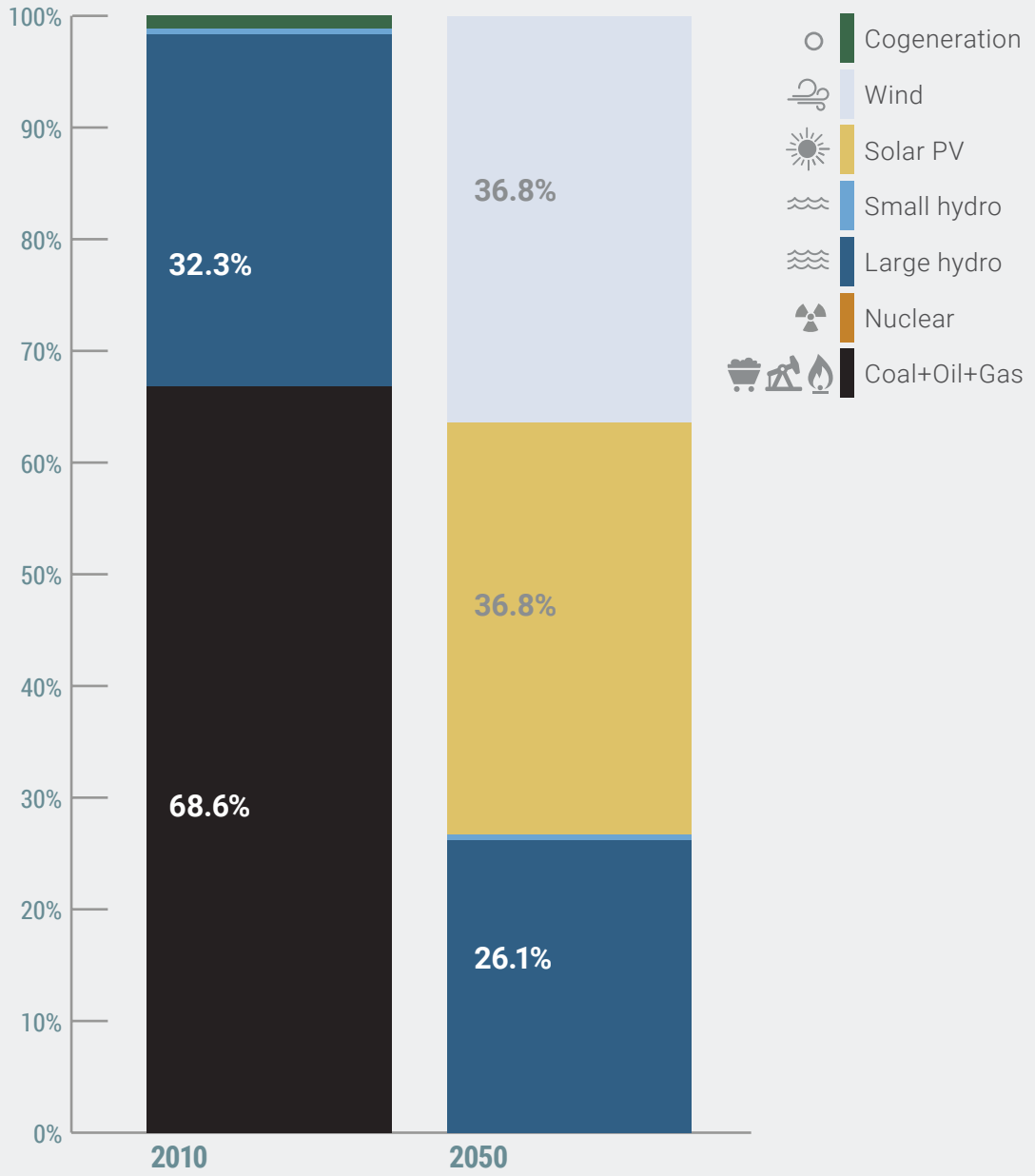
SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

SERBIA

SRB

POPULATION 7.1 million (2014, World Bank)
CAPITAL Belgrade
GDP $44 billion USD (2014, World Bank)

ELECTRICITY SOURCES



SOURCE: SEE 2050 Carbon Calculator (https://www.see2050carboncalculator.net)

THE NEED TO IMPROVE EFFICIENCY

ELECTRICITY LOSSES IN TRANSMISSION AND DISTRIBUTION 2014



WHY POLLUTION HAS TO STOP

SRB **PREMATURE DEATHS** DUE TO POLLUTION: **3366** PER YEAR

COAL IS A MAJOR POLLUTER

THE **ECONOMIC COST** OF THESE **DEATHS**



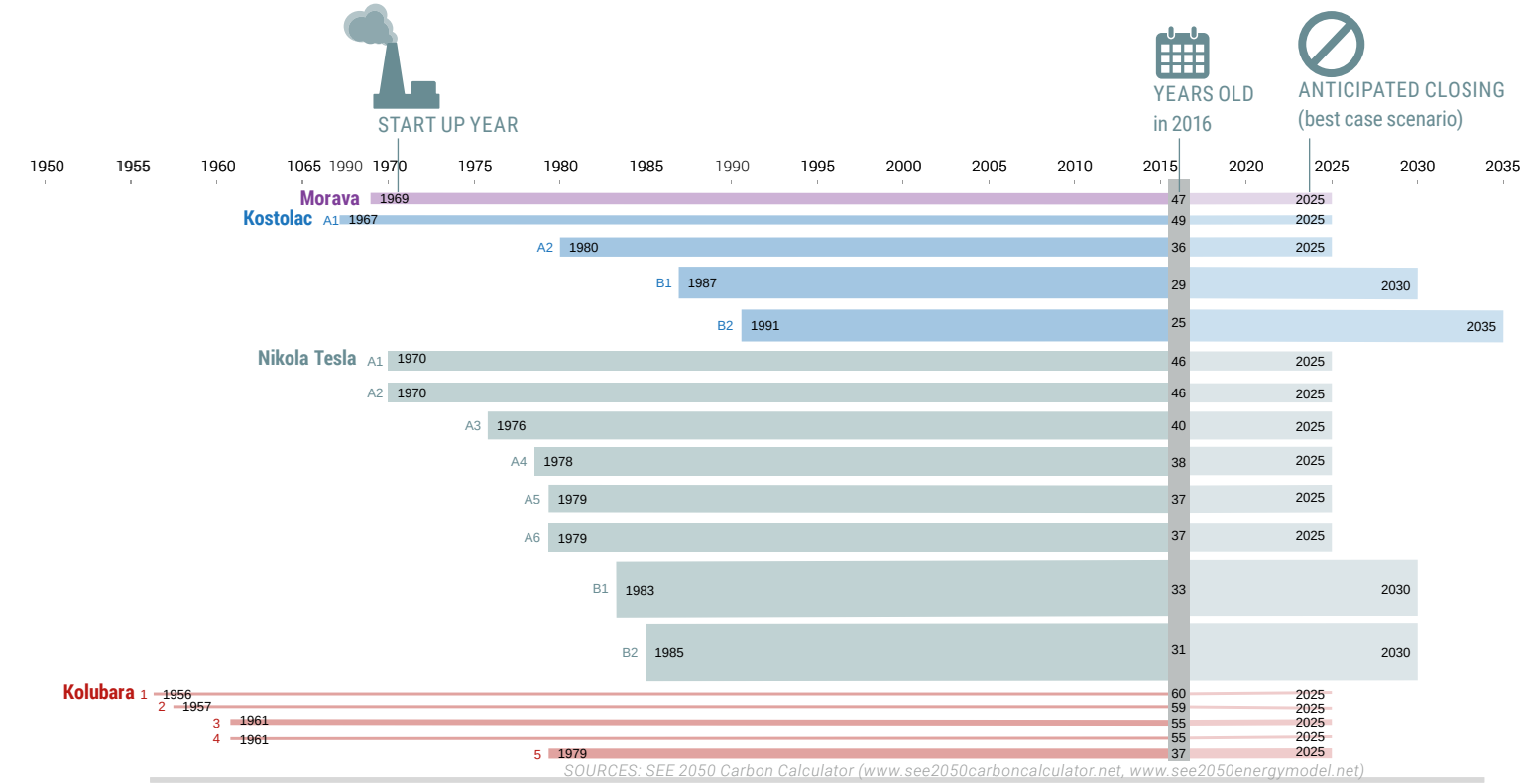
IS EQUAL TO **33.5% GDP**

WHICH IS EQUIVALENT TO **USD$ 28,850 MILLION**

SOURCES: The Unpaid Health Bill: How Coal Power Plants in Serbia Make us Sick, Health and Environment Alliance (HEAL), 2016 (http://env-health.org/IMG/pdf/factsheet_serbia_en_lr.pdf) World Health Organization, Annex: Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP, WHO European region, 2010 (http://www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf?ua=1)

THE LIFESPAN OF THE COUNTRY'S COAL PLANTS (width of lines indicates installed capacity MW)

Coal infrastructure is aging. The lifespan of a coal plant is generally around 40 years.



SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net, www.see2050energymodel.net)

UNTAPPED POTENTIAL



Photo: U.S. Department of Agriculture

Current policies and investments will lead to most SEE countries being left behind by the EU in the transition toward clean energy. But it's not too late for the region to catch up. SEE has a wealth of renewable energy resources, only a fraction of which have so far been exploited. Equally, current low levels of energy efficiency mean there is huge potential for energy savings.

ENERGY EFFICIENCY – THE "FIRST FUEL"

It's much more cost effective, and better for the environment, to save a unit of energy than to generate a new one. The countries of SEE should look to at least match the EU's efforts to improve energy efficiency. As discussed, energy intensity in the region is high and efficiency very low – which means great potential to save energy.[43]

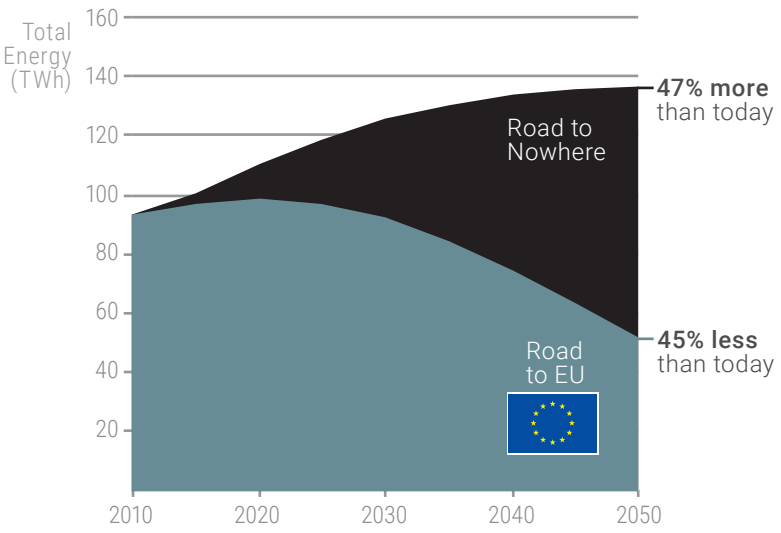
Residential and public buildings – which account for more than 40% of energy consumption in the region – stand out as areas with significant scope for improvement. This is also important when it comes to EU integration. The EU directive on the energy performance of buildings[44] stipulates that "Member States shall ensure that by 31 December 2020 all new buildings are nearly zero-energy buildings; and after 31 December 2018, new buildings occupied and owned by public authorities are nearly zero-energy buildings." It also requires states to draw up plans to encourage the refurbishment of existing buildings into near zero-energy buildings. Buildings have a long lifespan, so concentrating on new builds will not be enough: retrofitting needs to begin at a rapid rate and to the highest performance standards to generate the maximum energy savings.

Transport is another area with great opportunities for energy savings. A shift from using private cars to other modes of transport – trains for long journeys, buses in urban areas, walking or cycling for short journeys, as well as moving more freight by rail – could deliver huge reductions in energy use and related emissions. While the long-term trend is towards electrification of the transport system, improvements in vehicle efficiency will also cut energy use and emissions.

Figure 7

TOTAL FINAL ENERGY DEMAND (HEATING & COOLING) IN BUILDINGS

TWh, South East Europe



The two pathways provide very different visions for future energy use in buildings. They are not predictions, but show the implications of different levels of ambition to improve the energy performance of buildings. Technologies are available, and targets are already in place in the EU. SEE needs equally ambitious targets as early as possible in order to capture a large share of the energy-saving potential and avoid the risk of lock-in.

Efficiency in buildings also means higher level of comfort. A well-insulated building will feel warmer in the winter, cooler in the summer and be healthier to live in.

SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net) Energy Efficiency…Just do it! Act now for warmer homes, local jobs and cleaner air! 2015 (http://seechangenetwork.org/wp-content/uploads/2013/07/Report-Energy-Efficiency-Just-Do-It.pdf), http://ec.europa.eu/transport/media/publications/doc/trends-to-2050-update-2013.pdf, http://www.topten.eu/

[43] *SEE Change Net. 2015. Energy Efficiency… Just Do It! www.seechangenetwork.org/wp-content/uploads/2013/07/Report-Energy-Efficiency-Just-Do-It.pdf*

[44] *Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on the energy performance of buildings.*

THE FUTURE IS WARM

Nearly zero-energy buildings and retrofits would greatly reduce energy consumption in South East Europe. Following the EU Road almost halves the final energy demand for heating and cooling in buildings compared to today's level.

This also presents a huge potential to create sustainable local jobs – twice as many as in energy generation - in the construction sector and to address the energy poverty of households.



Low energy building Šparna hiža, built in Koprivnica, Croatia / Photo: Agency APOS, Koprivnica, Croatia

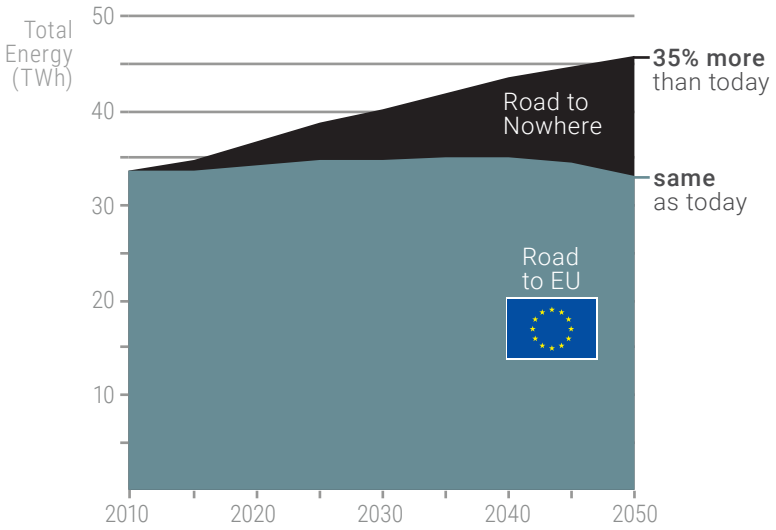


BUILDINGS OVERVIEW

Figure 8

TOTAL FINAL ENERGY DEMAND (LIGHTING, APPLIANCES AND COOKING/CATERING) IN BUILDINGS

TWh, South East Europe



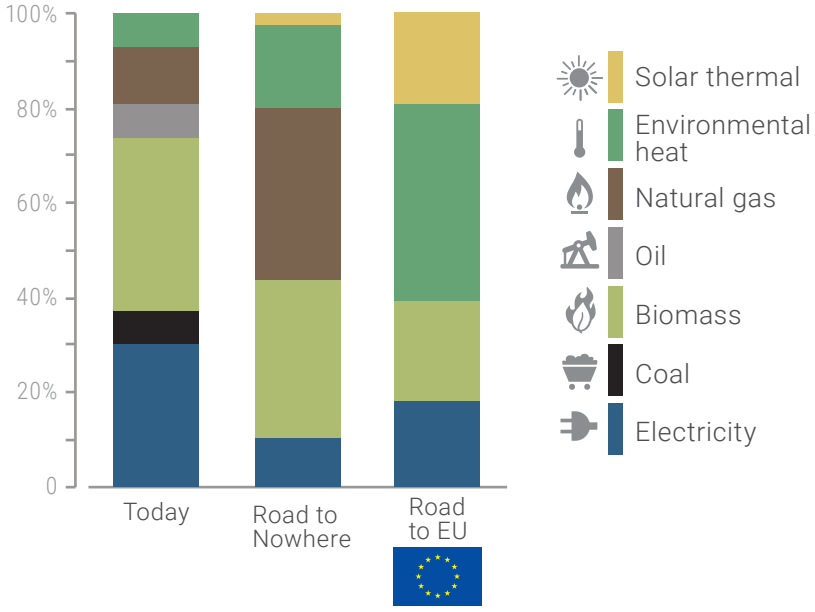
Eco-design regulation will drive significant energy savings. The average efficiency of appliances and lighting is expected to improve by 45% by 2030 (relative to 2005) and more by 2050. Even though the use of lighting and appliances grows, their energy consumption (including cooking) can stay comparable to today's level as a result of improved performance, use of LED and motion-detecting lighting, and better automation and control.

SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net) EU Energy, transport and GHG emissions trends to 2050 http://ec.europa.eu/transport/media/publications/doc/trends-to-2050-update-2013.pdf

Figure 9

FUEL MIX (HEATING & COOLING) IN BUILDINGS

As % of Total, South East Europe average



To achieve the full potential for reducing emissions and energy use, a substantial level of electrification of heating – based on heat pumps – will be needed. Combining renewable electricity and energy efficiency, heat pumps can convert one unit of electricity into up to four units of heat. They can also be used as cooling devices. But this makes sense only if coupled with ambitious energy-performance standards for new and retrofit buildings and a switch to renewables.

SOURCE: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net)

2050 RESIDENTIAL & SERVICE SECTOR ASSUMPTIONS

	SEE Region Assumptions
POPULATION	By 2050 the SEE population will decrease to 20.6 million.
PERSONS/ HOUSEHOLD	Number of persons per household will be 2.8 on average.
FLOOR AREA/ PERSON	Floor space per person in the region grows moderately by 2050.
% OF FLOOR AREA HEATED	At the same time, comfort levels improve and 85% of space area is heated in 2050.

	Road to EU
RENOVATION RATE	Around ¾ of the existing buildings are renovated. This requires a sharp increase in renovation rates, from currently lower than 1% per year towards 2%-2.5% as of 2020.
RENOVATION DEPTH	Retrofitting of existing buildings ramps up – starting with significant improvements like wall and loft insulation and super-glazing, but reaching energy cuts of 90% or more from 2030.
NEW BUILTS	All new buildings are near-zero energy from 2025: they are well insulated and generate power from rooftop solar panels which is fed back into the grid.
INDOOR TEMPERATURE	People lower their thermostats – to a lower but safe level of warmth.
HEATING TECHNOLOGY	Heating based on heat pumps ramps up, with up to 75% of heating coming from heat pumps. Additional heating includes burning biomass, from community scale or CHP systems. There's no gas, no oil, no coal.
SERVICES VALUE ADDED	Services floor area is assumed to increase by 2.3% annually on average, driven by growth in Services Value Added. Similar trend in buildings codes and heating technology is anticipated like in residential sector.

SOURCE: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net)

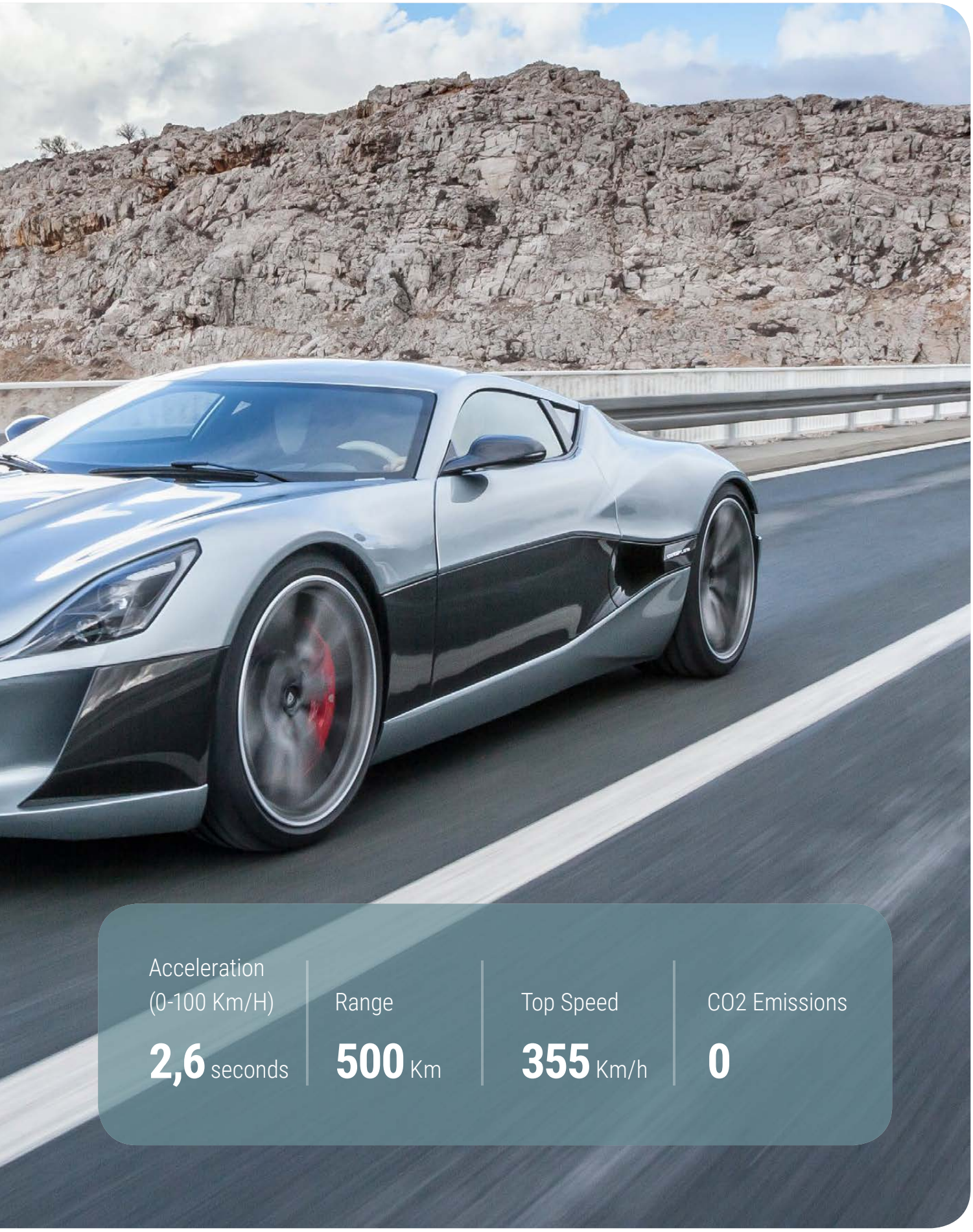


THE FUTURE IS NOW

While not all cars will look like this Croatian all electric supercar, electrification within the transport sector remains a critical piece of the path toward deep decarbonization. Looking toward 2050, the EU Road assumes that 35% of car passenger-km will be travelled in plug-in hybrid vehicles and 45% in zero emission vehicles such as electric and fuel-cell.

Furthermore, vehicle-to-grid interactions can spur innovation in the distribution system to improve reliability and provide ancillary services.

Supercar Concept_One electric car by Croatian company Rimac Automobili / Photo: Rimac Automobili

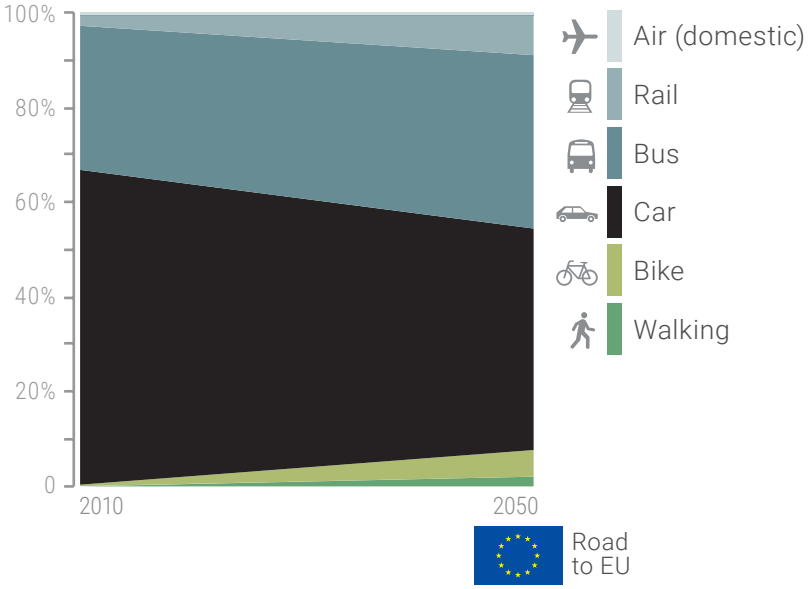

Acceleration
(0-100 Km/H)
2,6 seconds
Range
500 Km
Top Speed
355 Km/h
CO2 Emissions
0

TRANSPORTATION OVERVIEW

Figure 10

MODAL SPLIT IN PASSENGER TRANSPORT

As % of Total, South East Europe average



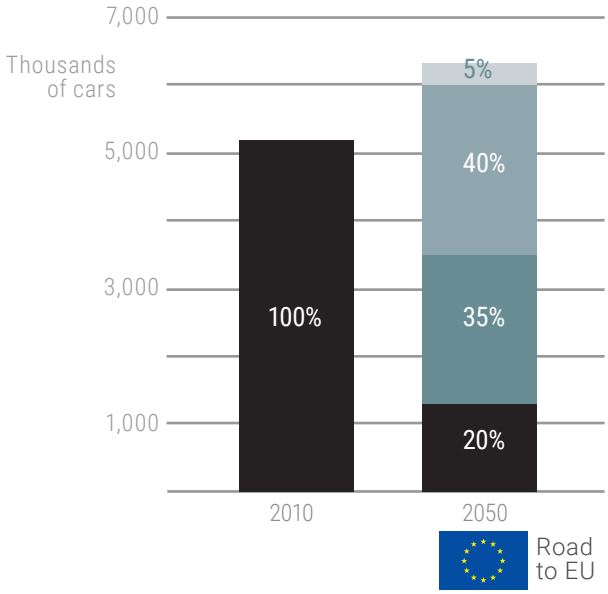
Even if kilometres travelled by person increase substantially by 2050, energy use in transport can be reduced with a shift away from car travel – including an increase in rail and buses in medium/long distance journeys and public transport and cycling in cities. This will also decrease high rates of motorized pollution, fatal accidents, congestion and noise currently present in the region, especially in the cities. Modal shift targets may be pushed even further following examples offered by some European nations (e.g. Netherlands for cycling.)

SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net) Roadmap to a Single European Transport Area - Towards a competitive and resource efficient transport system, 2011, http://ec.europa.eu/transport/themes/strategies/2011_white_paper_en.htm

Figure 11

ELECTRIFICATION OF PASSENGER TRANSPORT (CARS)

Thousands of cars per technology, South East Europe average



At present, almost all domestic vehicles are powered by diesel or petrol. A large transition to zero emission vehicles in the car fleet is expected between now and 2050. Globally, electric vehicles remain critical to decarbonization goals, especially following the Paris Agreement.

Fuel cell vehicles (FCV)
Electric vehicles (EV)
Plug-in hybrid electric vehicles (PHEV)
Internal combustion engines (ICE)

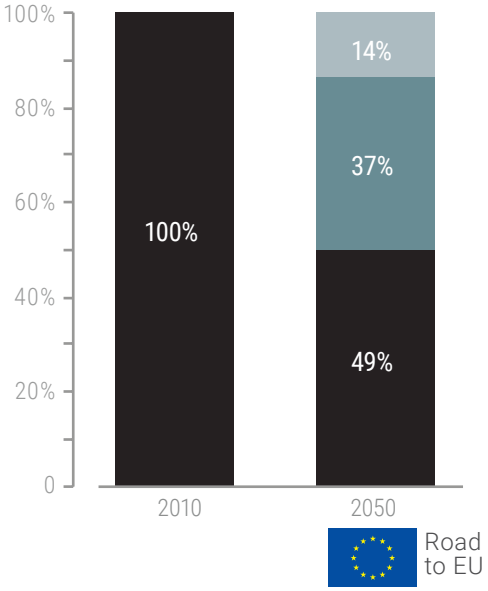
SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net)

Framework Strategy for a Resilient Energy Union with a Forward-Looking Climate Change Policy; International Energy Agency's (IEA) "2DS" scenario (2°C Scenario); Green Peace Energy [R]evolution 2015

Figure 12

ELECTRIFICATION OF FREIGHT TRANSPORT (ROAD)

As % of Total, South East Europe average



Electric and plug-in hybrid trucks are available already but more research and development is needed towards a truly 100% renewable freight system. Using biofuel rather than diesel or petrol carries a number of sustainability concerns. If these are resolved, future freight energy use and emissions could diminish at a faster pace than anticipated in the SEE 2050 Energy Model.

- Electric
- Compressed natural gas (CNG)
- Internal combustion engines

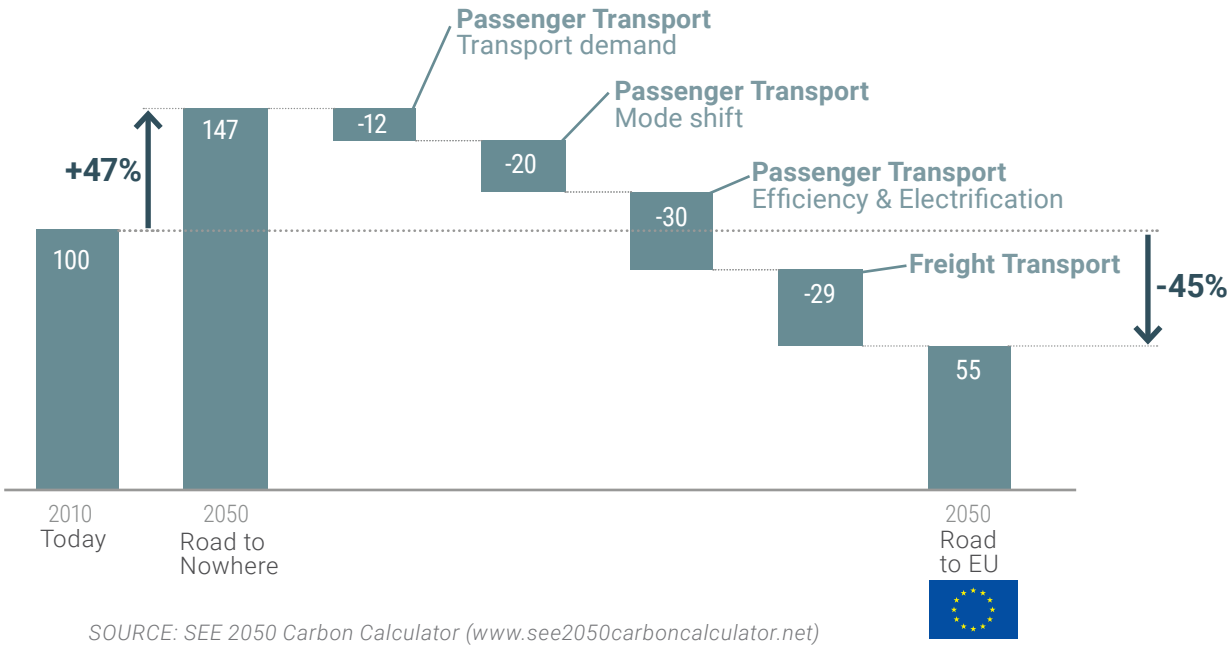
SOURCES: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net) Greenpeace. 2015. Green fleets: How companies can drive down costs and emissions

Figure 13

TOTAL FINAL ENERGY DEMAND IN TRANSPORT

2010=100, South East Europe

Taken together, modal shift, improvements in vehicle efficiency, switching from petrol and diesel to electric engines, and progress in smart routing and logistics, can significantly reduce energy use and emissions as well as dependence on predominantly imported oil.



SOURCE: SEE 2050 Carbon Calculator (www.see2050carboncalculator.net)

THE NEW GENERATION – RENEWABLE ENERGY

SOLAR

With most parts of the region enjoying more than 250 days of sunshine per year, SEE has massive potential for using solar energy from domestic rooftop photovoltaic panels and water heaters. To date, this vast renewable resource has barely been touched. The SEE 2050 Energy Model suggests that, if we installed solar panels on half the suitable rooftops in the region, we could meet 70% of total electricity demand in 2050 – for a cost of €5.9-7.7 billion.[45] If the investment envisaged for coal-fired power stations in the Energy Community's 2012 Strategy were switched to solar, we could do away with coal altogether – one of the biggest strides the region could take to meet EU targets, contribute to global climate goals and improve the health of its citizens.

WIND

Despite many areas with strong potential for wind power, SEE lags far behind the rest of Europe. While several countries are planning their first wind farms and Croatia has several in operation, electricity generated from wind in the region is negligible. Our energy scenario envisages constructing turbines only in areas with the highest and most reliable wind speeds and outside protected areas, though technically the potential for wind generation is much greater. A total of more than 5,000 wind turbines of 2.5 MW across the region – at a cost of around €15 billion – could supply around almost a quarter (24%) of electricity demand in 2050. Scotland alone has almost as many onshore turbines.[46]

HYDROPOWER

Hydropower has been an important part of the energy mix in SEE for many years, accounting for nearly a third of electricity supply across the region. This gives SEE countries a head-start on many of their EU counterparts when it comes to renewable energy – but it would be a mistake to rely on hydropower alone. Although a large number of new hydroelectric projects are planned, many are legally, environmentally and socially unacceptable. Long-term opportunities for sustainably increasing hydropower are limited, but the Energy Model suggests it is still possible to meet EU energy targets with little hydropower expansion.

GEOTHERMAL

The geological make-up of the Balkan peninsula offers considerable potential to use heat from beneath the Earth's surface for space heating – whether through ground-source heat pumps in houses and office buildings, in district heating systems, or for specialized uses like heating greenhouses and swimming pools. Some geothermally active areas may also be suitable for generating electricity.

BIOENERGY

With extensive forests and agricultural land, SEE has significant potential to increase its use of bioenergy – though this must go hand in hand with sustainable forest management and joined-up agricultural policy that balances demands for energy and food crops. There is also the potential to generate energy from wastes and residues: in Montenegro, waste from the wood processing industry alone could provide 204 GWh per year.[47] Firewood is widely used – most often very inefficiently, with high moisture, freshly cut wood and in old stoves/boilers – for domestic heating and cooking, with nine out of ten rural households in Kosovo, Bosnia and Herzegovina, Macedonia, Montenegro and Serbia using biomass.[48]

Meanwhile, energy poverty can lead to illegal firewood harvesting, compounding the issue of illegal logging which threatens important forests in the region.[49] Efforts to introduce more efficient stoves, insulate houses and tackle energy poverty could enable more biomass to be sustainably used to warm homes and to generate electricity.

SMART GRIDS

Increasing the share of renewable electricity, particularly from decentralized and variable sources like wind and solar, will require investment in up-to-date grid technology. "Smart" grids bring information and communications technology to every aspect of the electricity network, from generation through distribution to the end consumer. They can help energy companies to balance supply and demand, and enable available energy to be used more efficiently. In SEE, smart grids can also play an important role in reducing theft and other losses in the electricity system, as they can identify where in the network losses are occurring and detect suspicious activity.

Smart grids are already used effectively in countries with high levels of renewable energy. Denmark, which generates around 40% of its electricity consumption[50] – and sometimes much more – from wind, has Europe's most reliable electric system.[51] Wind energy forecasting is integrated into its daily grid operations, and those of connected grids in neighbouring countries. A smart, interconnected grid in SEE will help deliver a stable and flexible energy supply for the region, as intermittent sources like wind and solar can be balanced by pumped storage from converted hydropower dams and biomass plants.



Wind farm Trtar-Krtolin, Croatia
Photo: Tomaž Jančar (CC BY-SA 3.0)

[45] *Of course intermittency and storage of such electricity is an issue, which is why other sources of electricity are also used in this roadmap.*
[46] *www.renewableuk.com/en/renewable-energy/wind-energy/uk-wind-energy-database/index.cfm*
[47] *Energy Community. 2015. Regional Energy Strategy.*
[48] *Center for Renewable Energy Sources and Saving. 2012. Study on the Biomass Consumption for Energy Purposes in the Energy Community.*
[49] *"Energy poverty takes toll on Balkan forests." EurActiv 14 December 2012. www.euractiv.com/climate-environment/energy-poverty-takes-toll-balkan-news-513402*
[50] *http://energinet.dk/EN/El/Nyheder/Sider/Dansk-vindstroem-slaar-igen-rekord-42-procent.aspx*
[51] *IRENA. 2013. Smart grids and renewables: a guide for effective deployment. International Renewable Energy Agency.*

THE BENEFITS OF FOLLOWING THE ROADMAP



Wind farm in Pag, Croatia / Photo: Timur V. Voronkov (CC-By-SA-3.0)

The SEE 2050 Energy Model shows that it's feasible for SEE to shift to a secure, renewable and sustainable low-carbon energy supply. As well as enabling countries to meet their international commitments under the Paris Agreement, doing so would bring multiple other benefits to the region.

EU INTEGRATION

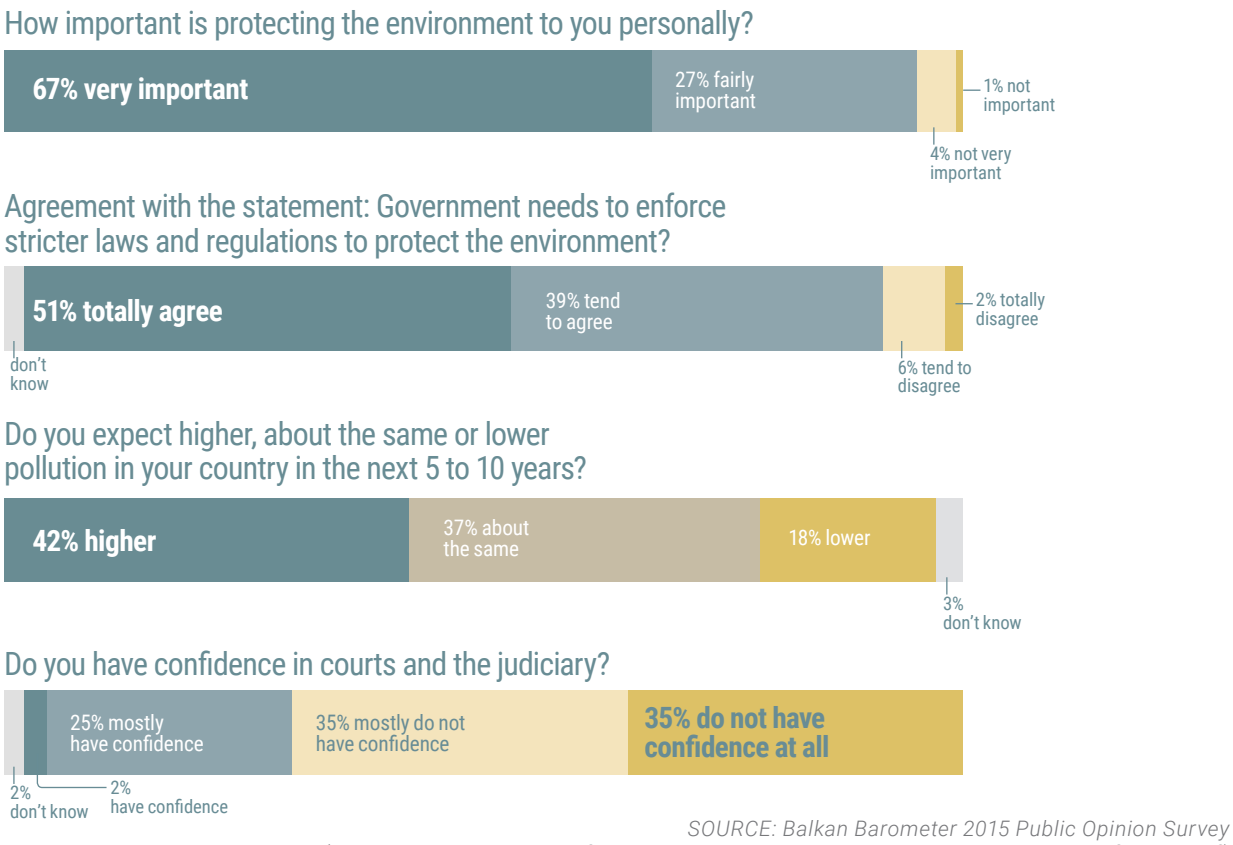
Taking action now to bring renewable energy use, agriculture and transport policies, energy efficiency and greenhouse-gas emissions in line with EU strategy will smooth the process of EU membership. Countries joining the EU will need to meet binding EU targets: it will be far more cost effective to plan for this now, rather than to take retrospective action after new fossil-fuel infrastructure has been built. Similarly, it's better to start making new buildings as energy-efficient as possible now, rather than retrofitting them to comply with EU standards at a later date.

CLIMATE CHANGE AND ENVIRONMENTAL BENEFITS

A rapid transition from fossil fuels to clean energy – and, most urgently, an end to the use of dirty lignite and coal – is vital if the world is to have any chance of avoiding dangerous levels of climate change. SEE countries have a responsibility to play their part; it is also in their own interests, with impacts of climate change in the region expected to include loss of biodiversity, flooding and bushfires, soil erosion and crop failures.[52] Floods in Serbia in 2014 caused damage and losses estimated at €1.7-1.8 billion,[53] and such events are expected to become more common. Climate change will also have an impact on the energy sector itself: droughts could affect hydroelectricity generation and cooling for thermal power stations, while increased temperatures themselves are predicted to reduce the output of thermal power plants. Meanwhile, moving away from burning fossil fuels will reduce levels of air and water pollution.

Figure 14

SEE CITIZEN PERSPECTIVE: CLIMATE CHANGE AND ENVIRONMENTAL BENEFITS



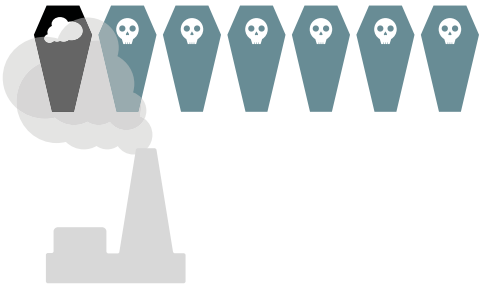
SOURCE: Balkan Barometer 2015 Public Opinion Survey (http://www.rcc.int/seeds/files/RCC_BalkanBarometer2015_PublicOpinion_FIN_forWeb.pdf)

[52] *ECNC. ECNC-European Centre for Nature Conservation. Ecosystem services and biodiversity assessment: Impacts of climate change in South-East Europe. www.ecnc.org/projects/ecosystem-services-and-biodiversity-assessment/impacts-of-climate-change-in-south-east-europe/*

[53] *Second Report on the Implementation of Social Inclusion and Poverty Reduction Strategy. 2015. http://socijalnoukljucivanje.gov.rs/wp-content/uploads/2014/11/Second-National-Report-on-Social-Inclusion-and-Poverty-Reduction-final.pdf*

AIR POLLUTION from power stations, mainly coal-burning plants globally,

CAUSES 1 out of **7 DEATHS**



SOURCE: The Guardian, http://bit.ly/1WMI1wr

PUBLIC HEALTH

Phasing out coal and other fossil fuels would have massive benefits for public health. A recent WHO report estimates that air pollution across Europe caused almost 600,000 premature deaths in 2010. The cost of deaths and diseases from air pollution was estimated at US$1.6 trillion (€1.5 trillion).[54] According to the latest HEAL report, 7181 premature deaths in Europe are a result of air pollution caused by coal power plants in the Western Balkans.[55] Burning coal, along with other fossil fuels, is a major contributor to this. In Serbia air pollution caused 16,449 deaths in 2010. The cost of this has been estimated at over US$15 billion (€14 billion), equivalent to 33.5% of the country's GDP.[56] The cost of deaths from air pollution was also over 20% of GDP in Bosnia and Herzegovina and Macedonia.[57] According to recent research, the public health cost of existing coal-fired power stations in the region is up to €8.5 billion per year; while new coal plants have higher pollution standards, going ahead with all those planned for the region could add a further €190-528 million a year in health costs.[58] Switching from petrol and diesel to electric cars will also reduce pollution, especially in cities.

ECONOMIC BENEFITS

Increasing energy efficiency and renewable energy generation will reduce dependence on costly energy imports. In Serbia alone, oil and gas imports cost an average of US$1.5 billion a year over the last decade.[59] Although renewable energy sources may have higher upfront costs than coal, they represent better economic value: long-term operating costs are considerably lower, there are no carbon costs, and improved air quality will reduce healthcare expenditure. Improving energy efficiency will also reduce SEE industries' costs. This will become even more important if, as has been suggested, EU countries introduce carbon tariffs on imports.[60]

INCREASED EMPLOYMENT

Renewable energy, energy efficiency and associated industries are much more labour intensive than large, mechanized fossil fuels plants. Employment related to renewable energy is growing fast, reaching 7.7 million globally (excluding large hydropower) in 2014 – up 18% from the previous year.[61] Following the clean energy roadmap could create tens of thousands of skilled jobs in the region – from building wind turbines, to selling, installing and maintaining rooftop solar panels and heaters, to retrofitting homes and public buildings, to designing, developing and marketing innovative clean-tech products and services. A study by Copenhagen Economics

[54] *WHO. 2015. Air pollution costs European economies US$ 1.6 trillion a year in diseases and deaths, new WHO study says. World Health Organization, Regional Office for Europe, Copenhagen and Haifa. www.euro.who.int/en/media-centre/sections/press-releases/2015/air-pollution-costs-european-economies-us$-1.6-trillion-a-year-in-diseases-and-deaths,-new-who-study-says*

[55] *HEAL. 2016. The unpaid health bill: How coal power plants in Western Balkans make us sick. Health and Environment Alliance (HEAL). http://env-health.org/IMG/pdf/factsheet_eu_and_western_balkan_en_web.pdf*

[56] *WHO. 2015. Economic cost of deaths from air pollution (outdoor and indoor) per country, as a percentage of GDP. World Health Organization, Regional Office for Europe, Copenhagen and Haifa. www.euro.who.int/__data/assets/pdf_file/0008/276956/PR_Economics-Annex_en.pdf*

[57] *Ibid.*

[58] *HEAL. 2016. The unpaid health bill: How coal power plants in Western Balkans make us sick. http://env-health.org/IMG/pdf/factsheet_eu_and_western_balkan_en_web.pdf*

[59] *Statistical office of Serbia.*

[60] *EU nation envoys suggest use of carbon import tariffs for some sectors. Carbon Pulse, 20 May 2015. http://carbon-pulse.com/eu-nation-envoys-suggest-use-of-carbon-import-tariffs-for-some-sectors*

[61] *IRENA. 2015. Renewable Energy and Jobs – Annual Review 2015. International Renewable Energy Agency. www.irena.org/DocumentDownloads/Publications/IRENA_RE_Jobs_Annual_Review_2015.pdf*

calculates that retrofitting building stock in the EU could employ 760,000–1,480,000 people, providing a valuable economic stimulus.[62] Sustainable bioenergy development can also create jobs in rural areas in forestry and agriculture.

ENDING ENERGY POVERTY

Although consumers in SEE pay relatively low per-unit energy prices, more than half the population in each country is estimated to spend more than 10% of their income on energy.[63] Improving energy conservation and efficiency, including by refurbishing homes to reduce heating requirements, can reduce household energy expenditure and lift people out of energy poverty. Counterintuitively, raising energy prices may help here: artificially low energy prices subsidize wasteful consumption by all sectors of society, and are a disincentive to improving efficiency. However, price rises should be offset by energy-saving measures and better targeted support for the most vulnerable, in place of subsidies to polluting energy companies.



Improving energy efficiency can lift people out of energy poverty
Photo: Lasta Slaviček

[62] *Copenhagen Economics. 2012. Multiple benefits of investing in energy efficient renovation of buildings. www.copenhageneconomics.com/dyn/resources/Publication/publicationPDF/8/198/0/Multiple%20benefits%20of%20EE%20renovations%20in%20buildings%20-%20Full%20report%20and%20appendix.pdf*

[63] *Energy Community. 2015. Tapping On Its Energy Efficiency Potential. Energy Community Secretariat. https://www.energy-community.org/portal/page/portal/ENC_HOME/DOCS/3750146/18B2AB6BA84663F2E053C92FA8C064DA.PDF*

KEY CHALLENGES



Mining Basin Kolubara, Serbia / Photo: Betaphoto / Miloš Miškov

Leaving the Road to Nowhere and getting on the EU pathway presents a number of challenges, which are discussed below. Key issues to address include taking aggressive action to end the use of coal, limiting the expansion of hydropower, mobilizing finance and tackling corruption.

THE END OF COAL

To cut greenhouse-gas emissions in line with EU targets, and the Paris Agreement's ambition to keep climate warming below 1.5-2°C, it's imperative that SEE countries reassess plans for new coal plants. Since coal plants have a lifespan of at least 40 years, going ahead with new constructions will lock in high-carbon energy infrastructure for years to come: it will be impossible to use all the planned new coal plants to their full capacity and still meet EU carbon targets. New coal plants risk being abandoned as hugely expensive mistakes as they are outpaced by clean renewable technologies and progressive climate-change policies – and the public will bear the cost.

Coal is the largest single contributor to manmade climate change.[64] In 2013, coal contributed 19.4% of total primary energy supply globally, but was responsible for 46% of global carbon emissions from fuel combustion.[65] Some 1,200 coal-fired power stations are planned around the world: if all were built, it would put us on the path to an unthinkable 6°C of warming by 2100.[66] Recent research suggests that, to have a 50% chance of limiting global warming to 2°C, 88% of global coal reserves must remain unused between 2010 and 2050,[67] and no new coal plants should be built beyond this year.[68] Although carbon capture and storage for coal plants is touted as a potential solution, the technology is hugely expensive and not yet ready to be deployed at scale.[69]

The facts are clear: if the world is serious about keeping climate change within safe limits, then most coal must remain unburnt. And that means that planned coal-fired power stations must remain unbuilt.

MANAGING THE COAL TRANSITION

While phasing out coal will undoubtedly bring environmental, social and economic net benefits, there will be costs too – particularly for communities that are heavily dependent on coal mining. The closure of coal mines in the UK in the mid-1980s, which provoked violent clashes between police and striking miners and led to widespread unemployment and poverty in many communities, provides a cautionary tale. Support is needed to buffer the impact on mining communities and provide alternative sources of employment, potentially in the renewable energy and clean-tech sectors. Coal mines and plants will not be closed overnight: the roadmap sees a gradual phasing out of coal as plants reach the end of their life. SEE has a generation to implement the coal transition, and train coal workers in new skills. The political leadership in the region needs to take responsibility for the future of these communities now, not ignore the inevitable.



Miners getting arrested during miners' strike in UK (1984-1985)
Photo: PA

[64] *International Energy Association. 2015. Key World Energy Statistics. www.iea.org/publications/freepublications/publication/KeyWorld_Statistics_2015.pdf*

[65] *International Energy Association. 2014. Key World Energy Statistics; International Energy Association. 2015. Key World Energy Statistics. www.iea.org/publications/freepublications/publication/KeyWorld_Statistics_2015.pdf*

[66] *End Coal. Towards Climate Catastrophe: The Contribution of Coal to Climate Change.*

[67] *Pidcock, R. 2015. Meeting two degree climate target means 80 per cent of world's coal is "unburnable", study says. The Carbon Brief, 7 January 2015. http://www.carbonbrief.org/meeting-two-degree-climate-target-means-80-per-cent-of-worlds-coal-is-unburnable-study-says*

[68] *Pfeiffera, A., Millara, R. and Hepburn, C. 2016. The '2°C capital stock' for electricity generation: Committed cumulative carbon emissions from the electricity generation sector and the transition to a green economy.*

[69] *Carbon capture and storage also uses up much of the energy generated, meaning that plants become less effective and even less economically viable than new coal plants often are already today.*

LESSONS UNLEARNT: LIGNITE IN SLOVENIA

The case of the Šoštanj lignite power plant in Slovenia shows how incompatible new coal plants are with EU 2050 climate goals. A new 600 MW unit has been built, and is touted as a way of cutting emissions since it is more efficient than those it replaces. However, the new plant will emit 3.4 Mt of CO2 per year: this is equivalent to almost all of Slovenia's emissions in 2050 if it is to meet the EU's minimum goal of reducing emissions by 80%.[70]

The cost of the plant also gives the lie to the idea of lignite being cheap. The project was originally supposed to be €600 million, but by June 2013 had more than doubled to €1.44 billion. A recent calculation suggests the project will generate losses of around €94 million annually, as operating costs considerably exceed the wholesale price of electricity.[71] And this doesn't take into account the wider costs of coal, including the price of carbon emissions and the health costs of air pollution. The project has also been dogged with allegations of corruption and a lack of transparency.

Despite the Šoštanj plant's incompatibility with EU climate goals, over half of the financing came from the European Investment Bank (€550 million) and the European Bank for Reconstruction and Development (€100 million). Both banks have since put strict limits on funding for coal infrastructure.

But to the southeast, the lessons from Slovenia are not being heeded, as other former Yugoslav republics press ahead with their own new lignite plants.

[70] *CEE Bankwatch Network. Coal in the Balkans: Sostanj lignite thermal power plant unit 6, Slovenia. www.bankwatch.org/our-work/projects/sostanj-lignite-thermal-power-plant-unit-6-slovenia*

[71] *Zumbar, A. 2015. Aleksander Mervar: Unit 6 of Šoštanj TPP Could Be a Success Story! Energetika.net 10 August 2015. www.energetika.net/eu/novice/intervjuji/mag-aleksander-mervar-tes-6-bi-lahko-bil-uspesna-zgodba*



Šoštanj lignite coal power plant in Slovenia
Photo: Pippa Gallop, CEE Bankwatch

HYDROPOWER

Hydropower provides SEE with almost a third of its electricity. These plants produce no carbon emissions and, unlike variable renewable energy sources like wind and solar, can to some extent provide baseload electricity. However, they also have major environmental and social impacts.

Dams can damage the health of freshwater ecosystems by changing water flow upstream and downstream of the dam, and fragmenting habitats. This in turn can affect the livelihoods of people who depend on the services rivers and wetlands provide, such as fisheries, drinking water supply, water for irrigation or regular deposits of fertile sediment on farmland. Large areas of land may also be flooded to create hydropower reservoirs. Dam building also often leads to deforestation, and associated problems such as soil erosion.

Even small hydropower plants,[72] commonly thought of as less harmful, can damage freshwater ecosystems, especially when several are planned on the same river. They often leave insufficient water flow downstream and disrupt fish migration and biodiversity. Even those which use pipes to divert water instead of dams disrupt river flow and species migration.

Hundreds of new large- and small-scale hydropower plants are planned for the SEE region. According to RiverWatch,[73] an NGO based in Austria, there are 700 dams proposed in Serbia, 435 in Albania, 400 in Macedonia, more than 100

in Bosnia and Herzegovina, and 70 in Montenegro.[74] Most will bring little benefit to the local people affected: the profits flow to private companies, some very close to the governments,[75] and some from abroad, whose profits do not stay in the country. In some cases, the electricity produced will be exported under long-term contracts.

The waterways of SEE are some of the most pristine on the continent, but the scale of proposed hydropower development is likely to change this. This has implications for countries' EU ambitions. Under the European Water Framework Directive, EU members must ensure all their water bodies achieve a good ecological status by 2027. New EU members will also need to comply with other environmental policies, including rules on managing key areas for conservation. A significant number of hydropower plants are planned in national parks and protected areas, including sites which could form part of the Natura 2000 network, where new developments are strictly controlled.

Hydropower projects are meeting with growing opposition from civil society and local communities. In Montenegro, for example, plans for a series of four dams on the Morača River were put on hold when the government received no interest from investors following strong objections from conservationists: WWF and Green Home had warned that the dams could lead to annual losses of €1.5 million in revenue from fisheries downstream.[76] In Macedonia, 100,000 people signed a petition objecting to two large-scale hydropower dams in Mavrovo National Park, home to the last breeding population of Balkan lynx; a recent appraisal for the legally binding Convention on the Conservation of European Wildlife and Natural Habitats (the Bern Convention) recommended that "the projects, as currently planned, should be abandoned" due to the impact on the park's status, ecosystems and species.[77]

Because of these concerns, the energy roadmap limits large-scale expansion of hydropower to areas which are not protected and rivers which are not considered to be of outstanding quality according to WWF and Euronatur assessments.[78] Where new hydropower is developed, it should be appropriately sited and subject to strict environmental and social impact assessments in line with EU directives.[79] Sustainability principles should include strategic planning and impact assessments on a river-basin scale for hydropower sector development, and environmental impact assessments, environmental flows and fish passes (where appropriate) for individual projects.[80]

FINANCE

Our modelling, based on the best available research and official data, shows that following the EU Road will be no more expensive than the Road to Nowhere – and may in fact be notably cheaper if the costs of renewable energy relative to fossil fuels fall at a faster rate than the model assumes. In the long term, renewable energy saves money on fuel costs, as wind and sunlight are free and inexhaustible resources. Nor do they carry coal's environmental and social externalities. However, investment costs are higher in the short term. Similarly, improving the energy efficiency of buildings, transport systems and

[72] *Definitions vary but these are usually considered as less than 10 MW in Europe.*

[73] *riverwatch.eu/en*

[74] *Neslen, A. 2015. Balkan dam boom threatens Europe's last wild waterways. The Guardian, 20 February 2015. www.theguardian.com/environment/2015/feb/20/balkan-dam-boom-threatens-europes-last-wild-waterways*

[75] *www.poslovni.hr/svijet-i-regija/ukanovicev-sin-gradi-malu-he-u-crnoj-gori-296318, www.dan.co.me/?nivo=3&rubrika=Ekonomija&datum=2015-01-09&clanak=470504*

[76] *awsassets.panda.org/downloads/wwf_supplement_for_vijesti_20_12_2011.pdf*

[77] *Convention on the Conservation of European Wildlife and Natural Habitats. 2015. Hydro power development within the territory of Mavrovo National Park: On-the-spot appraisal. Council of Europe. https://wcd.coe.int/com.instranet.InstraServlet?command=com.instranet.CmdBlobGet&InstranetImage=2830720&SecMode=1&DocId=2322758&Usage=2*

[78] *awsassets.panda.org/downloads/rivers_lifelines_of_the_dinaric_arc.pdf; balkanrivers.net/sites/default/files/BalkanRiverAssessment29032012web.pdf*

[79] *South East Europe Sustainable Energy Policy. 2015. EIA/SEA of Hydropower Projects in South East Europe: Meeting the EU Standards. http://seechangenetwork.org/wp-content/uploads/2015/11/EIASEA-of-hydropower-projects-in-Southeast-Europe-%E2%80%93-Meeting-the-EU-standards.pdf*

[80] *Guiding Principles on Sustainable Hydropower Development in the Danube Basin. International Commission for the Protection of the Danube River. 2013.*

industry will require significant investment before the savings take effect. Mobilizing the finance to bring renewable energy, other than hydropower, and energy-efficiency projects to scale over the next few years must be a key priority.

Significant energy investments are planned for the region – but in the wrong technologies. China has a dedicated US$10 billion credit line for investment in Central and Eastern Europe, "with a focus on cooperation projects in such areas as infrastructure, high and new technologies, and green economy."[81] Unfortunately, although China leads the world in renewable energy installations domestically,[82] its investment in SEE to date has focused on coal. In 2014, the China Development Bank lent €350 million to finance the construction of the Stanari thermal power plant in Bosnia and Herzegovina,[83] and the Export–Import Bank of China has committed to loan 85% of the value of the US$715 million Kostolac B3 unit in Serbia.[84] Several other proposed coal power plants in the region depend heavily on Chinese finance.[85] Other countries such as the Czech Republic and Japan have also shown readiness to finance coal in the region. These investments could make or break efforts to reduce greenhouse-gas emissions.

Along with other international finance institutions, the European investment banks have been slow to help prospective new member states to manage the transition to a cleaner energy supply. In fact, between 2006 and 2012, the European Bank for Reconstruction and Development, European Investment Bank, World Bank and EU-Instrument for Pre-accession Assistance invested a total of €1.68 billion in energy



infrastructure in South East Europe, of which fossil fuels received €597 million (35%). Hydropower received €310 million (19%), and other renewables just €18.5 million (1%) – though there has subsequently been some increase in support for wind power in Serbia[86] and Montenegro[87]. Just €289 million (17%) was spent on improving energy efficiency, even though this has massive potential for addressing energy poverty and cost-effectively meeting energy demands in the region.[88] [89] However, governments must take their share of responsibility for a lack of vision and for not using the funds that are available:

[81] *Cooperation between China and Central and Eastern European Countries. 2015. China's Twelve Measures for Promoting Friendly Cooperation with Central and Eastern European Countries. www.china-ceec.org/151/2015/01/26/41s5605.htm*

[82] *www.renewableenergyfocus.com/view/43562/globaldata-reports-2015-saw-china-push-global-renewable-installed-capacity-beyond-900-gigawatts*

[83] *www.eft-stanari.net/en/news/en/EFT-completes-financial-close-for-the-Stanari-TPP-project.html*

[84] *www.eps.rs/Eng/Article.aspx?lista=novosti&id=39*

[85] *These include Tuzla Bloc 7 (450 MW, €730 million), Banovići (350 MW, €405 million) and Ugljevik 3 (2 x 300 MW, €800 million) in Bosnia and Herzegovina.*

[86] *EBRD project summary document for Dolovo Cibuk 1 wind farm: http://www.ebrd.com/work-with-us/projects/psd/dolovo-cibuk-i-wind-farm.html – at the time of writing the project is not yet approved but is under consideration. IFC project summary for Alibunar wind farm: http://ifcext.ifc.org/ifcext/spiwebsite1.nsf/651aeb16abd09c1f8525797d006976ba/ad271ed8cf45144f85257b5700657ec5?OpenDocument – project approved but pending contract signing.*

[87] *EBRD project summary document for Krnovo wind farm http://www.ebrd.com/work-with-us/projects/psd/krnovo-wind-farm.html*

[88] *The rest was lent for transmission (25%) and mixed investments that could not be categorized (3%).*

[89] *South East Europe Sustainable Energy Policy. 2013. Invest in haste, repent at leisure: Are IFIs behaving as if EU accession criteria and extreme energy losses do not exist in South East Europe? http://seechangenetwork.org/wp-content/uploads/2014/11/SEE-IFI-energy.pdf*

a recent Energy Community study showed that only around one third of the €700 million available from the European Union and international financial institutions for energy efficiency has been used so far.[90]

Fossil fuels, chiefly coal, receive huge state support though hidden subsidies in SEE. Redirecting these subsidies could help to create a more level playing field for renewables, to support energy efficiency and to tackle energy poverty.

COAL'S TRUE COSTS

While coal is trumpeted by its supporters as a cheap source of energy, the true cost is much higher. Coal has significant social and environmental externalities, such as ill health caused by air pollution (as discussed above) and climate change impacts. Countries planning to join the European Union need to comply with European Industrial Emissions Directive on emissions of sulphur dioxide, nitrogen oxides and dust from large power plants and industrial facilities, which are not reflected in some proposed projects. On top of this, they need to take account of the price of carbon, as determined by emissions trading schemes. Currently in the EU this is around €6 per tonne,[91] but reform of the market is set to significantly increase the carbon price signal. Market analysts Point Carbon project an average carbon price of €23 per tonne between 2020 and 2030.[92]

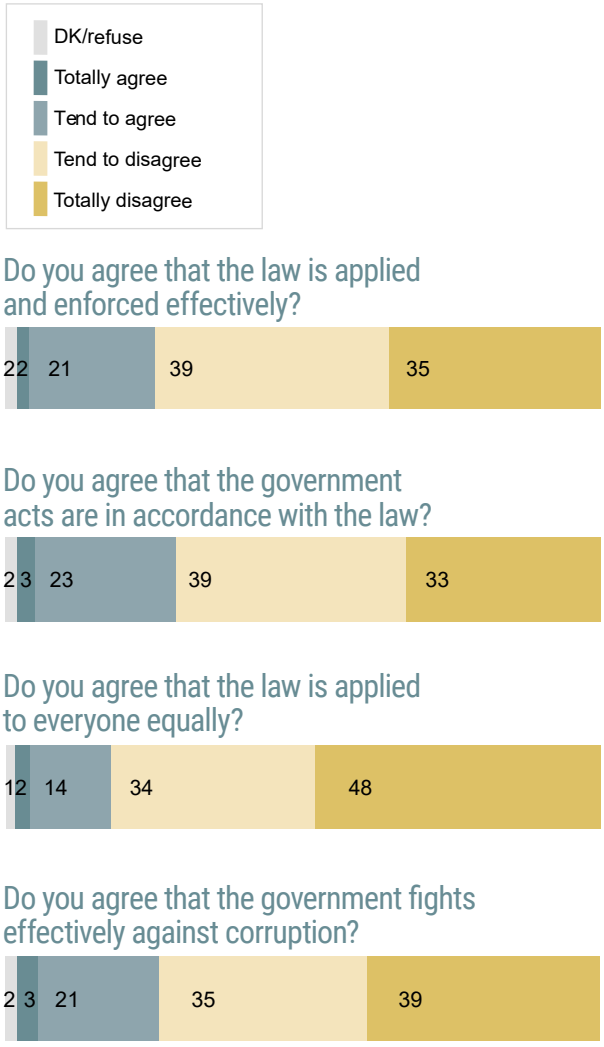
The Paris Agreement's aim to limit global warming to well below 2°C makes fossil fuels an even worse investment. To stay within a global carbon budget, 80% of coal, half of gas and a third of oil reserves will need to be left in the ground. A recent report by Citigroup values these "stranded assets" at US$100 trillion.[93]

There is a high risk that countries in the region that press ahead with plans for new coal and lignite power plants will find themselves with expensive white elephants that are not economic to run.[94] This will prove costly for the countries of SEE, and for the EU itself, which will need to invest enormous amounts in getting on track to meet targets for energy efficiency and sustainable renewable energy.

Figure 15

SEE CITIZEN PERSPECTIVE: CLIMATE CHANGE AND ENVIRONMENTAL BENEFITS

% of SEE respondents



SOURCE: Balkan Barometer 2015 Public Opinion Survey (http://www.rcc.int/seeds/files/RCC_BalkanBarometer2015_PublicOpinion_FIN_forWeb.pdf)

[90] *www.energy-community.org/portal/page/portal/ENC_HOME/NEWS/News_Details?p_new_id=11141*
[91] *www.eex.com/en/*
[92] *Thomson Reuters. 2014. EU carbon price to average €23/t between 2021 and 2030: Thomson Reuters assess the future. blog.financial. http://blog.financial.thomsonreuters.com/eu-carbon-price-average-e23t-2021-2030-thomson-reuters-assess-future/*
[93] *Parkinson, G. Citigroup Predicts $100 Trillion In Stranded Assets If Paris Summit Succeeds. RenewEconomy 25 August 15. reneweconomy.com.au/2015/citigroup-sees-100-trillion-of-stranded-assets-if-paris-succeeds-13431*
[94] *bankwatch.org/publications/stranded-assets-western-balkans-report-long-term-economic-viability-new-export-capaciti*

CORRUPTION

Billions of euros of investment will be needed in energy infrastructure in SEE over the coming years. This presents an opportunity to provide jobs for local people, revive communities and improve the environment, while providing affordable clean energy to all. Unfortunately, it also presents opportunities for unscrupulous officials and businesses to enrich themselves. Tackling systemic corruption will be crucial if the countries of SEE are to enjoy the benefits of a clean energy future.

High-level corruption and weak institutions are serious obstacles on the path to a sustainable energy future for South East Europe. According to the EU, a priority for the region should be "reforming public administration and strengthening of democratic institutions, which remain weak in most enlargement countries, with limited administrative capacity, high level of politicization and a lack of transparency".[95] According to the RCC Balkan Opinion Barometer, three-quarters (74%) of SEE citizens surveyed do not agree that the government fights corruption effectively.[96]

Historically, large-scale energy projects in the region have often been marked by corruption. This raises costs and drives away reputable investors. Entrenched interests have also hampered the development of sustainable energy in SEE. A 2014 report on high-level corruption in the energy sector, Winners and Losers: Who Benefits from High Level Corruption in the South East Europe Energy Sector?, details cases of corruption in energy projects in each of the seven SEE countries.[97] These have cost the public tens of millions of euros, and reach to the highest level: as in the case of former Croatian Prime Minister Ivo Sanader, who was previously in 2014 convicted of receiving a ten million euro bribe from a Hungarian energy company. However, in 2015 the Constitutional Court of Croatia overruled the conviction and the case was returned to the Municipal Court in Zagreb.[98]

The EU sees high-level corruption as a "serious concern in many enlargement countries";[99] it continues to have a negative effect on countries' development, the lives of ordinary citizens and the environment. Building a modern energy system also means building a strong system of governance and strengthening the rule of law. In particular, greater transparency and oversight is needed in areas such as tendering for new projects and privatization of state-owned energy assets.

[95] *European Commission. 2014. Press release: EU enlargement in 2014 and beyond: progress and challenges. Brussels, 8 October 2014. http://europa.eu/rapid/press-release_IP-14-1100_en.htm*

[96] *Regional Cooperation Council. 2015. Balkan Opinion Barometer 2015. www.rcc.int/pubs/25/balkan-opinion-barometer-2015. The study included 7,000 citizens from seven South East Europe economies - Albania, Bosnia and Herzegovina, Croatia, Kosovo, Macedonia, Montenegro and Serbia.*

[97] *SEE SEP. 2014. Winners and Losers: Who benefits from high-level corruption in the South East Europe energy sector? South East Europe Sustainable Energy Policy Programme. http://seechangenetwork.org/wp-content/uploads/2014/11/Winners-and-Losers-Who-benefits-from-high-level-corruption-in-the-South-East-Europe-energy-sector-1.pdf*

[98] *balkans.aljazeera.net/vijesti/ustavni-sud-ukinuo-presudu-sanaderu-za-hypo-i-ina-mol*

[99] *European Commission. 2013. Enlargement Strategy and Main Challenges 2013–2014.*



Ulrike Lunacek

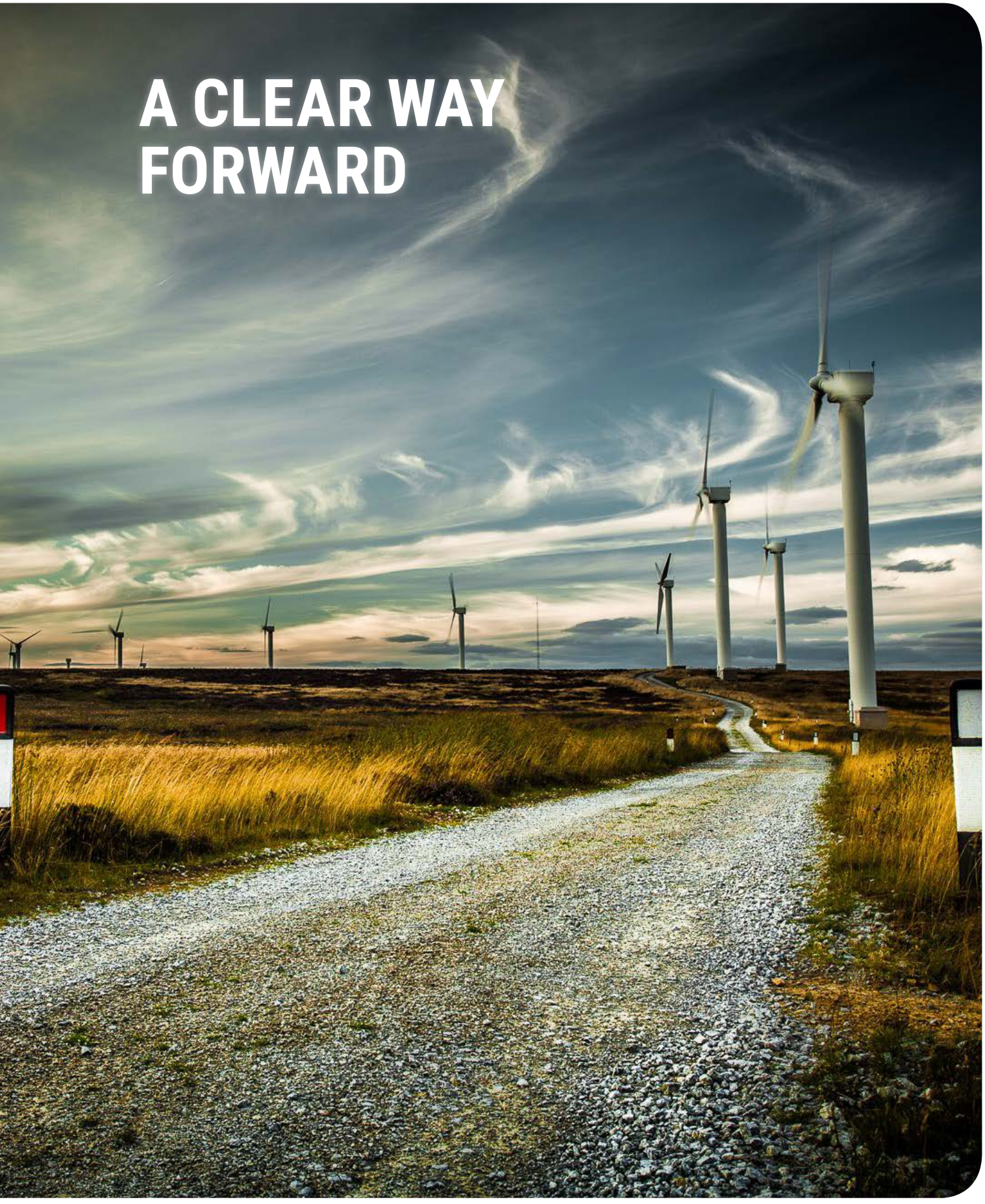
"Corruption must be fought in earnest by EU member states and candidate countries."*



Ulrike Lunacek
MEP and Vice-President of European Parliament

*Foreword of report Winners and Losers: Who benefits from high-level corruption in the South East Europe energy sector? by SEE Change Net and SEE SEP network. http://seechangenetwork.org/wp-content/uploads/2014/11/Winners-and-Losers-Who-benefits-from-high-level-corruption-in-the-South-East-Europe-energy-sector-1.pdf

A CLEAR WAY FORWARD



Wind farm Ovenden Moor, United Kingdom / Photo: McFade Photography

The EU has set out a clear long-term goal of at least 80-95% reduction in greenhouse-gas emissions by 2050. In the interim it has set targets of 20% share of renewables in final energy consumption and a 20% increase in energy efficiency, at EU level, until 2020. The agreed 2030 goal involves at least 40% reduction in emissions by 2030 – the target the EU committed to in its INDC submission for the United Nations Climate Change Conference in Paris in 2015. This goal is weighted by country, so each member state will have a clear target.

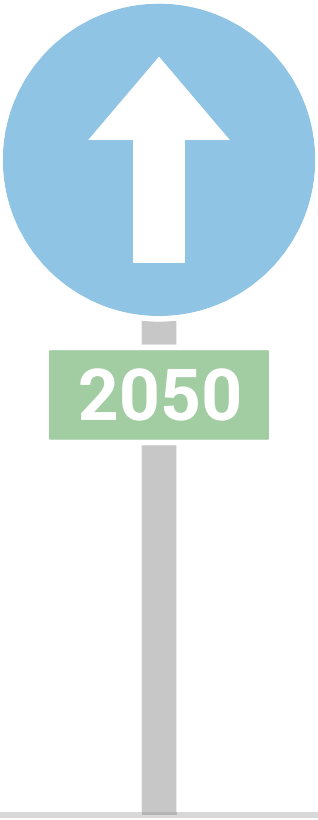
For prospective EU members in SEE, the energy sector is governed not only by the accession process, but also by a legal framework called the Energy Community Treaty. This applies not just to accession and pre-accession countries but also to some of the close neighbourhood countries as well. The Energy Community Treaty[100] puts more immediate legal obligations on prospective EU member states, but does not include all elements of EU legislation.

This lack of clarity of expectation is further blurred by the fact that the Energy Community does not yet state any long-term emissions target or include elements of the EU climate acquis within its legal framework. This has enabled candidate countries such as Serbia and Macedonia to announce targets in their INDCs which in practice allow for emissions to rise, since they refer to 1990 levels, when the former Yugoslavia had an economy based on heavy industry.

Over the next 10 years, almost 90% of the lignite-based energy infrastructure in the region is due to be closed or rehabilitated. Crucial decisions on how to replace this capacity need to be made urgently. With a development period of around 5-8 years, and a lifespan of 40-50 years, energy investments must be guided by clear long-term goals. South East Europe will lose its way and be left behind unless it adopts a consistent, forward-thinking strategy to guide long-term decision-making. The energy roadmap offers this vision.

Green power is now the **leading source** of electricity in Europe, providing **44%** of total EU capacity in 2015.

Investment in renewables reached $286bn worldwide in 2015, for the first time **developing countries outspent the richer** nations on renewables.[101]



[100] *See www.energy-community.org/portal/page/portal/ENC_HOME/ENERGY_COMMUNITY/Legal*

[101] *Renewable Energy Global Status Report 2016 by REN21 available from http://www.ren21.net/wp-content/uploads/2016/06/GSR_2016_Full_Report1.pdf*

RECOMMENDATIONS



Photo: Slim Dandy (CC BY 2.0)

NATIONAL GOVERNMENTS SHOULD:

- Cancel all planned new coal/lignite power plants and switch effort and investment to energy efficiency and diversified, sustainably planned renewable energy.
- Act immediately to remove the extremely damaging health and environmental impacts of pollution from existing coal power plants.
- Greatly increase transparency and improve corruption prevention mechanisms and actions around what are often highly controversial and questionable energy projects.

The European Commission and the Energy Community should agree with signatory parties to the Energy Community and other stakeholders on long-term 2050 emissions targets, and intermediate targets for 2030. These targets should be enshrined in the legal framework of the Energy Community.

About **147 gigawatts** (GW) of capacity was added in 2015 – mainly wind and solar – which is roughly equivalent to Africa's generating capacity from all sources.

Over **8 million** people are now **working in renewable energy** worldwide.[102]

THE ENERGY COMMUNITY SHOULD:

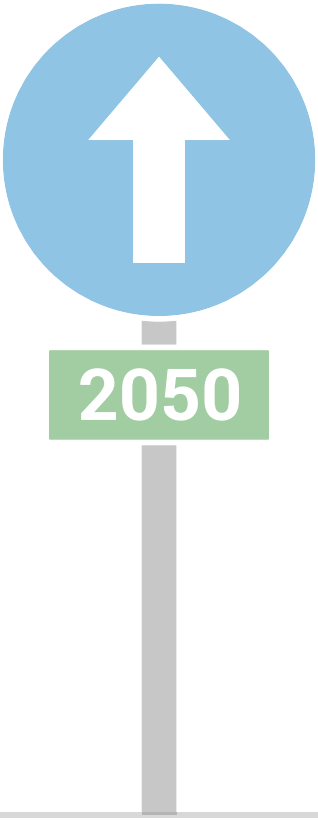
- Revise its Regional Energy Strategy, in consultation with all stakeholders, to reflect these 2050 targets and the Paris Agreement.
- Establish a task force or a working group to examine the issue of intermittence (a smart interconnected grid in SEE) as the region switches towards 2050 targets and make recommendations for time-bound, concrete actions.

The Energy Community, governments of the region, international financing institutions and the European Commission, in consultation with stakeholders, including civil society, should set up an open process with resources and a time-frame to identify concrete actions to unblock the barriers to concentrating resources on energy efficiency, especially for housing.

Investors who are currently funding projects such as new lignite plants should review their spending portfolios to align with 2050 targets.

European institutions should finance only sustainable projects that contribute to 2050 targets and should step up financing for residential energy efficiency.

All parties should set to work immediately to put into practice the 10 steps programme (presented on pages 16 and 17) to get the region back on the EU pathway and to avoid an energy strategy that puts us on the Road to Nowhere.



[102] *Renewable Energy Global Status Report 2016 by REN21 available from http://www.ren21.net/wp-content/uploads/2016/06/GSR_2016_Full_Report1.pdf*



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CLIMACT

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SEE 2050 CARBON CALCULATOR