

Energy Supply for Europe

Facts and Perspectives



European Power Plant Suppliers Association

Content

EPPSA Introductory Statement	03
EPPSA Key Messages	04
A Balanced Energy Mix for an Affordable and Clean Future	06
Secure Electricity Supplies	08
Greener Technology: The Importance of Research, Development and Demonstration	10
Thermal Power The backbone of Global and EU Energy Supply	12
A Shared Responsibility	14
Conclusions	15
EPPSA Members	16
Sources	19





EPPSA

Introductory Statement

■ The European Power Plant Suppliers Association (EPPSA) is the voice, at European level, of companies supplying power plants, components and services. The EPPSA members represent a leading technology and are located throughout Europe with more than 100 000 employees and annual revenue of over €30 billion.

EPPSA actively promotes technologies for highly flexible, efficient and sustainable power generation in a carbon constrained world.

EPPSA believes increased investment in Research, Development and Demonstration is a key factor in driving EU competitiveness as well as establishing affordable near zero emission power supply.


Virtually all power plants in the EU are built by EPPSA members, or built with their components.

EPPSA believes

- **in a balanced energy mix.** To meet the tremendous growth in demand for electricity and ensure the security of supply, all available sources are needed. There is not one, ideal energy source.

- **improved flexibility and efficiency in clean fossil fuel power plants needs rapid implementation for grid stability.** Flexibility and efficiency improvement in both new and existing plants is the decisive factor to preserve scarce natural resources and to achieve CO₂ reduction targets.

- **electricity must be affordable for consumers and industries.** Electricity in the EU must be affordable for consumers and industries to remain at the forefront of competitiveness in a global dimension.



- in a balanced energy mix
- improved flexibility and efficiency in clean fossil fuel power plants needs rapid implementation for grid stability
- electricity must be affordable for consumers and industries

EPPSA Key Messages

05

- increased investment in Research, Development & Demonstration is vital
- continuous investment and scale-up of CCS technologies is required to make Europe a world leader
- building public support for fossil fuel technology and infrastructure must be encouraged

• **increased investment in Research, Development & Demonstration is vital.** Suppliers are investing heavily to develop more environmentally friendly technologies which meet the ambitious EU targets. Investment from authorities and political support are also necessary.

• **continuous investment and scale-up of CCS technologies is required to make Europe a world leader.** Immediate commercialisation of available technologies is necessary to accelerate deployment since time is of the essence. Funding, a comprehensive legal framework and public support are needed to make demonstration plants happen.

• **building public support for fossil fuel technology and infrastructure must be encouraged.** Consumers must be better informed that reliable and affordable electricity – a pre-requisite for a stable economic growth – requires a significant contribution from fossil fuel power generation.

A Balanced Energy Mix for an Affordable and Clean Future



■ Energy Supplies Today and in the Future

The EU is on course to meet the major 2020 climate and energy targets; which consist of a 20% reduction in greenhouse gas emissions relative to 1990 and a 20% share of renewable energy in final energy consumption. The European Commission took a long-term perspective in its 'Energy Roadmap 2050', where it outlined different scenarios and pathways for achieving decarbonisation of 80-95% by 2050.

In the U.S., the shale gas revolution is changing the geopolitics of energy to an extent not seen since the 1970s, and recent reports from organisations such as the International Energy Agency (IEA) indicate that fossil fuels will continue to provide the largest share of global energy consumption in the foreseeable future. Thus, as global energy consumption continues to increase, fossil fuels will continue to provide a major share of this energy. This is as true for the EU as it is for the rest of the world.

Indeed, the European Commission has acknowledged that "projections show that under current policies, while fossil fuel use in the EU continues to decrease, it remains the largest share of the EU energy mix in the decades to come"¹ and that "even if policies are upscaled in order to shift our energy mix further towards lower carbon intensity, fossil fuels would still represent more than 50% of the EU energy mix by 2030".

■ Affordability, Security, Sustainability: The Energy Trilemma

Therefore, addressing the challenge of climate change without compromising any of the three goals of the energy trilemma – affordability, security, and sustainability – is challenging. The compatibility of the three goals of the energy trilemma is often debated. However, EPPSA believes there is a simple solution which reconciles ambitious EU decarbonisation policy with the facts of continuing fossil fuel use, and can meet objectives of the energy trilemma



while providing the flexibility to react to unpredictable geopolitical changes.

■ The Solution: A Balanced Energy Mix

A balanced energy mix is a diversified portfolio of complementary low-carbon energy technologies, with different advantages and disadvantages. Thus, while renewable energy is indispensable for decarbonisation, their intermittency can be balanced by dispatchable and affordable thermal power. Indeed, renewable energy and thermal power are not in competition, but are complementary. This should provide the starting point for discussion on the future of energy generation.

■ The Choice: Upgrading Existing Power Stations

Further research and innovation is needed to make thermal power cleaner by improving efficiency, flexibility, and part-load efficiency. Efficiency in power plants across Europe can be improved substantially with

available technology. Modernising thermal power plants can reduce emissions not only of CO₂ but also pollutants such as NO_x or SO₂. This is the first necessary step towards a cleaner, more secure, and affordable energy supply for Europe, as thermal power

is and will continue to be the backbone of the energy supply.



Secure Electricity ■ Supplies

■ Keeping the Power Supply System Stable

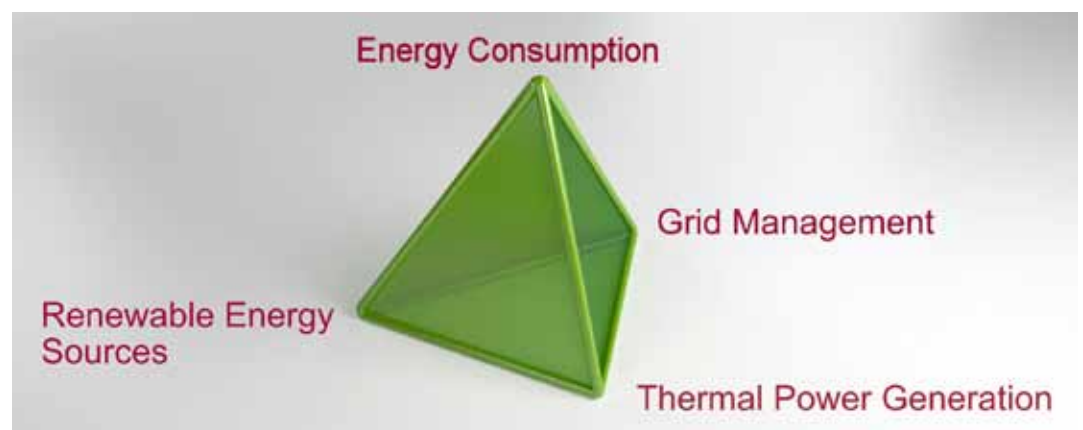
Of the 2020 targets, the most significant progress has been achieved in Renewable Energies. Much of it, however, has been in the form of intermittent energy such as solar or wind. To achieve the EU's decarbonisation goals, an even higher share of renewable energy will be needed, particularly in the electricity sector, as decarbonising the electricity sector is seen as crucial for unlocking decarbonisation in other sectors.

However, experience to date shows that even a small share of intermittent renewable energy can have significant impact on the electricity grid. Integration of renewable energy sources into the grid is seen as a key challenge. Thermal power must provide back-up generation when sun or wind energy fails. In addition, thermal power plants keep the grid functioning through sudden swings in electricity generation.

While other balancing options such as energy storage and demand-side management will play a role in the future, their contribution in the near-term is negligible. Excluding thermal power from any vision of a future energy supply is simply unrealistic if grid stability is desired. EPPSA believes therefore that it is necessary to take note of all the elements of grid stability:

Thermal Power: Essential for Power Supply

A stable grid requires all four elements of grid stability, as increasing energy consumption and renewables integration is enabled through thermal power generation and supported by grid management (e.g. demand-side management and storage)
Source: EPPSA 2013



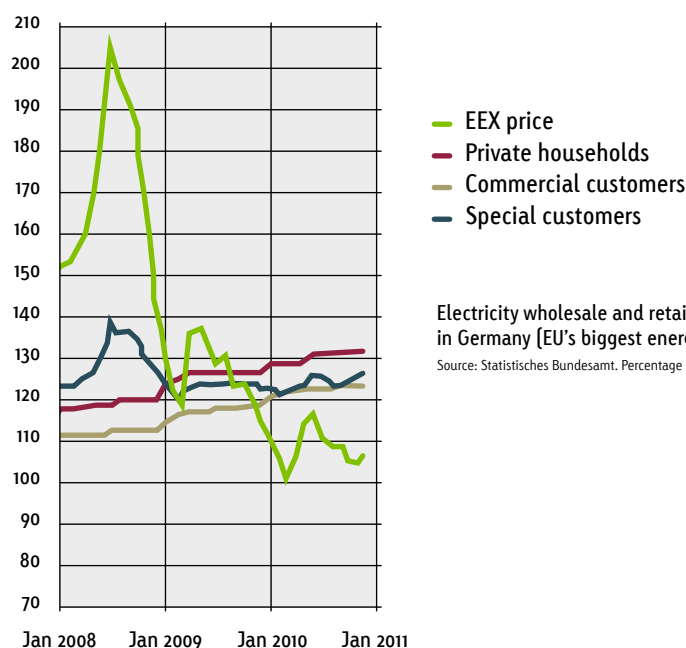


The Influence on Market Prices

It is not only the integration of renewables into the grid that is causing unexpected difficulties. Their integration into the energy market, without exposure to its competitive forces, is pushing down wholesale prices, with negative prices observed more and more often. However, as they are funded through top-up charges on the end-use energy prices, this wholesale dampening does not translate into lower end-use prices (in fact, the opposite is the case, as the increasing spread between prices and fixed support levels leads to increasing charges). Furthermore, these market effects result in lower incentives for thermal power plants to operate, even though they continue to be necessary for a reliable energy supply. Likewise, the incentives for modernising the power plant fleet, either through retrofits or new plants, also disappear. This can lead to a perverse outcome where the integration of renewable energy sources is not supported and backed up by the cleanest, state of the art power plants, but by old and inefficient plants, with the counterproductive

consequence of increasing CO₂ emissions. Finally, without incentives to invest, there are no incentives to innovate – yet safeguarding our future depends on innovation.

While wholesale prices decrease, retail prices increase...



Electricity wholesale and retail prices in Germany (EU's biggest energy market)

Source: Statistisches Bundesamt. Percentage change (2005 = 100%)

Greener Technology: The Importance of Research, Development and Demonstration

Investment in Research, Development and Demonstration (R, D & D) is key to responding to present and future challenges, to meeting Europe's needs for an affordable, secure and clean energy supply, and for maintaining European competitiveness and technological leadership.

■ Efficiency for Back-up Solutions

Energy efficiency has been recognised by various documents from the European Commission, such as the Energy Roadmap 2050 and the 2030 Green Paper, as playing a vital role in achieving decarbonisation. Essentially, development of higher efficiency technologies saves resources, reduces production costs, lowers import dependency, and supports the export capability and overall competitiveness of Europe and its industry, so it is clearly a 'no regrets' option.

However, efficiency improvements alone will not be enough. Power plants currently in operation were not designed to run at partial load and part time. For such plants, operating below a certain level of their design capacity leads to reduced efficiency so that more fuel is consumed and more CO₂ and pollutants are emitted per energy unit generated. The level of renewable energy sources that will be needed to achieve the EU's decarbonisation targets means that in the future, thermal power will provide less base-load generation and will increasingly be required to provide frequency control

and load balancing, essentially providing reserve capacity characterised by high flexibility. Research is needed to widen the range of operation/reducing lower part-load limits, increasing efficiencies and reducing emissions, maintaining ramp-up speeds at low loads, and enabling wider fuel flexibility.

Furthermore, like the power plants themselves, the components used to build them are designed for full load operation. Flexible and part-load operating conditions are different and may have adverse effects on components, reducing their lifetime, necessitating replacement, and increasing overall costs. Research is needed on improving materials' fatigue behaviour to overcome this.





■ Further Improvements with Incentives for R, D & D

It is clear that development of these technologies is vital to ensure a cleaner, more secure, and affordable future, and EPPSA's members are conducting R, D & D in all of these areas. Continuing investment depends on the possibility of obtaining an adequate return on this investment, something which is not currently provided by the energy-only market. Public support for R, D & D is therefore vital, as the development of these technologies is necessary not only

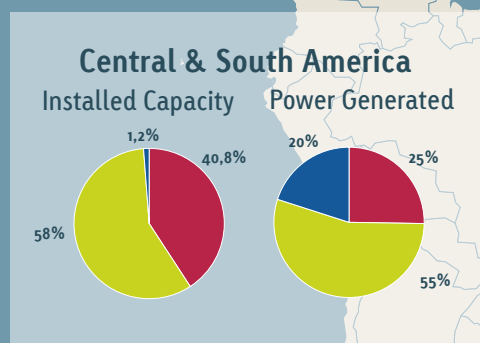
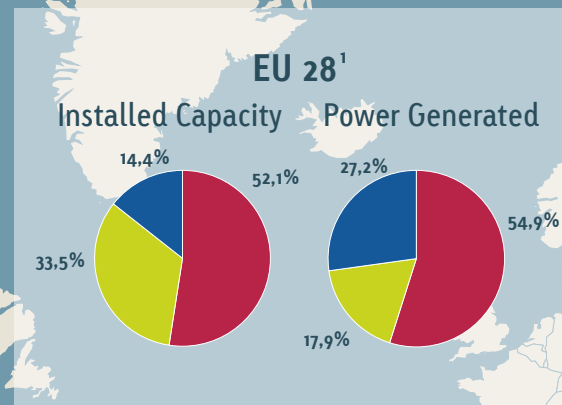
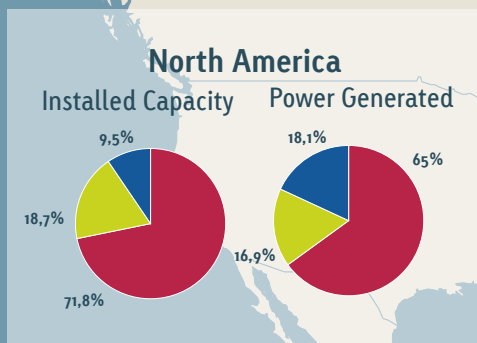
to reach climate and energy objectives, but to maintain European technological leadership with all its resulting benefits.

Thus, the lack of investment in new, modern, and more efficient power plants is not only detrimental from an economic and environmental point of view, but also because it de-incentivises R, D & D. Without investment and scheduled projects to work on, expertise of European engineers is under-utilised and promotes a brain-drain. This in turn means when investment can go ahead the expertise will have been lost, which is particularly pertinent in the EU, where much of the current power plant fleet will need replacing in the next decade.

Technological leadership is difficult to regain, and its loss should be avoided. Given that the current lack of incentives for innovation in the market is an unintended consequence of EU policy, it is clear that politics and institutions have a large role to play in promoting R, D & D – both directly and indirectly.



Thermal Power Generation:



■ The charts show the installed capacity and power generated by generation type for the year 2010, as percentage shares of the total for that year.

Sources:

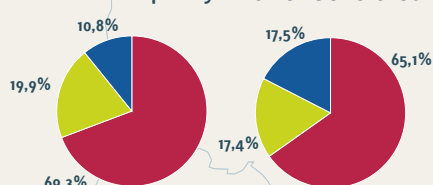
Eurostat, 2013

U.S. Energy Information Administration (EIA), 2013

The Backbone of Global and EU Energy Supply

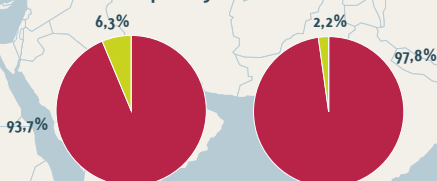
Eurasia

Installed Capacity Power Generated



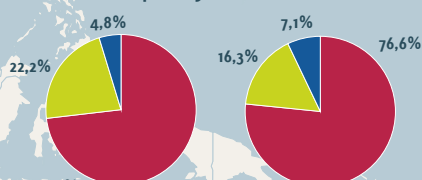
Middle East

Installed Capacity Power Generated



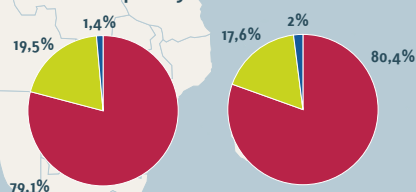
Asia & Oceania

Installed Capacity Power Generated



Africa

Installed Capacity Power Generated



¹ The data for the EU 28 represents 2010 data for the EU 27 plus Croatia, which at that time was not yet a member.

A Shared Responsibility

14 Growing demand for energy that is affordable, secure, and clean can only be met through a balanced energy mix. The varied sources of power generation that constitute this balanced energy mix require the refurbishing, upgrading, and expansion of the energy supply infrastructure. From power generation units to transmission



lines – but with few exceptions, large energy infrastructure projects often meet public opposition. This is the case for almost all energy sources: be it pumped hydro storage, wind turbines, thermal power plants, or grid extensions. The energy they supply is demanded yet the needed infrastructure is opposed.

Aside from opposition to energy infrastructure projects generally, opposition to thermal power generation as well as CCS is often due to a lack of awareness of the importance of thermal power generation in the EU energy mix, and little or simply wrong information about today's technologies such as clean, modern power stations and CCS and their economic, environmental, and social benefits.

■ Facts Instead of Fears

Like the solution to the energy trilemma, the solution to the mismatch between public demands for energy and public opposition to energy infrastructure is a balanced debate comprised of neutral and objective participation of all stakeholders.

Ensuring a secure energy supply while protecting the environment, promoting economic competitiveness, and combating climate change is a difficult, but not

impossible challenge, involving a complex web of issues where there is no room for half-truths or partial facts. Thus, politicians, industry, NGOs, and the media should strive for objectivity in their statements and treat the public with the respect that they deserve by providing them with facts about all technologies and possible actions for a sustainable future. In this regard, EPPSA favours a wide dialogue with all stakeholders so as to provide the public with more unbiased information.

Finally, as individuals we can all make a difference. After all, we are the public that elects politicians, consumes products, and wants more energy, while at the same time demanding solutions to protect the environment. We owe it to ourselves and our children to make difficult choices and sober judgements, and to consider all the consequences of all the policies, technologies, and courses of action that are available.



Conclusions

■ Meeting the challenge of climate change while ensuring a clean, affordable, and secure energy supply for Europe is difficult, but not impossible.

Agreeing on a balanced energy mix – including thermal power to maintain grid stability – is a first step.

This must be supported by increasing investment in Research, Development, and Demonstration to optimise advanced thermal power generation technologies for the new role they are increasingly being asked to play, and thereby to enable further integration of renewables into the energy system.

Policy, politics, and institutions must establish the correct framework, provide sound policy measures, and promote facts-based dialogue, as public awareness is the only solution to public opposition.

‘We are in it together!’





TLT-Turbo GmbH

ABB



ALSTOM



ANDRITZ

NE NOOTER/ERIKSEN S.r.l.

ANSALDO
CALDAIE S.p.A.

NEM
OUR ENERGY, YOUR POWER



eppsa

BWE

Howden

CARMEUSE



HITACHI
Inspire the Next

FLUOR



EPPSA Member Information

ABB Power Generation

Affolternstrasse 44
8050 Zürich – Switzerland
Tel: +41 43 317 53 68
Fax: +41 43 317 53 70
E-mail: powergeneration@ch.abb.com
www.abb.com/powergeneration

Clyde Bergemann Power Group

Schillwiese 20
46485 Wesel – Germany
Tel: +49 281 815 101
Fax: +49 281 815 184
Email: info@clydebergemannpowergroup.com
www.clydebergemannpowergroup.com

Howden Group

Old Govan Road
PA4 8XJ Renfrew – United Kingdom
Tel: +44 141 885 7300
Fax: +44 141 885 2892
E-mail: info@howden.com
www.howden.co.uk

Alstom

ALSTOM Boiler Deutschland GmbH
Augsburger Str. 712
70329 Stuttgart – Germany
Tel: +49 711 917-01
Fax: +49 711 917-1483
E-Mail: info.stuttgart@power.alstom.com
www.alstom.com, www.alstom.de

CMI Energy

Avenue Greiner 1
4100 Seraing – Belgium
Tel: +32 4 330 22 02
Fax: +32 4 330 22 00
E-mail: hrs@cmigroupe.com
www.cmigroupe.com/energy

Magaldi Power SpA

Via Irno 219
84135 Salerno – Italy
Tel: +39 089 489 111
Fax: +39 089 274 431
E-mail: mac@magaldi.com
www.magaldi.com

Andritz Energy & Environment GmbH

Waagner-Biro-Platz 1
8074 Graz/Raaba – Austria
Tel: +43 316 501-0
Fax: +43 316 501-482
E-mail: Info-ae@andritz.com
www.andritz.com

Doosan Power Systems SA

Doosan House, Crawley Business Quarter
Manor Royal, Crawley
West Sussex, RH10 9AD – United Kingdom
Tel: +44 1293 61 2888
Fax: +44 1293 58 4321
E-mail: DPS.info@doosan.com
www.doosanpowersystems.com

NEM Energy BV

Kanaalpark 159
2321 JW Leiden – The Netherlands
Tel: +31 71 579 2444
Fax: +31 71 579 2792
E-mail: info@nem.nl
www.nem-group.com

Ansaldo Caldaie SpA

Largo Buffoni 3
21013 Gallarate (VA) – Italy
Tel: +39 0331 738 111
Fax: +39 0331 781 589
E-mail: info@ansaldoboiler.it
www.ansaldoboiler.it



Nooter/Eriksen

Via Volta 50
21010 Cardano Al Campo (VA) – Italy
Tel: +39 0331 232500
Fax: +39 0331 232 590
E-mail: nesrl@ne.com
www.ne.com

Bilfinger Power Systems GmbH

Europaallee 1
46047 Oberhausen – Germany
Tel: +49 208 4575 7500
Fax: +49 208 4575 4637
E-mail: info.bbs@bilfinger.com
www.bbs.bilfinger.com

Fluor

Fluor Centre – Pinehurst Road 140
GU 14 7BF Farnborough – United Kingdom
Tel: +44 1252 29 2882
Fax: +44 1252 29 3330
E-mail: mervyn.sambles@fluor.com
www.fluor.com

STF

Via Robecco 20
20013 Magenta (MI) – Italy
Tel: +39 02 972091
Fax: +39 029 794 977
E-mail: stf@stf.it
www.stf.it

Burmeister & Wain Energy A/S

Lundtoftegårdsvej 93A
2800 Kgs. Lyngby – Denmark
Tel: +4539 45 20 00
Fax: +45 39 45 20 05
E-mail: info@bwe.dk
www.bwe.dk

Foster Wheeler Energia OY

Metsänneidonkuja 8
0231 Espoo – Finland
Tel: +358 10 393 11
Fax: +358 10 393 6162
E-mail: fweinfo@fwfin.fwc.com
www.fwc.com

Stork Thermeq

Langelermatweg 12
7553 JD Hengelo – The Netherlands
Tel: +31 74 240 1651
Fax: +31 74 240 1659
E-mail: info.technicalservices@stork.com
www.storktechnicalservices.com

Carmeuse Natural Chemicals

Parc Scientifique Athéna
Boulevard de Lauzelle 65
1348 Louvain-la-Neuve – Belgium
Tel: +32 10 48 16 00
Fax: +32 10 48 16 66
E-mail: info@carmeuse.be
www.thefluegassolutions.com

Hitachi Power Europe GmbH

Schifferstrasse 80
47059 Duisburg – Germany
Tel: +49 203 8038 0
Fax: +49 203 8038 1809
E-mail: infobox@hitachi-power.com
www.hitachi-power.com

TLT-Turbo GmbH

Gleiwitzstrasse 7
66482 Zweibrücken – Germany
Tel: +49 6332 80 80
Fax: +49 6332 80 82 67
E-mail: tlt@tlt-turbo.com
www.tlt-turbo.com

Notes

Sources

EIA - U.S. Energy Information Administration Statistics [2013]
Eurelectric [2011]: "Flexible Generation: Backing Up Renewables"
European Commission [2011]: EU Energy Roadmap 2050
European Commission [2013]-a: Communication on the Future of Carbon Capture and Storage in Europe
European Commission [2013]-b: Green Paper – A 2030 Framework for Climate and Energy Policies
Eurostat [2013]
International Energy Agency [2012]: CO₂ Emissions from Fuel Combustion – Highlights
Statistisches Bundesamt [2013]
Wind turbine [p.6]: EUBUSINESS.COM

Contact:
info@eppsa.eu

EPPSA
European Power Plant Suppliers Association
Avenue Adolphe Lacomblé 59
B-1030 Brussels
phone +32 2 743 29 86
fax +32 2 743 29 90
www.eppsa.eu



www.eppsa.eu