

MED & Italian Energy Report

Fostering renewables for new Euro Mediterranean cooperation

A look to a post-pandemic green future: electricity and the emergence of gas and hydrogen synergies

The map of existing and potential open-sea energy flows

2nd Annual Report

2020



EXTRACT



In cooperation with
Joint Research Center of the European Commission



POLITECNICO
DI TORINO



MED & ITALIAN ENERGY REPORT

FOSTERING RENEWABLES FOR A NEW EURO MEDITERRANEAN COOPERATION

A look to post pandemic green future: electricity and emerging of gas and hydrogen synergies

The map of existing and potential open-sea energy flows

Annual Report 2020

GIANNINI EDITORE

The analysis contained in this report represents the result of a specific SRM project and does not claim to be comprehensive. In addition, it does not undertake or represent in any way the thoughts and opinions of SRM's founder and ordinary members.

The research is exclusively aimed at cognitive and informational knowledge, and is not, at any purpose, an opinion, a suggestion of investment, a review of companies or individuals mentioned. All the interviews carried out for the case studies and whose text has been regularly approved by the interviewees have been edited by SRM, which is, under no circumstances, responsible for the facts, opinions, news and data referred to, as in the case of chapters not directly processed by SRM.

The faithful reproduction of text, even partial, cannot be carried out without the authorisation of SRM. The use of this research and of the information herein contained is only allowed for the purpose of studying and researching the industry and shall be carried out quoting the source.

The illustrations and visualisation data present in this report should be considered as images and not as maps, therefore the equivalence of areas and borders, for instance, is not respected.

Publication based on data information available at June 2020.

Cover Design: Marina RIPOLI - SRM

Editorial design: Raffaella QUAGLIETTA - SRM

Infographics: Emere ARCO - Energy Security Lab @Energy Center, Politecnico di Torino;
Raffaella QUAGLIETTA - SRM

ISBN: 978-88-6906-121-9

© 2020 Giannini Editore

Naples - 6/b, via Cisterna dell'Olio
www.gianninispa.it

Published by



POLITECNICO
DI TORINO



THE AUTHORS

(Authors details on page 255)

Scientific Board:

Massimo DEANDREIS and Ettore F. BOMPARD (Coordinators, Energy),
Piero BOCCARDO (Geomatics), Stefano CORGNATI (Energy), Stefano LO RUSSO (Energy)
Marcelo MASERA (Energy Policy), Francesco PROFUMO (Energy), Paolo SCUDIERI

Head of *Maritime & Energy*, SRM:

Alessandro PANARO

Team of Researchers:

Michele ACCIARO, Emere ARCO, Alessandro ARDUINO,
Anna Arianna BUONFANTI, Consuelo CARRERAS, Salvatore CELLURA,
Alessandro CIOCIA, Gianluca FULLI, Daniele GROSSO, Andrea MAZZA, Carmelo MOSCA,
Arturs PURVINS, Filippo SPERTINO, Silvia VITIELLO, Marco ZIGON

ACKNOWLEDGEMENTS

The 2020 Annual Report on MED & Italian Energy is part of a newly-inaugurated and broader research project launched by SRM and ESL@Energy Center and called ENEMED-IT which has the primary aim of evolving into a proper Permanent Observatory on Energy in the Mediterranean. This will focus on monitoring and analyzing the dynamics, the economic impact and the major phenomena connected to the energy sector which, from the point of view of infrastructures and entrepreneurship, represents one of the main assets of the development and competitiveness of our country's system in its Euro-Mediterranean context.

The research team wishes to thank:

INTESA SANPAOLO and COMPAGNIA DI SAN PAOLO for supporting the creation of the network underlying this research project and for promoting this work.

A special thanks to Professor Francesco PROFUMO, President of the COMPAGNIA DI SAN PAOLO and Full Professor at the Department of Energy of the Politecnico of Turin, for the precious advice he provided during the setup phase of this project alongside his continuing contribution in terms of specialized know-how supporting research activities.

A special thanks to MATCHING ENERGIES FOUNDATION and to its President Marco ZIGON, for supporting the research project and the creation of the network.

We would also like to thank all the institutions for their contributions, in particular (in alphabetical order):

ENEL FOUNDATION, ROME;

KÜHNE LOGISTICS UNIVERSITY, HAMBURG;

MIDDLE EAST INSTITUTE, NATIONAL UNIVERSITY OF SINGAPORE;

ROBERT TRIFFIN INTERNATIONAL, BRUXELLES.

We would also like to thank ASSOporti and all the PORT NETWORK AUTHORITIES for contributing data and information to the chapter on maritime transport.

NOTES

SRM and the ESL@Energy Center - Politecnico of Turin take full responsibility for the overall design of this work and for its coordination. Nonetheless, it is the individual authors who take responsibility for the data, analyses and information shown in each chapter. Contributions are as follows:

- Chapters I, II: Consuelo CARRERAS;
- Chapter III: Piero BOCCARDO, Ettore BOMPARD, Stefano CORGNATI, Daniele GROSSO, Alessandro CIOCIA, Filippo SPERTINO, Gianluca FULLI, Marcelo MASERA;
- Chapter IV: Emere ARCO, Ettore BOMPARD, Carmelo MOSCA, Francesco PROFUMO;
- Chapter V: Ettore BOMPARD, Salvatore CELLURA, Alessandro CIOCIA, Filippo SPERTINO, Gianluca FULLI, Marcelo MASERA, Arturs PURVINS, Silvia VITIELLO;
- Chapter VI: Ettore BOMPARD, Daniele GROSSO, Andrea MAZZA;
- Chapter VII: Emere ARCO, Ettore BOMPARD, Stefano CORGNATI, Daniele GROSSO, Stefano LO RUSSO, Francesco PROFUMO, Alessandro ARDUINO;
- Chapter VIII: Anna Arianna BUONFANTI;
- Chapter IX: Michele ACCIARO;
- Chapter X: Marco ZIGON.

The Report is enriched by various focuses authored as follows:

Focus (Chapter I) *The effects of the novel Coronavirus on global energy demand. Trends and forecast for the oil and renewable sectors*: Consuelo CARRERAS;

Focus (Chapter II) *The effect of Covid-19 pandemic on the Italian electricity consumption*: Ettore F. BOMPARD, Stefano CORGNATI, Carmelo MOSCA;

Focus (Chapter VIII) *The role of dollar as reference currency for Oil and Carbon prices and the emerging of SDR*: Elena FLOR, Robert Triffin International;

Focus (Chapter X) *The technology factor to increase the resilience of the electricity sector*: Carlo PAPA, Giuseppe MONTESANO, Nicolò SARTORI, Enel Foundation.

See page 255 for more specific information about the authors.

FOCUS

THE TECHNOLOGY FACTOR TO INCREASE THE RESILIENCE OF THE ELECTRICITY SECTOR

The Covid-19 emergency has demonstrated worldwide the essential role of sustainable, affordable and resilient electricity systems to enable a broad number of humanitarian, social and economic services that emerged as essential during the crisis. In addition, the demand shift towards different sectors and consumption patterns – driven by the social distancing and lockdown measures adopted by governments to respond to the disease – confirms the fundamental contribution of resilient and decarbonized energy systems to run modern societies and to boost a sustainable economic recovery. Only those governments and companies that have invested in a green development model, in skilled and motivated workforce and in technologically-advanced and digitalized networks and infrastructure have been able to secure the continuity of these functions despite the shocks brought about by the emergency.

The pandemic, erupted in the Chinese city of Wuhan at the beginning of 2020, has rapidly expanded all across the world causing millions of infected people and hundred thousands of fatalities. The disease progressively moved Westward, hitting first Europe – starting from Italy and Spain to then extend to the UK and the rest of the continent – and secondly the Americas, with the US being the most affected country at the global level with over 1 million cases and with infections rapidly expanding in Latin America – Brazil *in primis* – at the time of writing. Between 23 January 2020 – when the central government of China imposed a lockdown in the Chinese Hubei province to quarantine the center of the pandemic – and mid-May, at least 4 billion people have been affected by restrictive measures that significantly reduced economic activities and social interactions all across the world.

In this context, the electricity sector was significantly affected, both in terms of overall demand and of consumption patterns, specifically in those in services-oriented economies that implemented strict restrictive measures. According to the International Energy Agency (IEA), electricity demand decreased by 2.5% globally during the first quarter of 2020¹, when lockdown measures started hitting.² The full effects of these measures were felt in the following weeks, pushing electricity demand further down, with daily consumption dropping by at least 15% in major global economies such as France, India, Italy, Spain, the United Kingdom and the US (Western coast). Demand started recovering promptly as some of the lockdown measures were lifted (in Italy, for

¹ IEA, *Global Energy Review 2020*, Paris, 2020. <https://www.iea.org/reports/covid-19-impact-on-electricity#impact-of-lockdown-measures>

² China, the epicenter of the pandemic, represents an exception, since the lockdown started at the end of January and remained in place until the end of March. For this reason, the country experienced the world's largest demand reduction in Q1 2020, of 6.5%. See IEA, *Global Energy Review 2020*.

instance, consumption went up 12% on a monthly basis between April and May³), while future trends will depend on how the emergency will evolve and on the recovery patterns which will be adopted.

Another important effect of the emergency is the sectoral shift in demand, with consumption that moved from services (and to a lesser extent from the manufacturing industry) towards greater use in the residential sector and, of course, in the healthcare system. Under the Covid-19 pandemic, working days electricity demand patterns became more similar to those of the weekends, as a result of stringent measures affecting commercial and industrial activities (only partially balanced by the growth of residential) while weekend consumption remained relatively consistent, driven mainly by households demand. While services such as retail, office, hospitality, education and tourism were almost completely halted with huge drops in electricity demand⁴, consumption in the residential sector went up due to million people forced to stay home and run remotely their ordinary activities (i.e. working and studying).⁵

The current paradigm shift has, and is expected to have, relevant mid-to-long term implications for the business models of many utilities and energy companies.

On the demand side, while it is true that in certain areas – such as in the EU and North America – electricity is abundant and services are available and reliable to anyone,⁶ in other parts of the world the growth of demand for social services could raise major concerns. Indeed, the capacity to address growing public health and humanitarian emergency needs as well as to ensure the well-being and the livelihood of the population, in particular those belonging to the poorest and weakest segments of the society, is still questionable. The current electricity systems in regions such as the Mediterranean, Latin America and sub-Saharan Africa (each with their own peculiarities) are probably not able to sustain this change of paradigm and ensure access to reliable and affordable services to meet the new trends in demand.

³ Calculations made by the author on daily data provided by Terna. Data available here: <https://www.terna.it/it/sistema-elettrico/disaccamento/dati-esercizio#datiGiornalieri>

⁴ Manufacturing industry represents a partial exception because: 1) a number of factories have adopted precautionary measures to continue operations despite the lockdown; 2) electrification rates are generally lower than in the services sector, so the impact of industry closures on the electricity demand.

⁵ In the last week of March and first week of April, residential demand during the week was up to 40% higher across certain European economies than in the same weeks in 2019. See IEA, *Global Energy Review 2020*.

⁶ Say something on energy poverty in the EU, Southern Europe.

This adds to changes taking place on the supply side, as power generation will necessarily decarbonize to address both the mid-to-long term challenges of climate change and the more immediate risks in terms of pollution and environmental degradation. Interestingly, during the Covid-19 emergency, the share of renewable energies in the power mix of main global economies has increased, due to depressed electricity demand, low operating costs and priority access to the grid through regulations.⁷ In Europe, renewables have taken the reins of power generation, with coal-based production down 25% during the first quarter of 2020, and renewable energy reaching a 43% share in the period considered. This adds to a general trend of expansion of renewable energy capacity, which in 2019 – with additional 176 GW installed – hit a new record accounting to 72% of new generation additions at the global level.⁸

Against this backdrop, sustainable, smart and resilient systems become fundamental to meet the transformations currently in place in the electricity domain. First, to respond to the short-term challenges of contingent situations such as the Covid and to changes of paradigm on the demand side that the emergency has activated and are likely to remain in the future. Second, to guarantee the success in the fight against increasing air pollution and climate change, both of which represent existential challenges for the human being and that are considered as drivers – and possibly amplifiers – of crisis similar to the Covid-19 pandemic.

This situation is particularly relevant when we look at the broader Mediterranean area, including parts of the sub-Saharan continent. Despite being extremely heterogeneous in terms of electricity markets and consumption patterns, these areas are characterized by: 1) great impact of climate change, both in terms of extreme events – requiring higher resilience standards – and in terms of electricity demand to respond to growing temperatures; 2) urbanization trends and air pollution growth; 3) demographic growth and expansion of electricity consumption.

Under these conditions, digitalized, intelligent and resilient electricity systems will play a decisive role to address all the future challenges for the sector: on the one hand, the boom of electricity demand driven by a higher number of customers, in more adverse meteorological conditions and in more complex topographic environments such as megalopolis; on the other, the integration of more distributed and intermittent supply from renewable energies.

The most relevant benefits of a resilient and digitalized electricity infrastructure are the following:

- Digital solutions for infrastructures facilitate grid management and operation, improving the quality of service and avoiding unnecessary work and costs.
- Digital tools give companies in the energy sector new ways to interact with their customers, providing consumers with more capabilities and choices around their energy use.

⁷ IEA, *Global Energy Review 2020*.

⁸ IRENA, *Renewable Capacity Statistics 2020*, Paris, 2020. https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2020/Mar/IRENA_RE_Capacity_Statistics_2020.pdf

- Digitalization is the path to unlock new business opportunities, exploiting in particular distributed generation (i.e. participation to different energy and ancillary markets).
- Digital systems enable better management of variable generation leveraging demand response practices.
- Digital tools enhance grid reliability and security, allowing to respond better to potential shocks caused by effects of climate change or rapidly changing demand patterns as in the case of crises and emergencies.

Based on this analysis, the stimulus packages to be adopted by international and national institutions to boost post Covid-19 economic recovery, should not only encourage investments in new renewable generation (fundamental to enable the energy transition and fight climate change) and energy efficiency (instrumental to reduce our overall footprint on the Planet), but it should also promote the development of smarter and more resilient interconnections coupled with innovative services such as ‘demand-response’, which allow for greater flexibility, stability and sustainability. By transporting cheap renewable electricity, modern grids would contribute to address the new consumption patterns, ensuring sustainable and reliable energy services for all, allowing our system to bounce back greener and more resilient.

ABOUT THE AUTHORS

Michele ACCIARO, Associate Professor of Maritime Logistics and the Director of the Hapag-Lloyd Center for Shipping and Global Logistics (CSGL) at Kühne Logistics University (KLU) in Hamburg, Germany. (*Chpt. IX*)

Emere ARCO, Post-doc research fellow at the ESL@Energy Center Lab, Politecnico di Torino. (*Chpts. IV, VII*)

Alessandro ARDUINO, Principal Research Fellow @ Middle East Institute, National University of Singapore. (*Chpt. VII*)

Piero BOCCARDO, Scientific advisor of the ESL@Energy Center Lab, Politecnico di Torino. Professor in Topography and Cartography at the Interuniversity Department of Regional and Urban Studies and Planning of Politecnico di Torino and Director of the ITHACA centre. (*Chpt. III*)

Ettore BOMPARD, Scientific Director of the ESL@Energy Center Lab, Politecnico di Torino. Co-director of the Joint Research Center for Energy Transition Modelling and simulation between Politecnico di Torino and Shanghai Jiao Tong University. Professor in Power System at the Department of Energy of Politecnico di Torino. (*Chpts. III, IV, V, VI, VII, Focus Chpt. II*)

Anna Arianna BUONFANTI, Senior Researcher, Maritime Dept., SRM. (*Chpt. VIII*)

Consuelo CARRERAS, Senior Researcher, Energy Dept., SRM. (*Chpts. I, II, Focus Chpt. I*)

Salvatore CELLURA, Adjunct fellow at the ESL@Energy Center Lab, Politecnico di Torino. PhD student in Electrical, electronics and communications engineering at Politecnico di Torino. (*Chpt. V*)

Alessandro CIOCIA, Post-doc research fellow at the Department of Energy, Politecnico di Torino. (*Chpts. III, V*)

Stefano CORGNATI, Member of the Scientific Board of the ESL@Energy Center Lab, Politecnico di Torino. Professor in Building Physics and Environmental Quality at the Department of Energy and Vice-Rector for Research of Politecnico di Torino. (*Chpts. III, VII, Focus Chpt. II*)

Massimo DEANDREIS, General Manager, SRM.

Elena FLOR, Managing Director Robert Triffin International. (*Focus Chpt. VIII*)

Gianluca FULLI, Deputy Head of Energy Security, Distribution and Markets unit, Directorate General Joint Research Centre, European Commission. (*Chpts. III, V*)

Daniele GROSSO, Executive coordinator of the ESL@Energy Center Lab, Politecnico di Torino. (*Chpts. III, VI, VII*)

Stefano LO RUSSO, Academic partner of the ESL@Energy Center Lab, Politecnico di Torino. Professor in Hydrogeology and Engineering geology, Petroleum and Mining Geology, Geothermal Energy at the Department of Environment, Land and Infrastructure Engineering, Politecnico di Torino (*Chpt. VII*)

Marcelo MASERA, Head of Energy Security, Distribution and Markets unit, Directorate General Joint Research Centre, European Commission. (*Chpts. III, V*)

Andrea MAZZA, Associated researcher of the ESL@Energy Center Lab, Politecnico di Torino. Assistant professor in Power Systems at the Department of Energy of Politecnico di Torino. (*Chpt. VI*)

Giuseppe MONTESANO, Deputy Director, Enel Foundation. (*Focus Chpt. X*)

Carmelo MOSCA, Associated researcher of the ESL@Energy Center Lab, Politecnico di Torino. PhD student in Electrical, electronics and communications engineering at Politecnico di Torino. (*Chpts. IV, Focus Chpt. II*)

Alessandro PANARO, Head of Maritime & Energy Dept., SRM.

Carlo PAPA, Director, Enel Foundation. (*Focus Chpt. X*)

Francesco PROFUMO, Member of the Scientific Board of the ESL@Energy Center Lab, Politecnico di Torino. President of Compagnia di San Paolo. President of ACRI. Professor in Electrical Machines and Drives at the Department of Energy of Politecnico di Torino. (*Chpts. IV, VII*)

Arturs PURVINS, Scientific officer. Energy Security, Distribution and Markets unit, Directorate General Joint Research Centre, European Commission. (*Chpt. V*)

Nicolò SARTORI, Senior Researcher, Enel Foundation. (*Focus Chpt. X*)

Filippo SPERTINO, Associate Professor in Power Systems and Renewable Energy Systems at the Department of Energy, Politecnico di Torino. (*Chpts. III, V*)

Silvia VITIELLO, Project manager. Energy Security, Distribution and Markets unit, Directorate General Joint Research Centre, European Commission. (*Chpt. V*)

Marco ZIGON, Chairman Getra Group and Chairman Matching Energies Foundation. (*Chpt. X*)



16, Via Paolo Borsellino – 10129 Turin - Italy
Phone: +39 011 090 8570
info-esl@polito.it
www.esl.polito.it
www.energycenter.polito.it

Scientific Director: Ettore F. Bompard

Scientific Board: Piero Boccardo, Ettore F. Bompard, Andrea Carpignano, Stefano Corgnati, Francesco Profumo

Scientific secretariat: Daniele Grosso (coordinator)



POLITECNICO
DI TORINO





177, Via Toledo - 80134 Naples - Italy
Phone: +39 0817913758-61 - Fax +39 0817913817
comunicazione@sr-m.it - www.sr-m.it

President: Paolo Scudieri

General Manager: Massimo Deandreis

Board of Directors: Gregorio De Felice, Elena Flor, Piero Gastaldo, Francesco Guido, Stefano Lucchini, Pierluigi Monceri, Marco Musella

The composition of the Scientific Committee is available at www.sr-m.it

Board of Auditors: Danilo Intreccialagli (president), Giovanni Maria Dal Negro, Lucio Palopoli

Supervisory Body (art.6 D.Lgs. 231/01): Gian Maria Dal Negro
Ethics Committee (art.6 D.Lgs. 231/01): Lucio Palopoli

**COMPANY WITH
QUALITY SYSTEM
CERTIFIED BY DNV GL
= ISO 9001 =**

SRM uses a Quality Management System in compliance with the UNI EN ISO 9001 Regulations for the following fields: Design and carrying out of studies, researches, conferences and seminars on economic and financial matters of the Southern Italy, Mediterranean Area and Maritime; publishing activities and management of the periodical output in the economic and financial field of the Southern Italy, Mediterranean Area and Maritime.

Shareholders

INTESA  SANPAOLO

 Fondazione
Compagnia
di San Paolo

 ALEXBANK

 INTESA SANPAOLO
FORVALUE

 INTESA SANPAOLO
INNOVATION CENTER

The Covid-19 pandemic – and its consequent lockdown measures - had huge effects on lowering industry production, stopping entire sectors of economic activities and discontinuing some important global value chains. All this situation also affected the energy sector. The impact was clearly driven by the demand side with a strong reduction in energy consumption. In this framework, the Mediterranean Area represents a relevant arena in which to firstly implement and test new recovery plans to counteract the negative impacts of the recent pandemic. In the future decades, it could become an archetype of a fruitful approach to the energy transition. The Basin Area, coupling the renewable potential with the presence of relevant electricity and gas infrastructures, could be a fertile area for developing and applying innovative solutions to integrate electricity and gas system and building new flexible energy systems. Furthermore the Med Area has a huge role in the maritime transport, finding itself on a privileged route for the trade of oil and gas. In this second edition of MED & Italian Energy Report, SRM and ESL@Energy Center have developed as much as possible a holistic and dynamic perspective of the potential scenarios with a core focus on renewables as a key to foster energy transition and Mediterranean cooperation, also looking at new technologies and the emergence of green electricity, gas and hydrogen synergies. In the light of Covid-19 pandemic and its consequences, these opportunities and challenges could really allow Italy and the Euro-Mediterranean area to take on a leading role in carrying out and enhancing the already started energy transition process.

SRM

Study Centre based in Naples, connected to the Intesa Sanpaolo Group, originally an intellectual and scientific safeguard, has the objective to improve the knowledge about Italy's territory in terms of infrastructural, productive and social assets with a European and Mediterranean vision in mind. Specialized in the analysis of regional dynamics, and with a particular eye on the Southern Italy, it runs two research observatories monitoring maritime transport, logistics and energy.

www.sr-m.it

ESL@Energy Center

ESL@Energy Center is a research laboratory located in Torino, at the Energy Center, an initiative by Politecnico di Torino, Regione Piemonte, Città di Torino, Compagnia di San Paolo and Fondazione CRT. The lab devoted to the development of scientific methodologies and tools for scenario analyses of energy systems and policy making support with respect to all the involved dimensions (technical, economic, environmental, and socio-political) and with a special focus on the energy security aspects.

www.esl.polito.it | www.energycenter.polito.it

The activity fits with a new proposed initiative, the Energy Transition Club Torino (ETCT). It is intended as dynamic think-tank that aims at allowing several players belonging to different areas (university, research, industry, economy, institutions, etc.) to meet together sharing common views and topics. The goal of the ETCT is to provide answers, in the area of energy, to the instances of different stakeholders through ad hoc science-based tools able to link several perspectives related to the energy systems that are being currently developed at the Energy Center in Torino, around the ESL lab.

