WAREG
European Water Regulators

IMPACTS OF THE ENERGY CRISIS ON THE PRICE OF WATER SERVICES

COMPARATIVE ASSESSMENT OF REGULATORY RESPONSES ACROSS EUROPE

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WAREG
European Water Regulators

in cooperation with

REKK optima ENERGY CONSULTING

Authors and methodology

This research report has been **commissioned by WAREG to the Regional Center for Energy Policy Research (REKK) and Optima Energy Consulting** through an open call for proposals.
The findings of the report are based on the data provided by 18 WAREG members from 17 European Countries*. The data has been collected through a structured questionnaire and additional interviews.

The data collected concern the following research questions:

- the impact of electricity prices on the cost of water service and the tariffs paid by customers;
- the different methodologies used to set water tariffs;
- the recovery of electricity costs through water tariffs;
- the frequency and procedures to update/adjust electricity costs;
- the possibility of triggering an extraordinary review of tariffs;
- the incentives for energy conservation/efficiency under a 'business-as-usual' setting;
- the use of Key Performance Indicators (KPIs) to monitor energy costs;
- the measures that regulatory entities have undertaken in response to the energy crisis; and
- the extent to which the current regulatory governance and tariff frameworks are suitable to address the impacts of the energy crisis.

This report was written under the supervision of WAREG, which is liable for any data and information included in this report. We wish to thank the following experts:

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Table of contents

List of figures

List of tables

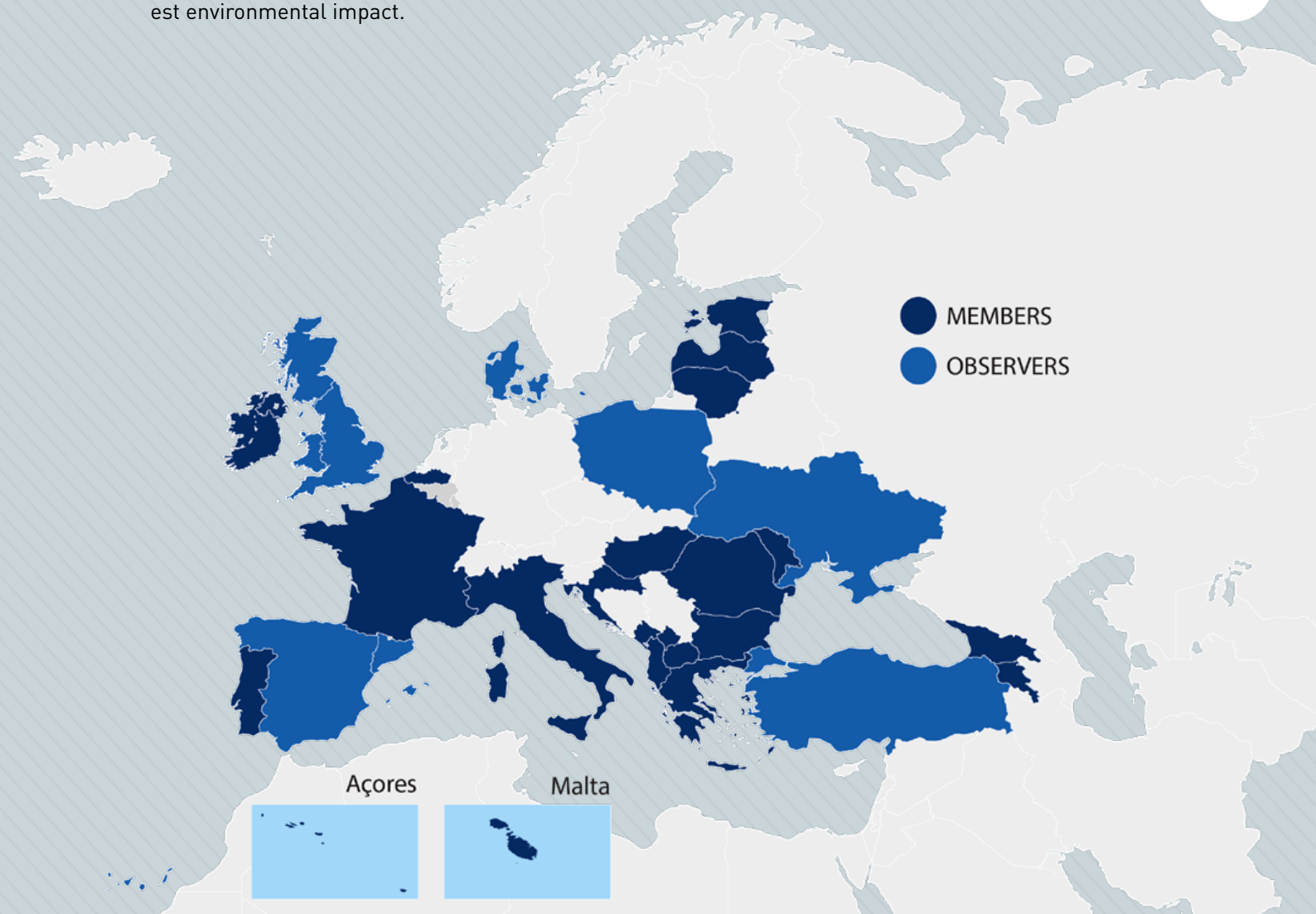
About WAREG
European Water Regulators

WAREG is the European association of public Authorities with national or regional responsibilities to overview and regulate the water and wastewater sectors in the European Union and its neighbouring Countries. Created in April 2014, it is made up of independent regulators, competition authorities, ministerial departments, and governmental agencies.

WAREG's mission is to promote the cooperation of its members and to understand the key challenges of drinking water and wastewater services in Europe. Typically, these services are offered by local public utility companies under monopoly conditions that may not ensure adequate investment and efficient costs to provide good quality services for citizens, at the fairest prices and with the lowest environmental impact.

We exchange information and knowledge, analyse sector data and collaborate to identify the most suitable economic incentives that can generate stable governance frameworks to attract investment and increase the cost-efficiency of public utility services, promote innovation for environmental sustainability and protect customers.

The Association is based in Milan (Italy), hosted by the Italian Regulatory Authority for Energy, Networks and Environment (ARERA), and has an institutional office in Brussels (Belgium), hosted by the Brussels Region Energy Regulatory Commission (BRUGEL). Our activities can be followed online at www.wareg.org, on social media (LinkedIn and Twitter) and through our free monthly newsletter.



Executive summary

Over the past two years, Europe has witnessed an unprecedented increase in the cost of energy supply. The increase in energy costs resulted from the combined effect of several factors occurring at the same time in what has been dubbed 'the perfect storm' in energy markets. These factors included low natural gas storage levels in Europe, post-Covid economic recovery, and – most notably - Russia seeking to gain political leverage on European countries by curtailing natural gas supplies and exposing customers to higher energy bills.

This report studies the impact of the energy crisis on the water and wastewater utility sector and reviews measures undertaken by WAREG members to address the crisis. The findings are based on data from 18 member regulators collected through a structured questionnaire as well as interviews with regulator representatives. These discussions sought to understand the extent to which the regulatory governance and the tariff framework among WAREG members are suitable to address the energy crisis.

On the regulatory governance front, the responses suggest that most member regulators are able to review the allowed revenues of regulated water utilities and approve the tariffs required to recover the costs emerging from the crisis. On the tariff framework, the majority of regulatory authorities apply a price-cap or revenue-cap regulation with incentive measures to expose regulated water service companies to some pressure to reduce costs, emulating companies operating in competitive markets. This is followed by an equal representation of cost-plus and rate-of-return methods. While it can be argued that these frameworks have their advantages and setbacks in terms of cost recovery and efficiency savings, in principle, all three are equally adequate in recovering the rising energy costs.

Under most jurisdictions, the tariff framework includes automatic annual adjustments to recover differences between forecast and actual pass-through costs, and to index costs to inflation. In the event that regular adjustments are insufficient to capture the effects which occur as a result of an extraordinary event – such as the energy crisis – then extraordinary tariff reviews can take place. This allows for an expedited policy response as, in nearly half of the cases, the tariffs resulting from the extraordinary reviews are effective within a period of 3 months.

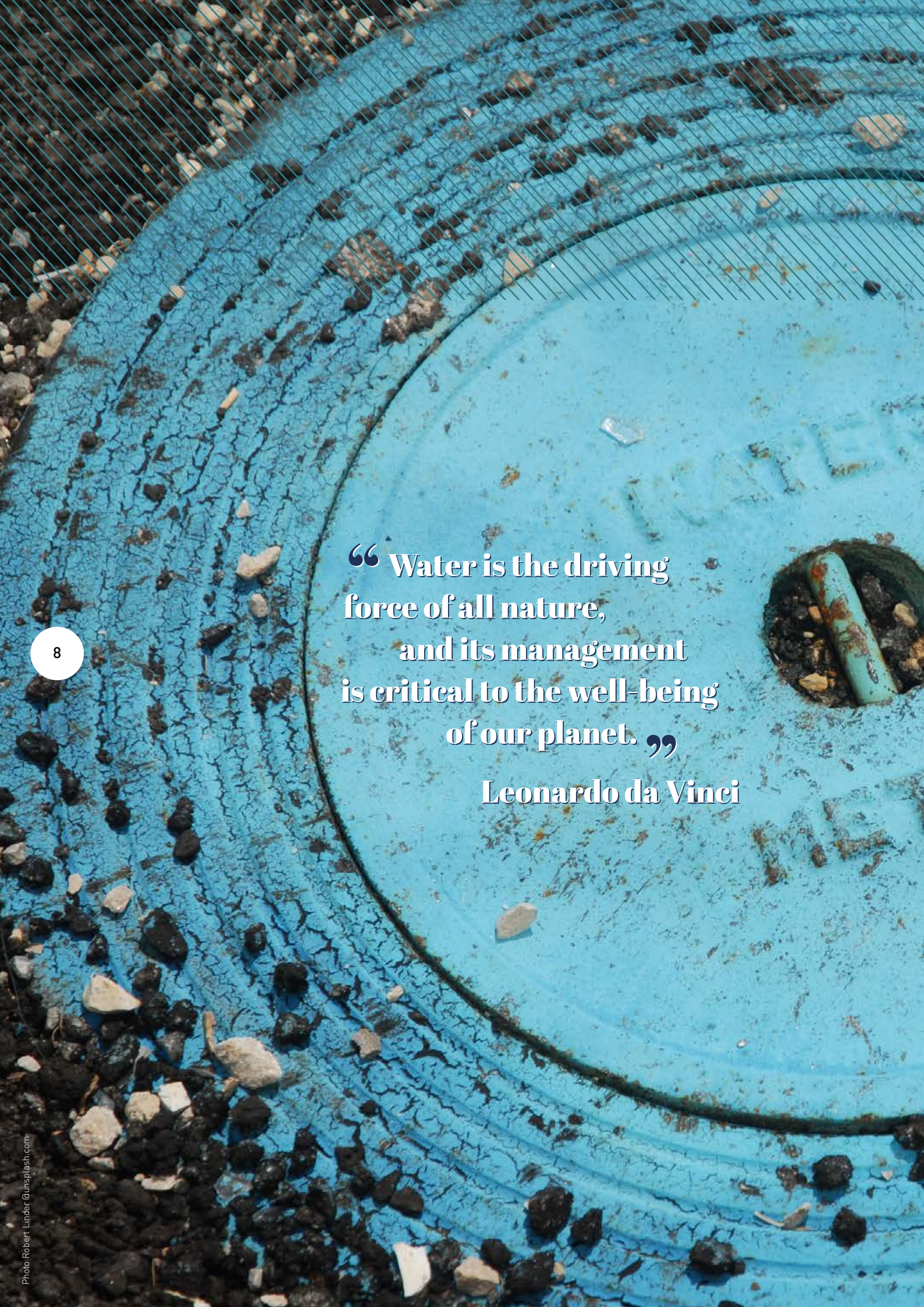
Tariff reviews caused by the energy crisis have only taken place in 5 of the 18 members surveyed due to a number of reasons. In the majority of cas-

es where reviews have not taken place, energy supply costs were fixed in long-term bilateral contracts before the effect of the crisis, and these contracts were still in force in 2022. In other cases, the energy supply costs are covered by regulated electricity tariffs similar to household customers or small businesses, and therefore, utilities are shielded from wholesale electricity market volatility. In some jurisdictions, the energy costs paid by water utilities have already risen, while corresponding tariff reviews have not yet taken place. Regulators in jurisdictions where the energy supply costs are linked to the spot market are receiving high numbers of extraordinary review applications which is making the tariff-setting process an overwhelming regulatory challenge. Automated and streamlined tariff reviews are being put in place to handle the high number of tariff applications in an expedited manner, saving time and effort for both the regulator and the utility company.

Besides streamlined measures for regular and extraordinary tariff adjustment, regulators can also have a role in incentivizing energy efficiency improvements, lower cost procurement of energy and own power generation. While good practices in this field can be observed, there is also substantial room to improve the energy efficiency of operators in most surveyed countries. To introduce related incentives in tariff methodologies, regulators are improving their understanding of the relationship between energy prices and the economic feasibility of energy-saving measures. This can be supported by the more widespread use of indicators as well as in-depth benchmarking exercises.

Regulators are also considering the newly proposed EU directive on urban wastewater treatment that will impose the target of energy neutrality in the wastewater treatment sector by 2040. This requirement, is also an opportunity to harvest some low-hanging fruits in the field of own electricity generation, especially for sludge-based biogas production and solar photovoltaic.

The experience from countries already affected by the crisis may provide an insight into what can be expected in other WAREG members. Policy predictability and the continued experience sharing among the WAREG member base will have a critical importance in addressing the impact of the crisis. Detailed case studies in selected countries are analysed and provided in the report.



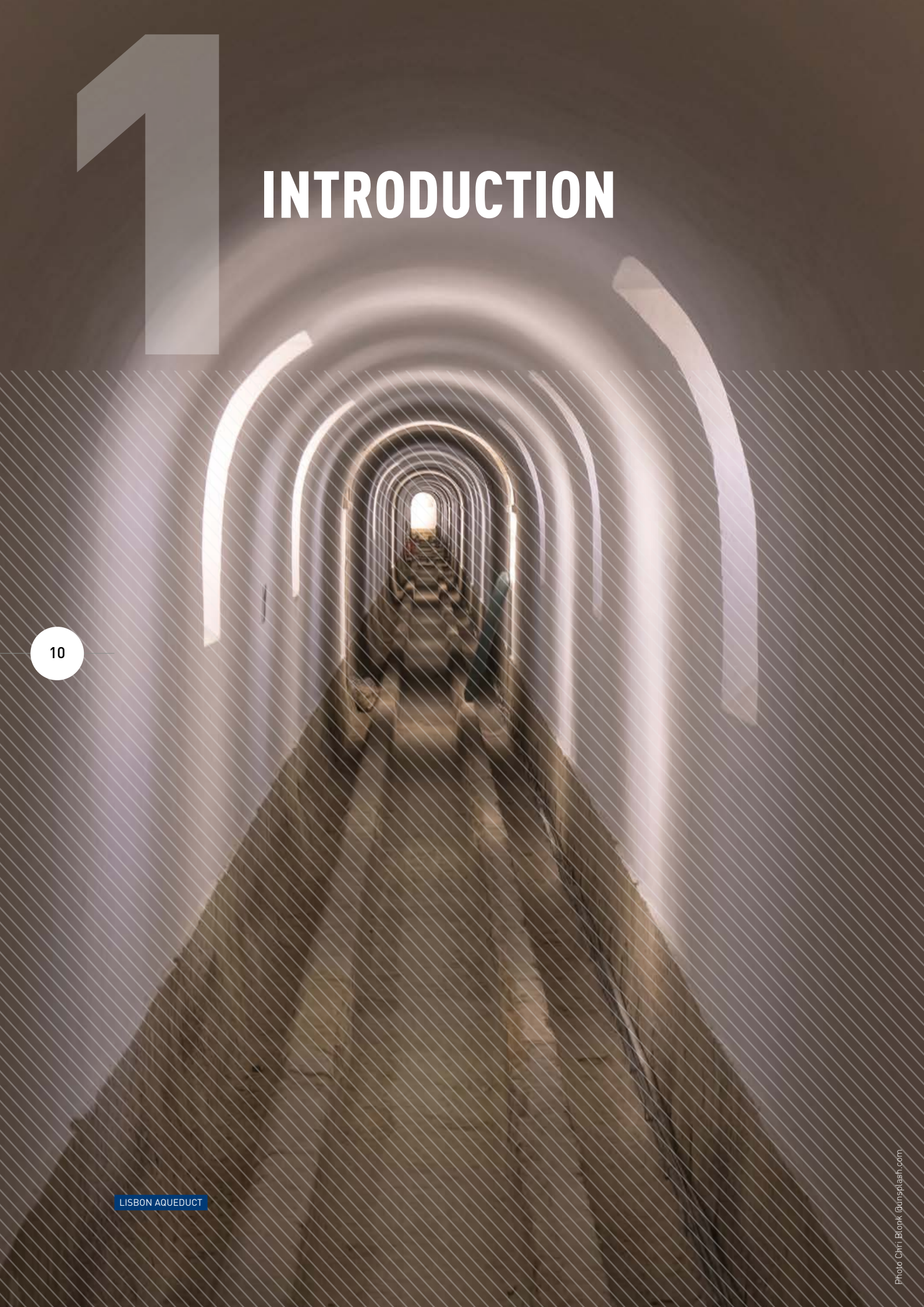
“Water is the driving force of all nature, and its management is critical to the well-being of our planet.”

Leonardo da Vinci

Photo Robert Linder @unsplash.com

MANHOLE COVER OF THE AQUEDUCT

1 INTRODUCTION



LISBON AQUEDUCT

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This Report presents some key findings and is structured as follows:

SECTION 2 PROVIDES AN OVERVIEW OF THE EUROPEAN ENERGY CRISIS

SECTION 3 ADDRESSES ENERGY MANAGEMENT AND ENERGY COSTS OF WATER SERVICE PROVIDERS

SECTION 4 REVIEWS TARIFF-SETTING PRACTICES AMONG MEMBER REGULATORS;

SECTION 5 COVERS THE IMPACT OF THE ENERGY CRISIS;

SECTION 6 PROVIDES FURTHER INSIGHTS INTO CASE STUDIES ABOUT HOW THE CRISIS IS DEALT WITH IN PARTICULAR JURISDICTIONS; AND

SECTION 7 PROVIDES POLICY RECOMMENDATIONS TO BE CONSIDERED BY MEMBER REGULATORS AS A RESULT OF THE CRISIS.

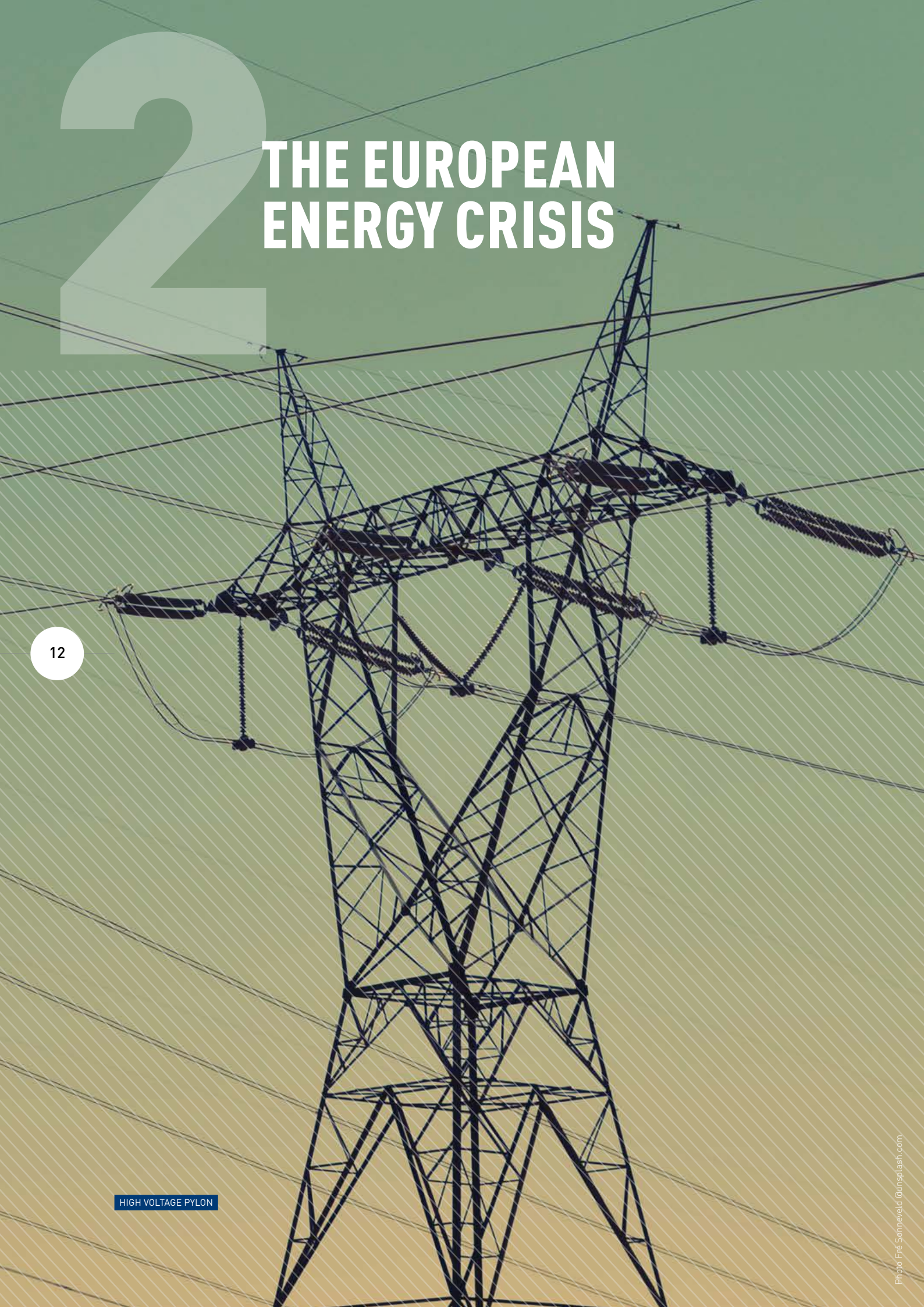
Over the past two years, Europe experienced a shocking rise in energy prices. The increase in energy costs occurred as the joint result of multiple drivers, most notably stemming from low natural gas storage levels, economic recovery following Covid lockdowns, falling natural gas imports from Russia and power generation restricted by a prolonged drought.

Energy costs can make up a significant part of the cost of water supply companies. These costs need to be recovered by increasing water service tariffs, increasing subsidies, delaying expenditures, or by using a combination of these measures in order to send adequate price signals for conservation while managing affordability concerns.

In order to understand the measures undertaken by regulatory authorities to address the rising energy costs, the Association of European Water Regulators (WAREG) decided to undertake an analysis of the practices of member regulators in handling rising energy costs, with an emphasis on the recent crises. Specifically, WAREG seeks to understand the measures implemented by regulatory authorities on updating allowed revenues to reconcile differences between forecast and actual energy costs.

2

THE EUROPEAN ENERGY CRISIS



HIGH VOLTAGE PYLON

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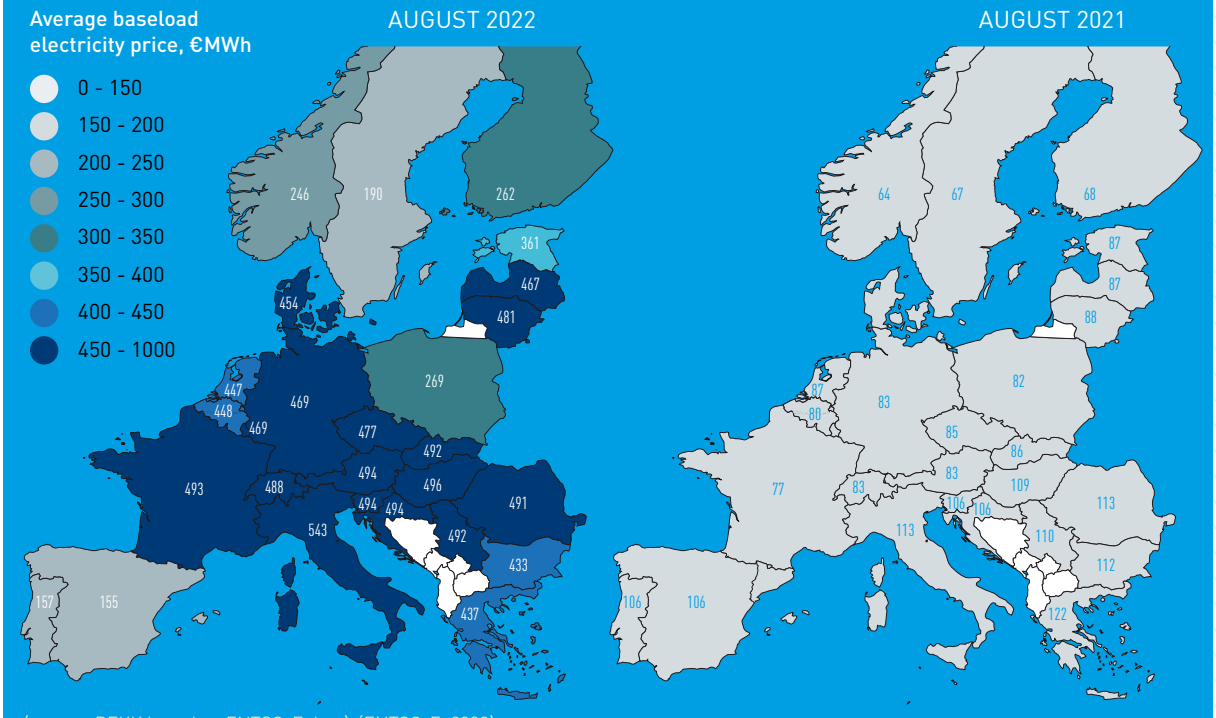
This section of the report discusses the significant increase in energy costs faced by European consumers over the past two years, particularly in the electricity market.
The reasons behind this price surge are explored, including the effects of post-Covid recovery, changes in Russia's gas supply behavior, and other contributing factors.

Over the past two years, European consumers have faced an unparalleled increase in energy costs. Electricity market prices, compared to the period before 2021, rose 4-5 times by the summer of 2022, peaking at 500 EUR/MWh in some markets in August 2022. There are complex reasons behind this shocking rise. The growing demand for energy because of post-covid recovery, the changed behaviour of Russia regarding gas supplies to Europe and one-off effects have all contributed to the "perfect storm" in energy markets. The main reason behind the rising electricity costs is the rocketing of natural gas prices. While the price for all inputs of electricity generation increased, the price of natural gas jumped the most. European countries use natural gas for diverse purposes and in varying amounts. Natural gas constitutes approximately 36% of total consumption used by the power & heat sector, 27% by the industry and 37% by the residential and other sectors. The natural gas price directly influences wholesale electricity prices. Gas-fired power plants have become price setters in wholesale electricity markets as they

FIGURE 1 WHOLESALE ELECTRICITY PRICES IN SELECTED EUROPEAN MARKETS



(source: REKK based on ENTSO-E data) (ENTSO-E, 2022)

face the highest short-term variable (fuel) costs. As the European electricity network is strongly interconnected, wholesale electricity prices stabilized and mostly equalized at a level set by the gas-fired units. Figure 1, shows that some markets could achieve a lower market price as a result of regulatory measures (such as in the case of Spain, where the government compensated the gas-fired power plants for higher fuel costs), or different locally available energy sources (such as in the case of Poland, where coal-fired power plants produced the majority of electricity or the Nordic peninsula with the high proportion of hydro). However, in each case, the prerequisite of the price difference was the relative scarcity of available transmission capacities to transfer cheaper electricity to higher-priced markets. In a highly physically interconnected market, like the one in Central Europe, local measures cannot, in the long run, bring prices below the average price level for the whole interconnected region.

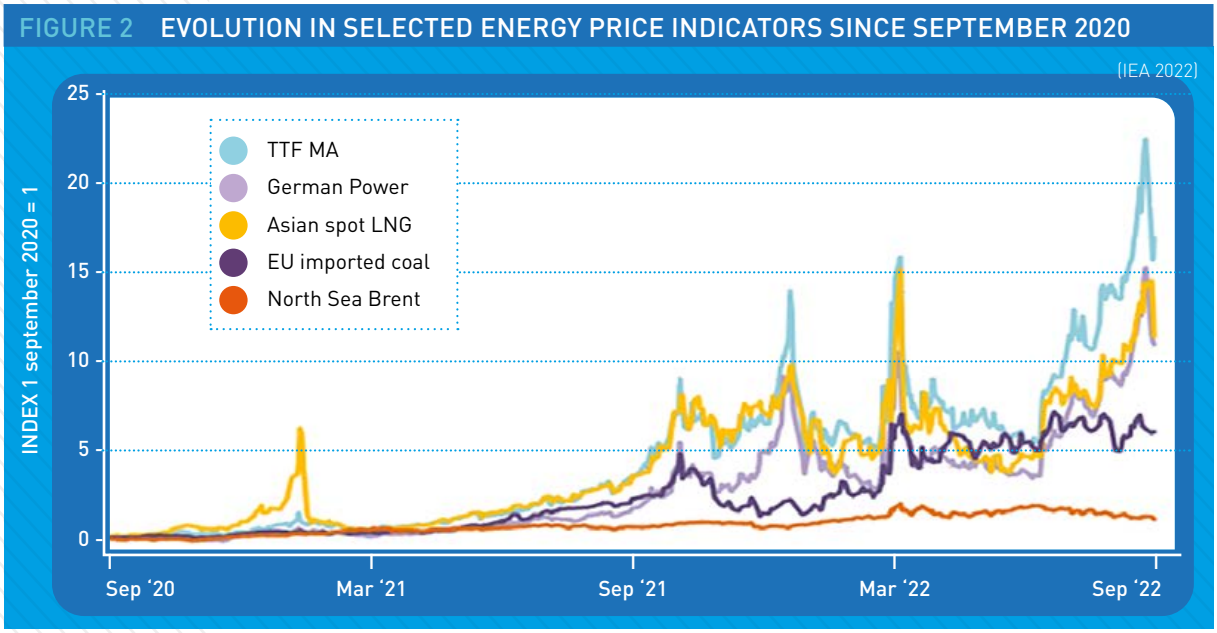
Figure 2 illustrates that gas prices in August 2022 were 15 or 20 times higher compared to September 2020. This unprecedented price increase is mirrored by rising electricity prices. For the future, the market estimates a slow consolidation and moderate decline of record-high prices. At the beginning of December 2022, the yearly base load future settlement prices are 393, 290, 191 and 138 EUR/MWh, respectively, from 2023 to 2026 in the EEX German Power Futures market. The slight decrease shows that the high-price environment may persist for a longer period. It seems likely that gas will remain the price setter for the coming years in the electricity markets.

Surprisingly, despite the rising gas prices, the share of gas-based electricity increased by 5% in 2022 in comparison to the previous year (Figure 3). This is a result of two main factors:

(i) due to a dry year, the European hydroelectric production was 19% below the previous year's volume; and
(ii) European nuclear power plants, mainly in France, produced significantly less electricity in 2022 because of technological problems and shortages in available cooling water.

While the production by nuclear and hydro-power facilities decreased, solar and wind-based generation continued to ascend. Thanks to permanent investments into these technologies, the share of renewable electricity achieved

FIGURE 2 EVOLUTION IN SELECTED ENERGY PRICE INDICATORS SINCE SEPTEMBER 2020



a close to 40% share in the European electricity market.

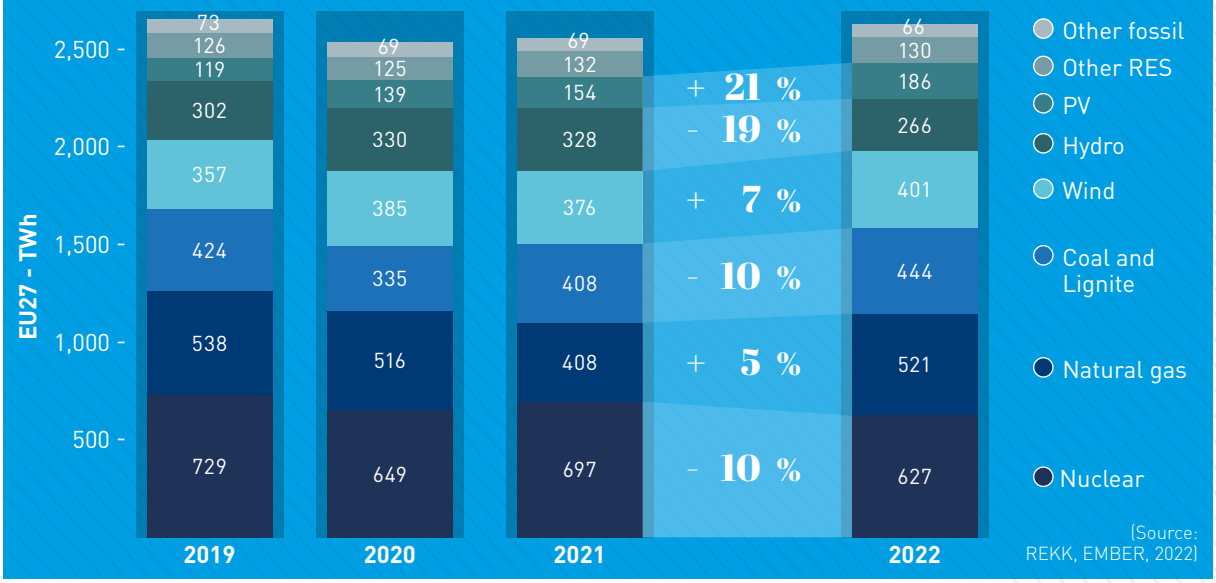
As a result of the price-setting position of gas-fired power plants, all other electricity production technologies enjoy extra income as their costs did not increase on the same level. To reduce the windfall profit, the European Council agreed in its September meeting to cap the market revenues at 180 EUR/MWh for electricity generators, including intermediaries, that use so-called inframarginal technologies to produce electricity, such as renewables, nuclear and lignite. The political agreement was adopted by the Council Regulation of 6 October 2022. As an additional measure, some member states introduced or plan to adopt a windfall tax on energy firms (e.g., Germany, Austria, Hungary).

From the water utility perspective, the increasing energy prices have important impacts. Water utilities are struggling under the impacts of rising electricity and gas costs. The rising cost of electricity and the increasing cost of power to run water networks and pumps is a huge challenge for operators working in the current regulatory framework. In many countries, water utility tariffs do not reflect the price increase and the extreme market volatility. The tariff mechanisms should reflect the new macroeconomic constraints and need to be more accommodating to extraordinary requests for tariff adjustments.

On the other hand, the increasing energy prices can stimulate energy efficiency projects and usage of own resources, such as installing solar or wind or using sewage sludge to produce sustainable energy at a reasonable cost level. The persistence of high energy prices may guarantee a better return on investment for such undertakings. Many renewable projects seem economically rational, however, they require significant capital expenditure. Current regulatory incentives may not always be sufficient to go ahead with capital-intensive investments that will save on operational costs.

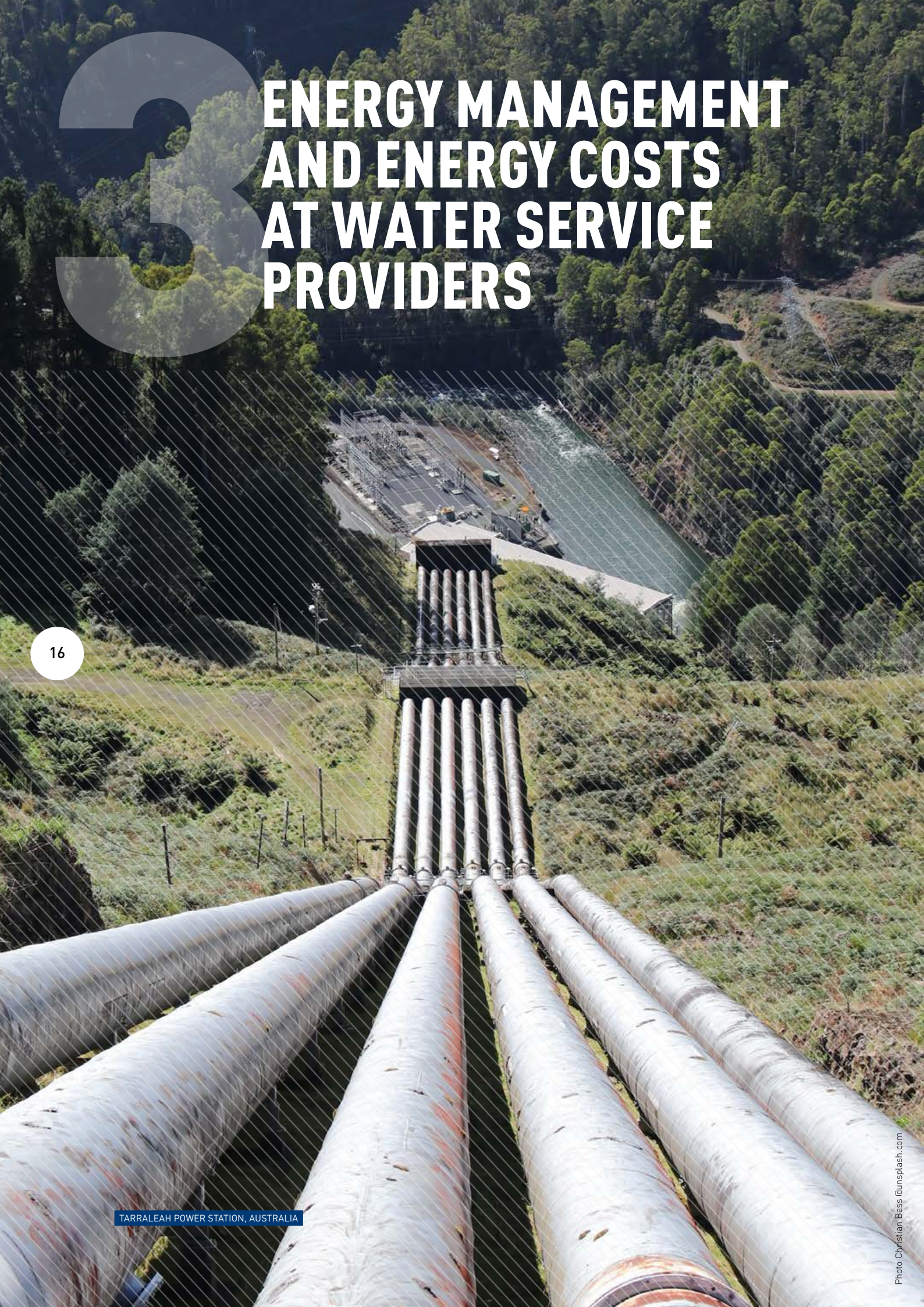
Finally, investment decisions require a long-term view on technologies and the stability of the regulatory framework. Companies need to choose the best technological option (such as biogas to electricity or to the grid) based on their specific circumstances. The stability of the regulatory framework is therefore a critical pre-requisite in order to provide the required confidence to pursue investments in self-production.

FIGURE 3 EUROPEAN ELECTRICITY PRODUCTION BY SOURCES



(Source: REKK, EMBER, 2022)

3 ENERGY MANAGEMENT AND ENERGY COSTS AT WATER SERVICE PROVIDERS



TARRALEAH POWER STATION, AUSTRALIA

Photo Christian Bass @unsplash.com

This section of the report provides an overview of the energy management and the energy costs of water service providers. It is organized as follows:

SECTION 3.1 SHOWS THE SHARE OF THE ENERGY COSTS IN THE TOTAL COSTS OF THE WATER UTILITIES;

SECTION 3.2 PROVIDES AN OVERVIEW OF THE PRODUCTION OF ENERGY FOR OWN USE AMONG THE WATER UTILITIES;

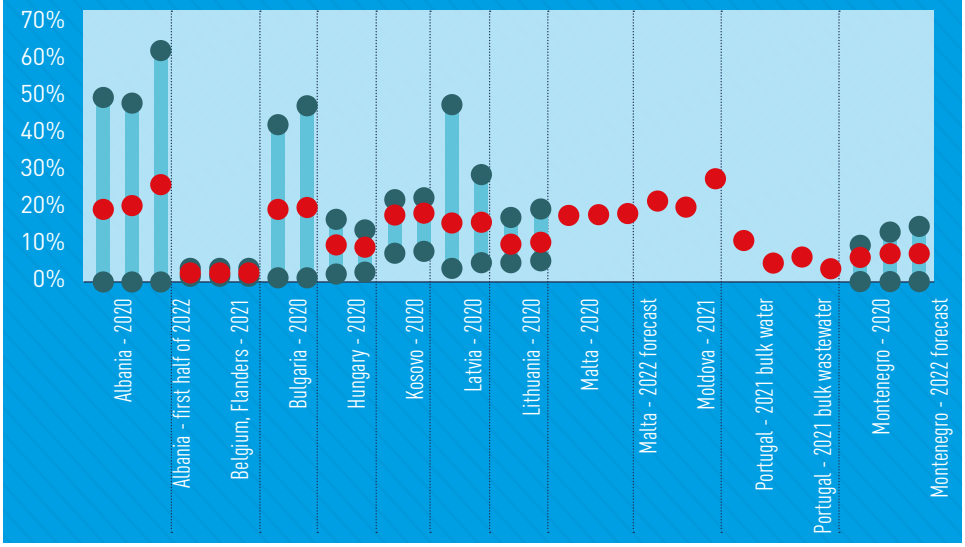
SECTION 3.3 REVIEWS ENERGY EFFICIENCY PRACTICE; AND

SECTION 3.4 LAYS OUT THE KEY PERFORMANCE INDICATORS (KPIS) WHICH ARE USED TO ADDRESS ENERGY USE AND EFFICIENCY INCENTIVES.

3.1 SHARE OF ENERGY COSTS IN TOTAL COSTS

This Section of the report provides an overview of the share of the energy costs in the total cost structure of the water utilities. Figure 4 shows the share of energy costs in total annual costs by countries and years[1]. Data was available from 11 out of the 18 surveyed regulators. Red dots display the sector average, while the blue dots and vertical bars represent the range of values for the regulated companies within the country[2]. The values across countries are not directly comparable, since total annual costs strongly depend on how total costs in a country are defined and whether some costs are registered at other entities (e.g. depreciation at the municipality in case it owns some of the assets).

FIGURE 4 SHARE OF ENERGY COSTS IN TOTAL ANNUAL COSTS (%)



1 In the case of Portugal, this information is also shown by service.

2 2022 values are estimates or forecasts for the whole year or actual values for the first half of the year.

The actual shares of energy costs are explained by a number of factors. The purchase price of electricity is a major driver of this ratio, and the market price for electricity is paid in only a subset of the surveyed countries (Section 5.1). The share of energy generated within the water utility company is also important (Section 3.2). The higher the ratio of own generation, the lower the need for energy purchase from the market, while total annual costs excluding energy purchase are likely to be higher since investments into own generation appear among other cost items (depreciation, financing costs, maintenance etc.). Operating conditions, such as the length and quality of the network, terrain, the location of aquifers etc., all play an important role in energy use, and therefore energy costs. The choice of technologies, such as the stage of wastewater treatment and the energy efficiency of specific machines and equipment are likewise important.

For the few countries with 2022 data, no clear pattern is visible. The share of energy costs is on the rise in Albania and Moldova, while it is mainly unchanged in Flanders (Belgium), Montenegro and Malta (due to an increase in government subsidies). This indicates that energy costs are not (yet) rising, or they increase in line with all other costs, resulting in similar ratios. Some of the water utilities in these jurisdictions have entered into long-term supply contracts with water supply companies, and these contracts were signed before the rise in energy costs, such as the case of Brussels (BRUGEL).

In some countries, such as Albania, Bulgaria and Latvia, individual company figures are spread across a wide range, but even in Hungary, Kosovo, Lithuania, and Montenegro there are substantial differences between the low and high ends of the range. Company-specific differences are driven mainly by operating conditions, and to a lower extent, by choice of technology and its energy efficiency.

3.2 OWN GENERATION OF ENERGY

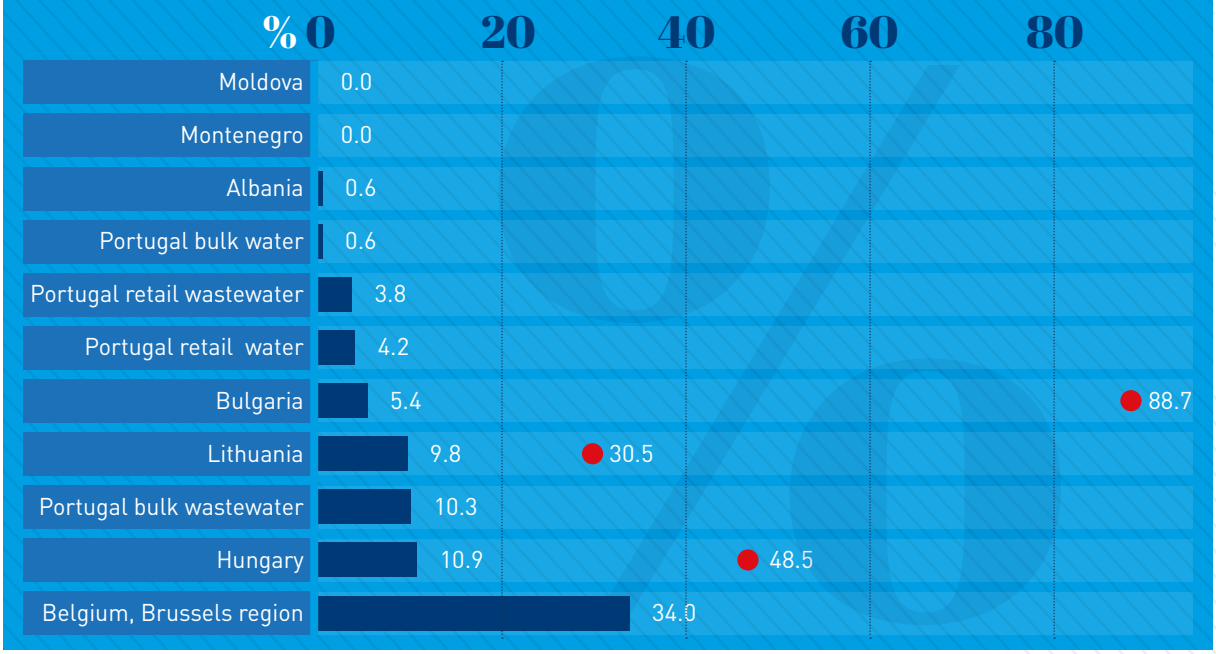
This Section of the report reviews the use of own generation of energy among European water utilities. Data was available from 8 out of the 18 surveyed regulatory authorities and the results are shown in Figure 5 which depicts the share of own energy generation compared to the total energy use, representing sector averages[3].

Own generation includes both on-site and off-site production of energy by water utility service providers. Company-specific minimum and maximum values were also provided for some member regulators. The minimum value is typically 0 or close to 0. The maximum values stand for water utility companies that outshine their peers, with the highest values observed in Lithuania (30.5%), Belgium (34%), Hungary (48.5%) and Bulgaria (88.7%). The value for the Brussels region in Belgium refers only to the sewage sector.

The most typical technology for own production of energy is sludge-based biogas production and utilisation. The volume of solar photovoltaic and hydropower generation is notable in some member regulators. Biogas-based generation is a natural fit for the water and wastewater sector, since, in addition to energy generation, the volume of sludge released from wastewater treatment plants is reduced, lowering the cost of disposal. The European Commission is proposing a new directive on urban wastewater treatment that will impose a "clear and measurable objective to reach energy neutrality in the wastewater treatment sector by 2040" (European Commission, 2022) which will be applied to facilities above 10,000 p.e. In reaching the above goals the proposal spells out the critical role of sludge-based biogas production but also anticipates the enhancement of energy efficiency measures and rising solar energy production by better use of the available surfaces of urban waste-

[3] For Portugal data has been supplied for both water and wastewater services, and for bulk and retail service providers alike.

FIGURE 5 OWN ENERGY GENERATION AS A SHARE OF ENERGY USE IN 2021*



water treatment plants. The measures are foreseen to be implemented gradually, with energy audits required for facilities above 10,000 p.e. from 2030, an interim target for energy neutrality by 2030 (50% from renewables), 2035 (75% from renewables) and full neutrality by 2040. With the increasing European penetration of advanced and more energy intensive wastewater treatment technologies, energy neutrality is becoming a more and more ambitious target to reach. With the increasing European penetration of advanced and more energy intensive wastewater treatment technologies, energy neutrality is becoming a more and more ambitious target to reach.

Sofiyska Voda, the water and wastewater utility for the city of Sofia in Bulgaria, already generates more power from its wastewater operations than the corresponding energy use. In Portugal, the main wholesale service provider, Águas de Portugal, aims to become fully energy independent by 2030, as described in Section 6.8.

In Bulgaria (Sofiyska Voda) achieved sludge based biogas production by 2007-2008, and since 2009 cogeneration was introduced. Implementation was helped by the availability of external financing sources (EU and national funds). A new methane tank was constructed in 2021 and there are plans for one more cogenerator. Currently the plant is 100% energy independent, in fact, it produced about 10-20% more energy than it needs, reducing the energy dependence of its other operations. These investments were triggered not by external requirements (e.g. by regulation), but by economic sense, a desire to appear as environmentally friendly and increased independence from the energy markets.

While own generation of energy is becoming increasingly important for the water sector, many regulators still do not collect this type of data. Given the new, stringent requirements of European regulation and the increasing value of own generation, regulators will likely start paying more attention to this topic. The country averages for the share of own generation are mainly at or below 10%, implying that most utilities have 0 or just a few % own generation. This suggests that there is a lot of unused potential for own generation.

3.3 OBSERVED ENERGY EFFICIENCY OF WATER UTILITY COMPANIES

Figure 6 shows the energy efficiency indicators for water production, water treatment, wastewater collection and wastewater treatment. The red dots represent the sector average in the country, the blue dots show the maximum and minimum values among individual operators. In Portugal, outliers are excluded from the range, and the minimum values for water production and wastewater collection belong to bulk service providers. Some of the surveyed regulatory authorities were unable to provide any indicator values, others gave only national average values, the data set is therefore not comprehensive, but it still allows some conclusions:

- For water production, country averages are within a moderately narrow range (0.34-0.82 kWh/m³). For the other three indicators, ranges are much wider. This implies that the energy used for water production is easier to estimate than the energy used for water distribution, wastewater collection and wastewater treatment. The energy used for water distribution and wastewater collection is heavily influenced by terrain and relief, while the energy used for wastewater treatment is driven by the treatment stage (primary, secondary, tertiary). A profound understanding of the role of these and other factors is necessary for setting efficiency targets.
- Company-specific individual values fall in a particularly wide range, e.g., 0.00-3.57 kWh/m³ for water distribution, or 0.002-3.363 kWh/m³ for wastewater treatment. This shows the role of operating conditions and technological attributes, but higher values may also indicate significant room for efficiency improvements. Sector studies, audits of water operations and the realized energy savings of water utility companies also support this assumption (see e.g., Limaye and Welsien, 2019). Sustained high prices of energy will improve the returns on energy efficiency investments.
- The EU Taxonomy for sustainable activities[4] calls for substantial improvements of the energy efficiency of water collection, treatment and supply. Besides lower specific energy use, the role of reduced leakage is highlighted as an option contributing to energy saving goals.
- For wastewater operations, the EU Taxonomy calls for lowered GHG emissions without prescribing specific energy efficiency targets.

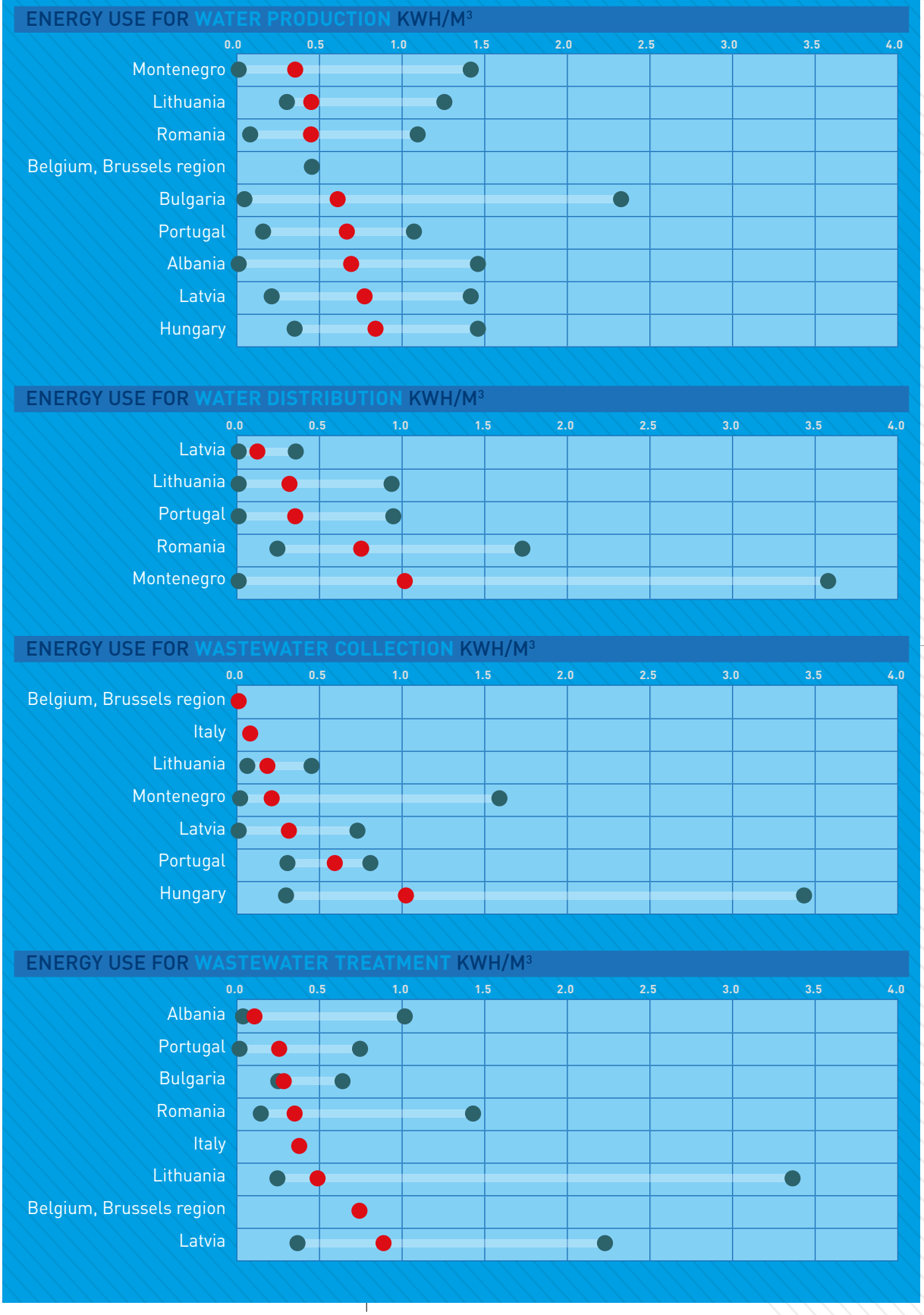
The answers by regulators in the survey also pointed to other indicators used by some authorities to assess the energy efficiency of the regulated companies. For instance, electricity consumption of water extraction and distribution (kWh/m³/100m H2O) and Electricity consumption of wastewater collection (kWh/m³/100m H2O) indicators, used in Lithuania, show the energy needed to raise a cubic meter of water or wastewater to an elevation of 100 meters. Similar indicators are used in Portugal to assess the energy efficiency of pumping facilities. Other indicators look at the quantity of pollutants, not the volume of sewage, when evaluating the energy efficiency of wastewater treatment operations.

The general indicators of Figure 6 are more widely used and cover a bigger portion of operations, but their comparability is limited by widely different operating and network conditions. The latter, standardised indicators of pumping energy efficiency are narrower in scope, but provide a better basis of comparison among service areas.

As the ranges of indicators' values suggest, there is room for efficiency improvement in the European water sector, though regulatory knowledge

[4] EU Technical Expert Group on Sustainable Finance (2020)

FIGURE 6 ENERGY USE FOR WATER PRODUCTION, WATER DISTRIBUTION, WASTEWATER COLLECTION, WASTEWATER TREATMENT



on this potential is limited. Given the high energy prices, it is important to enhance this knowledge to be able to provide appropriate incentives for improvement. A step in this direction would be the harmonisation and standardised definition of indicators among regulators to improve comparability of utility and country specific values.

3.4 USE OF KPIS

This Section of the report provides an overview of the use of Key Performance Indicators (KPIs) for the purpose of monitoring the provision of water services or for economic regulation purposes. Figure 7 shows the number of regulatory authorities assessing and using certain energy-related KPIs.

We observe that KPIs are more frequently used by regulatory authorities for monitoring purposes than to set financial incentives, as more than half of the surveyed WAREG Members use these KPIs for monitoring purposes only.

The most widely used indicators are electricity use for water production and electricity used for wastewater treatment. The share of renewable energy is only used by three authorities.

The indicator on the share of renewable energy use is expected to gain more attention in line with the implementation

FIGURE 7 THE NUMBER OF REGULATORS THAT USE KPIS FOR SPECIFIC PURPOSES

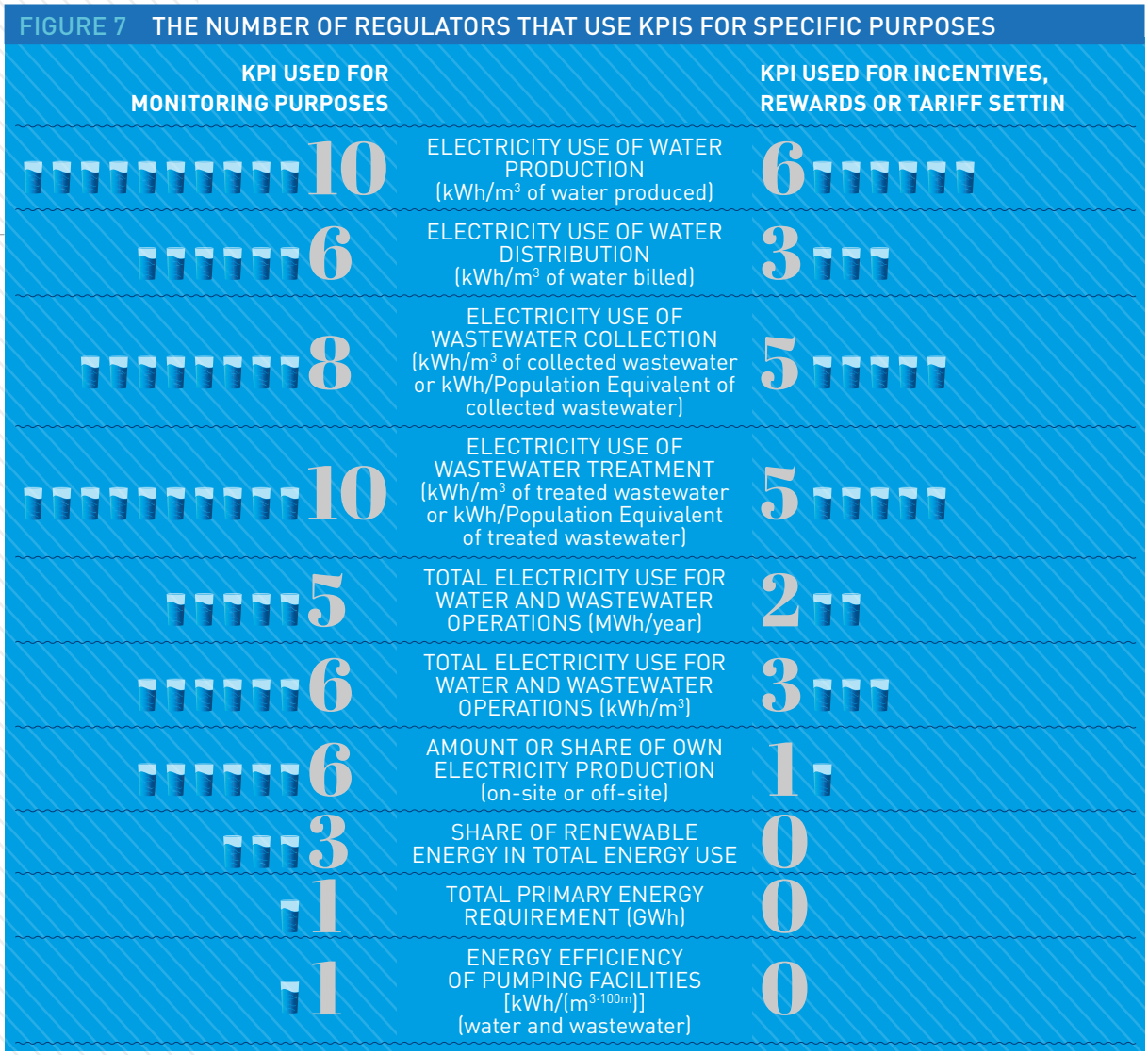


Photo Oscar Ovalle @unsplash.com

PLAN DE AYALA, MEXICO

of the urban wastewater treatment directive proposal, which prescribes energy neutrality by 2040[5].

The same Directive will also require wastewater operators to publish KPIs on their own performance: "The urban wastewater collection and treatment sector is specific, operating as a captive market, with public and small enterprises being connected to the collecting system without having the possibility to choose their operators.

It is therefore important to ensure public access to operators' key performance indicators, such as the level of treatment achieved, the costs of treatment, the energy used and produced, and the related GHG emissions and carbon footprint. In order to make the public more aware of the implications of urban wastewater treatment, key information on the annual wastewater collection and treatment costs for each household should be provided in an easily accessible manner, for instance on the invoices, while other detailed information should be accessible online, on a website of the operator or the competent authority." (European Commission, 2022).

The enhanced regulatory use of energy-related KPIs for wastewater services will likely follow. On the other hand, for drinking water services the European legislation[6] will only require the publication of indicators on drinking water quality but not on the performance efficiency of drinking water operations, with the exception of water leakage levels and the potential for improvements in water leakage reduction (Directive (EU) 2020/2184), closely related to energy consumption. The role of regulators in gathering and validating information in a comparable way is already important at the national level, but the above requirements will further increase the importance to have sound information at the EU level for each country with comparable KPIs.

5 COM(2022) 541 final of 26 October 2022.

6 Directive (EU) 2020/2184 of the European Parliament and of the Council of 16 December 2020 on the quality of water intended for human consumption (recast).

4 TARIFF SETTING METHODOLOGIES IN WAREG MEMBERS' COUNTRIES

RAPEL HYDROELECTRIC PLANT, CHILE

Photo Francisco Kemeny @unsplash.com

This Section of the report discusses the regulatory frameworks in WAREG countries applicable to drinking water and wastewater tariffs. This Section aims to provide an overall context of tariff regulation in each country.
It is organized as follows:

SECTION 4.1 PROVIDES A GENERAL OVERSIGHT ON THE TARIFF FRAMEWORK;

SECTION 4.2 REVIEWS THE PROCESS OF ADJUSTING DIFFERENCES BETWEEN FORECAST AND ACTUAL COSTS DURING 'BUSINESS-AS-USUAL' REGULAR ADJUSTMENTS;

SECTION 4.3 REVIEWS THE ABILITY OF REGULATORS TO IMPLEMENT EXTRAORDINARY ADJUSTMENTS DUE TO DIFFERENCES BETWEEN FORECAST AND ACTUAL COST BREACHING A MATERIALITY THRESHOLD

4.1 GENERAL TARIFF FRAMEWORK

4.1.1 RESPONSIBILITY TO ASSESS AND APPROVE TARIFFS

Under the first subSection of the tariff framework, we seek to gain an understanding of the general principles of the tariff-setting framework related to the responsibility to assess and review the tariffs. This is important in understanding the ability of regulatory authorities to collect, validate and monitor the necessary data required from water utilities in order to review, assess and approve the tariffs, in an independent and expedited manner. One of the advantages of national or regional regulatory authorities is their ability to provide a transparent overview on sector data, at aggrated level (without indulging on specific cases nor providing any industrially sensitive information). In fact, transparency of information on drinking water and wastewater data, is a growingly relevant requirement in EU water legislation. In this subSection we try to provide insights into the extent to which the governance framework allows regulatory authorities to directly pass-through the rise in energy costs without prejudice to social and affordability considerations.

The questionnaire asked respondents about their responsibility of assessing and approving water tariffs in WAREG countries. The answers are summarized in Figure 8.

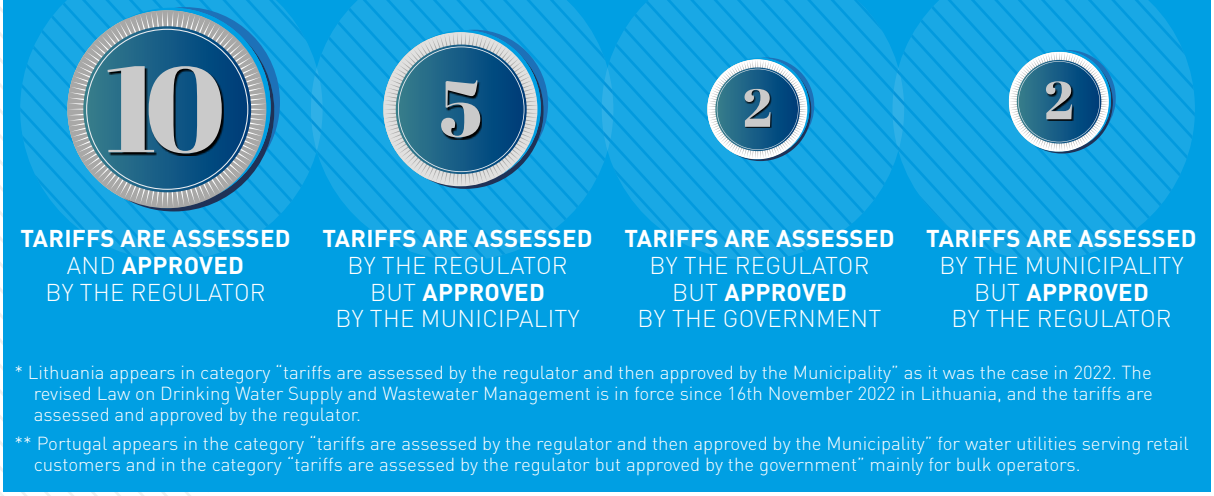
In the majority of the surveyed authorities (10 out of 18), tariffs are assessed and approved by the regulator (Albania, Belgium-Brussels, Bulgaria, Estonia, Ireland, Kosovo, Latvia, Malta, Romania and the UK-England and Wales).

In Latvia the regulator assesses and approves tariffs only for companies whose volumes exceed 100 thousand cubic meters per year. Smaller companies are supervised and regulated by local governments.

In Malta the sole water service provider (WSC) proposes the change in tariffs. The regulator assesses and approves them (or requests modifications). The Government then issues legislation regarding the set tariffs.

In the UK (England and Wales), the regulator sets the revenue cap. The companies are free to set the tariffs as long

FIGURE 8 RESPONSIBILITY TO ASSESS AND APPROVE TARIFFS */**



* Lithuania appears in category "tariffs are assessed by the regulator and then approved by the Municipality" as it was the case in 2022. The revised Law on Drinking Water Supply and Wastewater Management is in force since 16th November 2022 in Lithuania, and the tariffs are assessed and approved by the regulator.

** Portugal appears in the category "tariffs are assessed by the regulator and then approved by the Municipality" for water utilities serving retail customers and in the category "tariffs are assessed by the regulator but approved by the government" mainly for bulk operators.

as they do not exceed the revenue cap and are in line with the law.

In 1 regulator (Belgium-Flanders (only for water tariffs) and Italy), tariffs are assessed by municipalities and then approved by the regulator.

In Italy, ARERA (the national independent Authority) is responsible for approving the tariff methodology, then the Local Authority (EGA[7]) has to set and approve the tariff for its local operator (or operators) according to the said methodology. Finally, the tariff is definitely approved by ARERA (which can also modify the Local Authority calculations). ARERA has competences also in determining technical and quality standards and adopting rules and tools to protect users. ARERA regulates the entire water cycle (water supply, wastewater collection and wastewater treatment) on all the national territory (more than 2000 utilities, even if only approximately, 200 have a significant dimension). In the remaining surveyed authorities, the tariffs are assessed by the regulator and then approved by the Municipality (Moldova, Montenegro, North Macedonia, Portugal (retail)) or by the Government (Hungary, Portugal (main bulk operators)).

In North Macedonia, the regulator sets the maximum and minimum tariff revenues, establishing a range that needs to be respected by the utility. The utilities then define end-user tariffs which are approved by the municipal council. Until November 2022, in Lithuania tariffs were assessed by the regulator and then approved by the Municipality. Based on the revised Law on Drinking Water Supply and Wastewater Management (in force since 16th November 2022), tariffs are now assessed and approved by the regulator.

As a general observation, therefore, it can be said that in the majority of jurisdictions, the governance structure allows the regulators to directly assess the costs and directly pass-through the impact on the tariffs.

Again, this assessment is made without prejudice to social and affordability considerations. In a number of cases, the tariffs are reviewed and assessed by the regulator but ultimately, the responsibility for approval lies with the municipalities (Moldova, Montenegro, North Macedonia, and Portugal, for retail companies). While the involvement of municipal and central government authorities is important in any water service tariff determination case, the ability of the regulator to approve tariffs independently may also be compromised.

[7] EGAs cover areas of the national territory corresponding, at minimum, to a Province (group of Municipalities with an administrative center) but, in many cases, also to an entire Region.

4.1.2 TARIFF FRAMEWORK

The second sub-section of the analysis seeks to understand the extent to which the tariff framework regulating water services affects the ability of the regulatory authorities to reflect changes in costs (hence including extraordinary energy costs) at regular tariff review intervals. Distinctions between the three main regulatory models:

- Cost-plus regulation – under which the regulatory authority sets the tariffs to allow the recovery of actual costs plus a reasonable return. The cost-plus framework typically relies on frequent annual reviews in order to adjust the tariffs to match the actual cost. The advantage of this framework is that it ensures cost recovery, as the tariffs are – in principle – set to reflect reasonable costs. One possible setback is that it does not provide cost-efficiency incentives, as regulated entities are guaranteed to recover the costs that the regulator considers reasonable. The recovery of the energy cost increase, in such a framework, would typically be recovered during a tariff reset window, unless the cost is material enough that it would require an extraordinary intervention by the regulator.
- Rate-of-return regulation – under which tariffs are set to allow the recovery of reasonable costs and a reasonable return. The regulatory authority then monitors the actual returns incurred by the water utilities and intervenes, not on an annual basis – as is the case in the cost-plus framework - but only if the actual returns differ by a considerable margin from the allowed return. As with cost-plus regulation, the main benefit of the framework is on the assurance of cost recovery, however, again, there are no incentives to reduce costs since – if costs fall – then actual return increase and the regulator intervenes by reducing the tariff. The recovery of the energy cost increase, in such a framework, would be reflected as soon as it breaches the target return, which – depending on the materiality of the increase – may be immediate or absorbed within the threshold of the deviation of the actual return from the allowed or target return.
- Price Cap or Revenue Cap regulation – where allowed revenues or prices are typically set for a long-term period (three, five or more years), and the main determinants of the allowed revenues/tariffs do not change for the duration of the regulatory period so as to promote revenue predictability. However, some automatic adjustments occur within each year of the regulatory period in order to adjust for differences between forecast and actual pass-through costs or to adjust costs to inflation. The allowed revenue parameters typically include some target efficiency factors (on operational/maintenance cost efficiency, or on losses, or on collection rate, for instance) which, if successfully met or exceeded by the regulated water service company, lead to an increased profit for the company, and vice-versa (if they are not met, then the company incurs a loss). The overall idea of the framework is that – in the long run – the regulatory authority is able to reduce the information asymmetry by encouraging the company to expose their efficient costs by providing them with an incentive of a short-term profit (or avoidance of loss). One possible setback of this approach is that if these targets are set arbitrarily, or are overly ambitious, the company may not necessarily recover their costs, leading to some risk exposure. Under this framework, the company would recover the rising energy costs either during automatic adjustments (at

the end of each year of the regulatory period) or during extraordinary reviews which are typically complementing such a framework.

The results from the survey are presented in Table 1 and are summarized as follows:

- In most jurisdictions, the applied Regulatory Tariff Framework is an incentive-based framework where the regulatory authority sets a Price-cap or a Revenue-cap for a multi-year period.

TABLE 1 TARIFF REGULATORY FRAMEWORK

	TARIFF REGULATORY FRAMEWORK	LENGTH OF REGULATORY PERIOD
Albania	Price Cap – When tariffs fully cover total costs of service. Cost Plus – When utilities intend to cover less than 100% of costs	5 years – when Price cap is used 3 years – when Cost Plus is used[8]
Belgium (BRUGEL)	Cost plus	5 years
Belgium (VMM)	Price-cap; Revenue-cap	6 years
Bulgaria	Price-cap; Revenue-cap	5 years
England and Wales	Price-cap; Revenue-cap	5 years
Estonia	Rate-of-return	Open ended
Hungary	Price-Cap	1 year
Ireland	Price-cap; Revenue-cap	3 years
Italy	Price-cap; Revenue-cap The regulator offers different choices for utilities based on their level of maturity and scale.	4 years With a 2 years update period
Kosovo	Price-cap; Revenue-cap	3 years
Latvia	Cost Plus or Rate-of-Return Utilities may choose to use Cost Plus or Rate of Return.	Open ended
Lithuania	Cost plus	5 years
Malta	Rate-of-return	1 year[9]
Moldova	Rate-of-return	5 years
Montenegro	Other Tariffs cover only reasonable OPEX and Depreciation.	1 year
North Macedonia	Price-cap; Revenue-cap	3 years
Portugal	Rate-of-return and Price Cap	5 years – For bulk service utilities, and retail utilities with delegated management. 1 year – For services directly managed by utilities and concession contracts.
Romania	Price-cap; Revenue-cap	5 years

[8] When cost plus tariff methodology is used in Albania, the utilities do not submit a 3 year business plan. The 3 year regulatory period means that the utility should apply for new tariffs after this period. During the 3 years period the tariffs are not subject of revision by inflation etc, but the utilities can apply for new tariffs, not more than once a year.

[9] The regulator performs a yearly license review as per the licence agreement, which includes the financial aspects of the sole water supplier, there is no yearly tariff structure but any reviews requested by the water supplier are then reviewed by the Regulator as necessary.

- Two regulatory authorities (Estonia, Latvia), use an open-ended tariff framework where a tariff is set indefinitely and is only reconsidered if there are significant deviations of costs from the set tariffs (similar to a revenue-cap framework).
- Some other authorities (Hungary, Montenegro, and Portugal for specific utilities) set 1-year tariffs, with yearly reviews of the tariff structure and costs.
- In Malta, the regulatory authority performs a yearly licence review as per the licence agreement, which includes the financial aspects of the sole water supplier, there is no yearly tariff structure, but any reviews requested by the water supplier are then reviewed by the Regulator as necessary.

In summary, the majority of regulatory authorities apply a price-cap or revenue-cap regulation with incentive measures in order to expose regulated water service companies to some pressure to reduce costs, emulating companies operating in competitive markets. This is followed by an equal representation of cost-plus and rate-of-return methods. While it can be argued that these frameworks have their advantages and setbacks in terms of cost recovery and efficiency savings, in principle all three are equally adequate in recovering the rising energy costs.
However, whether extraordinary energy costs can be fully recovered or not, cannot depend entirely on cost efficiencies generated through tariffs, but largely on governmental tools, that are out of the scope of this research.

4.1.3 TARIFF COST RECOVERY

After reviewing the governance framework and the tariff models applied among regulatory authorities, the report focuses on the ability of regulatory authorities to set tariffs which fully cover service costs. This was done to understand whether, in case of a cost increase – such as the energy crisis – the regulator would be able to directly increase the tariffs to address the cost (again, this is without prejudice to affordability/social concerns).
In cases where tariffs are set net of subsidies, it would require coordination with the bodies issuing the subsidy, therefore slowing the expediency of reflecting the costs and ensuring the solvency of the regulated water service utilities. The results are summarized in Table 2.
In most member regulators, reasonable costs of utilities are fully covered through tariffs. In Ireland, tariffs are currently set only for non-domestic customers. Tariffs for domestic customers are covered by government subsidies. However, legislation is being drafted to allow charging domestic customers for excessive use, the level of this will be set by the CRU.
In Hungary, the regulator proposes tariffs to the Government which fully cover reasonable costs. However, most tariffs have not been adjusted by the Government since 2013 (tariffs are "frozen"). The water and sewage sector, on average, operates with losses. Companies with majority state ownership receive central government subsidies, but municipal companies do not. These circumstances create a heterogenous situation from the perspective of cost recovery, which is why there are utilities in all three categories
In Portugal, since municipalities set retail tariffs, they may choose to set tariffs at levels which do not fully cover costs. In this case, the municipality covers the part of the costs of the services for their municipality, which in practice has meant that 50% of water supply utilities and 65% of wastewater utilities in retail services do not fully cover costs from tariffs in Portugal.
It is important to stress that these percentages are relative to retail services, which are composed of materially different management models, from di-

TABLE 2 COST RECOVERY FROM TARIFFS AND SUBSIDIES

	TARIFFS FULLY RECOVER REASONABLE COSTS	TARIFFS RECOVER COSTS NET OF GOVERNMENT SUBSIDIES	TARIFFS AND SUBSIDIES ARE INSUFFICIENT TO COVER REASONABLE COSTS
Albania[10]	✔	✔	
Belgium (BRUGEL)		✔	
Belgium (VMM)	✔		
Bulgaria			✔
England and Wales	✔		
Estonia	✔		
Hungary	✔	✔	✔
Ireland	NON-DOMESTIC	DOMESTIC	
Italy	✔		
Kosovo	✔		
Latvia	✔		
Lithuania	✔		
Malta		✔	
Moldova	✔		
Montenegro	✔		
North Macedonia	✔		
Portugal	RETAIL	BULK	RETAIL[11]
Romania	✔		

rect management by the municipalities (which are the majority and have poorer cost recovery track records) to municipal delegated management or municipal concessions (which tend to have tariffs that fully recover costs).

In the UK (England and Wales), non-household customers are served by competitive retailers who purchase wholesale services from incumbents. Retailers offer competitive charges, but for the smallest customers, there is a limit to how much above the incumbent's relative wholesale charge the retailer can charge if the customer has not switched to an alternative tariff. Thus the role of the regulator for non-household customers is limited to monitoring. In summary, for the majority of regulatory authorities, there are no structural impediments which would slow down the recovery of the energy cost adjustment. In several cases, these would require the contribution of a subsidy, and in a few cases, the combination of the tariff and the subsidy is insufficient to recover the total cost of supply, even under business-as-usual conditions.

4.1.4 AFFORDABILITY CONCERNS

Affordability concerns are a critical factor in setting water tariffs across all jurisdictions, and it is what distinguishes water service regulation from other

[10] In Albania Tariffs are proposed to fully cover reasonable costs. In some cases, the government may issue subsidies to water utilities which are then subtracted from the total revenues.

[11] Most retail utilities fall under this category, however retail utilities under delegated municipal management and municipal private concessions do recover costs through tariffs.

sectors which rely on targeted non-tariff-based support schemes.

Regulatory authorities in countries such as Albania, Bulgaria, North Macedonia, Italy, Portugal, and Romania noted that the affordability of tariffs for end users is core to setting water tariffs.

In Albania, for instance, utilities may propose tariffs which do not fully cover costs, and request subdidies from the government to cover the remaining costs. The subsidies are usually provided by the Government or by the Municipalities. Water costs should not exceed more than 5% of an average monthly family income. 12 out of 26 utilities in Albania cover all costs from tariffs, while the remaining utilities rely on subsidies to cover costs.

In Bulgaria, a consumption of 2.8 m^3/month/person should not exceed 2.5% of the average income for the region. If the tariffs exceed affordability levels and are not covered by subsidies, the entity incurs a loss.

In North Macedonia, the affordability level is set at 3%. Until now, no tariff decision exceeded 2% of the average household income. The affordability level in Romania is also set to 3%.

In Italy, the tariff methodology balances contractual and technical quality regulation against the affordability of the tariffs applicable to end-users. At a national level, affordability is ensured through an equalization component and at least 50 litres per person per day are guaranteed and made available for vulnerable consumers. The equalization component is collected by CSEA[12] and is re-distributed to water service utilities for some specific adjustments, which may relate to discounts for vulnerable customers, for technical quality or for extraordinary events such as earthquakes. More details from the Italian case study are provided in Section 6.4.

In Portugal the "poor quality of service" affordability threshold is established at 1% of the average disposable income per service (that is, 2% for both water supply and wastewater management services). In Portugal, there is no single municipality where the tariffs are unaffordable following this criterion. This is called the "macro-affordability indicator" that has an approach on the average. If a given household is a lower income family, it can benefit from social tariffs which are broadly available in the utilities in Portugal.

4.2 REGULAR TARIFF ADJUSTMENT

This Section of the report seeks to review the regulatory policy and practice in undertaking regular tariff adjustments to reflect differences between forecast and actual pass-through costs or to adjust costs to inflation. For multi-year tariff periods, regular tariff adjustment allows the regulatory authority and utilities to periodically review their tariffs and to adjust them for changes in costs throughout the tariff period.

As seen in **Figure 9**, out of 13 regulatory authorities which use multi-year tariffs, only one does not currently perform regular adjustments (Ireland).

In four regulatory authorities (Albania, Belgium-Flanders (VMM), Bulgaria and Kosovo) costs are adjusted for inflation, whereas pass-through costs are not reconciled and thus are capped. In the event that actual costs deviate significantly from approved costs, the utility may file for an extraordinary tariff review.

In 8 regulatory authorities (Belgium-Brussels (BRUGEL), Italy, Lithuania, Moldova, North Macedonia, Portugal, Romania, and the UK-England and Wales (Ofwat) efficient pass-through costs are reconciled, and future costs are adjusted through an Inflation index.

In Italy, the regulatory authority adjusts tariffs every two years. These adjustments also include inflation components and a reconciliation for the differences between forecast and actual pass-through costs[8]. During such ad-

[12] Only a part of operating costs are considered as pass-through, while the main part is subdued to an efficiency process, applying an econometric function.

FIGURE 9 ADJUSTMENTS OF COSTS DURING REGULAR TARIF ADJUSTMENTS

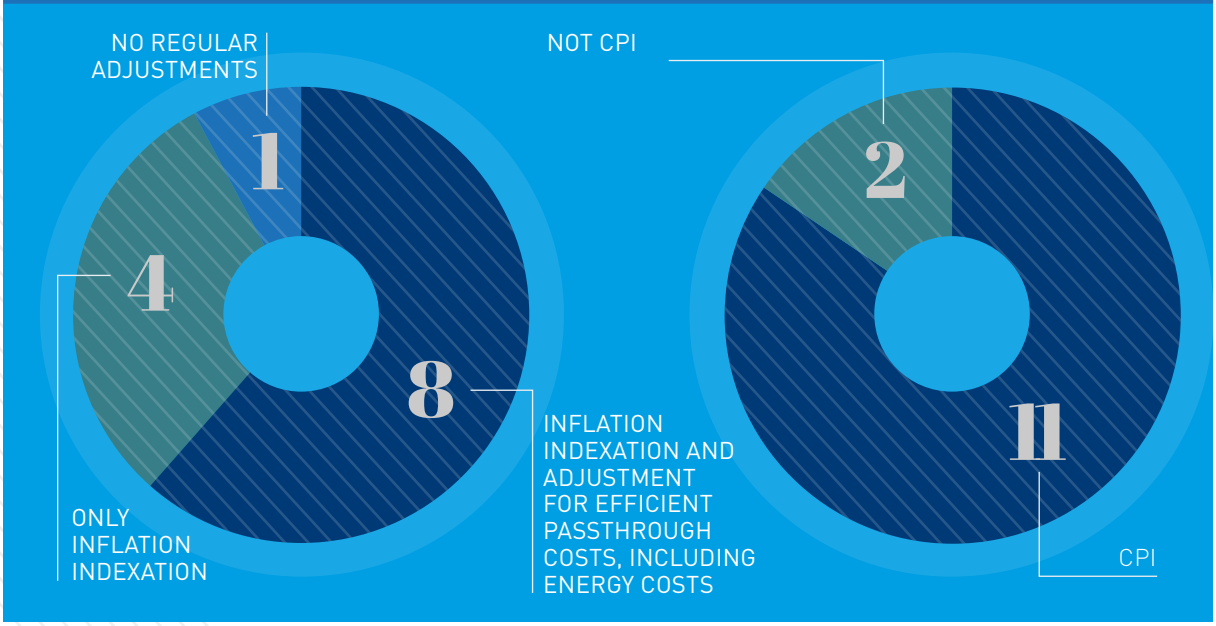
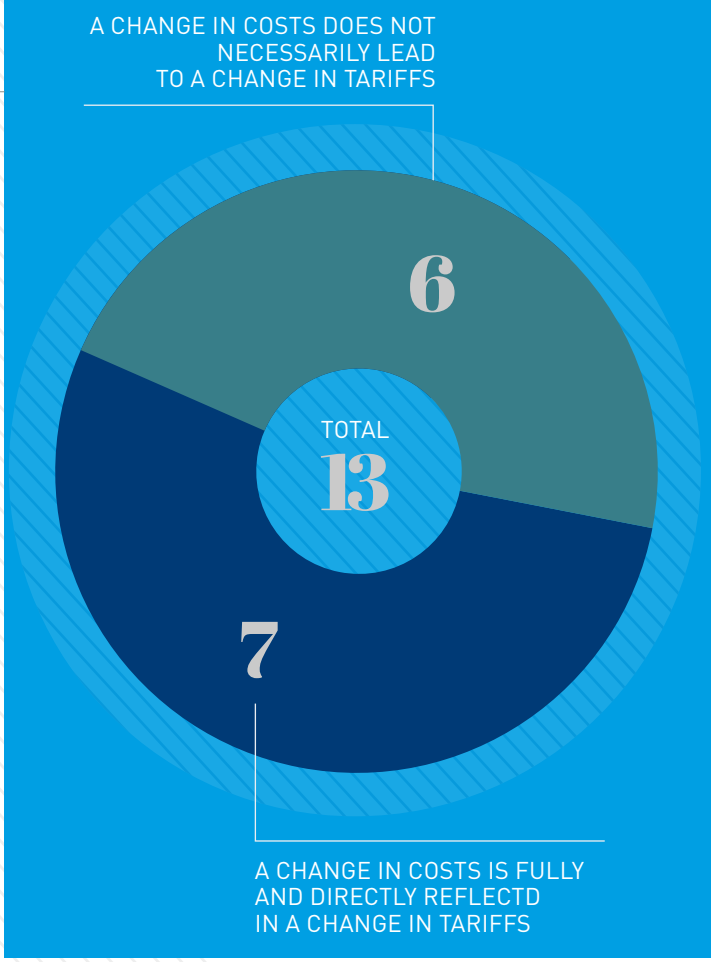


FIGURE 10 THE EXTENT TO WHICH A CHANGE IN COSTS IS FULLY REFLECTED IN TARIFFS



justments, energy costs are only addressed through an efficiency basis and if such costs are lower than 110% of the average cost. A detailed description of this process can be found in Section 6.4.

Other regulatory authorities (such as in the UK-Englandand Wales, and Albania) the adjustment of tariffs is based on the utilities' achievement of KPIs.

From the 12 regulatory authorities which adjust for inflation, 10 use the Consumer Price Index (CPI).

Ireland uses the HICP, however, it is calculated for the whole tariff period prior to the start of the multi-year period.

In the UK (England and Wales), Ofwat uses the Consumer Prices Index, including owner occupiers' housing costs (CPIH).

In Belgium (Flanders) VMM uses a weighted index which is comprised of: 20% CPI; 50% reference wage index and 10% material index. 20% of the costs are not indexed due to the share of values such as depreciation and profit appropriation in the costs.

As seen in Figure 10, in six of the regulatory authorities which implement regular tariff reviews, a change in efficient and prudent costs during the review in

theory is fully and directly reflected in a change in tariffs (Italy, Lithuania, Moldova, North Macedonia, Portugal and Romania).

In Kosovo, Belgium (Brussels and Flanders), Bulgaria, Ireland, and Albania, changes in costs are only reflected through the inflation index, and thus are not directly reflected in a change of tariffs.

In Albania and the UK (England and Wales), changes in costs do not necessarily lead to changes in tariffs. As a result, same tariffs may remain throughout the regulatory tariff period, with the difference covered by subsidies or a reconciliation at the end of the tariff period.

4.3 EXTRAORDINARY TARIFF ADJUSTMENTS

Under multi-year tariff frameworks tariffs are typically updated under regular adjustments as reflected under Section 4.2, above. However, such frameworks acknowledge that on some occasions there may be changes which are so significant that their impact cannot fully be

TABLE 3 EXTRAORDINARY TARIFF REVIEWS AND EXPEDIENCY OF IMPLEMANTATION

	LENGTH OF TARIFF PERIOD	IS THERE A SET MATERIALITY THRESHOLD?	WHEN CAN THE NEW TARIFFS BE IMPLEMENTED?
Albania	Multi-year	2%	Beginning of next year
Belgium BRUGEL	Multi-year	- 5% of non-controllable costs or extraordinary event	No defined timeframe
Belgium VMM	Multi-year	No set threshold	Beginning of next year
Bulgaria	Multi-year	2%	Beginning of next year
England and Wales	Multi-year	10% - Interim Determination 20% - Substantial Determination	3 months
Estonia	Open-ended	Up to 5%	1 month
Hungary	1 year tariff periods - No extraordinary tariff review		
Ireland	Multi-year	No set threshold	No defined timeframe
Italy	Multi-year	No set threshold	No defined timeframe
Kosovo	Multi-year	No set threshold	Up to 3 months
Latvia	Open-ended	Up to 10%	51 days - Fast Review, 30 days - Self-determined tariffs
Lithuania[13]	Multi-year	30% change of energy tariffs	~ 2 months
Malta	1 year tariff periods - No extraordinary tariff review		
Moldova	Multi-year	5%	2 months
Montenegro	1 year tariff periods - No extraordinary tariff review		
North Macedonia	Multi-year	No set threshold	1 month + public consultation
Portugal	Multi-year	No set threshold	Immediately for delegated management or concession of municipal operations. Beginning of next year for others
Romania	Multi-year	No set threshold	No defined timeframe

[13] Lithuania - Under the revised Law on Drinking Water Supply and Wastewater Management, in force since 16th November 2022, Lithuania will start implementing extraordinary tariff reviews.

captured during regular adjustments or require immediate intervention prior to the regular adjustment. These can be accommodated through extraordinary review adjustments which can be triggered in the event that the change in costs breaches a certain materiality threshold.

This sub-Section of the report reviews whether the tariff policy and implementation allow for extraordinary adjustments to the tariffs as these would be required, in some instances, to address the unprecedented increase in energy costs faced by the water service companies. The results of the findings are summarized in Table 3.

Overall, regulatory aouthorities may intervene through extraordinary adjustments. However, these adjustments are sometimes based on regulatory discretion and, for the majority of member regulators, not necessarily based on policy stipulations which would clearly define the extraordinary event and its materiality threshold.

4.3.1 EXPEDIENCY OF IMPLEMENTATION OF THE TARIFF ADJUSTMENT

This Section reviews the expediency according to which a regulatory intervention to address a change in costs – such as an extraordinary review for the energy cost increase – is reflected in the tariffs. The results are summarized below:

- In all analysed regions which implement multi-year tariffs, the utility or the regulatory authority may request an extraordinary tariff review if actual costs differ significantly from assumed or allowed costs.
- In regulatory authorities which implement 1-year tariff reviews, the tariff period cannot be interrupted during the year, and all elements of the tariffs are reviewed at the end of the year.
- In regulatory authorities which use open-ended tariffs (rate-of-return regulation) extraordinary tariff reviews are considered as regular tariff review. For instance, Estonia and Latvia, which implement this regulation, have introduced fast reviews to deal with the energy crisis.

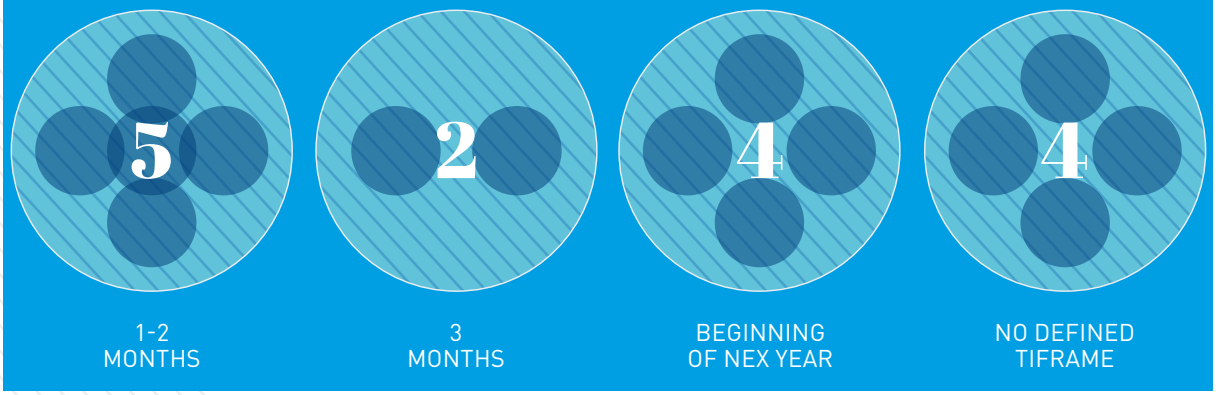
The graphic in Figure 11 shows the diversity among how fast new tariffs resulting from an extraordinary review can be implemented.

In Belgium (Brussels), Kosovo, Lithuania, Moldova and the UK (England and Wales), the expediency of tariff implementation is 2-3 months.

In Estonia and Latvia, through fast-review methodology, tariffs can be approved and put into force within one month. New tariffs immediately come into force in Portugal for municipal utilities with delegated management or concession.

Regulatory authorities from Albania,

FIGURE 11 EXPEDIENCY OF TARIFF IMPLEMENTATION



Belgium (Flanders), Bulgaria, and Portugal (except for the above municipal utilities), tariffs resulting from extraordinary reviews can only be implemented during the next tariff year. Thus, at most, there is a one-year lag from tariff request to tariff approval.

In Ireland, Italy, Belgium (Brussels), and Romania, there is no defined timeframe for the implementation of the new tariffs. The implementation timeline depends on the utility's complexity, specific case, negotiations between the utility and the regulator and the scale of events.

In summary, extraordinary tariff adjustments are applicable in a period of less than three months for almost half of the regulatory authorities. For the others, the tariff resulting from the extraordinary tariff review only commences from the beginning of next year, or there is an undefined timeframe for implementation. A shorter period of effectiveness ensures solvency and cost-recovery by the water service utilities.

4.3.2 DEFINING EXTRAORDINARY EVENTS

Extraordinary reviews can be triggered subject to the occurrence of an extraordinary event. This Section of the report review show various jurisdictions define extraordinary events.

In Albania, Bulgaria, Moldova, the UK (England and Wales), Belgium (Brussels) and Lithuania (for energy costs), differences in revenues due to uncontrollable and extraordinary events would need to pass a certain threshold of materiality to be considered as extraordinary events. The utility in all cases must prove that the change in costs is due to an external event, which could not be reasonably mitigated by the utility.

The regulatory authority of England and Wales (Ofwat) has two ways for which companies can request extraordinary tariff reviews:

1. **Interim determinations**
   If changes in costs, receipts or revenues are 10% - 20% of the company's turnover. A company may add together a number of specific changes.
2. **Substantial effect determination**
   If changes in costs, receipts or revenues are at least 20% of the company's turnover.

Belgium-Brussels (BRUGEL) also considers extraordinary events, such as the energy crisis, or changes in the business plan as valid reasons for requesting an extraordinary tariff review.

Belgium-Flanders (VMM), Ireland, Italy, Kosovo, North Macedonia, Portugal, and Romania have not set a materiality threshold. The regulatory authority will analyse in detail changes to the business plan, specific changes in individual costs, and justifications of the utility regarding these changes. If the regulator considers that the changes have a considerable effect on the utility and are reasonable, then the regulator may approve new interim tariffs.

In Italy, the regulatory authority only approves extraordinary reviews if economic and financial indicators change significantly and cause a serious risk of failure to the utility. The request for extraordinary tariff reviews must be accompanied by a strict program to overcome the crisis from the utility.

Overall, the regulatory responses suggest that there is considerable variety in defining extraordinary reviews and regulatory authorities have considerable discretion in deciding when to intervene. This is of course useful from the regulatory perspective as the nature of the extraordinary event can vary and it is not necessarily the case that the process is automated. However, in the interest of improving policy predictability, regulatory authorities may consider introducing some materiality threshold which, if breached, can lead to a review of costs for an extraordinary adjustment.

5 EFFECT OF THE ENERGY CRISIS

Photo Spiros Xanthos (unsplash.com)

Sections 3 and 4 of the report reviewed the utility practice in managing energy costs and regulatory perspectives on policy and implementation in reviewing costs and updating them under 'business-as-usual' assumptions. The main purpose of the analysis under Section 5 is to describe how utility operations and regulatory measures are impacted by the energy crisis. The section is organized as follows:

SECTION 5.1 REVIEWS THE ELECTRICITY PURCHASE PRACTICES OF WATER COMPANIES;

SECTION 5.2 COVERS HOW ENERGY COSTS ARE NORMALLY DEALT WITH UNDER THE TARIFF FRAMEWORK AND HOW THESE METHODS HAVE CHANGED FOR SOME REGULATORS;

SECTION 5.3 PROVIDES INSIGHTS INTO THE SOURCE OF THE COST PRESSURE, DISTINGUISHING THE RISE IN ENERGY COSTS FROM THE GENERAL INFLATIONARY PRESSURE;

SECTION 5.4 PROVIDES AN OVERVIEW OF REGULATORY RESPONSES; AND,

SECTION 5.5 REVIEWS IF CAPEX SPENDING IS ADVERSELY AFFECTED.

5.1 ELECTRICITY PURCHASE PRACTICES OF WATER COMPANIES

This Section of the report reviews electricity purchase practices of water service utilities and whether they purchase electricity under regulated prices, under long-term fixed contracts, directly from the spot market or from futures markets. Table 4 reviews the electricity purchase practice of water utilities and how these practices were impacted by the energy crisis.

In most water utilities buy electricity from the competitive market, either directly (spot market, futures market) or through an energy trading company (long-term fixed contracts).

However, in some Southeast European countries, utilities buy energy at a regulated fixed price. This is the case in Albania, Kosovo, Moldova and for the smaller water companies in North Macedonia (utilities with annual revenue below 2 million euros and maximum 50 employees).

Malta is in a similar situation due to derogations under the EU Electricity Directive.

During the energy crisis, the regulated fixed electricity prices in these countries did not increase, or increased much less than the market price, therefore, the water companies have not yet faced the majority of the burden from higher energy costs. Consequently, there was no need for a response by the water utility regulatory authority, either.

Long-term fixed contracts are used in many countries. The contracted energy traders secure long-term positions in the futures energy market, ensuring predictable energy purchase costs for their clients. Some of these contracts are still valid in late 2022 (e.g. Belgium-Brussels, Ireland, selectively in other countries), having successfully protected the contracting water companies from the rise of energy prices.

Many of the contracts, however, have expired, and in 2022 it has become increasingly difficult to renew them, es-

TABLE 4 ELECTRICITY PURCHASE PRACTICES OF WATER SERVICE PROVIDERS

	REGULATED PRICE	LONG TERM FIXED CONTRACTS	SPOT MARKET	FUTURES MARKET
Albania	✔			
Belgium (Brussels)				✔
Belgium (Flanders)[14]				
Bulgaria[15]			✔	
England & Wales		✔	✔	✔
Estonia[16]		→	✔	
Hungary		✔	✔	✔
Ireland		✔	OCCASIONALLY	
Italy[17]		→	✔	
Kosovo	✔			
Latvia[18]		✔	✔	✔
Lithuania		→	✔	
Malta	✔			
Moldova	✔			
Montenegro		✔		
North Macedonia[19]	✔		✔	
Portugal	✔	✔	✔	
Romania		✔	✔	

pecially on favourable terms, therefore, many water utilities had to start buying electricity directly from the spot market, being exposed to much higher prices than previously. Water companies that have traditionally procured energy from the spot or the futures markets (even before the energy crisis) also experienced a steep rise in their energy costs, multiplying their expenditures on electricity.

Governments in some countries intervened to mitigate high energy costs for specific groups of energy users, sometimes including the water sector or selected water sector participants (e.g. smaller service providers).

In Bulgaria, energy costs above 127 EUR/MWh are fully subsidised by the government.

In Latvia, there is partial subsidy above 160 EUR/MWh, and there are other concessions as detailed in Section 6.5 on the Latvian case study.

In North Macedonia, any additional cost above the regulated price is subsidised for those water utility companies that need to make their purchases in the spot market.

In summary, the full impact of the energy crisis on water companies is observable only in some of the countries,

[14] No available information.

[15] Subsidy for electricity costs over 127 EUR/MWh.

[16] Shift toward spot market.

[17] Shift toward spot market.

[18] 50% subsidy above 160 EUR/MWh from October 1st, 2022, till March 31st, 2023, reduced electricity distribution fee, mandatory procurement and capacity components excluded.

[19] Government subsidy above the regulated price for those buying from the open market.

most notably Estonia, Hungary, Italy, Latvia, Lithuania, Portugal, Romania, and the UK (England and Wales). Even in these countries, long-term contracts provide temporary protection to some water companies.

Companies that are fully exposed to energy price increases face electricity costs of 100-300 EUR/MWh as opposed to past multi-year average values of 40-80 EUR/MWh. The total costs of water utility companies in least favourable situations (high baseline share of energy costs and full exposure to the energy market price changes) may even double.

5.2 ENERGY COSTS WITHIN THE TARIFF FRAMEWORK

During the tariff setting process regulatory authorities use a set price of electricity to define total costs for the future year(s). As mentioned, during the regular adjustments, the difference between the pre-set price of electricity and the actual realized price of electricity can be adjusted by several regulatory authorities. Depending on the regulatory framework in the water sector, energy purchase practices and the energy market in the country, the regulatory authority may choose different methods to analyse the price of electricity.

Table 5 shows a summary of practices on setting the energy price for water tariffs. It is based on the information provided by the regulatory authorities and background knowledge of the energy market of the regulators. In the questionnaire, regulatory authoritiess were asked "What does the regulator use to determine/approve prices of energy for utilities?", the authorities could choose any of the following answers, including their combinations:

- **Long-term fixed contracts (including Regulated Prices)** – In many countries water utilities have long-term fixed energy contracts with energy suppliers (these suppliers may be subject to regulation in regulated energy markets). In this case the regulator considers the price of energy in the fixed contracts (or the Regulated Prices). Energy tariffs for water utilities are predictable, and in many cases do not change throughout the regulatory period. In general, regulatory authorities ensure that water utilities consider best procurement practices when signing long-term fixed contracts with energy utilities.
- **Historical realized energy prices** – The regulatory authority analyzes individual, or sector average realized energy prices in the water sector, based on actual energy purchases realized in the past. This includes among others, past long-term energy contracts, purchases from spot or future energy markets. Through this method, the regulatory authority allows flexibility in electricity purchasing practices from water utilities. When using historical realized energy prices, the regulator does not need to reconciliate differences between allowed energy costs and realized energy costs, since current costs are considered in the next tariff period when setting the allowed energy costs through historical data. The regulator may use historical realized energy prices to conduct a benchmarking analysis of energy costs of all water utilities, and thus utilize a uniform "efficient" average cost for all water utilities. This method introduces incentives for water utilities to adjust their energy purchasing practices to lower costs.
- **Historical spot energy prices** – The regulatory authority analyses past spot energy prices in the energy market. This method is usually used when water utilities purchase energy in the spot market, it is similar to "Historical realized energy prices", however, the regulator

TABLE 5 SETTING ENERGY PRICES FOR WATER TARIFFS

		WHAT IS CONSIDERED WHEN DETERMINING THE ALLOWED ENERGY PRICE?				
COUNTRY	SINGLE / DIFFERENT PRICE	REGULATED PRICES	LONG-TERM FIXED CONTRACTS	HISTORICAL REALIZED PRICES	HISTORICAL SPOT PRICES	FORECAST OF FUTURE PRICES
Regulators and utilities using regulated energy prices						
Albania	SINGLE	✔				
Kosovo	SINGLE	✔				
Malta	SINGLE	✔				
North Macedonia	SINGLE	✔			FOR LARGE UTILITIES	
Montenegro	SINGLE	→				
Regulators using historical realized energy prices or historical market prices						
Belgium (Brussels)	DIFFERENT					
Belgium (Flanders)	DIFFERENT					
Bulgaria	SINGLE [20]					
Moldova	DIFFERENT					
Italy	DIFFERENT [21]			THE RULE		EXCEPTION
Estonia	DIFFERENT					
Regulators analysing long-term contracts and forecasting future prices						
Romania	DIFFERENT					[22]
Hungary	DIFFERENT				USED FOR FORECASTS	INTERIM METHOD
Latvia	DIFFERENT					
Lithuania	DIFFERENT					
Regulators considering overall OPEX						
Ireland	N/A					
Portugal	DIFFERENT					
England & Wales	N/A					

does not analyze past contracts, which do not apply to the water utility in the present. The regulator may use different time frames to analyze past spot energy prices. Similar to historical realized energy prices, the regulator may choose to not pass-through differences between the allowed energy costs and the realized energy costs, since these will be reflected in the next tariff period through past historical spot prices.

- Forecast of future energy prices – The regulatory authority may set allowed energy prices based on forward-looking data. The forecast of future prices may be based on

[20] Except for companies with affordability issues, which were allowed a lower price of electricity.

[21] Different, but with a maximum allowed cost capped at the average energy purchase cost multiplied by 1.1. If actual costs are below this maximum, only the borne energy costs can be put in tariffs

[22] Based on notifications of price changes from energy supplier.

future energy markets, statistical modeling, analysis of market trends from historical data, and by inputs from industry, stakeholders, and energy market experts. When using forecasts of future energy prices, the regulator aims to set an allowed energy price which reflects actual costs that the utility will incur during the future tariff period. Usually, when using forecasted energy prices, the regulator allows ex-post adjustments of energy prices to reflect differences between the forecasted costs and actual costs.

Regulatory authorities and their regulated utilities can be split into four main categories based on the methodology of analysing and setting energy prices for water tariffs, which are explained in detail in Sections 5.2.1, 5.2.2, 5.2.3, and 5.2.4.

1. Regulators and utilities using regulated energy prices.
2. Regulators using historical realized energy prices or historical market prices.
3. Regulators analysing long-term contracts and forecasting future prices.
4. Regulators considering overall OPEX. The Table also shows if the regulatory authority uses a single price for all utilities within their jurisdiction or if they analyse utility-specific (different) prices for each utility. A detailed description of each country is provided below the table.

5.2.1 USE OF REGULATED ENERGY PRICES

In Albania, Kosovo, Malta, and North Macedonia (partially) water utilities are supplied from a regulated energy supplier. The regulatory authority sets electricity tariffs for the sole or main electricity supplier in the country. As noted above, for these cases, energy prices are predictable for the water utilities, and water utilities are not subject to spot prices, and they do not have to procure electricity themselves. In this case, the water utility regulator sets the cost of electricity for water utilities at the regulated price of electricity.

As nearly all water utilities are entitled to regulated electricity tariffs, the price of electricity used for setting water tariffs is the same (single price) for all utilities. The effect of the energy crisis has yet to impact these water utilities due to the fact that they are served under regulated tariffs from a regulated supplier below competitive market price.

As the energy market in these countries shifts from a centralized regulated market towards an open market, utilities are expected to procure electricity in the open market through long-term contracts or through the spot/future energy markets. This shift has happened in North Macedonia for larger water utilities. For these utilities, the North Macedonian regulator uses historical spot prices and forecasted future prices (based on price trends and future prices) of electricity to set the energy price within water tariffs.

In Montenegro, the retail electricity market was regulated until 2021. The regulated electricity supplier is now the main electricity supplier in the market (other suppliers also exist). All water utilities are supplied by this supplier, their electricity tariffs for water utilities have not changed yet as the energy crisis was absorbed by the electricity supplier. The regulatory authority analyses the long-term fixed contracts of the utilities with the supplier. Since all water utilities are supplied by the same electricity supplier with the same rates, the regulator approves a single per-unit price for all utilities.

Ex-post adjustments and incentives for efficient procurement

In terms of energy prices, long-term contracts and regulated prices, in general, are highly predictable and stable, thus the need for ex-post adjustments is limited.

Water utilities with long-term contracts and regulated prices, have low incentives to procure energy in the energy market. Water utilities tend to favour regulated prices when available, as these prices tend to be lower than market prices in the beginning of energy market reforms, and water utilities are not subject to risks and uncertainties of energy prices.

5.2.2 USING HISTORICAL REALIZED ENERGY PRICES OR HISTORICAL MARKET PRICES

Regulatory authoritiess in Belgium (Brussels and Flanders), Bulgaria, Italy, Estonia, and Moldova use historical realized energy prices (from balance sheets) or historical spot prices to set an energy price for future tariffs.

In Bulgaria, all water utilities procure electricity in the day-ahead market. During the preparation of the new business plans (2022-2026), utilities were instructed to calculate the average unit price (BGN/MWh) of the past 6 months from the Day-Ahead Market (DAM). Most operators used average prices of the second half of 2021.

An exception was made for companies which had affordability issues due to the high electricity prices. Since the Government of Bulgaria was subsidizing companies for electricity costs over 127 €/MWh through the windfall gains of electricity producers, the regulatory authority allowed companies with affordability issues to use lower prices for their tariff setting procedure. Thus, these water utilities with affordability issues could cover part of their energy costs from tariffs and the rest from electricity subsidies.

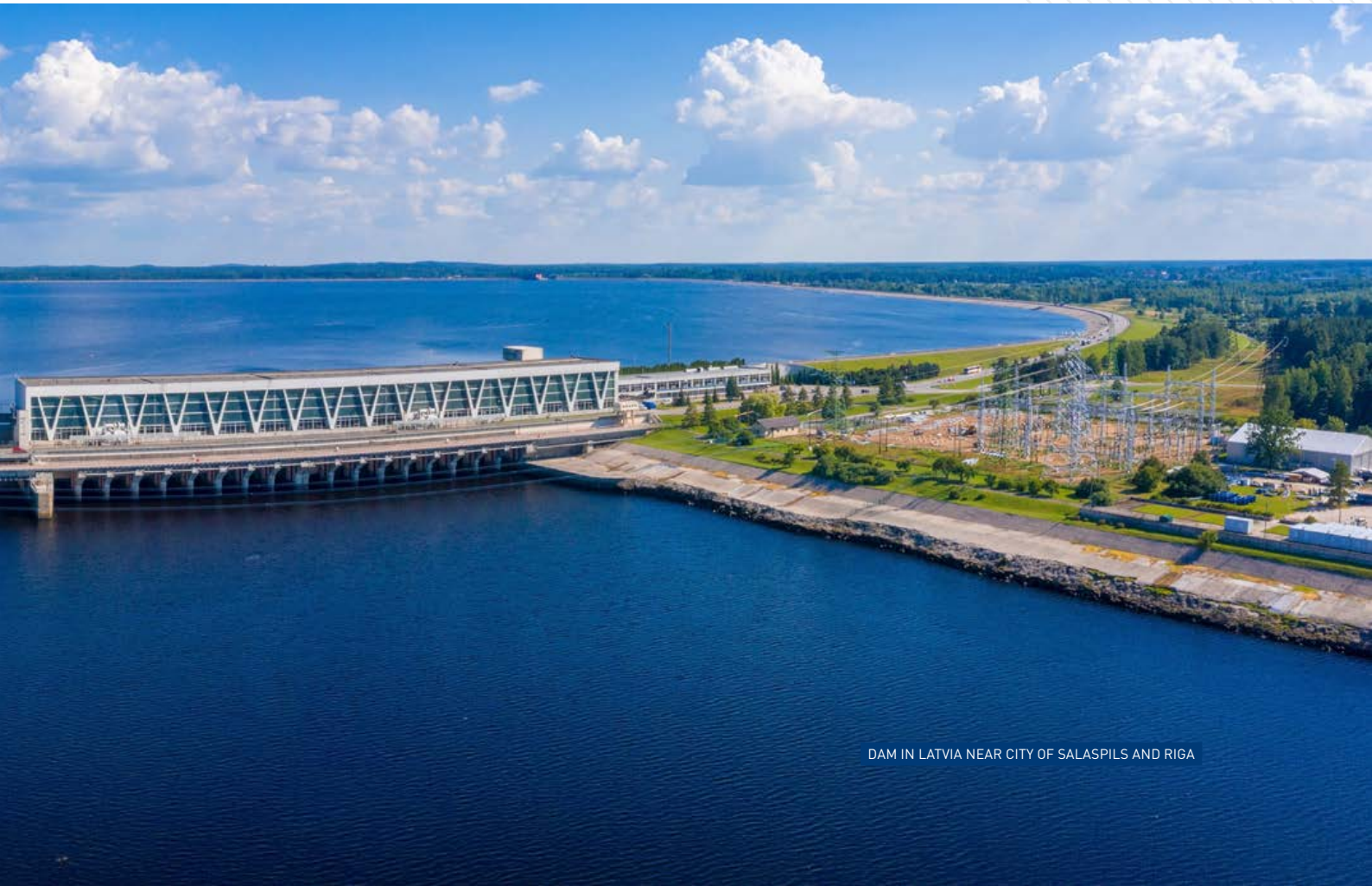
Italy applies a cap on the energy cost components which is limited to the average energy cost in the sector and an addition of 10%. This cap is applied to all regulated utilities and is applicable only on the price and not on the quantity of energy units utilized. At the beginning there was hesitation, especially from small and medium-sized operators, who noted they are unable, due to their size, to obtain prices which fit under the cap. However, they then formed an auc-

tion pool to organize a common auction for energy in order to reduce the costs and were able to obtain much lower prices. This was the improvement that was made on the unit-price component of the energy cost. Notwithstanding the cap, if the company's actual costs are lower than the cap, then these actual costs are considered by the Italian regulatory authority (ARERA).

A recent update of the tariff methodology provides the incentive of increasing cap on energy prices by saving on their energy consumption. For instance, if operators are able to save a certain part of their energy consumption, then they get an additional allowance on the tariffs.

In Italy, there are presently a considerable number of operators who are being supplied at fixed prices agreed before the crisis and are, therefore not yet affected by the energy price spike. However, newer contracts which are signed by the operators have a variable component which reflects the volatility. Therefore, for the majority of the utilities, the energy component will have to be re-set from the forthcoming year, and this is expected to be reflected as an energy cost increase for such utilities. For this reason, the change in costs is not yet reflected in the majority of the utilities.

A recent regulatory tool introduced by ARERA allows utilities to recover anticipated energy costs at a value of up to 60% of the previous energy costs. These costs are to be recovered 'in anticipation' of the future energy price increases in order to address potential financial liquidity problems for the water utilities. Of the 60%, up to 25% (percentage points) can be recovered from the tariffs as long as the associated increase of water and wastewater tariffs stays below 8.5% in order to ensure affordability. The difference of 35% (percentage points) will be recovered through an anticipation funded from an equalization fund. This component will have to be repaid, it is considered as a loan and it does not lead to an immediate further increase of the water tariffs. A detailed description of the Italian Case Study can be found in Section 6.4



DAM IN LATVIA NEAR CITY OF SALASPILS AND RIGA

In Estonia, the justified energy costs are determined through estimating energy (electricity) consumption and price (fixed or market price) set in contracts with the energy supplier of each utility. In case of fixed price contracts, the water utility must prove that it secured the most favourable price from energy suppliers, and then the contracted price is used for cost calculation. In case of the market price, the Estonian Competition Authority (ECA) considers the average Nord Pool price of the last 12 months prior to the tariff review. A sales margin according to the contract is added to the estimated average energy market price.

Due to the electricity crisis, which caused energy prices to be extremely volatile, ECA considers the average energy price of a shorter period of 1-3 months instead of the usual 12 months. This shorter time frame ensures that energy prices used for tariff calculations do not deviate substantially from current market prices.

A detailed description of the Estonian Case Study can be found in Section 6.2.

Ex-post adjustments and incentives for efficient procurement

As mentioned in Chapter 4.2, in Belgium (Flanders) and Bulgaria, there is no ex-post adjustment on energy prices deviating from allowed/historical prices. The regulatory authority only allows for inflation adjustments. If the deviations are significant the utility may request an extraordinary adjustment as described in Chapter 4.3.

In Italy the regulatory authority applies a cap on the energy cost components which is limited to the average energy cost in the sector and an addition of 10%.

Estonia utilizes an open-ended regulatory period, and companies can request reviews when costs deviate significantly. Past costs are not adjusted ex-post. The incentives for this group of countries to efficiently procure electricity is that deviations from the set electricity price are not adjusted ex-post, thus all gains and losses from electricity prices are born by the utility. The setback is that energy costs can largely be outside of the control of the licensee, and they may not be able to fully recover the costs despite implementing efficient energy procurement strategies.

In Belgium (Brussels) and Moldova, efficient pass-through costs in general are reconciled. Belgium (Brussels) utilizes the "tunnel methodology" where energy cost deviations, are only reconciled to a certain extent. A detailed analysis of the "tunnel methodology" is presented in Chapter 6.1.

The financial incentives for water utilities to engage in efficient procurement or to invest in renewable energy, when costs are adjusted ex-post are limited, since the water utility bears no risk on the cost of electricity since they are passed on to customers. However, this approach acknowledges that costs are likely to be outside of the control of the utility and ensures cost recovery for the regulated licensee. Moreover, it assures predictability for water utilities and investors, thus increasing investments in the sector.

5.2.3 REGULATORY AUTHORITIES ANALYSING LONG-TERM CONTRACTS AND FORECASTING FUTURE PRICES

In Romania, Hungary, Latvia and Lithuania, the regulatory authorities analyse the justified energy price on a case-by-case basis. For utilities which have long term fixed contracts in place, the regulator uses the price of the fixed contract as a justified energy price. In Romania this is usually the case, however, utilities are notified if a price increase is expected to occur, thus including an element of "forecasting" or projections of future prices.

Due to the energy crisis, the Hungarian regulatory authority MEKH allowed utilities to use future energy prices from HUPX (Hungarian Power Exchange). The MEKH also considers

historical prices for in-house forecasting by the regulator. MEKH states that forecasting is seen as a one-time use, and plans to go back to analysing long-term contracts.
For utilities which do not have long-term contracts, the Latvian and Lithuanian regulatory authorities use forecasts based on data from the Nord Pool power exchange, since most utilities purchase energy through this exchange. Lithuania uses the 3-month average of future prices for next year of Nord Pool.
Latvia forecasts energy prices based on a weighted average monthly price of electricity in the forecasting period. The forecasting period starts with the month when the tariffs are expected to come into force and consists of two calendar semesters plus 1-2 months prior to those semesters if the tariffs will come into force on 2nd or 3rd month of a semester.
For forecasting the future electricity prices in Latvia for water management services, its regulatory authority (PUC) (and water utility companies) use data from the Nasdaq exchange and the Nord Pool exchange. The Finnish bidding area's future instruments are used from the Nasdaq exchange, since they have more liquidity. From the Nord Pool exchange the historical price difference between Latvian and Finnish bidding areas is used (average value from the last six months). A markup of energy supplier (according to the contracts) is also added to the calculation. The principles mentioned above are summarized in guidelines for the merchants. Gas prices are usually forecasted by using TTF Virtual Trading Point future data.

Ex-post adjustments of energy costs and incentives for efficient procurement

As mentioned in Chapter 4.2, in Romania and Lithuania efficient pass-through costs in general are reconciled. Similar to Estonia, Latvia utilizes an open-ended regulatory period, and companies can request reviews when costs deviate significantly, and past costs are not adjusted ex-post.
Hungary utilizes a 1-year regulatory period, where costs are not adjusted ex-post. When ex-post adjustments of energy costs are possible, the financial incentive for efficient procurement lowers, since utilities are guaranteed to recover costs. Therefore, regulatory authorities should continue to monitor procurement activities of water utilities and push for the implementation of best procurement practices.
Regulatory authorities may also provide a range of allowed energy prices, where past energy costs are only partially recovered, depending on how much they deviate from allowed costs, in order to financially incentivise efficient procurement. When using this approach, regulatory authorities should carefully consider the allowed price and should make sure that it is set correctly. Forecasting prices is a difficult task and may be seen as non-transparent, and could be opposed by water utilities which are not guaranteed full cost-recovery of energy costs.

5.2.4 REGULATORY AUTHORITIES CONSIDERING OVERALL ALLOWED OPEX

In Ireland, Portugal and the UK (England and Wales), energy costs are not treated specifically. The regulatory authorites group OPEX expenditure elements and analyse them as a whole.
In England and Wales, Ofwat (the water services regulator) does not provide a specific allowance for energy costs. The regulatory authority provides an allowance for normal running expenses based on econometric models and an allowance for expenditure for enhancing networks based on an assessment across companies. This allows companies to be flexible with their expenditures.
In Portugal, the regulatory authority does not analyse the energy cost spe-

cifically. The regulator considers energy costs as pass-through costs.
In Ireland, as part of the revenue control process, Uisce Éireann (Ireland's national public drinking water and wastewater services utility) submits an OPEX request for review to the regulatory authority (CRU) which is broken down into controllable and uncontrollable OPEX. Energy falls under controllable OPEX. The annual OPEX projections are provided at a high level to the regulator and 'lock-in' energy costs over the five years of the revenue control cycle. The regulator analyses the business plan, and the energy costs are benchmarked against similar UK water and wastewater companies (considering equivalence of scale).
Ex-post adjustments of total OPEX are explained in Chapter 4.2.

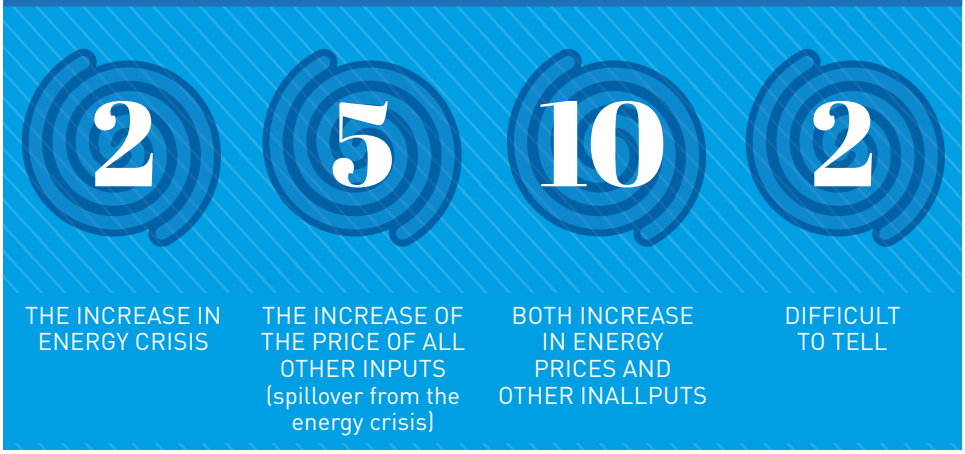
5.3 THE SOURCES OF COST PRESSURE

Even though many water utilities are (still) protected from rising energy prices, all companies experience a general inflationary pressure. In October 2022, the annual inflation of the Euro area was 10.6%, while the forecast for November 2022 (Eurostat, 2022) is 10.0%. The price increase in individual countries can be substantially higher, irrespective of Euro membership. The most recent figures for the surveyed countries are in Table 6.
The pressure from general inflation is evident by the answers of the surveyed regulators (Figure 12). In most countries, energy prices and other prices (general inflation) either appear to be equally critical or it is difficult to distinguish which one dominates. Energy prices are the main culprit in Estonia and Lithuania only, while general inflation is critical in Belgium (Brussels), Kosovo and Portugal.
Specific cost factors have been highlighted by several regulators. The increase of minimum (regulated) wage is important in Albania. In Belgium, salaries are adjusted for general inflation, placing a short-term pressure on costs. The costs of personnel, chemicals, construction activities and external services have been cited by a number authorites. Utilities with drinking water service only are more exposed to energy prices than wastewater operators that also produce biogas from sludge.
In 2023, the pressure from energy costs may become more critical if high energy prices are sustained while an increasing number of companies are exposed to market prices due to expiring long term fixed contracts or because of less government assistance in mitigating high energy prices. If energy prices decline compared to 2022, then general inflation will be a more important factor, since it takes a number of years

TABLE 6 OCTOBER 2022 INFLATION RATES IN THE SURVEYED COUNTRIES
(Trading Economics, 2022)

COUNTRY	RATE OF INFLATION
Albania	8.3%
Belgium	12.3%
Bulgaria	17.6%
England and Wales	11.1%
Estonia	22.5%
Hungary	21.1%
Ireland	9.2%
Italy	11.8%
Kosovo	12.7%
Latvia	21.8%
Lithuania	23.6%
North Macedonia	19.8%
Malta	7.4%
Moldova	34.6%
Montenegro	16.8%
Portugal	10.1%
Romania	15.3%

FIGURE 12 THE SOURCE OF THE PRESSURE ON THE INPUT COSTS OF REGULATED WATER UTILITIES



for inflation to subside. During regular tariff adjustments, water and wastewater tariffs are most commonly raised in line with general inflation, as described in Section 4.2.

5.4 REGULATORY RESPONSES

This Section of the Report provides insights into regulatory responses on the crisis, first describing the application of extraordinary reviews, how increased energy costs are being reflected in tariffs, then looking at amendments to the tariff-setting methodology, focusing on those jurisdictions which were directly impacted from the energy crisis.

5.4.1 COST PASS THROUGH TO TARIFFS

The rising energy prices in the competitive market have not yet reached all water utility companies (see Chapter 5.1). Even at affected water companies, costpass-through has not yet happened universally. As displayed in Figure 13, in over half of the surveyed countries current tariffs do not yet reflect increased energy prices, while in 2 countries subsidies play a partial role in keeping water tariffs at a muted level. Only in 5 countries have increased energy costs been passed through, but even in these countries only for those water companies that have already gone through an extraordinary review (see Section 5.4.2).

If this same survey took place sometime in 2023, the answers in category d) would decrease and a) and b) would increase.

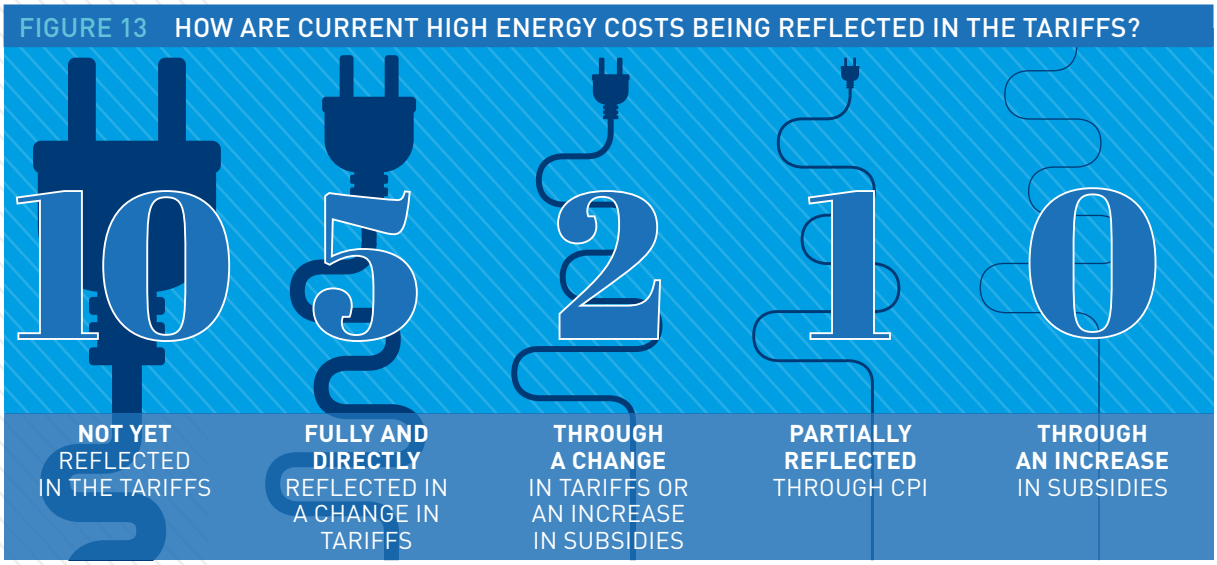
BRUGEL from Belgium (Brussels) indicates that once water utilities face higher market prices after the expiry of their long-term fixed contracts, energy cost increases will be reflected in a change of tariffs or an increase in subsidies (answer b). VMM from Belgium (Flanders) also emphasised that it is only a matter of time before energy cost increases will be passed through.

In Montenegro, higher water tariffs will take effect from January 2023.

In Portugal, in retail services where tariffs are decided by municipalities (direct management) it is very likely that many municipalities will go for increased subsidies instead of the steeper increase of water tariffs once the long term fixed contracts get to the term of their period. In bulk services, an efficient change in energy costs is likely to be fully reflected in a change in tariffs once the long term fixed contracts get to the term of their period.

In the UK annual adjustments of tariffs are based on the Consumer Prices Index including owner occupiers' housing costs (CPIH). Energy costs represent a

FIGURE 13 HOW ARE CURRENT HIGH ENERGY COSTS BEING REFLECTED IN THE TARIFFS?



substantial input into CPIH. However, since water companies typically consume more energy as a proportion of their costs than is included in CPIH, the effect of any change in costs is only partially reflected until extraordinary reviews are carried out or a new regulatory period arrives.

5.4.2 EXTRAORDINARY REVIEWS DUE TO THE ENERGY CRISIS

Only 5 of 18regulatory authorities have undergone extraordinary review(s) triggered by the increase of energy prices: Estonia, Ireland, Italy, Latvia and North Macedonia.

Estonia has developed a new fast process for utilities that request the review solely because of the rise of energy prices. About two dozen water companies have made use of this process. As a result, water and wastewater tariffs increased by approximately 10 – 25% only because of the higher electricity prices. The Estonian approach is detailed in Chapter 6.2.

In Ireland, the CRU has published a decision (CRU2022977) for an interim review of the current Revenue Control 3 (2020-2024). This follows the publication of a consultation paper: CRU202267. This review was prompted by a request from Uisce Éireann for additional OPEX for 2023 due mainly to the recent dramatic rise in the cost of fuel and electricity, as well as further issues caused by supply chain shortages and inflation. In its decision paper, the CRU granted Uisce Éireann an additional 2023 OPEX allowance of €137m (in 2017 monies) to address deficits caused by inflation and energy increases as well as granting access to €556m (in 2017 monies) of previously ring-fenced funds for diversion to its broader CAPEX budget.

In Italy, new extraordinary review measures were developed, tailored specifically to the high energy prices as detailed in Chapter 4 Reference source not found. A combination of cost pass-through and loans from the sector lending facility can be combined to cover expenditures related to energy cost increases equivalent to a maximum60% of the baseline energy costs. There is no information on the number of companies that have gone through an extraordinary review, but growing interest is expected as a large number of fixed-price energy procurement contracts will expire soon.

Latvia created a fast review procedure, later upgraded to a methodology for" self-determined" tariffs, as detailed in Chapter 6.5. As a result, reviewed tariffs increased by 25-81% (35% on average).

In Lithuania, the revised Law on Drink-

ing Water Supply and Waste Water Management allows the recalculation of water and wastewater tariffs due to a 30% increase in energy costs. Once applied, changes in electricity prices will be reflected in prices over the course of the year. Electricity bills due to higher energy cost components are expected to increase by 30-40%.

In North Macedonia, extraordinary reviews have been initiated by water companies the fixed price electricity contracts of which expired and open market prices resulted in an escalation of their energy costs. The regulatory aouthority approved new tariffs in a period of 30 days, trying to balance the goals of affordability, cost recovery and incentives for efficiency improvements.

5.4.3 CHANGES IN THE TARIFF METHODOLOGY

A number of regulatory authorities introduced changes to their water sector tariff methodology as a response to the energy crisis. WRA in Albania changed the tariff methodology starting from January of 2022 to take care of the extraordinary increase in O&M costs.

Bulgaria has not yet revised its methodology, but the establishment of a new coefficient in X to cover electricity costs is under consideration. The regulatory authority is waiting for 2022 reports on actual costs, subsidies, and other factors in order to make decisions on this measure.

In Lithuania, methodological changes were made by the regulatory authority, allowing extraordinary reviews due to changes in energy costs (Chapter 6.6.3).

ARERA in Italy introduced a new regulatory tool allowing utilities to recover energy costs in anticipation at a value of up to 60% of the previous costs, through a combination of tariff increase and loan from the sector equalization fund (**Chapter 4** Reference source not found.).

The updated tariff methodologies of Estonia and Latvia merit more explanation, as they are materially different from the practices of the other surveyed countries. As noted previously, Estonia and Latvia implemented rate-of-return regulation, however, they recently introduced fast reviews in order to deal with the direct impact of the energy crisis on water utilities. Tariffs in Estonia and Latvia are approved for an indefinite period of time under rate-of-return regulation, and stay in force until a new tariff is approved. Utilities and regulatory authorites alike may request a tariff review if there are changes to costs. The regular tariff reviews are lengthy and require a detailed analysis of investments and costs.

The Estonian regulatory authority (ECA) has three employees in the water regulation department. Overseeing 59 water utilities until 2022. Since 2022, this number was increased by at least 60 water companies, which had not been subject to ECA regulations.

In the Latvian regulatory authority (PUC), 7 employees in the water sector regulate around 63 water companies. This shows how scare regulatory resources are and adjustments to the review process are required to complete the high number of required reviews.

5.4.3.1 Estonia's fast tariff review

In Estonia, the regulatory authority (ECA) has developed a short and fast procedure to adjust only electricity prices for water companies. Although, the procedure is not a regular procedure and was established in 2022, it is seen as a temporary measure to mitigate the effects of the energy crisis for companies which risk bankruptcy.

The procedure applies to water utilities that wish to adjust the electricity component of their costs. The previous tariff decision must not be older than three years, and the effect towards the increase in tariffs must not be higher than 5%. The company must request a full tariff review if these conditions are not fulfilled.

Through the fast tariff review, new tariffs are enforced after 1 month of approval. Around 20-30 companies have utilized this methodology in 2022. There is no limit on how often companies can request fast tariff reviews.
A detailed description of the Estonian case study is laid out in Section 6.2.

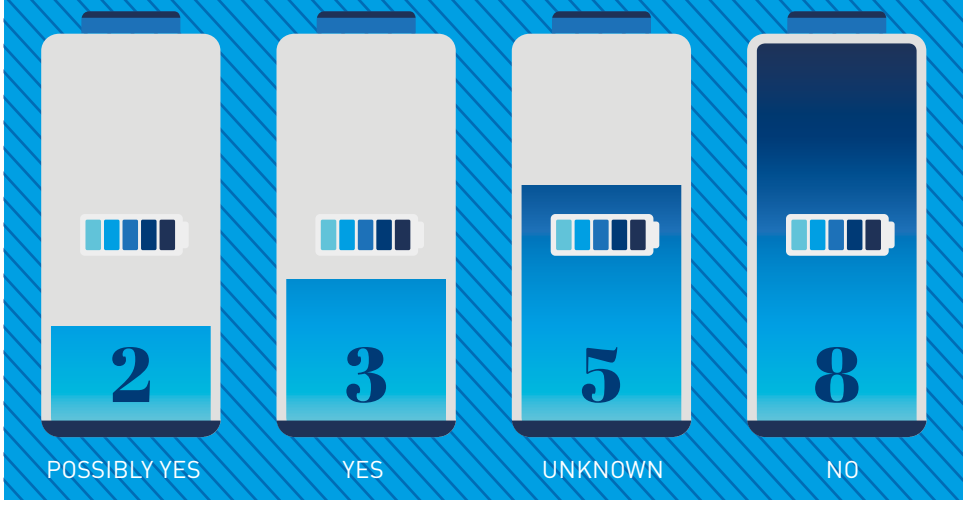
5.4.3.2 Latvia's fast tariff review

The Latvian regulatory authority (PUC) has introduced two new methodologies to mitigate the impact of energy costs on water utilities.

1. **Fast Review** – available from 1 January to 9 November 2022.
2. **Self-determined tariffs** – available since 9 November 2022.

Fast Reviews were available for companies whose tariffs were approved during the last 3 years (since 2019) and only if their non-energy costs and the volume of services have not changed by more than 10% compared to the previous full tariff review. If the latter items changed by more than 10% then the company needs to go for the full tariff review process. However, PUChas made some exceptions and allowed companies to ask for fast review even if their non-energy cost changes exceeded 10% to prevent large cash-flow problems. These companies then submitted full draft tariffs immediately after the fast review. It took 51 days for a proposed tariff to come into force, including mandatory deadlines of 20 days for consumer suggestions and 30 days after PUC publishes the decision in the official gazette.
This method was applied to 15 draft tariffs. In many cases, utilities applied for a fast review to ensure cash-flow, and then applied for a full tariff review. The fast review could be used several times by companies, as was the case with one company which opted to use the methodology twice.
Self-Determined Tariffs had the same criteria as the fast review methodology. The self-determined tariffs offered a faster way for new tariffs to take effect, as they would come into force within 30 days latest.
The regulatory authority prepared and shared uniform forms with utilities to calculate the self-determined tariffs. The water company makes the calculations, submits them to PUC and at the same time publishes the new tariffs in the official gazette, 30 days after which the tariffs come into force. PUC

FIGURE 14 HAS THE RECENT INCREASE OF ENERGY PRICES LED UTILITIES HOTIES OR THE REGULATOR TO TEMPORARILY FOREGO CAPEX INVESTMENTS IN THE SECTOR?



has 21 days to review the tariff proposal through a streamlined internal procedure. If the tariff is rejected, PUC has 7 days to publish the negative decision. In addition to changes in electricity costs, there is also a possibility to revise the costs of drinking water purchase and wastewater drainage from/to another water utility company if the corresponding service fees have changed. A detailed description of the Latvian case can be found in Section 6.5.

5.5 THE IMPACT ON CAPITAL EXPENDITURES (CAPEX)

The financial balance of water utilities is easily upset by increasing energy costs that are not yet reflected in tariffs. They can address this problem through access liquidity (loans), subsidy from the government or municipality, or reducing other expenditures. The temporary reduction of CAPEX – for reconstruction or new investments – is an expedient short-term solution as it does not usually threaten service continuity or quality, as long as the missing CAPEX is replenished later.

The answers from WAREG membersprovide a better understanding of whether utilities forego CAPEX investments because of the increase in energy prices. Only 3 of the 18 regulators answered yes, and 2 said "possibly yes". 7 regulators do not see evidence of reduced CAPEX expenditures.

This is either because the water utilities in their countries have not yet been affected adversely by rising energy prices, investments and renewal of assets is a municipal responsibility or extraordinary adjustments have already happened ensuring that a financial deficit is avoided. Those companies that do cut back on investments prioritize their projects and delay those investments that are less critical for short-term operations.

Photo American Public Power Association @unsplash.com

HOLYOKE, UNITED STATES

6 DETAILED CASE STUDIES

ZAPORIZHIA OBLAST, UKRAINE

Photo Rodion Kutsaiev (unsplash.com)

This Section of the report provides insights into the regulatory frameworks of regulatory authorities in selected countries and the way they dealt with the energy crisis.
While there are a number of notable examples, the report focuses on those cases which were directly exposed to the crisis to use them as reference points for potential policy considerations by other regulatory authorities.

6.1 BELGIUM, BRUSSELS

brugel
LE REGULATEUR BRUXELLOIS POUR L'ENERGIE
DE BRUSSELSE REGULATOR VOOR ENERGIE

6.1.1 TARIFF FRAMEWORK

BRUGEL is the authority responsible for the economic regulation of the water and wastewater services in the Brussels region. It is the sole responsible body for the assessment of the allowed revenues and approval of the tariffs, through a cost-plus methodology which nets out any subsidies provided to the utilities. The tariffs are set for a 5-year regulatory period. However, they can be reviewed after three years if the non-controllable costs exceed the forecasted allowed budget by 5%.
In addition to this, the tariff methodology allows for the occurrence of 'extraordinary' tariff reviews. These can be triggered through the occurrence of an event which materially impacts the costs of the utility – such as the energy crisis – and after which the utility is required to submit an application for an extraordinary proposal for tariffs. In such events, BRUGEL is required to approve or refuse the tariffs' extraordinary proposal within a period of two months.

6.1.2 ENERGY COST ADJUSTMENT UNDER THE TARIFF FRAMEWORK

The general principle is that energy costs are recovered through a reconciliation between forecast and actual costs through an incentive mechanism granted under total controllable costs (referred to as the 'tunnel' approach and described in more detail below). The unit costs of energy are dependent on each utility and are set based on actual historical costs of energy. Energy is procured following the advice of a consultant engaged jointly by the water utilities, the consultant provides recommendations on best practices for energy procurement.
The reconciliation of the energy costs is provided under a 'tunnel' approach applied by BRUGEL. The costs of the water operators are separated into three categories: (i) controllable costs with an efficiency factor; (ii) controllable costs without an efficiency factor; and (iii) non-controllable costs. There is an incentive mechanism for the first two components of costs. Energy is consid-

ered to be part of the controllable costs without an efficiency factor. There is a reconciliation between forecast and actual costs and, as long as this difference is within 5%, then the benefit or cost is shared 50-50 between the operator and the consumer. However, all costs which go beyond the 5% threshold are borne 100% by the consumer through a 'regulative fund' which accounts for such differences in order to increase or decrease tariff impacts for future tariff adjustments. This fund acts as a buffer between actual and future tariffs in order to avoid price spikes.

The width of the tunnel was inspired by the one used in electricity and gas methodologies. The width of the tunnel, however, is not the same for the drinking water operator and for the water treatment company. This is also partly set through a negotiation between the water service companies and the regulator.

The energy adjustment is within the whole basket of adjustments related to controllable costs.

6.1.3 DEALING WITH THE ENERGY CRISIS

The operators in Brussels signed their supply contracts in December of 2019 and are being supplied at these prices with guaranteed supply until the end of 2023. The current energy crisis does not, therefore, impact the operators in Brussels. The focus now is to define strategies for addressing energy costs from 2024 onwards. In the meantime, while the utilities are temporarily shielded from the energy crisis, there is an indirect impact related to the increase in other costs, which is placing pressure on water utilities. Specifically, the increase in salaries is one such factor as Belgium automatically increases salaries to inflation and this implies an increase in the costs of the water utilities. In addition, the increase in the cost of materials had an impact on the investment plans.

The share of renewable energy in the total energy used for the companies is 99% for wastewater companies. This ratio is normally 100% because the supply contracts are 'green' contracts, however, in some instances, there is some fuel used by the companies. In addition, 37% of the electricity is produced on-site based on sludge-based biogas plants. The production of heating together with electricity (co-generation) and solar-based production is promoted in Brussels because Renewable Energy Sources (RES) producers receive green certificates for the energy that is generated by such installations, returning the investments within a period of ~7 years for solar panels. Regulated utilities are therefore installing panels to benefit from this policy support.

6.2 BULGARIA:

Energy and Water Regulatory Commission

6.2.1 TARIFF FRAMEWORK

The Energy and Water Regulatory Commission of Bulgaria (EWRC) is a multisector regulator that has responsibilities in regulating electricity, district heating, natural gas and water and sanitation (WS) services. Responsibilities in WS sector include regulation of the quality and tariffs of WS services, setting targets for Key Performance Indicators (KPIs), approval of business plans and tariffs, annual control of their

implementation, review of customer complaints, approval of common terms for service provision and others.

For the water utility sector price-cap regulation is applied and tariffs are set at a level which fully recovers reasonable costs, including depreciation costs of corporate and public WS assets. The regulatory period lasts for 5 years. The regulator approves with one decision the 5-year business plan and the tariffs for each year, and then updates approved tariffs with CPI-X. A number of factors are considered during annual tariff updates, where X includes efficiency coefficient and also reflects implementation of approved investments and achieved levels of some of the regulated KPIs.

Approved tariffs can be reviewed in case of an extraordinary event that has significantly changed the costs or revenues of the WS operators. A threshold level is introduced – the effect should be more than 2% in order to review the approved tariffs, or 10% to review the approved business plan.

Approved WS tariffs should not exceed the level of social affordability, where the tariff paid for the consumption of 2.8 m3 of drinking water should not exceed 2.5% of the average monthly income for the region.

6.2.2 ENERGY COST IN THE TARIFF FRAMEWORK

A significant share of electricity in Bulgaria is purchased on the spot "day ahead" market, and WS operators are supplied by traders that purchase energy mostly from this spot market. WS Holding (state-owned holding that took ownership of most of the state-owned operators) established a daughter-company that received in 2022 a license for electricity trading, and it is expected that it may supply electricity to state-owned WSOs by long-term fixed contracts.

The regulator provides incentives for energy efficiency improvements through allowed electricity consumption. Regulated companies are assigned to 4 groups based on size (large, medium, small and micro). There are around 45 operators in the WS sector, including regional state-owned companies, smaller municipal and private companies, as well as PPP in the capital of Bulgaria – Sofia city. KPIs for energy efficiency in water supply and wastewater treatment are applied (kWh per m3 water abstracted and wastewater treated), as well as KPIs for Non-revenue water (m3 per km of network per day, as well as %), affecting electricity consumption planning. The regulatory framework allows companies to include costs for new assets that will be passed for operation during the regulatory period (including costs for electricity), and the actual costs for these assets are considered during the annual update of the approved tariffs.

6.2.3 DEALING WITH THE ENERGY CRISIS

The rising costs of energy took place during the second half of 2021, while WS operators were preparing their 5-year business plans for 2022-2026. Thus, as energy prices were dramatically increasing on daily basis, the reported costs for the 2020 base year could not be used as basis for planning. Therefore, EWRC instructed WS operators to use 6-month period from 2021 spot "day ahead" market in order to calculate average price, to be used for unit cost in the business plan. All of the operators that did not have issues with social affordability used 2nd half of 2021 average price (around 309 BGN/MWh or 158 EUR/MWh).

The price-cap tariff regulation requires that costs in the business plan are planned without inflation, as inflation is used for annual tariff updates. Thus, by setting targets for optimization of non-revenue water and energy efficiency, energy costs in the business plan tend to decrease over the years.

In 2022 different subsidies were provid-

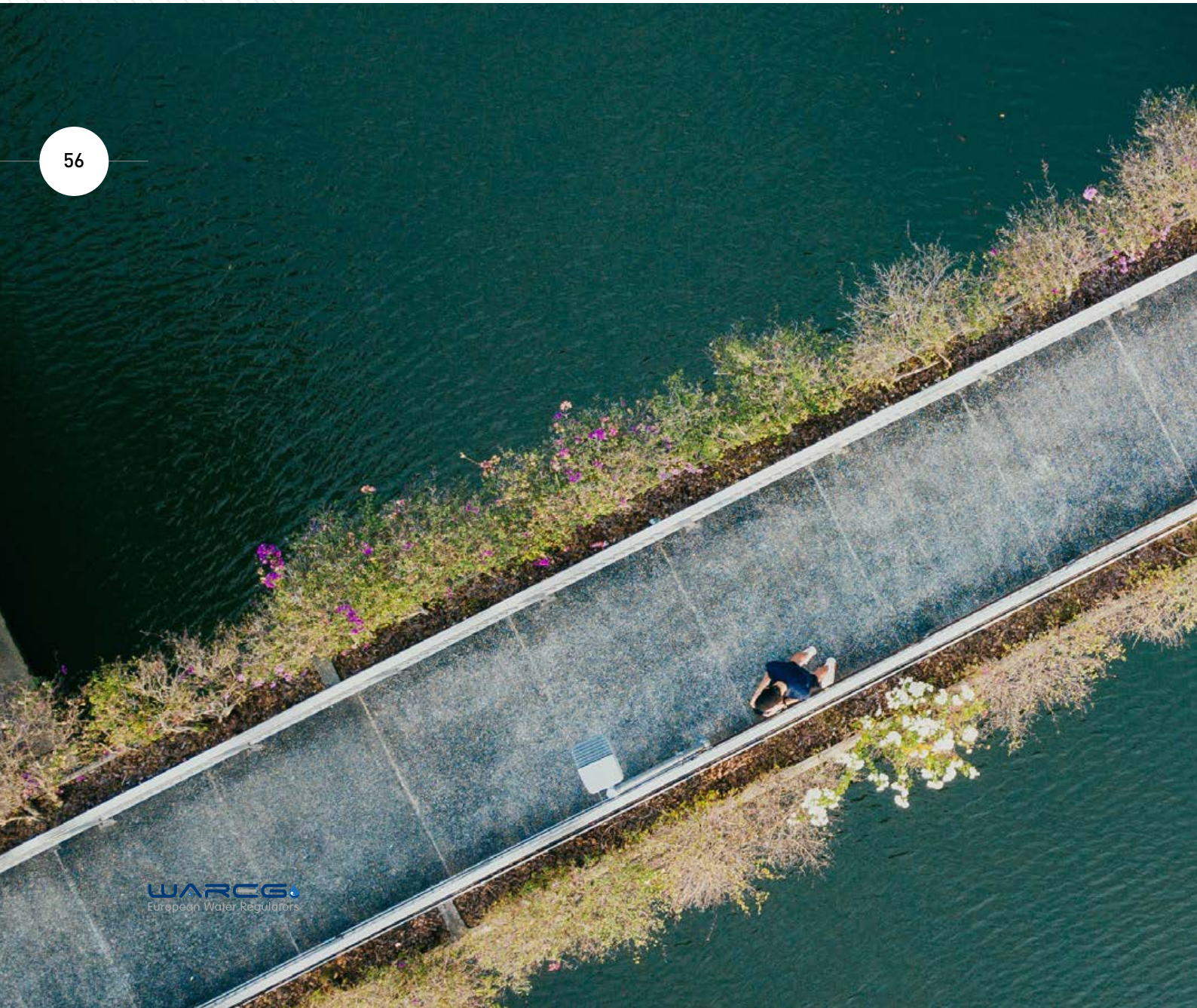
ed from the state to non-domestic energy consumers and particularly to WS operators.

Subsidies were provided to all non-domestic energy consumers (supplied with electricity from the energy exchange by licensed traders) covering some of the costs. For example, during the second half of 2022, average costs above 250 BGN/MWh (around 128 EUR per MWh) were compensated.

Additionally, in 2022 the Government approved special program for WS operators that compensated their energy costs for 2021 and the first half of 2022, taking into consideration the costs in the tariffs applied and the actual costs (after non-domestic consumers compensations).

6.3 ESTONIA

The Estonian Competition Authority (ECA) is the office responsible for the



economic regulation of water utilities in Estonia, it has full competence over tariffs and rate-of-return regulation is applied. Costs are fully recovered by tariffs. Approved tariffs are valid for an indefinite period of time, that is, until new tariffs are approved upon the water company's application. During tariff review, changes in eligible costs are fully and directly reflected in tariffs.

During tariff review, justified energy costs are determined by estimating energy (electricity) consumption and the purchase price which may be based on a fixed price contract or market prices depending on how electricity is procured by the water company. Thus different allowed prices prevail for each regulated entity. Energy costs are then calculated by multiplying the amount of energy (MWh) and the price (€/MWh).

In the case of fixed-price contracts, the water utility must prove that it secured the most favourable price from energy suppliers offered at that time. This can be done by proving that the utility followed best procurement practices. Three competitive offers from electricity suppliers or a public procurement process is required by the regulator. During the current energy market turmoil, a fixed price contract is already acceptable if the electricity price is reasonable compared to the exchange-based price (e.g. when the contracted price is noticeably lower than the average market price of the previous three months). The contracted price is then

WATER CHANNEL

used for cost calculation. In the case of market price, ECA usually takes into account the average Nord Pool price of the last 12 months prior to the tariff review. Then, a sales margin according to the contract, is added to the estimated average energy market price.

The energy crisis has triggered a number of adjustments both for the water companies and the regulator:

- A shift has taken place from fixed-price contracts to spot market purchases, because it has become difficult to engage in fixed-price contracts under favourable conditions.
- Currently, when energy prices are extremely volatile, ECA considers the average energy price of a shorter period of 1-3 months (sometimes up to six months) instead of the usual 12 months. This shorter time frame ensures that energy prices used for tariff calculations do not deviate substantially from current market prices.
- ECA has worked out a short and fast process for water tariff review for those water companies that wish to change their tariffs only because of the rise of electricity prices. This methodology is available for those water utilities 1) whose tariffs have been approved by ECA not more than three years ago and 2) other costs or indicators influence the tariffs by less than 5% or 3) no other significant changes have taken place (like consolidation with other companies, major changes in operational areas or clients). Under this methodology, only the electricity cost component is changed (no other cost elements). New prices become effective 30 days after publishing new tariffs by water utility after ECA approval. This option is available only for a temporary period specifically because of the energy crisis. As of 5 December 2022, about 45% of the 2022 reviews were "short and fast", and the other half were regular reviews. However, the relatively high proportion of regular reviews is due to the fact that a large number of water companies were transferred from municipal oversight to regulation by ECA (entered into force on the 1st of January 2022), and for them, only the regular review was available. Aside from these companies, the majority of water utilities (that were under ECA regulation previously) opted for the fast review process.
- In 2022 the Government of Estonia launched temporary policies to ensure preferential, lower energy costs for specific user categories, including households and small (or micro) companies. Some water utilities fall into the latter category. For these energy users, a universal energy service and price is available. The electricity producer (Enefit Power) is obliged to supply energy with a regulated price which covers production costs and justified profit. Energy companies (distributors) can add sales margins freely. The end universal service price is significantly below the market price. When a water utility takes advantage of these lower prices, it has to reflect the lower prices in its tariffs (i.e. it has to go for a tariff review, and it may choose between the regular review or the fast review).

The suitability of the fast review procedure is confirmed by the fact that already about 30 water companies have made use of it. As a result, water and wastewater tariffs increased by approximately 5 – 37% only because of the higher electricity prices. One potential challenge would be if energy prices suddenly dropped then water tariffs could contain excessive amounts of energy costs until the next review. Since Estonia does not have multi-year tariff periods, in theory, water tariffs could stay indefinitely. However, ECA has the legal capacity to initiate tariff reviews. This could be the solution for a large

decrease in energy costs. One can also imagine that even if energy prices decline, the average cost will continue to rise or stay at current high levels due to general inflation, rendering a tariff review unnecessary.
While ECA does not impose specific energy efficiency factors on regulated water companies, energy efficiency indicators (kWh/m^3 of service) cannot deteriorate unless there is a reasonable explanation for it.

6.4 IRELAND

6.4.1 TARIFF FRAMEWORK

The Commission for Regulation of Utilities (CRU) is the authority responsible for setting public water and wastewater service tariffs for the Republic of Ireland. It is responsible for both assessing the revenues required to recover reasonable costs as well as approving the final tariffs for non-domestic customers only. There are no direct water tariffs for domestic customers. The utility's allowed revenue is regulated through a multi-year revenue control, capping allowed revenues across a five-year regulatory period which limits operational and capital expenditures over the duration of the regulatory period.
Presently, tariffs are applied to non-domestic customers only. The costs of water services allocated to domestic customers are fully recovered from government subsidies and funded through central taxation. Subject to enactment of the legislative instrument, the CRU will put in place a regulation which will charge domestic customers for excessive use of more than 213,000 litres of water per year. This 'cap' is set at 1.7 times the average annual domestic usage in the country (125,000 litres). The CRU expects that this measure will encourage households to conserve water use and identify and fix leaks in their water supply.
A new harmonized national framework for non-domestic tariffs was introduced in October 2021. The non-domestic tariffs remain fixed for a 3-year transition period to allow a number of customers to transition to their new tariffs over time. However, when this transition period is completed the CRU will consider setting non-domestic tariffs on an annual basis during the next revenue control period. Inflation, proxied to a forecast of the Harmonized Index of Consumer Prices (HICP), is included in the tariffs ex-ante.

6.4.2 ENERGY COST IN THE TARIFF FRAMEWORK

During the periodic reviews, Uisce Éireann (formally Irish Water) submits its forecast operational and maintenance costs for the regulator to evaluate. These are broken down into controllable and non-controllable costs. Energy is categorized as a controllable cost and is projected for a five-year period. These costs are not typically updated year to year to reconcile differences between forecast and actual costs.
The CRU does not necessarily engage in the detailed energy cost procurement practices of the water utility. Instead, energy costs are included in the business plan submissions as part of the controllable operational and maintenance costs. These are then discussed in a series of workshops and Q&A sessions before being bench-

marked against comparable UK water and wastewater companies (taking into account comparability and equivalence of scale). The total operational and maintenance costs are then exposed to an efficiency factor. This is not necessarily related to energy but to the overall costs and the utility may then choose to make some of its savings in energy costs.

The long-term regulatory period provides an incentive to the companies to hedge their energy costs through long-term fixed contracts with energy suppliers. It is the case of Uisce Éireann, the water service utility, which covers most of its energy demand with a long-term contract, however ,it is still somewhat exposed to the spot price.

6.4.3 DEALING WITH THE ENERGY CRISIS

As noted above, the energy costs are fixed for the duration of the regulatory period as part of the controllable operational and maintenance costs. However, the revenue control can allow for an extraordinary adjustment and ad-hoc interventions can take place due to the occurrence of a significant unforeseen event. Indeed, the CRU has recently published a decision paper (CRU2022977) regarding the granting of additional revenues for OPEX and CAPEX (across 2023 and 2024) in light of recent energy inflation and supply chain issues. This decision was followed by a stakeholder consultation (CRU202267) and extensive engagement with Uisce Éireann to understand its rising costs in detail.

6.5 ITALY

6.5.1 GOVERNANCE

The water sector in Italy is governed through a multi-level governance framework, reaching from national to the regional and local levels of governance. Economic regulation is applied at

a national level to all aqueduct, sewerage and wastewater treatment services (which will be commonly referred to as water services) by the Italian Regulatory Authority for Energy, Networks and Environment (ARERA).

The competencies of ARERA with regard to the economic regulation of water services extend to defining the cost components, including the financial cost of investments, which are used to calculate the tariffs, defining the tariff methodology and approving the final tariffs. For the latter, there is close coordination between the national and local authorities where the Local Regulatory Authority (EGA) approves the tariffs based on the ARERA methodology, which the latter then checks and undertakes a final approval which may include a modification of the previous EGA proposal.

6.5.2 TARIFF FRAMEWORK

The tariff-setting principles are guided by a set of objectives which seek to ensure an efficient level of full cost recovery while maintaining a water services supply level of certain quality at an equitable non-discriminatory tariff. The framework is based on price-cap and revenue-cap principles, but it gives options to the Local Authorities depending on the level of maturity of the operators providing the water services (in terms of planned and actual infra-

[23] CSEA is similar to a financing institution dedicated to Energy and Environment sectors in Italy, and it manages the equalization components through dedicated funds.

structure investments and cost levels). The tariff methodology balances contractual and technical quality regulation against the affordability of the tariffs applicable to end-users. At the national level, affordability is ensured in different ways; the most stringent one is the social "bonus" that guarantees the free provision of at least 50 litres per person per day for vulnerable consumers, and it is financed through an equalization component. The equalization component is collected by CSEA[23] and is re-distributed to water service utilities according to the number of served vulnerable customers. Other equalization components regard technical and contractual quality, extraordinary adverse events such as earthquakes, the fund for guaranteeing investments and the fund for innovation stimulus purposes. The regulatory period is set for four years, however, there is an update every two years to cover regulatory lag in data. These adjustments also include inflation components and a reconciliation for the differences between forecast and actual pass-through costs. During such adjustments, energy costs are only addressed through an efficiency basis and if such costs are lower than 110% of the average cost.
Economic regulation in Italy is very closely linked to quality regulation. On one side, ARERA strives to incentivize efficient outcomes from the operators, but they are attentive to ensure that the quality of service is retained.

6.5.3 ENERGY

Italy applies a cap on the energy cost components, which is limited to the average energy cost in the sector and an additional 10%. This cap is applied to all regulated utilities and is applicable only to the price and not to the quantity of energy units utilized. Notwithstanding the cap, if the company's actual costs are lower than the cap, then these actual costs are covered by the ARERA tariff methodology. The three years ago update of the methodology introduced an incentive for water utilities to save on their energy consumption. For instance, if they are able to save a certain part of their energy cost, then they get an additional allowance on the tariffs. This is done by comparing the volume of energy used to the volumes used in the two years before. The 'sharing' mechanism added to the tariff methodology enables that the total cap of energy used can be, de facto, increased by the savings as an incentive to the water utility. However, only 25% of the saving can be added to the cap, implying that the remainder of the savings benefit the consumers. ARERA notes that the cap on energy prices proved to be very powerful as a stimulus to reduce costs. In the beginning, there was hesitation, especially from small and medium-sized operators, who noted they were unable, due to thei r size, to obtain prices which fit under the cap. However, they then formed some auction pools to organize a common auction for energy in order to reduce the costs and were able to obtain much lower prices. This improvement is related to the unit-price component of the energy cost.
Since the 'saving' incentive was introduced starting from the year 2020, ARERA observed that water utilities are making efforts to reduce the volume of energy. Data is not yet completely assessed, due to the discontinuity of energy consumption in the year 2020 for the COVID-19 pandemic. However, the best operators are taking measures, for instance, integrating biogas or renewable energy self-production in their facilities, but also improving efficiency in the production process. ARERA carefully monitors the use of energy, however, in order not to provide too strong of an incentive which would lead to a deterioration in the quality or reliability of service.
Efficient use of energy is indirectly incentivized through a sludge treatment provision. The technical quality regulation includes an indicator which reflects sludge treatment. According to this in-

dicator, ARERA provides an award or a penalty to the utilities according to the volume of sludge disposed on the landfill. Biogas is one way of using sludge, this provides an 'indirect' incentive to reduce energy use by replacing it with biogas production from sludge. In addition, the energy produced from solar plants is incentivized as the capital expenditure for the investment is recovered through the tariffs and it also helps the utilities not to reach the energy cap. ARERA incentivizes such efficiency savings from non-core activities for the utilities by allowing them to retain 50% of the savings or up to 75% for savings incurred by engaging in activities related to energy efficiency, plastic use reduction, energy and raw material recovery or wastewater use.

6.5.4 CURRENT ENERGY SUPPLY SITUATION

There are a number of large operators who are currently being supplied at fixed prices agreed before the crisis and are not yet affected by the energy price spike. However, newer contracts which are signed by the operators have generally a variable component which reflect the volatility. Therefore, for the majority of the utilities, the energy component will have to be re-set from the forthcoming year and this is expected to be reflected as an energy cost increase for such utilities. For this reason, the change in costs is not yet reflected in many large utilities.

A recent regulatory tool introduced by ARERA allows utilities to recover energy costs in anticipation at a value of up to 60% of the previous costs. Of this, up to 25% (percentage points) can be recovered from the tariffs, whereas the difference of 35% (percentage points) can be recovered through an anticipation funded through an equalization fund. These costs are recovered 'in anticipation', as this year's increase normally reflects in tariffs two year after, in order to address potential financial liquidity problems for the water utilities. Tariffs can increase for a maximum of 8.5% in order to address affordability and sustainable development of the crisis. It is too early to say if this 'cap' will need to be reviewed in light of the current energy crisis and the additional increase in costs caused by recent inflationary pressures.

6.6 LATVIA

PUBLIC UTILITIES COMMISSION

6.6.1 STANDARD REGULATION

The Public Utilities Commission (PUC) of Latvia regulates and determines tariffs for public water management services provided by companies if the volume exceeds 100,000 cubic meters per year in at least one type of public water management service (water abstraction, water supply, wastewater collection, wastewater treatment). Smaller companies and local government institutions are supervised by the local governments, and the local government council determines fees for their water management services. At the moment 61 water utility companies are regulated by PUC and for these companies it has full authority over tariff decisions.

Water companies can choose between cost-plus and rate-of-return regulations. Under the cost-plus methodology the company is entitled to a maximum profitability of 7% of the total costs of the water utility services.

Under rate-of-return, a return on invested capital is ensured based on Regulatory Asset Base (RAB) and Weighted Average Cost of Capital (WACC). WACC is set by PUC every year till September 1st (the WACC set for the year 2023 is 5.11% for micro and small enterprises and 3.36% for medium and large enterprises). Rate-of-return regulation is currently used by only one company, the service provider for the capital city of Riga. This is a big company, as it supplies over 50% of all drinking water in Latvia. All regulated companies in Latvia are owned by municipalities, private capital and private operation are absent.

Full cost recovery is ensured by the regulated tariffs, and this applies to both residential and commercial customers. During the calculation of tariffs, justified expected or planned changes in costs and amounts of service are also to be considered. Tariffs are approved for an indefinite period of time, and stay in force until a new tariff is approved. This is similar to the open-ended regulatory regime of Estonia. The usual tariff review process is described in Figure 15.

To supervise the level of tariffs, PUC checks the annual reports of the regulated companies every year, inspecting costs and revenues, the amount of the provided services and the characterization of water supply and sewerage systems. According to the Methodology for Calculating Tariffs for Water Management Services, water utility companies ("merchants" in Figure 15) are obliged to submit draft tariffs or an explanation of the reasons for changes if either the annual volume of services, or the cost level changes by more than 10% compared to the calculation of the effective tariff. Irregularities discovered during an inspection of annual reports may lead to consultations with the water utility company, and possibly to a tariff review. Other than this, the companies themselves can initiate a tariff review at any time.

6.6.2 RESPONSE TO THE ENERGY CRISIS

6.6.2.1 Government support

The Government of Latvia introduced measures to mitigate the cost of energy for households as well as for enterprises. Households receive various assistance, including electricity price concessions, gas price concessions, concessions for district heating, and support for the purchase of fuel (electricity, wood pellets, wood briquettes and firewood) for local heating. Additonally, mandatory procurement and capacity components are excluded from households' electricity bills.

For enterprises, including all water utility companies, electricity costs are

FIGURE 15 THE ORDINARY TARIFF REVIEW PROCESS APPLICABLE IN LATVIA

Source: Public Utilities Commission, Latvia (2022)

restrained through three measures:

- Electricity distribution fee concessions (from October 1st, 2022, till April 30th, 2023);
- Mandatory procurement and capacity components are excluded from electricity bills (from September 1st, 2022);
- Electricity price concessions – the state covers 50% of the difference between the actual price and 160 EUR/MWh (from October 1st, 2022, till March 31st, 2023).

6.6.2.2 Fast review

For Latvian water utility companies, the cost of electricity in operating costs was about 13% in 2021, this ratio increased to the range of 20-50% in 2022. The rise of energy prices requires the increase of water utility tariffs by 25-81%, on average 35% according to PUC. This adjustment entails a large number of tariff reviews. While in an average year, 8-10 water service tariff reviews take place, in 2022, this number multiplied, reaching 53 by the end of November.

The increased number of tariff reviews goes with substantial transaction costs: for the regulator as well as the water companies. To mitigate this burden and speed up the process, PUC introduced the possibility of fast reviews. This option under the methodology was available between 1 January 2022, and 9 November 2022.

The assumption behind fast reviews is that the single biggest cost pressure comes from increasing energy prices. This measure was available for companies the tariffs of which have been approved during the last 3 years (since 2019) and only if their non-energy costs and the volume of services have not changed by more than 10% compared to the previous full tariff review. If the latter items change by more than 10%, then the company needs to go for the full tariff review process. However, PUC made some exceptions and allowed companies to ask for fast review even if their non-energy cost changes exceeded 10% to prevent large cash flow problems. These companies then submitted full draft tariffs immediately after the fast review.

While this method was available, it was applied to 15 draft tariffs. Besides its simplicity, an important advantage is its speed: usually it took 51 days for a proposed tariff to come into force, including mandatory deadlines of 20 days for consumer's suggestions and 30 days after PUC publishes the decision in Latvijas Vestnesis. Some water companies chose to go for the fast review to ensure positive cash flow quickly, and soon or immediately afterwards, they also submitted full draft tariffs and other companies adjusted energy costs after their full tariff review was done at the end of year 2021 or in the first half of 2022 . One company used this option 2 times along with the quick changes in electricity costs.

Frequent tariff updates would be made difficult by the need to read water meters, as many meters are mechanical that require manual reading. Latvia also has mechanical water meters with additional equipment for remote reading and ultrasonic and electromagnetic water meters that are read remotely, but mostly with the drive-by method because of natural and human-made obstacles that interfere with signal transmission. Prior to the change of tariffs, water utilities warn the customers and readings are made manually or remotely.

Considering the support provided by the state to mitigate the impact of energy price increases (Section 6.5.2.1) PUC simultaneously approves two tariffs: an interim tariff for the period of state support (till 30 April 2023) and tariffs for an indefinite period of time after the state support end date (starting with 1 May 2023).

6.6.2.1 Self-determined tariffs

In accordance with the amendments to the tariff methodology, which have been in force since 9 November 2022,

PUC introduced a new method (in addition to the full tariff review process) under which water companies determine their own tariffs ("Self-determined tariffs"). This method shows similarities to the Fast review process described in Section 6.5.2.2, but it is even quicker and relies more on the calculations of the water company. Below only the deviations from the Fast review are described.

The regulatory authority has prepared and shared uniform forms to calculate the self-determined tariffs. The water company makes the calculations, submits them to PUC and at the same time publishes the new tariffs in Latvijas Vestnesis, 30 days after which the tariffs come into force. PUC has 21 days to review the tariff proposal and it applies a streamlined internal procedure for this. In case the tariff is rejected, PUC has 7 days to publish the negative decision. The process is illustrated in Figure 16.

In addition to changes in electricity costs, there is also a possibility to revise the costs of drinking water purchase and wastewater drainage from/to another water utility company if the corresponding service fees have changed.

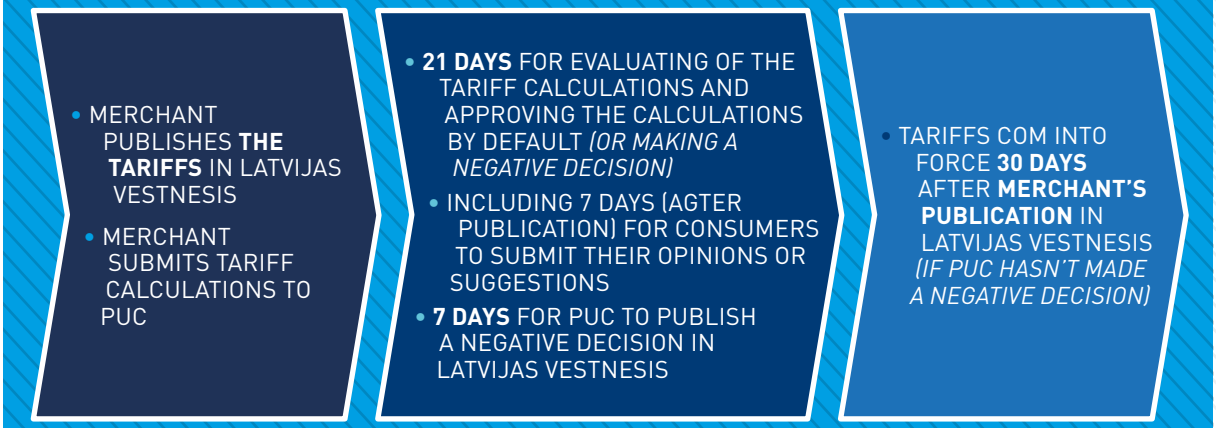
Given the high volatility of energy markets, the new method also includes stipulations for lower energy prices. Water companies are obliged to set tariffs by changing only the electricity price (based on the calculations of tariffs previously approved by PUC) if the actual price of electricity has been lower than the price of electricity in the applicable tariffs for two months and if the forecasted change in the price of electricity results in a reduction of tariffs by more than 10%. The volatility of energy markets therefore translates to a (somewhat muted) volatility of water utility service tariffs.

Most water utility service providers in Latvia buy electricity in the Nord Pool exchange. These days it is difficult to predict electricity prices for a longer period (during 2022, the price of electricity moved between about 130 and 560 EUR/MWh, compared to the fixed prices of 40-80 EUR/MWh in previous years). Therefore the regulator made guidelines for electricity price prognosis to ensure a unified approach, which is of utmost importance in the case of self-determined tariffs.

6.6.2.4 Unexpected expenditure/income

During the energy crisis, many water utility companies incurred unexpected energy costs that were not part of the last tariff calculation. A similar situation could also occur in the future. At the same time, following the tariff reviews in a high energy price environment, water companies may also

FIGURE 16 SELF-DETERMINED TARIFF REVIEW PROCESS APPLIED IN LATVIA



Source: Public Utilities Commission, Latvia (2022)

realise unexpected revenues due to decreasing energy prices. The newly adopted amendments in the methodology provide rules to handle unplanned losses and revenues:

- Water companies have the right to include unexpected costs in the tariff calculation related to the changes in the price of energy between the tariff review periods (if the difference between the forecast and actual unit cost of purchasing the energy (electricity, fuel, gas, and heating services) is negative);
- They are also obliged to include unexpected revenues (if the difference between the forecast and actual unit cost of purchasing the energy is positive);
- Unexpected costs and revenues are included from the previous period not longer than 2 years (starting with January 1st, 2022); and,
- The unexpected costs/revenues of the previous period shall be recovered/compensated over a period that is no longer than two years.

6.7 LITHUANIA

6.7.1 TARIFF FRAMEWORK

In Lithuania, the National Energy Regulatory Council (NERC) is a multisector regulator that has responsibilities in regulating electricity, renewables, district heating, natural gas, centrally supplied liquefied petroleum gas, alternative fuels, water supply and wastewater management, transportation sectors, and the waste management sector. NERC also performs technical regulatory functions alongside economic market regulation. Until November 2022, NERC was the body assessing water and wastewater tariffs which were then approved by municipalities. However, a new regulatory proposal recently granted the full power of tariff setting to NERC. The revised Law on Drinking Water Supply and Wastewater Management is in force since 16 November 2022. It is established in the mentioned law that the regulator would be the body assessing and approving the tariffs.

For the water utility sector, cost-plus regulation is applied and tariffs are set at a level which fully recovers reasonable costs. The regulatory period lasts for five years and annual adjustments are made. As a default, the Consumer Price Index is used for tariff adjustment. However, adjustments in energy costs for differences between the forecast and the actual unit cost of purchasing the energy are also possible. The review period is two months. So far, extraordinary reviews were not allowed, but a recently adopted regulation will enable them.

6.7.2 ENERGY COST IN THE TARIFF FRAMEWORK

The majority of water companies purchase electricity in the Nord Pool market, a lower number of companies have fixed contracts. For the latter, the contracted price is used for tariff setting. For the companies that buy electricity from the market, the average Nord Pool price of the last three months is used in the tariff formula. Deviations between forecast and realised energy prices are passed through to tariffs during the annual adjustment.

The regulatory authority provides incentives for energy efficiency im-

provements. Regulated companies are assigned to 5 groups based on size. There are 70 operators in the water and wastewater sector (WAREG, 2021), thus, about 13-15 companies are in each group. There are 4 indicators that measure the energy efficiency of water production, water distribution, wastewater collection and wastewater treatment. The average values are calculated within each group and for each indicator. If the energy efficiency of a company is worse than the average value, then the corresponding difference in energy use (the inefficient part) cannot be used for the calculation of eligible costs. Energy efficiency improvements have been observed as a result of this rule.

6.7.3 DEALING WITH THE ENERGY CRISIS

The 2022 rise in energy prices equals 30-40%of the water and wastewater tariffs in Lithuania. This puts a lot of pressure on service providers, some of whom have started to delay already planned investments. In response to the energy market turmoil, a new law has been passed that allows extraordinary reviews when the purchase price of energy changes by more than 30% compared to the price used for the calculation of currently effective water and sewage tariffs. This law is yet to enter into force. Operators can request an extraordinary review each time when energy prices increase/decrease on this scale – if it happens multiple times in a year, then multiple reviews can be initiated. If the increase in energy prices stays below 30%, then energy cost changes will be passed through to tariffs as part of the next annual adjustment. The adjustment includes the increased energy costs of the year that were not part of an extraordinary review (past costs) and also the energy price expectations for next year (future costs). Lithuania also introduced measures to protect household customers from the increase in energy prices.

While these measures fall outside the water sector, they are briefly summarised as they illustrate an approach that can serve as a source of ideas for water sector regulators. Two schemes were introduced.

1st support scheme in 2021:

Energy prices started their ascent already in the second half of 2021. As a result, specific acts were amended to limit the increase of the regulated household electricity and gas price caps. If these caps increased by more than 40% due to the rise of wholesale prices of energy, then NERC has the right to spread the increase in wholesale prices over a 5-year period, instead of passing through all of it instantly. For the postponed income of energy utility companies, interests are applied. NERC applies this mechanism when calculating gas tariffs for the first half of 2022.

2nd support scheme in 2022:

This scheme abolished the 1st support scheme and introduced direct support from the state budget in case the regulated price of natural gas or electricity would increase by more than 40%. Any additional increase is compensated by the state budget. A budget line of 570 million euros was anticipated for this purpose. Moreover, a price ceiling was established for those household consumers that had already switched to an independent electricity supplier. The limit for the household consumer tariff (24ct/kWh "floor") is set by the Government providing that: 1) if the price of the electricity is lower or equal to 24 ct/kWh, compensation is not provided; 2) if the price of electricity is higher than 24 ct/kWh but lower than 33 ct/kWh, then compensation is provided to lower the price till 24 ct/kWh; 3) if the price of electricity is higher than 33 ct/kWh, then compensation is applied and the price is lowered by a maximum compensation of 9 ct/kWh. The compensation will cover the electricity product price component in the tariff (set by the Government, ~ max 9 ct/kWh) and the electricity supply component of the tar-

iff (also set by the Government).
As an accompanying measure, the deadlines for different stages of the electricity market liberalisation were postponed to provide a shelter from competitive market prices for households below 5,000 kWh of annual electricity consumption (with more lenient rules applying to those below 1,000 kWh per year).

6.8 PORTUGAL: ENERGY NEUTRALITY AND ENERGY SELF-SUFFICIENCY AT AGUAS DE PORTUGAL

Águas de Portugal (AdP) is a state-owned holding company. It is the main service group in the water supply and wastewater sanitation sectors in Portugal. Directly or indirectly, AdP provides services to 80% of the population, operating in all phases of the urban water cycle, from the collection, treatment, transport, and distribution of water to the collection, transport, treatment, and disposal of urban and industrial wastewater, including its recycling and reuse, and also in energy production through their own electricity generation. AdP works at a supra-municipal scale to provide integrated solutions across the regions. Service provision is organised through 13 companies with regional operation where AdP holds the majority stake, and the rest of the shares are owned by the participating municipalities.
The AdP Group is the largest public consumer of electricity in Portugal, with grid consumption amounting to 725 GWh/year in 2019, just over 1.4% of all the electricity consumed in the country. (As a comparison, this volume is equivalent to the household energy consumption of Lisbon, the capital).
In 2020 the company announced its ZERO Energy Neutrality Program. The program aims at neutralising the energy consumption of the company by 2030(in ten years' time).
Neutrality, in this sense, means being 100% self-sufficient from renewable energy sources. The program focuses on two directions: reducing energy consumption and replacing the consumption from the grid with its own renewable sources. The technical details of the program (the composition of the renewable energy sources) are shown in the Figure 17.
The ZERO Program's investment activities are based on a wide range of financial resources available for Portugal from the EU Recovery and Resilience Facility and own sources of the national budget.
Besides the energy efficiency improvements and the increase of renewable energy generation, the investments tackle the development of operational control and digitalization. The annual savings of the investment package through avoided costs will result in an average payback period of eight years (annual savings of 47 million EUR vs investments costs of 370 million EUR).
Although the ZERO program itself fits in the scope of the current study, it is not a standalone project that happens to coincide with the anticipation of turbulent energy markets, but rather a result of comprehensive actions to capitalize on the momentum initiated by the European Green Deal roadmap and the adoption of the Circular Economy Action Plan for a Cleaner and More

Competitive Europe in the Portuguese economy and in the operation of AdP accordingly.

This process and the company's sophisticated development strategy are extensively covered by the World Bank's Water Global Practice series, Water in Circular Economy and Resilience – The case of Águas de Portugal. ERSAR reviews those elements of this wider approach below according to their relevance from a regulatory perspective.

The legal environment for more efficient operation was defined in advance. In 2019 a 20% water reuse target was set for the 50 largest wastewater treatment plants, to be reached by 2030. This was included in the concession contracts of the municipalities. Energy efficiency measures were facilitated by enacting obligatory energy audits and the valorisation of onsite energy production. These changes incentivised companies to answer the rising cost of sludge disposal by both facilitating own energy production and developing products that make use of the compounds of the sludge.

These new technical approaches of adaptation processes towards circular economy goals were in line with the long-standing expectation of ever-more efficient operation of the utilities that the regulatory authority, ERSAR enforces.

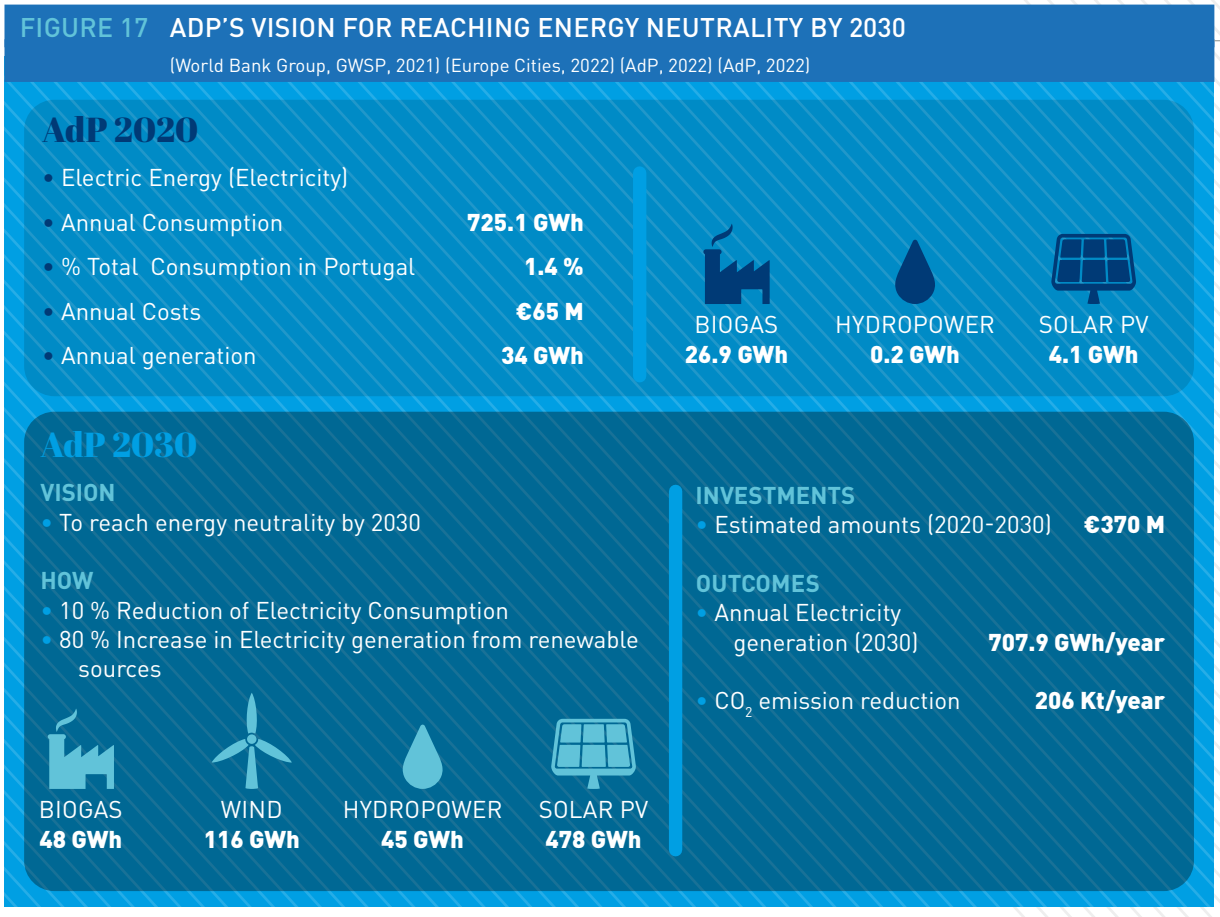
AdP had an Energy Efficiency and Production Plan before the initiation of the ZERO program between 2017-2020.

ERSAR, monitors the effect of the development programs on tariffs to balance between the requirement of facing long-term resilience and their short-term impact on tariffs.

ERSAR also periodically reviews targets on quality of service assessment system, to promote operational efficiency and continuous improvement by water operators.

FIGURE 17 ADP'S VISION FOR REACHING ENERGY NEUTRALITY BY 2030

(World Bank Group, GWSP, 2021) (Europe Cities, 2022) (AdP, 2022) (AdP, 2022)



7 CONCLUSIONS AND KEY FINDINGS

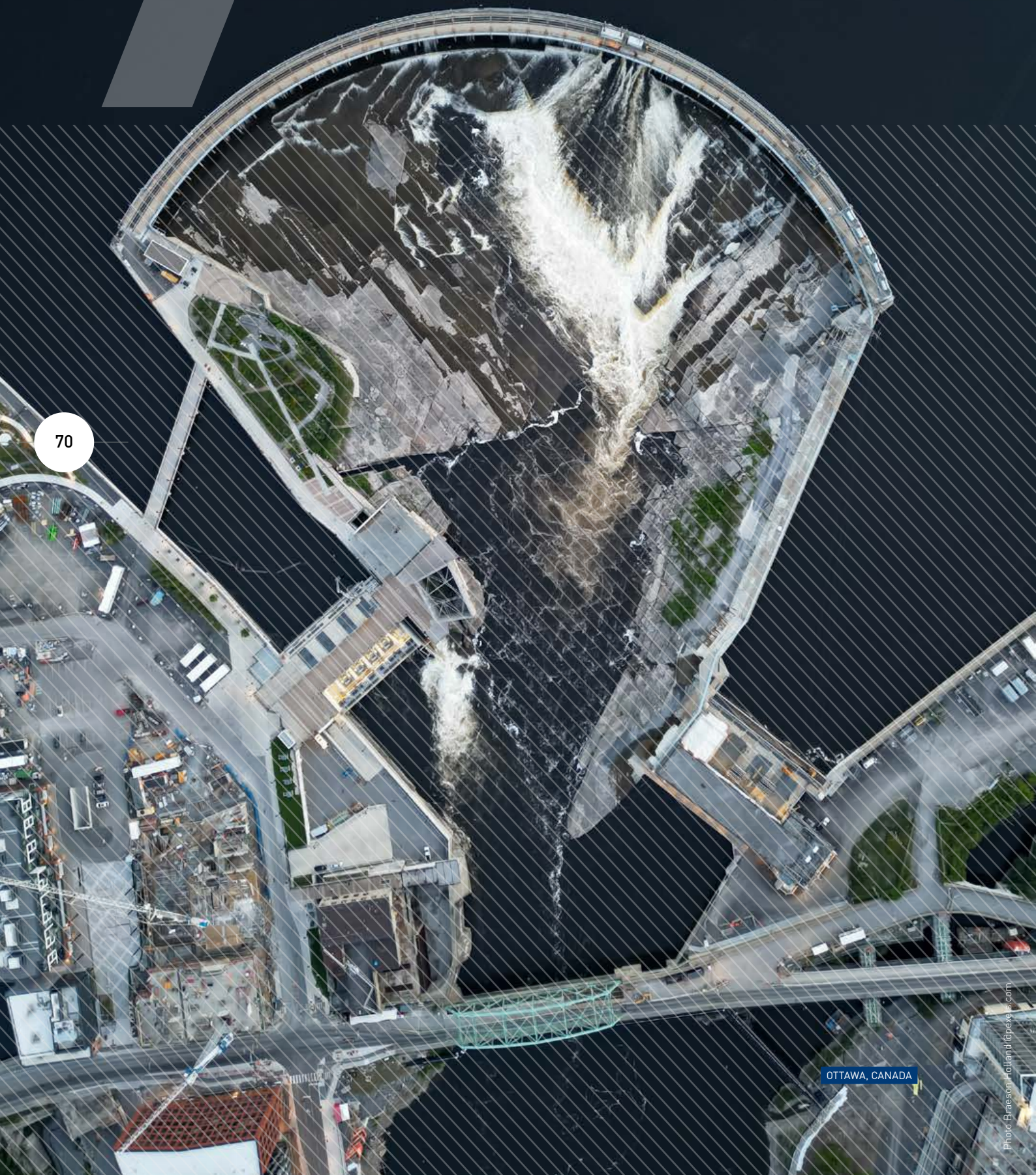


Photo: Braeson Holland (bpexpress.com)

As the report highlights, European countries and water utilities have had a very diverse experience and approach towards the recent energy crisis. This stems from the diversity of regulatory practices within regulatory authorities, as well as diverse water and energy market structures.

The following Chapter provides an overview of findings from the report and possible measures regulatory authorities can take to tackle the energy crisis.

PREPARING FOR CONTINUED HIGH FUTURE ENERGY PRICES

After the record-breaking energy prices of 2022, a calmer period of still high prices is expected. For the coming years, companies fully exposed to energy price increases are likely to face electricity costs of 100-300 EUR/MWh as opposed to past multi-year average values of 40-80 EUR/MWh. Besides energy market modelling, futures prices can serve as a guide on coming energy prices. Companies with long-term energy contracts in place that did not reflect the costs of the energy crisis, will soon have difficulties of securing energy supply at past "low" prices. Many utilities will have to procure energy in spot markets or sign new long-term contracts which reflect the recent increase in energy prices.

Regulatory authorites can prepare for this era by doing a "stress test" of the regulated companies, assessing their energy needs, energy procurement practices, the expiry of former fixed price contracts, their future exposure to high energy prices, and company liquidity. This way, the regulators can also predict the effect of the high energy prices towards utilities and their own workload in the form of tariff adjustment requests and, if needed, prepare by establishing streamlined steps or increasing internal capacities.

In addition, the spike in energy prices in Europe is now followed by a general inflationary trend. Past experience suggests that prices in the next few years will continue to change more swiftly than recently. In the case of energy prices, volatility can be expected. As for general inflation (often measured by the consumer price index, CPI), once it picks up, it usually takes several years for it to subside. Regulatory authorities should be prepared for a period when the significance of annual adjustments will increase, and the number of extraordinary adjustments is likely to grow.

ENHANCING REGULATORY INDEPENDENCE TO INCREASE THE RESILIENCY OF THE WATER SECTOR

Subsidies in the energy market and the water sector may help temporarily bridge the gap between affordability and increasing water tariffs. However, to ensure long-term sustainability and efficiency of the water sector, true costs should be reflected to a certain degree through water tariffs. Fully independent regulators have more freedom to pass through increasing costs, whether through annual or extraordinary adjustments. This ensures predictability and

confidence within the sector, contributing to robust and resilient water services. Increasing regulatory independence is of course not within the competence of the regulatory authority itself. However, in turbulent times like the current period it is important to emphasize this otherwise obvious argument.

STREAMLINING REGULAR AND EXTRAORDINARY TARIFF ADJUSTMENTS

The ability of utilities to fully and efficiently cover costs which are deemed outside of their control is crucial for sustainable operations and to attract investment within a regulated sector. While most observed regulatory authorities utilize regular and extraordinary adjustments, there is a high variety and ambiguity on what consists of extraordinary events. Most regulators do not have predefined criteria or a materiality threshold on when extraordinary reviews should be triggered. The time to analyse if a case is considered extraordinary along with the needed time to analyse new tariffs, may lead to lag periods of up to one year. For some utilities, this may have significant effects on their liquidity and could lead to delays of needed maintenance expenses or even bankruptcy.

A minority of regulatory authorites (5 out of 18) already observe that utilities forego some CAPEX investments because of the increase in energy prices. This also underlines the quick and full-scale adjustment of tariffs. A temporary reduction of CAPEX may not harm much. However, the prolonged cut of funds for reconstruction and new development will eventually result in asset degradation, followed by quality of service problems and increased operating costs.

Considering the workload spike for regulatory authorities during different crisis periods, regulators should aim to streamline extraordinary reviews, while working with utilities to help them overcome these periods.

BALANCING BETWEEN AFFORDABILITY, END-USER PREDICTABILITY OF TARIFFS AND COST-REFLECTIVITY

Fast cost-reflectivity of water tariffs during crisis times may clash with the concept of affordability and end-user predictability of water tariffs. To tackle this issue, a "Balancing Account", or "Equalization Component" is utilized in several water regulators. A balancing account is funded through slightly increased water tariffs during normal times and used to stabilize spikes in tariffs in extraordinary events (such as the energy crisis or natural disasters), or to ensure affordability for vulnerable customers. This ensures that costs are primarily recovered through tariffs while also safeguarding affordability and end-user predictability of tariffs.

ENHANCING PROCUREMENT EFFICIENCY IN THE ENERGY MARKET FOR WATER UTILITIES

In many cases, water utilities do not have the expertise or direct incentives to increase their procurement efficiency when purchasing energy. While energy markets and procurement are not the core business of water utilities, they should have direct incentives to lower their purchasing costs. Direct incentives implemented in some WAREG countries such as a "Tunnel Methodology" and an adjustable allowance cap on OPEX costs lead to utilities to introduce innovative measures of energy procurement. Water utilities in Belgium (Brussels) have grouped to engage an energy procurement consultant who assisted them in energy procurement methods, while in Italy, water utilities grouped to jointly purchase energy, which led to lower energy costs for all utilities compared to previous procurement practices.

INCREASING ENERGY EFFICIENCY AND ENERGY PRODUCTION WITHIN WATER UTILITIES

Energy-efficient water companies can better cope with the energy crisis than

their peers. The regulatory authority can advance the transition of water companies toward more efficient operation. Tariff schemes with built-in efficiency factors will do exactly this, and higher energy prices refocus management efforts to reduce the volume of energy purchased from the market. Regulators can also provide additional, tailored incentives. Setting efficiency targets for the energy use of water production, distribution, wastewater collection and treatment is a viable strategy. Sector studies show that there is ample room for energy efficiency improvements. This argument is also reinforced by the answers provided by regulatory authorities for this report. Partial or zero cost recovery for the inefficient part of energy use, or the constant requirement to improve compared to past indicator values are proven methods to incentivize more energy-efficient operations.

Realistic efficiency targets need to be evidence-based. Regulatory aouthorites often lack the information needed to set challenging, but achievable KPI targets. To reduce the asymmetrical nature of their knowledge, authorites need to make enhanced efforts, including the collection of performance data, benchmarking exercises, and advanced statistical analysis. A step in this direction would be the harmonisation and standardised definition of indicators among regulators to improve comparability of utility and country specific values.

Water companies with a significant share of own energy generation also fare better than their peers, with lower current energy costs and muted energy market risks. Our analysis introduced the case of Sofiyska Voda and Águas de Portugal, with large-scale current and future energy production. The strict energy neutrality requirements for EU-based wastewater operations will be a major factor in future investments into own generation. Regulatory authorities can reinforce these targets through incentives built into tariff methodologies. While sludge-based biogas production is an obvious development path toward energy self-sufficiency, other renewa-

Photo Jani Brumat @unsplash.com

ble sources, such as solar, hydro, wind, geothermal, are more ambiguous. Water companies should be left with the choice of own development or contracting for renewable power generation.
The trade-offs between current investments with lower future energy purchase costs and no investment with higher future energy costs is influenced by the incentives provided by tariff methodologies. General government policy, such as the availability of grants for renewable capacities will also play a crucial role.

KNOWLEDGE SHARING AMONG WAREG MEMBERS

As mentioned, regulation and water and energy markets within WAREG countries are highly diverse. During the energy crisis,different sets of regulatory approaches were developed throughout including reactions to the energy crisis. A large number of innovative solutions were developed and tested. The continuous exchange of experience among regulatory authorities in forums like WAREG will benefit all participants.

TABLE 7 MEASURES TO BETTER COPE WITH THE ENERGY MARKET CRISIS

MEASURE	DESCRIPTION	ADVANTAGES	RISKS AND DISADVANTAGES
Fast tariff adjustments	A streamlined process to enable the quick pass-through of changed energy costs without the need for a full tariff review	It saves time and effort for both the regulator and the water company.	In a highly volatile energy market, tariffs adjusted upward may linger for a longer period than justified. Tariff adjustment may become too frequent from the perspective of customers (meter reading, digesting time for the new tariff information)
Self-determined tariffs	Similar to fast tariff adjustments, but the water company has an active role in calculating and setting new tariffs	Further reduced burden for the regulator, clear methodological rules for all parties	Same as for fast tariff adjustments, plus there is a need to develop tailored toolsets to be used by the water companies to calculate new tariffs, and support user guides and/or training sessions.
Definition of the prerequisites for extraordinary adjustment	Undefined or poorly defined conditions for extraordinary adjustment may generate a delay in the adjustment process, deferring a healthy financial balance.	Quick and unambiguous launch of the process	None
Carry-over of unexpected costs	Already paid eligible expenditures not covered by tariffs are considered during tariff review so that future revenues will cover them. These expenditures can be spread across a longer time horizon, e.g. 2 years.	Already paid cost items that are eligible and necessary are not left without tariff coverage	In case the level of costs declines, recent excess revenues should be considered during the next tariff adjustment, resulting in lower tariffs, compensating customers for higher than justified recent tariffs
Access to financial liquidity	Escalating energy prices may require quick access to financial resources even before tariffs are adjusted. However, the tariff methodology can ensure that the associated costs (especially interests) can be covered through future tariffs.	The cost of financing for expenditures that are eligible and necessary is covered.	In an inflationary environment, the cost of financing can be large.

Countries where the impacts of the energy crisis reach the water sector with a delay will find such cooperation especially valuable.

SUMMARY OF POTENTIAL MEASURES

The tables below provide a list of potential measures for the consideration of regulatory authorities.
The measures in the Table 7 are applicable for the current energy crisis.
The measures of Table 8 are relevant in all periods to bolster the resistance of the water sector against energy market shocks. As it was accentuated before, WAREG countries materially differ from each other with respect to institutional governance, regulatory methodologies and water and energy market structures.
Therefore, not all measures are applicable to the same extent in each country. The provision of contextual information and a short evaluation of the pros and cons of each measure allows to underscore the consequences of its prospective use.

TABLE 8 MEASURES IN SUPPORT OF INCREASED RESILIENCE AGAINST ENERGY MARKET SHOCKS

MEASURE	DESCRIPTION	ADVANTAGES	RISKS AND DISADVANTAGES
Setting energy efficiency targets	Partial or zero cost recovery for the inefficient part of energy use. Incentives to improve energy efficiency with a sharing component between the utility and customers.	It forces more efficient operations, resulting in lower costs and lower tariffs, contributes to lower environmental burdens and the achievement of European Union targets	It takes considerable time for water companies to improve their energy efficiency. Setting proper targets requires in-depth knowledge about the scope for energy efficiency improvement at each regulated entity, including the cost level of interventions. Benchmarking, econometric analyses, energy audits and negotiations with the water utilities are useful tools for this purpose.
Incentivising the own generation of energy	The tariff methodology should ensure that water utilities have an interest in investing in energy generation (e.g. inclusion in RAB). In addition, provisions directed at the utilisation of sewage sludge may provide indirect incentives for biogas production.	Own generation reduces the exposure to energy market shocks and moderates the volatility of future costs. Sludge-based biogas production is widely viewed as an attractive investment that is currently underutilised. The measure helps to accomplish the energy neutrality targets of the European Union.	A changing energy market environment can quickly alter the rationality of these investments.
Lower energy procurement costs	The regulator can provide incentives to lower the average price of the procured energy. For example, water companies may realise lower prices if they hire specialised consultants and/or do joint procurement to exploit economies of scale.	A relatively straightforward way of cost reduction under normal energy markets.	Specific knowledge of energy market procurement opportunities is required to set proper targets for water companies.

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