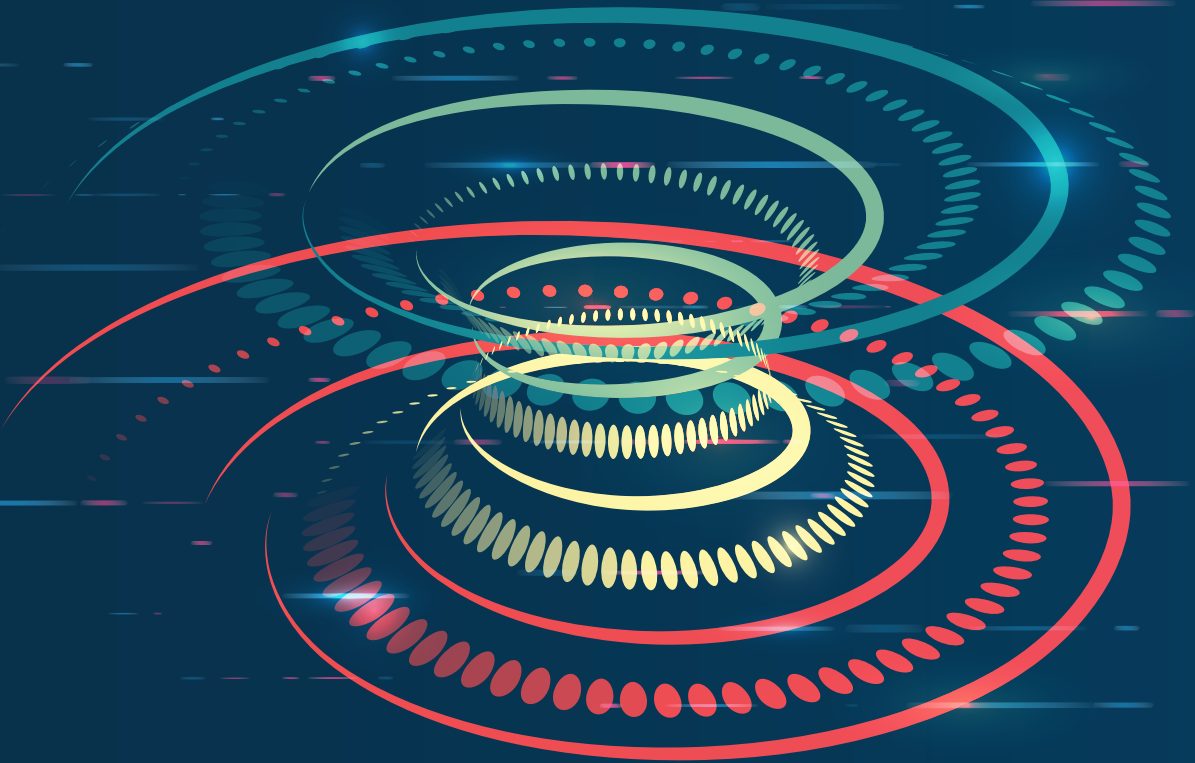
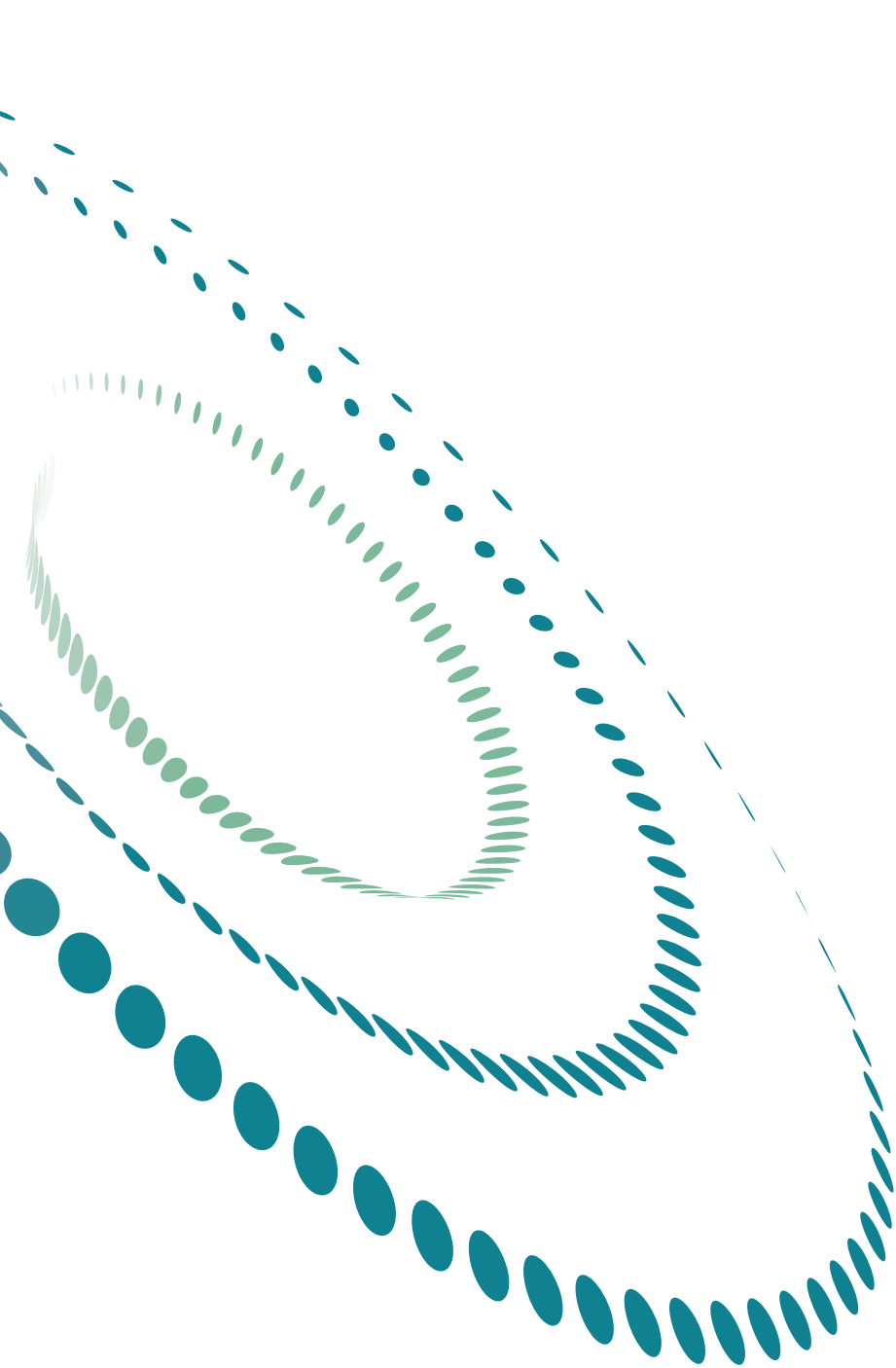


2021 ANNUAL REPORT

REGULATORY & SUPERVISORY BUREAU
FOR ELECTRICITY & WATER





Regulatory & Supervisory Bureau
P.O. Box. 121555, Dubai
www.rsbdubai.gov.ae



**HIS HIGHNESS SHEIKH
MOHAMMED BIN ZAYED AL NAHYAN**
PRESIDENT OF THE UNITED ARAB EMIRATES

“

We are committed to seize the opportunity to cement our leadership on climate change within our region and take this key economic opportunity to drive development, growth and new jobs as we pivot our economy and nation to net zero. With an investment of over AED600 billion in renewable energy, our vision for a clean future is clear.

”



**HIS HIGHNESS SHEIKH
MOHAMMED BIN RASHID AL MAKTOUM**

UAE VICE PRESIDENT AND PRIME MINISTER, AND RULER OF DUBAI

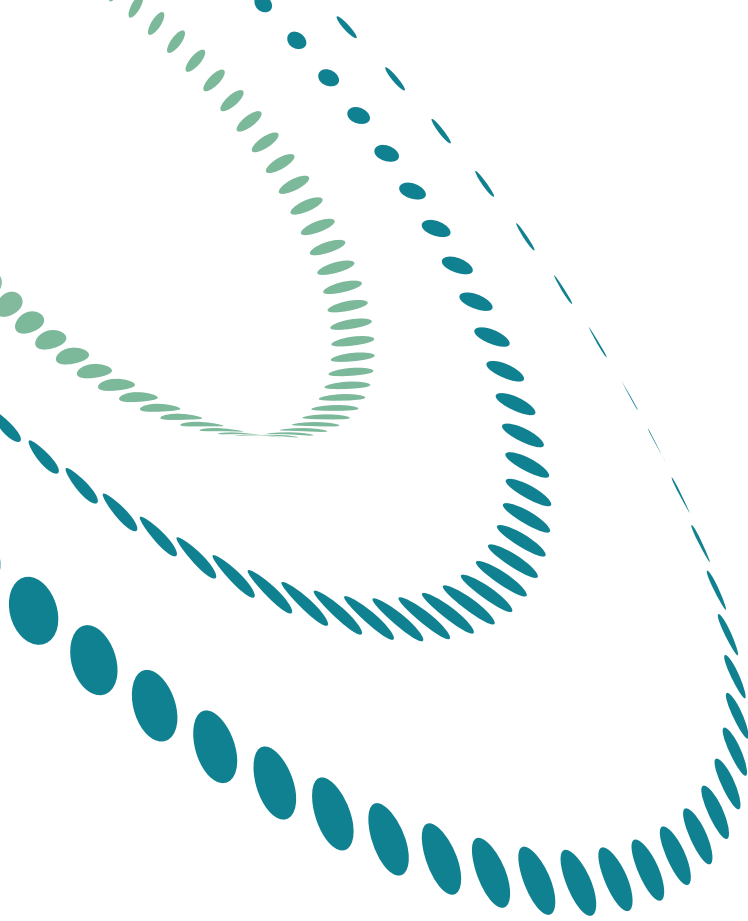


TABLE OF CONTENTS

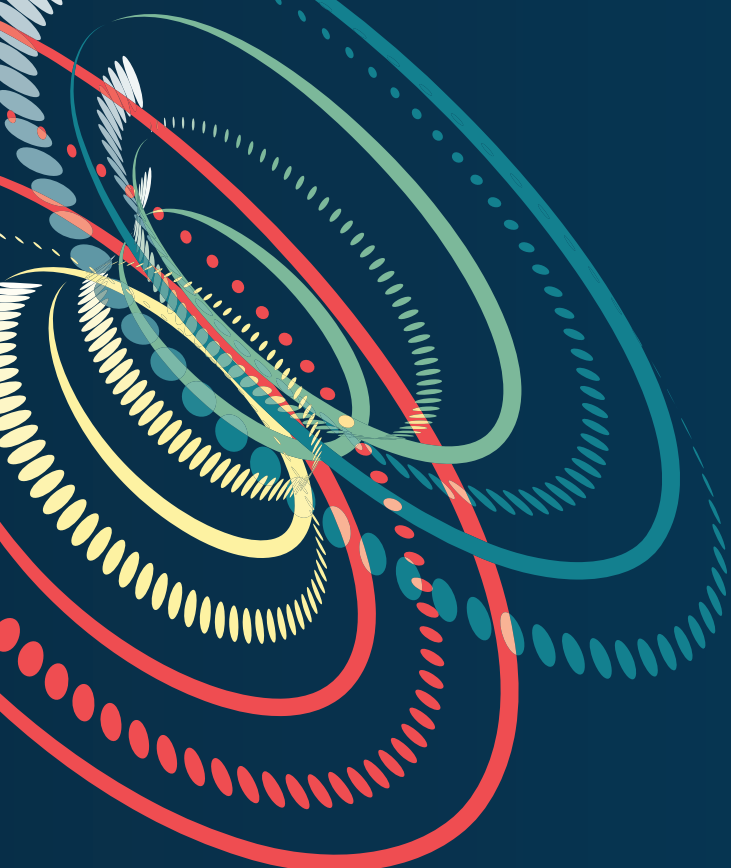
- SUSTAINABLE SUPPLY 12
- THE ENERGY SERVICES MARKET 18
- EFFICIENT COOLING 26

ABOUT THE RSB

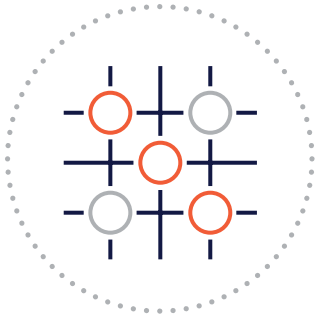
Our vision is to become a leading example of regulatory practice in the Gulf region. Our mission is to support Dubai’s economic, social, and environmental objectives through development of an effective, independent, and transparent regulatory regime for the emirate’s electricity, water and district cooling sectors.

The RSB was established by Executive Council Resolution Number 2 of 2010. We work under the auspices of the Dubai Supreme Council of Energy, developing regulatory frameworks to support Dubai’s development through secure and affordable energy supply and efficient energy use, while meeting environmental and sustainability objectives. Supporting the implementation of the Dubai Integrated Energy Strategy 2030 and Clean Energy Strategy 2050 is central to our role. By 2030 the aim is to raise energy efficiency by 30% and the electricity generation mix, currently dominated by gas, is to be

transformed, particularly by the addition of large and small scale renewables. We licence and regulate independent power & water producers, ensuring new entrants to the sector deliver safe, reliable, and efficient services to the benefit of all in Dubai. Private sector participation in electricity and water production brings technology, expertise and capital to the energy sector and is governed by Law Number 6 of 2011. In 2021 we became the regulator of Dubai’s district cooling market following the promulgation of Executive Council Resolution 6 of 2021. We develop and administer frameworks to encourage greater energy efficiency in buildings. Our energy service company (ESCO) and energy auditor accreditation schemes are designed to build trust and make the process of contracting for energy services smoother for accredited entities and their clients.



EXECUTIVE DIRECTOR'S REVIEW



Without doubt our biggest challenge in 2021 was development of the district cooling regulatory regime.

We have licensed a large number of market participants, both the producers and suppliers of chilled water and the billing agents employed in many buildings. We built the elements of the regime into a set of regulatory

documents on which we worked progressively through the year, consulting the industry and wider stakeholders and agreeing them with the RSB board before seeking final approval from the Supreme Council of Energy.

The regime is comprehensive in its scope, covering tariffs, complaints, customer service standards, energy and water performance, billing and metering practices, contracts, debt recovery procedures, and

health and safety. It is also capable of evolution and we expect that, as we gain experience of regulating the sector, much of what we have developed so far will be refined.

Performance of the district cooling sector showed encouraging signs with electrical efficiency at the highest level since we started collecting such data ten years ago, and a welcome trend of improving performance over the last couple of years. As we report, water efficiency, on the other hand, has shown little sign of consistent

improvement, albeit higher volumes of recycled water mean overall lower resource cost. An encouraging development from both an electrical and water efficiency point of view is EMAAR's seawater cooled district cooling plant at its Beachfront development. No potable or recycled water is required and electrical efficiency is potentially superior.

Our licensing activity under the framework for independent power and water producers saw two important milestones: the

first independent power producer in which DEWA does not have an ownership stake, and the first independent water project.

The waste to energy plant at Warsan will supply to the DEWA grid under a power purchase agreement between the municipality and DEWA. The plant is a major contribution

to the municipality's target of zero waste to landfill by 2030. At over 200MW it is the largest plant of its kind in the world, and by some margin.

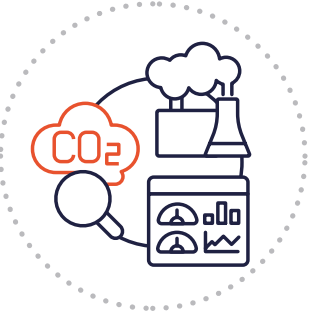
The Hassyan reverse osmosis plant represents the future of water production: a switch from thermal desalination at cogeneration plant to the use of renewable

energy to power the more efficient RO process. DEWA has already announced that it expects a further 120MIGD plant at the site in due course.

Our ESCO accreditation activity was in line with previous years but, as we report in detail later, ESCO project activity remained subdued. This may still be a hangover from the Covid 19 pandemic but we spent some time in 2021 discussing the market with ESCOs and Etihad Energy Services to understand

if the slowdown reflected deeper seated issues. Our building rating scheme will, we hope, give new impetus to the search for energy savings but there is likely to be more to do to increase confidence that Dubai's targets for building retrofits will be hit.

SUSTAINABLE SUPPLY



As already noted, in the quotation from HH Sheikh Mohammed bin Rashid Al Maktoum at the beginning of our report in October 2021

the UAE became the first country in the Middle East and North Africa to announce a national drive to achieve net zero emissions by 2050.



Contributing to this goal, close to 3GW of zero-emission solar power plant has now been licensed by the RSB, of which around 0.6GW joined the grid in 2021, bringing

the operational capacity at Mohammed bin Rashid Al Maktoum Solar Park to 1.6GW. The remainder is expected to be fully operational by 2023.



Noor Energy 1 commissioned 217MW of PV capacity in 2021 and plans to commission 300MW of its concentrated solar plant (CSP) in 2022. Shuaa Energy 3 commissioned

300MW of PV capacity, which subsequently proved, unaltered, capable of delivering 330MW. Shuaa Energy 2 added 70MW of PV capacity to their 800MW plant.



In addition to those utility-scale installations, rooftop solar capacity across

the Emirate reached 400MW in 2021 under DEWA's Shams Dubai initiative.

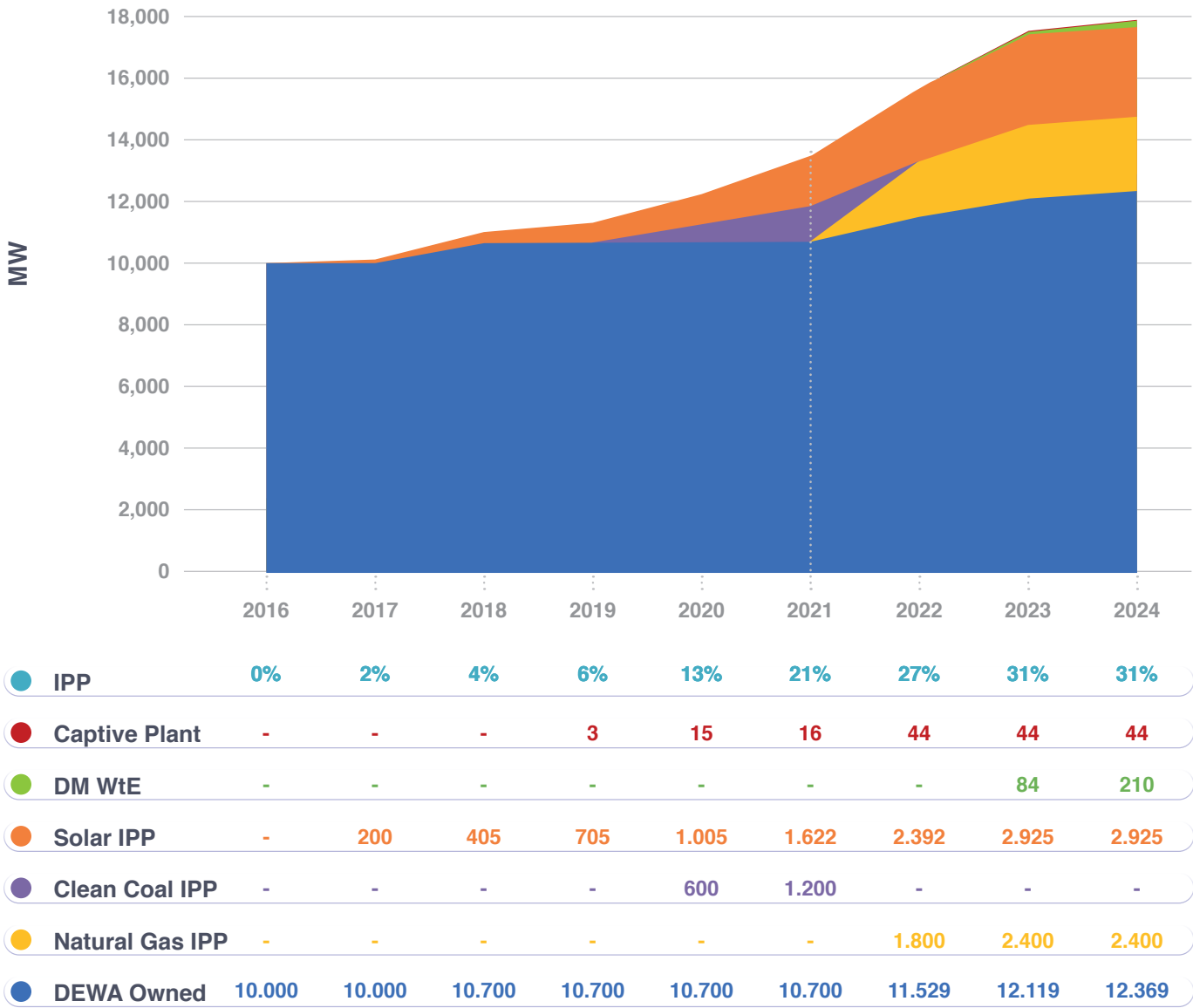


As part of the drive to more sustainable waste management, the Dubai Waste Management Company was granted a 210MW electricity generation licence and broke ground at its waste to energy plant site

in Warsan. It is expected to start producing energy from waste by mid 2023. This is the world's largest waste to energy plant and will handle 40% of Dubai's municipal solid waste.

Hassyan Energy Phase 1 commissioned another 600MW of its production capacity. Early in 2022 the Supreme Council of Energy endorsed a decision by DEWA to convert

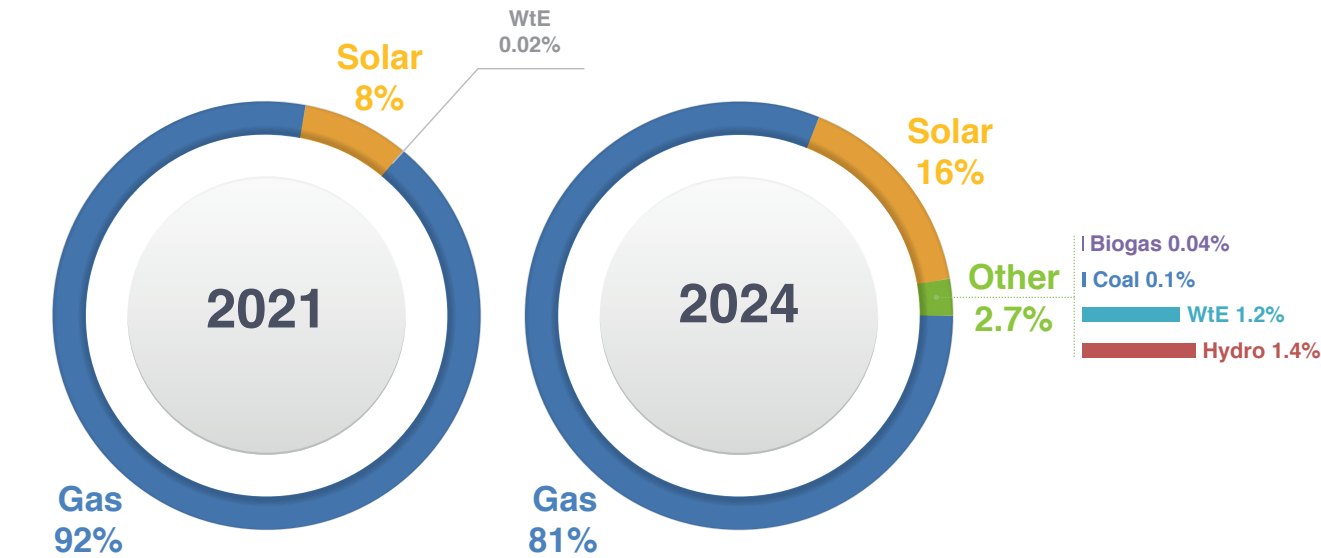
the 2,400MW plant from coal to gas. This was in line with plans to reduce carbon emissions by 30% by 2030 and support the country’s net zero ambitions.



> Figure (1) Electricity generation capacity in Dubai

(Figure 1) shows the evolution of Dubai’s electricity generation capacity from 2016 through to 2021 and a forecast till 2024 when all currently licensed capacity will have been commissioned. It is worth

noting that these figures do not include the 400MW of distributed solar under Shams Dubai mentioned above, as this is treated as an energy saving, rather than production, measure.

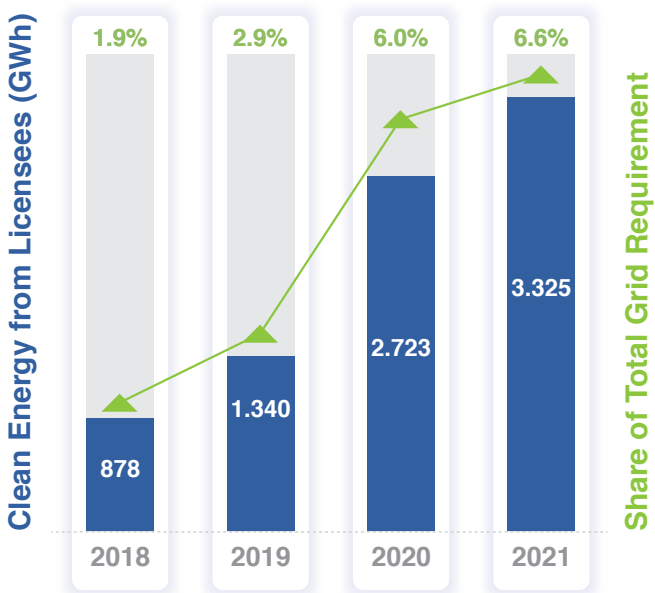


> Figure (2) Generation capacity breakdown by energy source

Electricity generation is still currently dominated by gas, yet the energy transition is well in place and the share of renewable sources from the energy mix is increasing as

(Figure 2) shows from a capacity perspective. The figure for hydro represents the 250MW pumped storage plant under construction in Hatta.

As capacity has been added, so the share of production from renewable sources has increased. Our licensees contributed 3,325GWh of clean energy to the grid in 2021, or 6.6% of the total requirement, a more than trebling from just three years ago. (Figure 3).



> Figure (3) Clean energy production 2018-2021

Independent Water Production

2021 saw the first water desalination licence granted in accordance with Law 6 of 2011, Dubai’s private sector participation law. Hassyan Water, a joint

venture between DEWA and Utico, received its licence for a 120MIGD plant to be constructed adjacent to the Hassyan power plant.

The combination of proven reverse osmosis technology, low cost solar energy and the IWPP model already so successful in electricity generation saw the project

awarded with a levelized cost of water of US\$0.277 per cubic metre. Once built, the plant will represent 20% of DEWA’s total desalination capacity.

Development of this project also marks the first major step towards decoupling Dubai’s water production from electricity generation.

The plant consists of several pre-treatment stages prior to the reverse osmosis stage which enable the licensee to monitor the quality of the feed water, ensure an

efficient desalination process and protect the membranes from damage.

The desalination plant is expected to be over 80% more energy efficient than existing co-generation water desalination processes. These improvements will be fundamental as Dubai embarks on its journey to Net Zero by 2050.

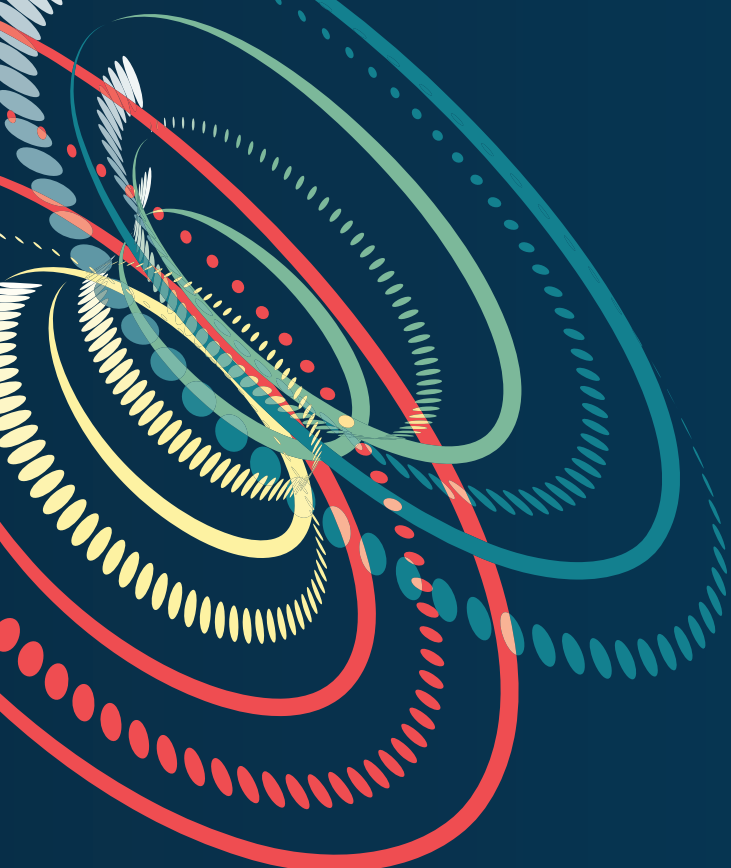
Health & Safety

Historically, we have collected and reported health and safety data on the operational activities of our licensees. With more sites witnessing both operational and construction activities as some of their generation units are commissioned while others are being built, we started collecting data on all site activities. Our 12 licensees reported more than 45.4 million manhours in 2021 compared to less than 1 million manhours reported by four licensees related to their operational

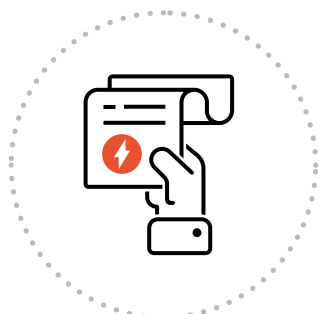
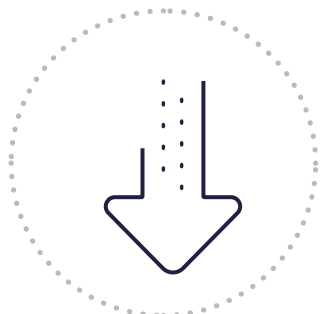
plant the year before. Totals of 184 near misses and 4 lost time injuries were recorded in 2021. Two construction related incidents that led to two fatalities in 2021 were also reported. We have investigated these serious incidents and reviewed 3rd party investigation reports. We will follow up on action items and recommendations with the competent parties to remedy any identified shortfalls to promote safer practices at our licensees’ sites.

Manhours 45,427,874		
Incidents	Number	Accident Frequency Rate*
Near Misses	184	0.405
LTIs	4	0.009
Serious Injuries	0	0.000
Fatalities	2	0.004

* Number of incidents divided by the number of man-hours worked multiplied by 100,000.



THE ENERGY SERVICES MARKET



The RSB's ESCO accreditation scheme continued to be popular among those offering energy services in Dubai. By year end there was a total of 26 accredited ESCOs; 12 fully accredited and 14 provisionally

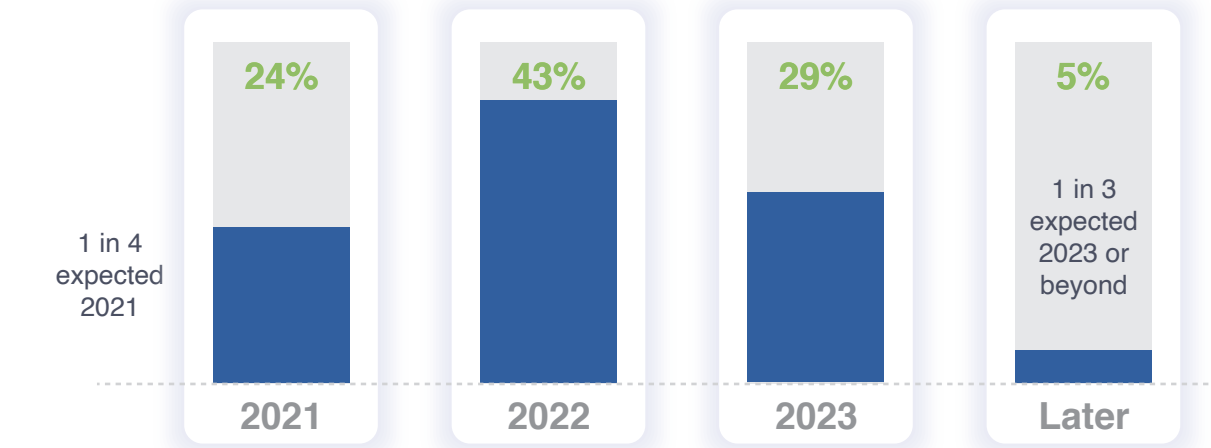
accredited. 23 applications were submitted in the year, 17 of which were successful. Three full accreditations were awarded, valid for three years, and 14 provisional accreditations were granted for one year.

Three Energy Auditors were accredited during the year, resulting in a total of 12 accredited Energy Auditors by year end.



In 2020 we polled ESCOs regarding the impact of the Covid 19 pandemic. We followed up on that poll with a further survey in the summer of 2021 designed to gauge the level of activity in the ESCO market in the wake of

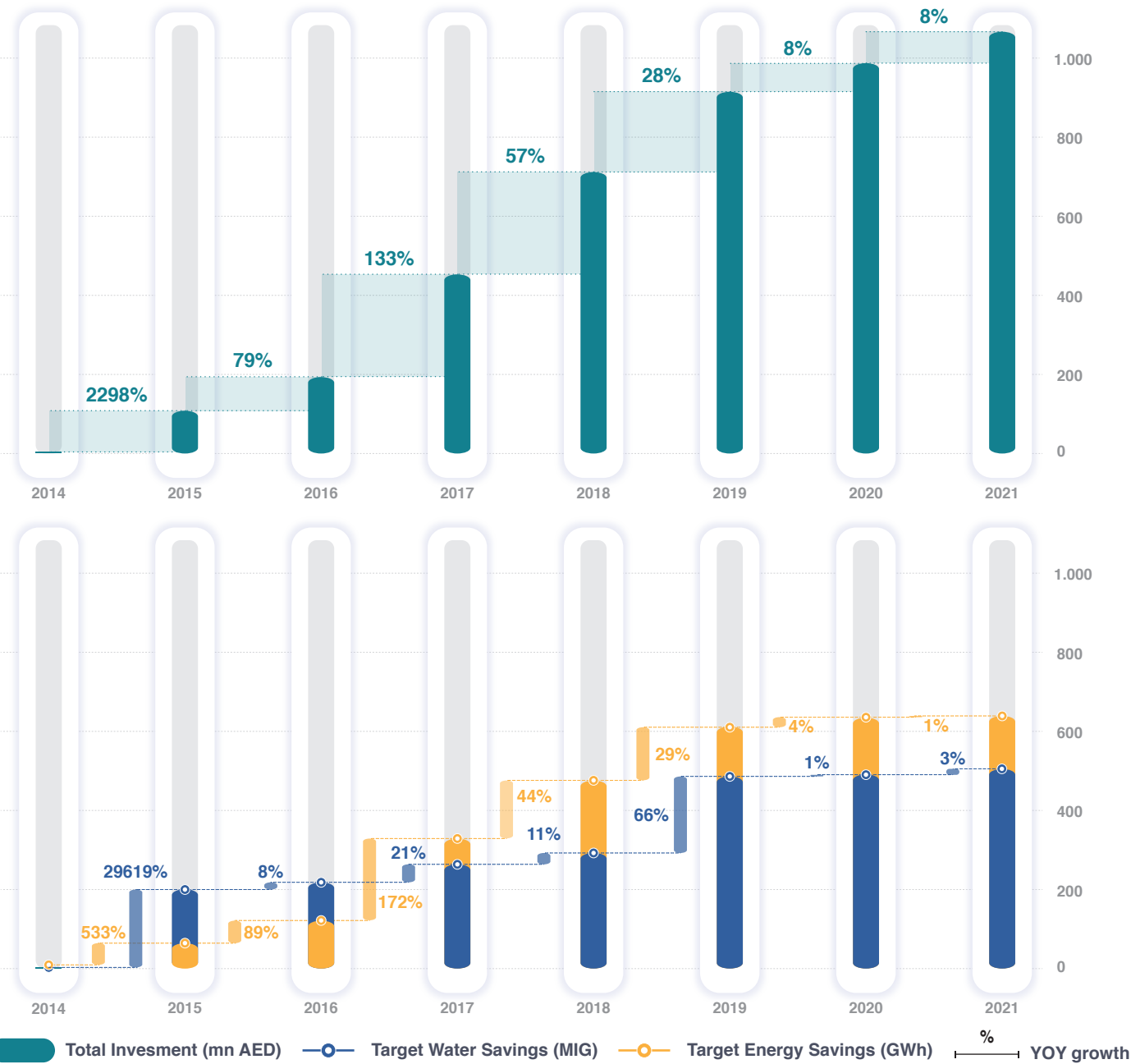
the pandemic and expectations for a return to pre-covid activity levels. 21 ESCOs participated. More than three quarters did not expect a return to normality that year, still experiencing deep impacts from Covid 19 (Figure 4).



> Figure (4) ESCO Survey Results - Expected return to normality

These survey results were reflected in the project data we collected from ESCOs, of whom 19 reported. It confirmed sluggish growth in the retrofit market;

total investment was up by just 8% year-on-year and target energy and water savings up by 1% and 3%, respectively (Figure 5).



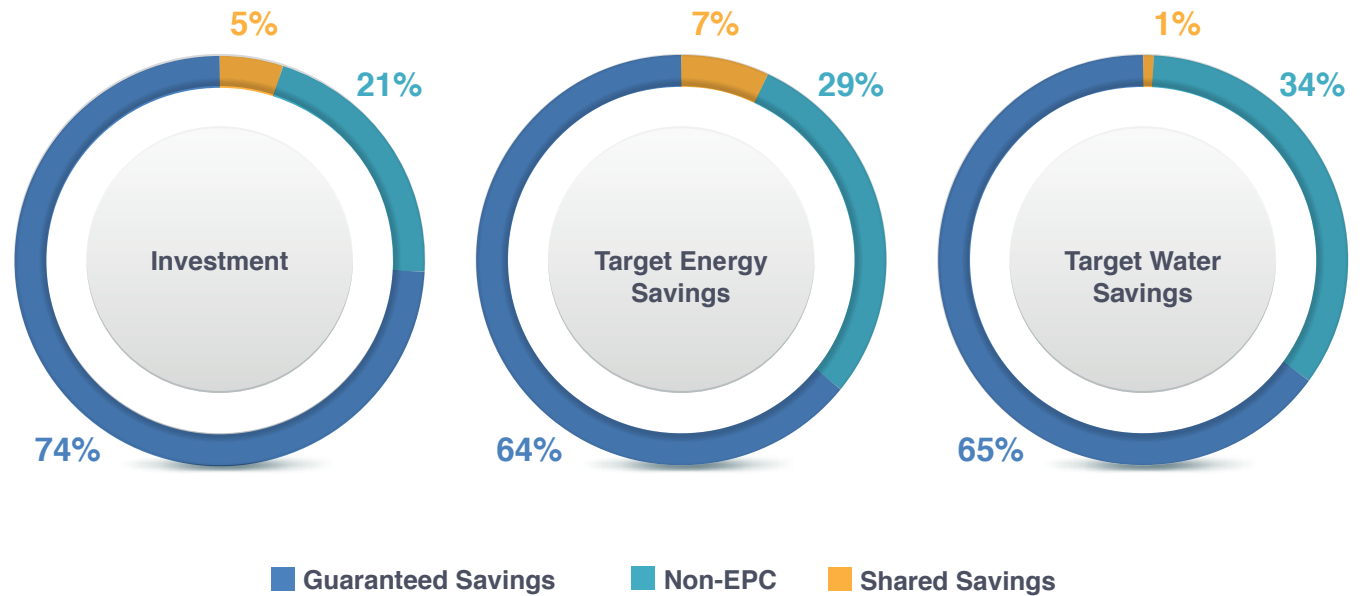
> Figure (5) Project Investment and Savings

In the same poll, 76% of respondents thought lack of awareness of their benefits was a main barrier to retrofit projects, as was cost and availability of

funding according to 57%. As for the main drivers for retrofit projects, 62% of respondents put lowering energy bills at the top.

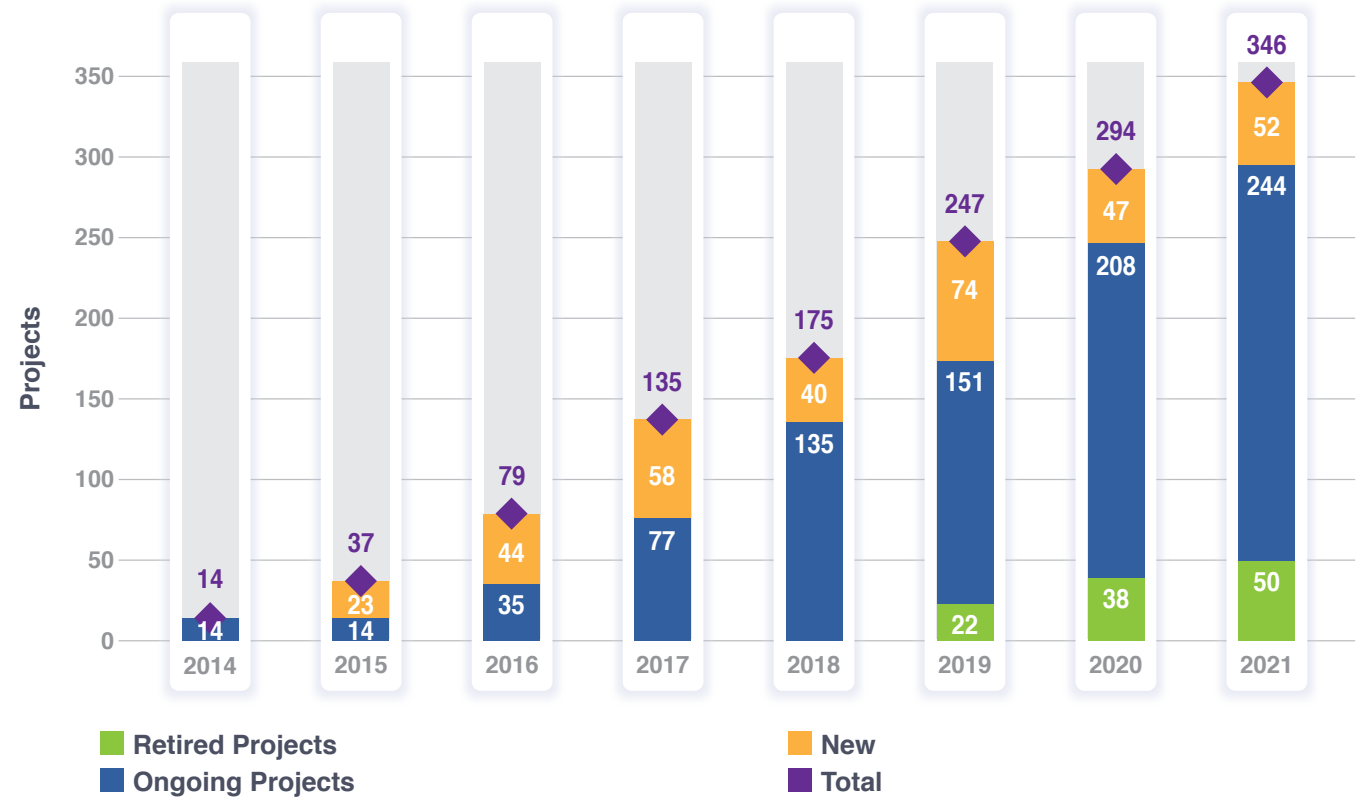
ESCOs continue to offer energy performance contracts (EPC) where either the client finances investment and savings are guaranteed or investments are made by the ESCO and savings shared. Around 21% of the total investment reported

to the RSB since 2014 has gone into non-EPC projects, where savings are not guaranteed, and capital investment is made by clients. These investments are targeting around a third of the total savings (Figure 6).



> Figure (6) Investment and Savings Shares by Contract Type

Accredited ESCOs reported a total of 346 projects, 52 of which were new (Figure 7). AED74 million were invested in these new projects, bringing the cumulative investment in the sector to a little over AED1 billion since 2014.



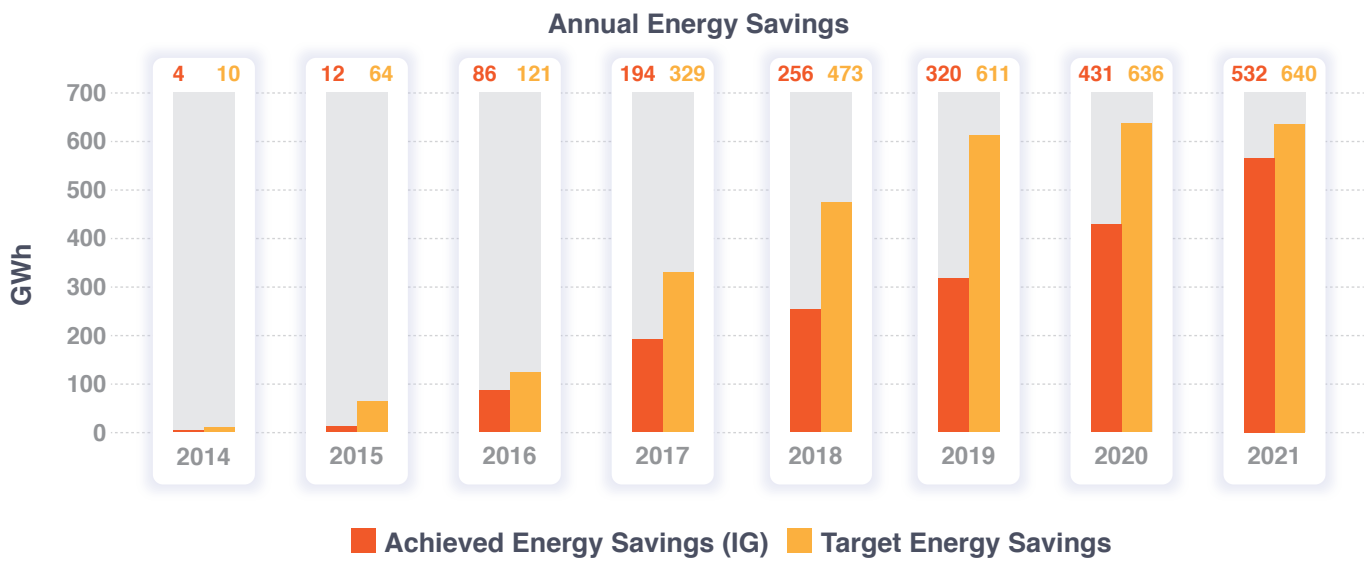
> Figure (7) Projects

12 projects were retired in 2021, resulting in a total of 50 retired projects to date. These 12 projects had targeted 31 buildings and 14.8GWh of energy savings. Their investment value continues to be included in cumulative investment figures.

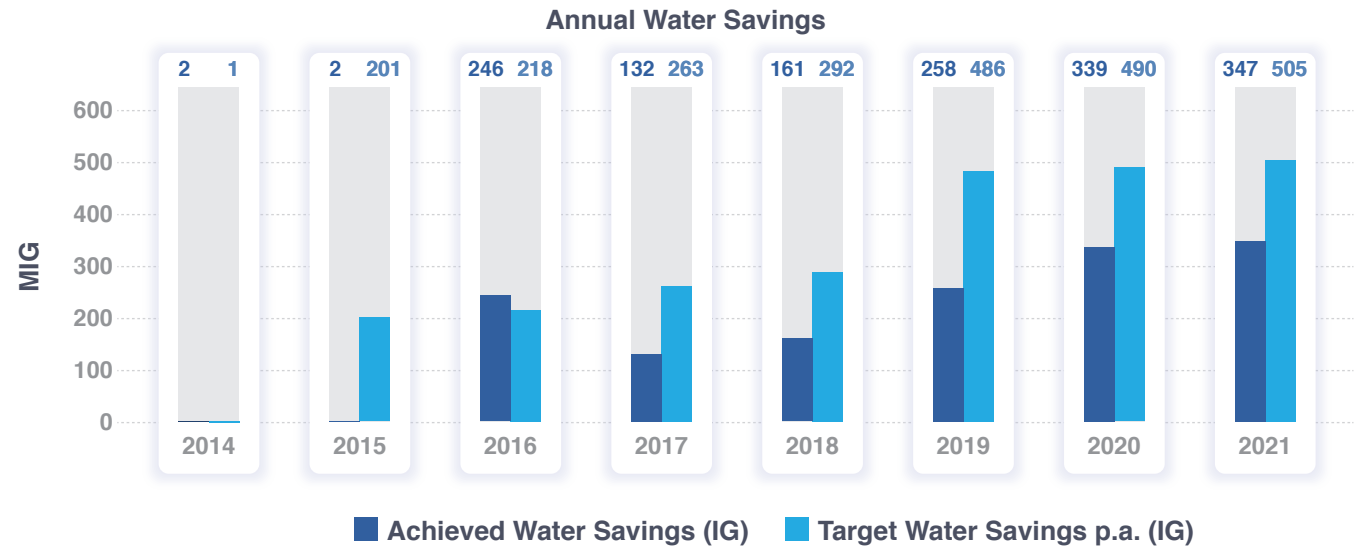
Target energy savings per annum for 2021 increased by only 1% from the previous year, with 49GWh added by new projects to a total target of 640GWh. In addition, target water savings rose from 490MIG in 2020 to 505MIG in 2021, an increase of less than 3%.

Retrofit projects continued to achieve their potential savings, reaching 532GWh in energy savings, up from 431GWh in 2020 (a rise of 23%), and 347MIG in water savings compared to the previous year's 339MIG (up 2%).

(Figures 8 and 9) illustrate the increase in savings, both targeted and achieved, from 2014 to 2021.



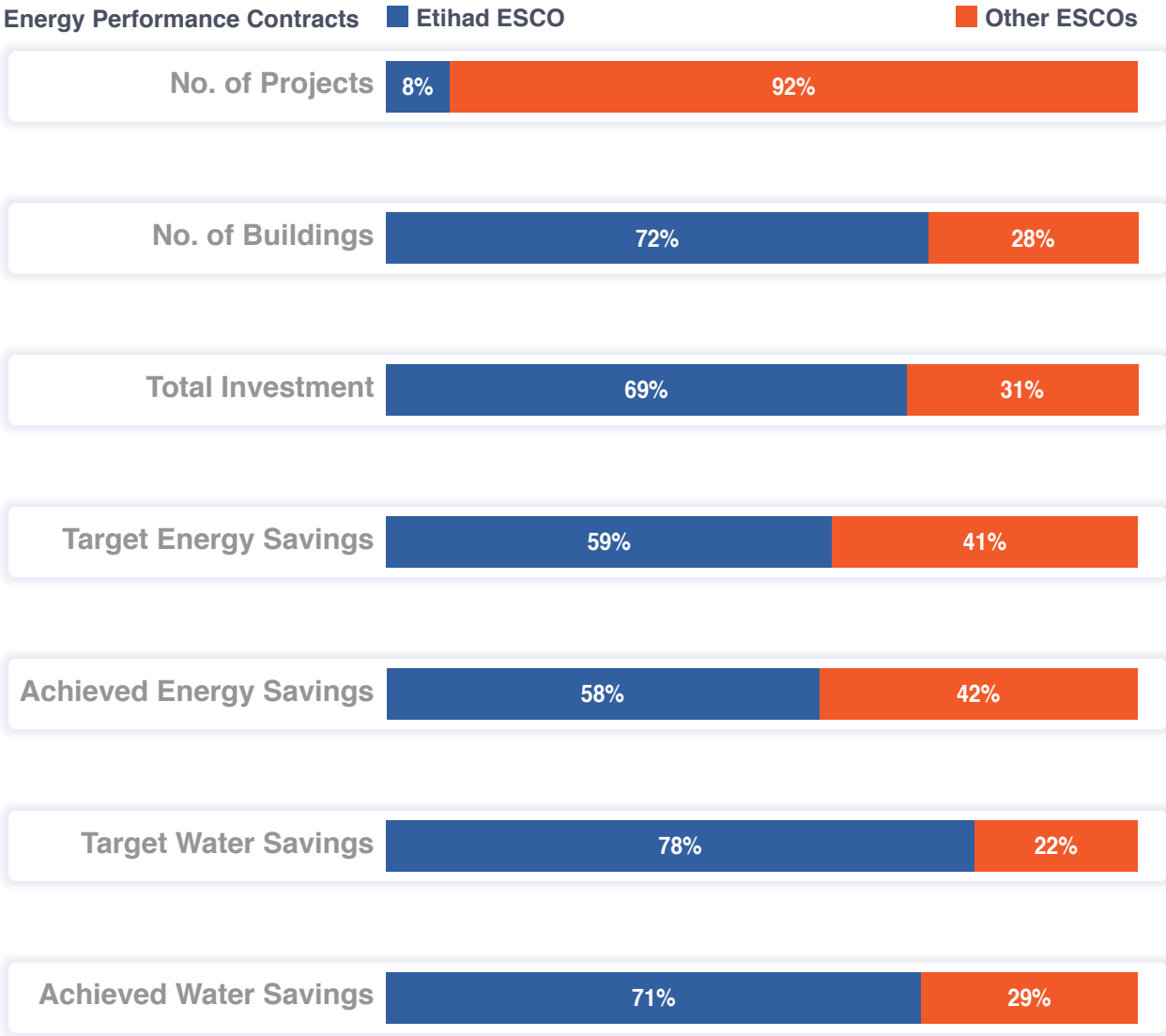
> Figure (8) Energy Savings



> Figure (9) Water Savings

(Figure 10) shows a comparison between Etihad Energy Service's (EES) EPC activities and those of private ESCOs. EES's 16 EPC projects employed 69% of the cumulative investments in EPC activity to date and covered 657 buildings versus 254 covered by private

ESCOs. In terms of energy savings, EES projects' share of the savings targeted by EPC activity was 59%, whereas they achieved 58% of the corresponding actual energy savings in 2020. They were responsible for 78% of target water savings and 71% of actual savings.



> Figure (10) Shares of Etihad Energy Services and Other ESCOs

The payback period for retrofit projects was calculated at 3.3 years (up from 3.1 in 2020) as shown in (Figure 11).

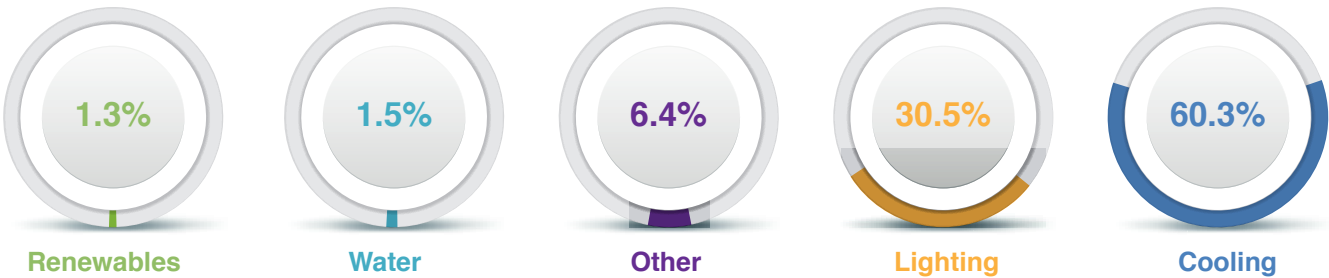
Non-EPC projects aim for 2.5 years in payback (up from 1.8 in 2020), whereas EPC projects remain at 3.7 years to achieve payback, on average.



> Figure (11) Payback Periods

A breakdown of the total investment by conservation measure showed 90% of investments in retrofit projects still go into

cooling and lighting systems, with 60% spent on cooling related measures and 30% on lighting.(Figure 12)

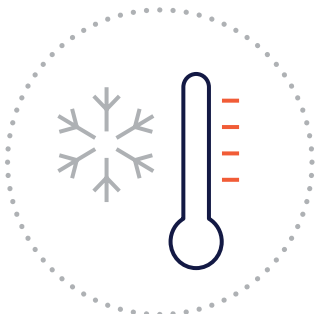
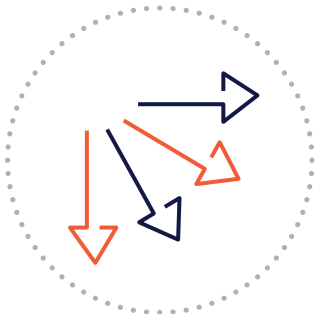
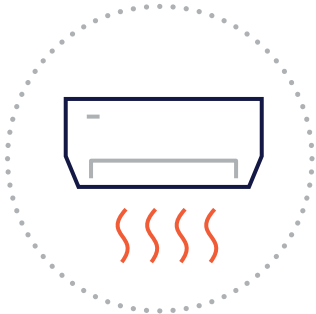
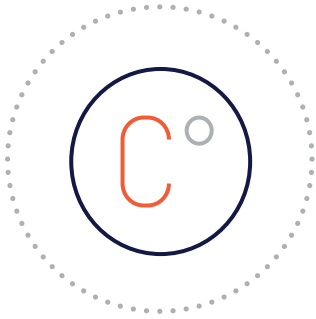


> Figure (12) Investment by Conservation Measure

Energy Rating Dubai's Buildings
The RSB started developing an online tool to assess the energy and water performance of buildings. This tool will make use of data the RSB collected from a statistically representative sample of buildings in Dubai in 2019 and from which benchmarks were established for residential and office buildings. The benchmarking approach accounts for statistically significant differences in the performance of buildings. When the tool is launched in 2022, building owners will be able to identify the relative performance of their buildings.

They can then choose between an indicative rating of their building's energy and water performance based on self-reported data, and a certified rating by appointing an energy auditor to verify their data and rating request. The scheme is intended to raise awareness of energy and water performance and encourage improvements in building efficiency. It relies on actual energy and water consumption and Dubai-specific benchmarks to assess performance, in contrast to schemes that assess a building's features, rather than actual performance, or rely on benchmarks from outside the emirate.

EFFICIENT COOLING



On March 29th 2021 Executive Council Resolution 6 of 2021 Regulating the Provision of District Cooling Services in Dubai was published. The Resolution represents the first step in introducing regulation to the well-established district cooling market in Dubai.

The RSB is the regulator for the sector, with important functions also assigned to the Supreme Council of Energy. Our aim is to provide a stable framework for all aspects of district cooling services in the emirate. Helping district cooling to achieve its full economic potential will contribute towards delivery of the energy savings in Dubai's Demand Side Management Strategy and the 2040 Urban Plan.

Permits

The regime includes a requirement for any person to obtain a permit before providing district cooling services or billing services to customers. The permitting process allows us to ensure those operating in the market are competent to do so. On publication of the Resolution, we set about establishing the permit regime and, in May 2021, "RD01: Permits and Schedules", the RSB's first regulatory document for the sector, was approved by the DSCE and implemented.

The scope of regulation includes:

- District Cooling Service Providers – who produce, distribute and sell chilled water
- Billing Agents – who are chosen by building owners and managers to bill occupants of units within buildings supplied with district cooling services.





Tariffs

The DSCE has powers to approve all charges for district cooling. During 2021 we collected

details of the charges currently applied in order to inform our advice to the Supreme Council.

Contracts

Permit Holders are required to align their existing service contracts with standard agreements established by the RSB and, for new agreements, use the RSB’s standard. Over the course of the year, we reviewed agreements in use in the district cooling sector and developed two standard agreements for use. As with all aspects of the regulatory regime, we consulted sector participants and other stakeholders.

The first is a Billing Services Agreement (RD04a). This agreement addresses the provision of billing services for cooling to units within buildings. Noting the success of the standard rental agreement in the real estate sector, we developed a concise agreement, establishing the most important rights and responsibilities of the parties.

Customers with a home or business supplied by district cooling can have confidence that their rights will be protected whoever provides them with billing services. The RSB’s Cooling Services Agreement (RD04b) regulates the relationship between a district cooling service provider and a building owner. This is inevitably a more complex agreement as it covers the physical delivery of chilled water to the building’s system. The regulatory regime is modular by design so we can alter it to reflect the performance of the sector and keep regulations relevant. Whilst the permits and standard agreements are expected to be in place for the longer term, they reference other regulatory documents that set standards in terms of customer service and energy performance.



Energy Performance

One of the objectives of the regime is to improve the energy efficiency of cooling in Dubai. “RD03 Energy Performance” has been

developed to set minimum thresholds that district cooling service providers must meet for electrical and water efficiency.

Customer Service

The legislation under which we are working identifies a number of instruments designed to protect customers’ interests. RD02 Handling Customers in Arrears lays down clear and fair procedures that permit holders must follow when handling customers in arrears. RD05 Customer Charters requires permit holders to set their own objectives for delivering customer service and to publish them in the form of Customer Charters. The Resolution requires that permit holders set out processes and procedures for resolving customer complaints and we expect permit holders to include these

in their Customer Charters. We will hold permit holders to account if their service falls short of these standards and, if the standards set fall short of our expectations, we may require the permit holder to set higher standards before approving its Customer Charter. RD06 Metering Billing and Charges sets minimum requirements for the information to be contained in bills and the approach that permit holders must take to billing, including the charges they may make. It also sets metering requirements. RD06 recognises, of course, that the DSCE approves all tariffs, fees and charges.

Health and Safety

We have extended our existing Health and Safety Performance reporting requirements for the power and water sector to cover permit holders. In doing so, we took the opportunity

to update the requirements, which are now several years old, and we will keep them under review as we receive performance data from permit holders and licensees.

Data Collection.

Prior to the publication of the Resolution we had reduced the data we collect from district cooling companies to the minimum required for us to report on savings under the DSCE’s demand side management strategy. However, with the introduction of the Resolution, we undertook a review to ensure that the data we collect gives us sufficient insight to assess performance in areas such as:

- market share
- energy performance at plant level

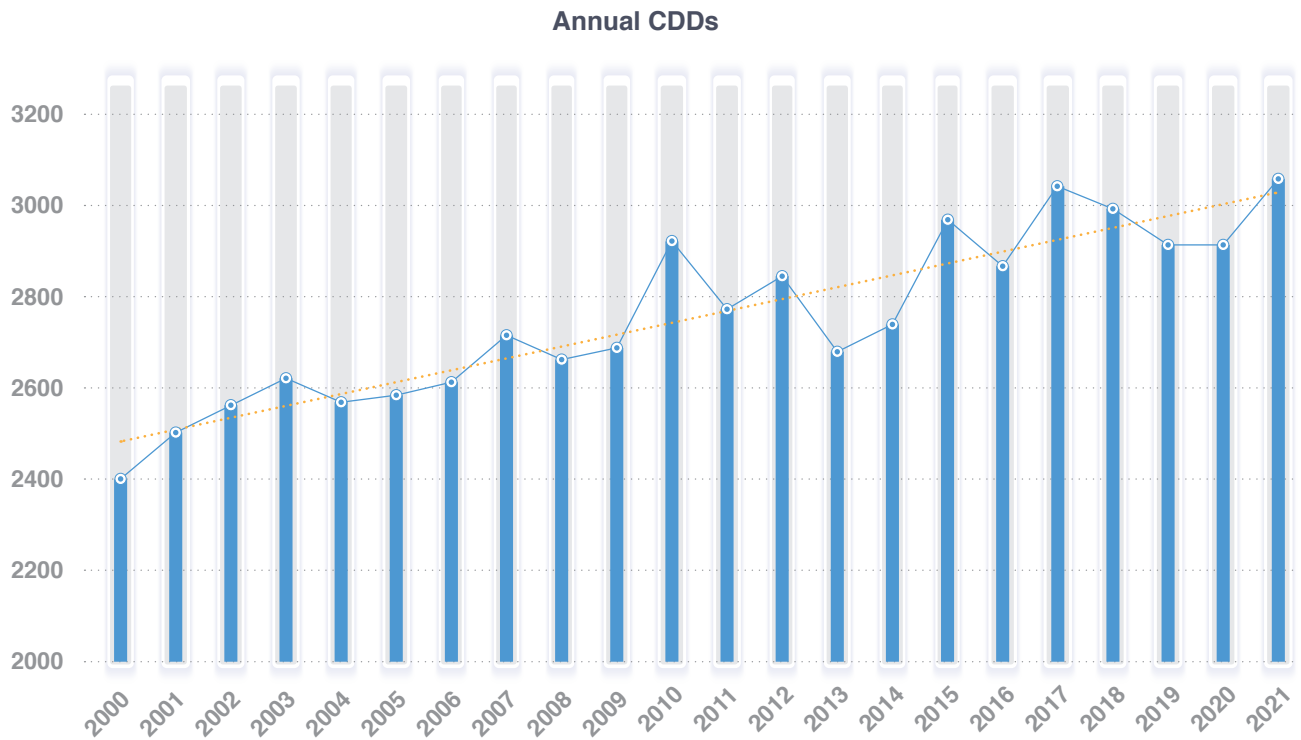
- tariffs
- outturn prices
- cooling load density
- consumption density
- permit holder revenues

In addition to annual data returns on DC systems and Billing Services, as a condition of permit we will collect data on the financial, and health and safety performance of permit holders each year.

2021 Annual Performance.

It was another record year for cooling degree days as measured at Dubai International Airport. Higher cooling degree days augment demand for cooling services, reflected in total demand for cooling rising to nearly

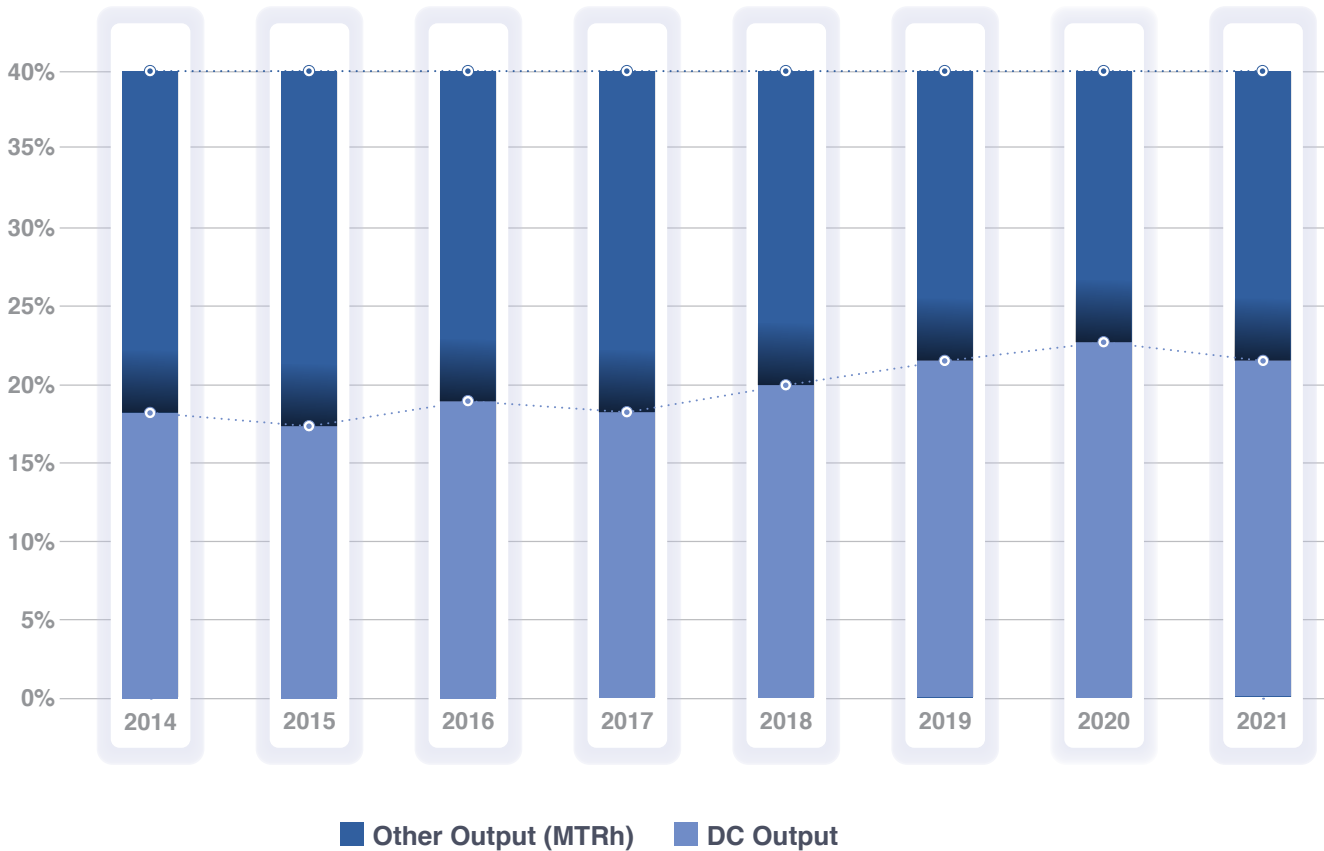
12.5 billion ton-hours. The upward trend in cooling degree days shown in (Figure 13) is driven mainly by the heat island effect of urban Dubai as it has grown over the past 20 years.



> Figure (13) Cooling Degree Days

The share of that demand met by district cooling was 21.6% compared with 22.7% in 2020. We believe this is influenced by the warmer weather experienced in 2021. The full load hours of smaller systems will be higher compared to the larger district cooling systems that provide more stable cooling. Smaller systems will also become less efficient in warmer weather and these

subtleties are not accounted for in the general market share analysis. Overall, we believe the share of cooling demand met by district cooling continued to grow. DSM savings attributable to district cooling were 742GWh up 14% on 2020. This year on year increase was delivered through further improvements in energy efficiency as detailed below. (Figure 14)



> Figure (14) District Cooling's Share of Cooling Demand

2020’s improvements in electrical efficiency were further extended as the sector reached average efficiency of 0.86kWh/TRh. It is worth looking back to 2013 when the

original DSM plan targeted district cooling companies to deliver 0.824kWh/TRh by 2030. At the time this was considered highly ambitious yet now that target now looks increasingly achievable.

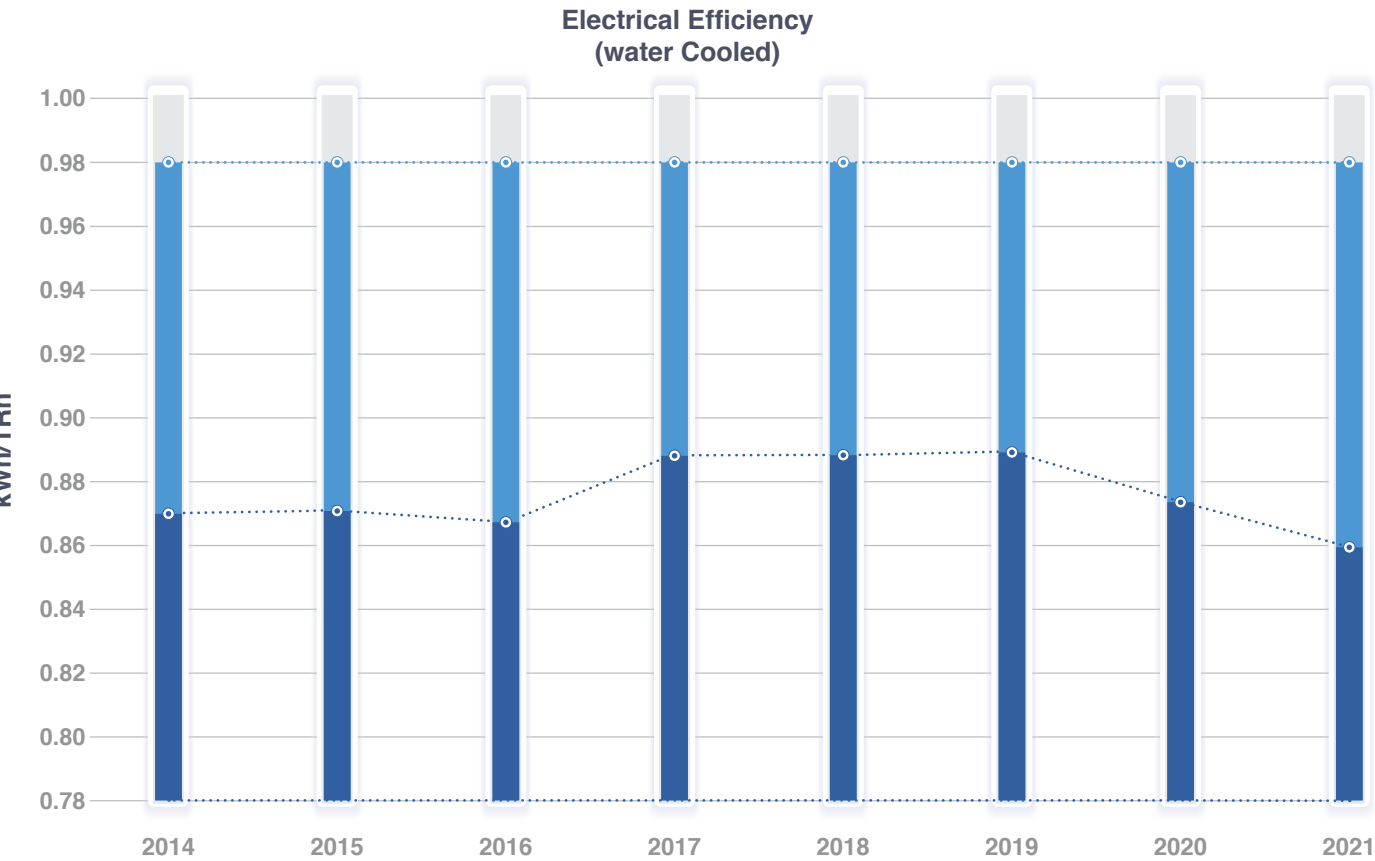


Figure (15) Electrical efficiency performance of water cooled plant

However, there remains room for further improvement. As discussed above, we are introducing a minimum energy performance threshold of 0.98kWh/TRh as shown in (Figure 15), for each district cooling plant. Under our proposal seven plant would have

failed in 2021. The best performing plant were new plant or plant incorporating innovative technology, such as seawater cooling. There are eight plant that beat the 2030 electrical efficiency target in 2021.

Water efficiency

Water efficiency has remained relatively stable since we started collecting data. This has occurred alongside increasing dependence on recycled water instead of potable water. Where used, recycled water is typically passed through reverse osmosis, allowing efficiency levels similar to potable water to be achieved.

Recycled water accounted for over 26% of

water demand, up from 25% in 2020. During the year there were constructive discussions between district cooling operators, Dubai Municipality and the RSB concerning making increased quantities of recycled water available. (Figure 16) shows the sector performance and the minimum water efficiency performance threshold of 9 litres per ton-hour. Analysis of 2021 data shows that nine plant would have failed this threshold.

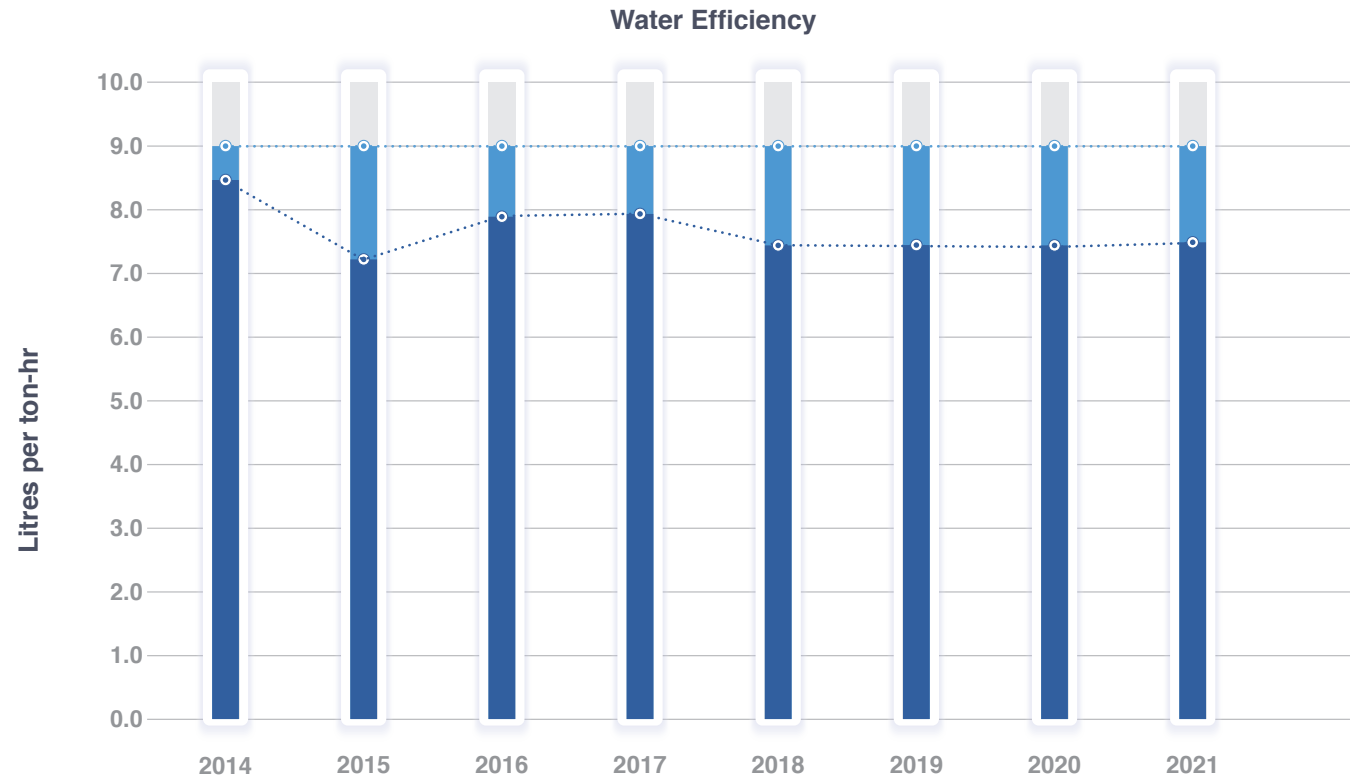


Figure (16) Water efficiency performance

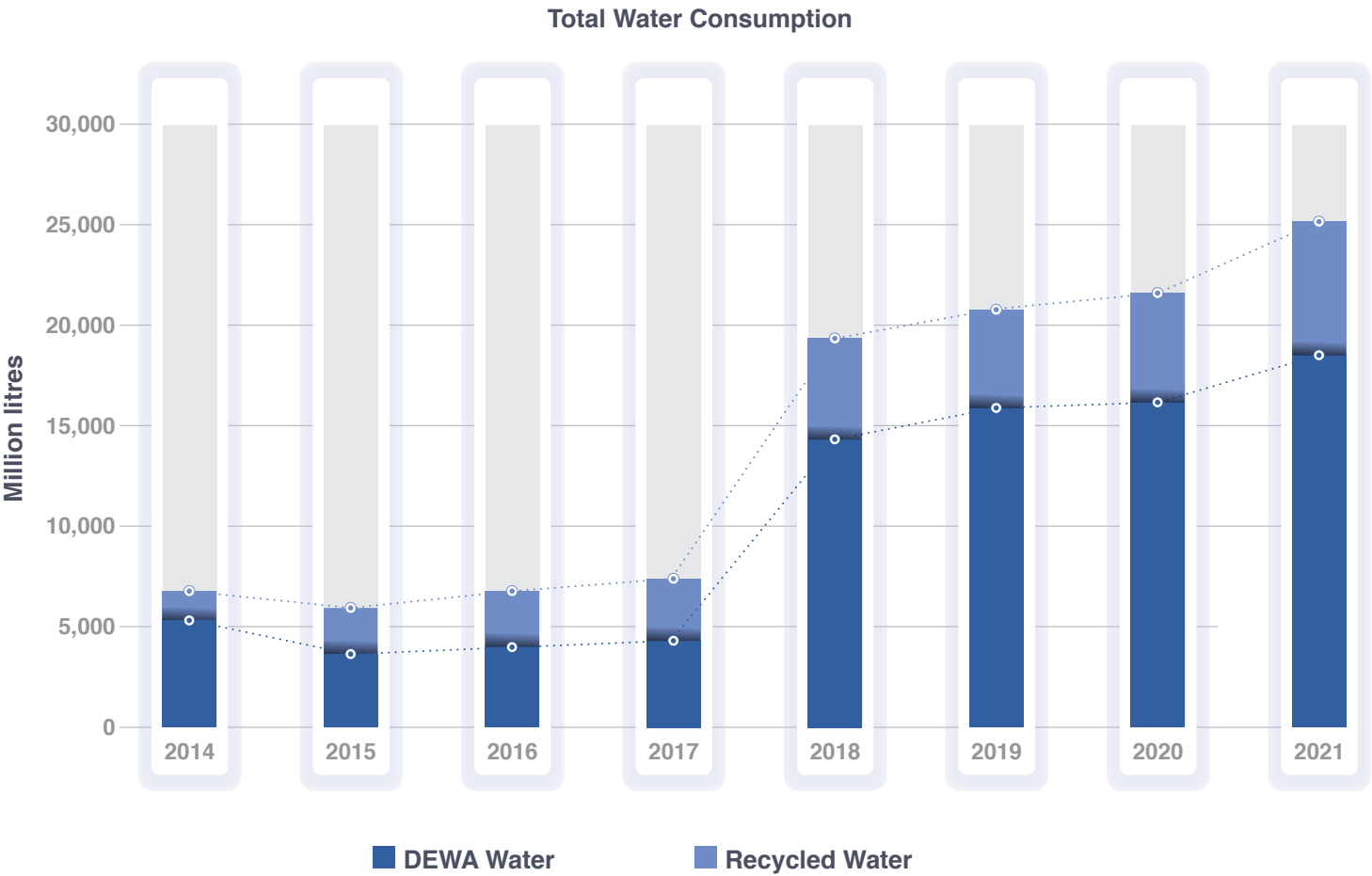


Escalated complaints

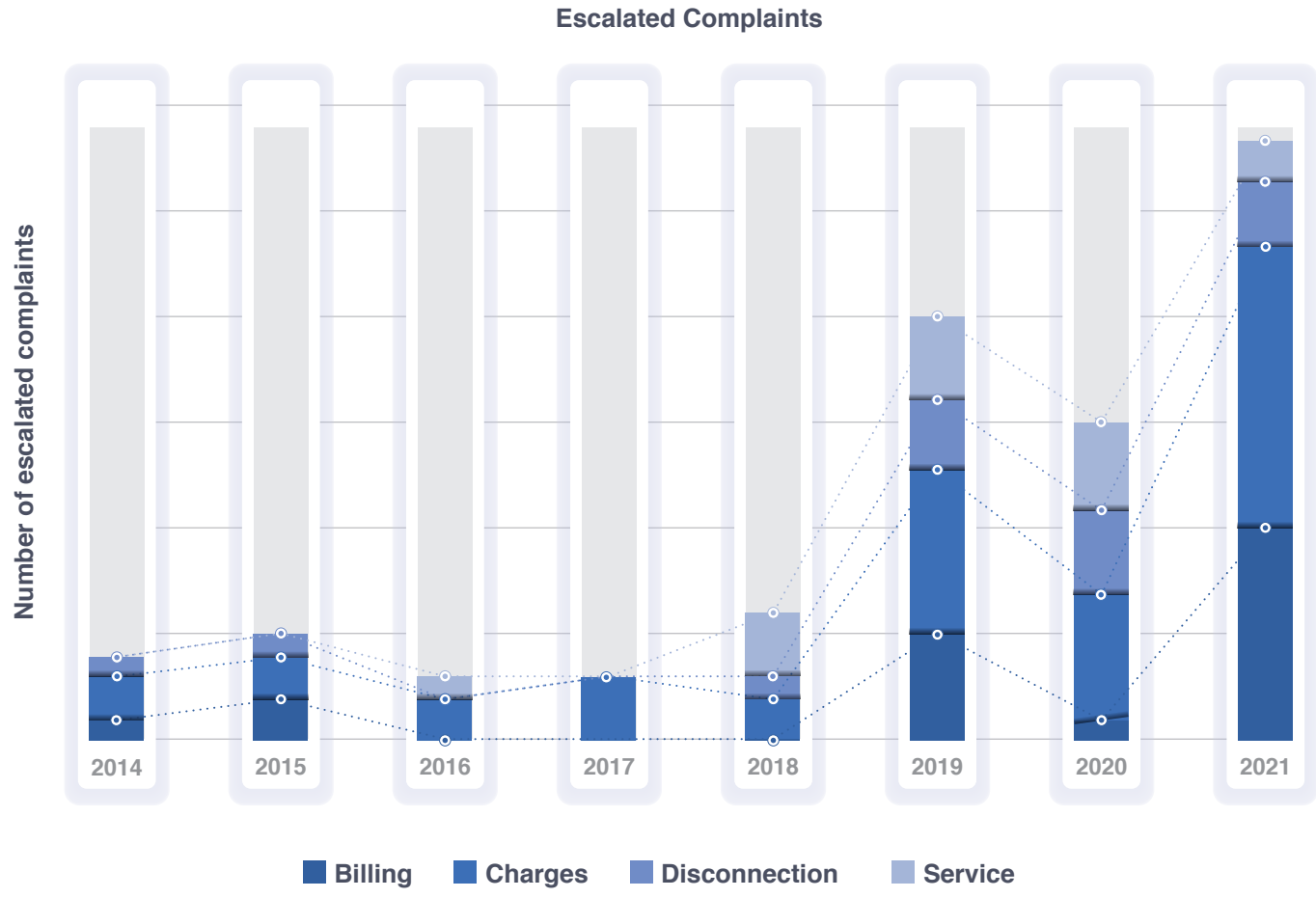
The number of complaints escalated to the RSB or DSCE has grown significantly since 2019 and with publication of the resolution that number has continued to grow.

complaints we receive, with relatively few concerning the quality and continuity of supply. We expect permit holders to resolve customer’s complaints to their satisfaction so that over the next few years the number of complaints brought to us will abate.

Billing and charges issues dominate the



> **Figure (17)** Water demand by source



> **Figure (18)** Complaints Escalated to the RSB

