حكومة دبي
GOVERNMENT OF DUBAI

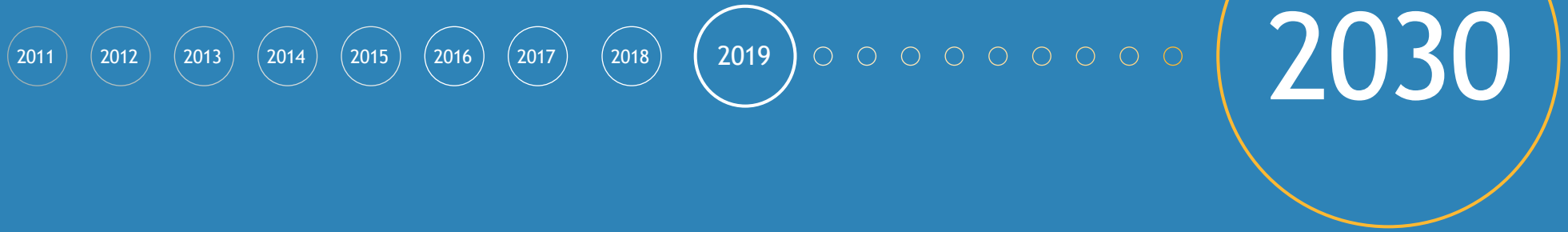
المجلس الأعلى للطاقة
Supreme Council of Energy

2019 Annual Report

Dubai Demand Side Management Strategy

طاقتي
TAQATI
برنامج دبي لكفاءة الطاقة
DUBAI ENERGY EFFICIENCY PROGRAM

"For an Efficient Future"



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HH Sheikh Mohammed bin Rashid Al Maktoum

Vice President and Prime Minister of
the United Arab Emirates and Ruler of Dubai

"We recognise that preserving our energy resources will be one of the greatest challenges in our drive towards sustainable development. This, however, will not materialise unless the different facets of our society adopt energy conservation principles in their core values. The future generations will be the chief beneficiary of our achievements and the best judge of what we accomplish in this field."

HH Sheikh Hamdan bin Mohammed bin Rashid Al Maktoum

Crown Prince of Dubai and Chairman of the Executive Council of Dubai

> History bears witness to our Founding Fathers' foresight and wisdom in the decisions they've made, decisions whose benefits we continue to enjoy today. Looking to the future is our leadership's permanent policy; they spare no effort in building a bright tomorrow for the nation's coming generations.

HH Sheikh Ahmed bin Saeed Al Maktoum

Chairman of the Dubai Supreme Council of Energy

> There has been much progress to date in the move towards a green economy, where economic growth and environmental responsibility are given equal importance in the development of a sustainable future. Indeed, the green economy is an engine of growth, providing opportunities for both the public and private sector.

MESSAGE FROM: VICE CHAIRMAN OF DUBAI SUPREME COUNCIL OF ENERGY

At the Dubai Supreme Council of Energy (DSCE), we are working to achieve the vision of His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, to promote the shift towards a sustainable green economy as well as to achieve the Dubai Clean Energy Strategy 2050 to produce 75% of Dubai's total power output from clean energy by 2050, and make Dubai the city with the lowest carbon footprint in the world. The DSCE launched the Demand Side Management Strategy (DSM) 2030 in 2013 to reduce energy and water demand by 30% by 2030 as part of its efforts to make Dubai a leading example of energy efficiency regionally and globally.

Given the importance of the DSM target of reducing energy consumption by 30% by 2030 and the different stakeholders involved to make it happen, the DSCE established TAQATI in January 2016, as the dedicated Program Management Office for the Dubai Demand Side Management Strategy. It interacts with a wide and diverse range of stakeholders to provide coherent and comprehensive DSM Strategy implementation management.

The 2019 DSM report shows another year of positive results from the implementation of the strategy; Dubai has successfully cut down electricity and water consumption by 11.3% and 7.7% respectively, compared to normal consumption rates. The 5.3 TWh of electricity and 9.6 billion imperial gallons of desalinated water saved during the past year, added to the savings from previous years, has not only brought environmental benefits to the emirate, but also economical ones. Reduced demand in electricity and water, has resulted in AED 6.6 billion in avoided generation costs, that can be used in other strategic investments that promote economic growth.

This is a result of excellent collaboration between all stakeholders, government entities leading the implementation of DSM programmes, industry players, and individuals.

We thank all stakeholders for their efforts and we are confident to achieve our wise leadership vision.

HE Saeed Mohammed Al Tayer

Vice Chairman of the Dubai Supreme Council of Energy

MESSAGE FROM: SECRETARY GENERAL OF DUBAI SUPREME COUNCIL OF ENERGY

The road we set in 2013 through the Demand Side Management (DSM) initiatives and projects over the years have provided many benefits to everyone. To ensure this continues, in 2019 we completed the update of the DSM Strategy, leveraging the knowledge and experience collected since inception of the Strategy, and including latest developments and trends from the world, tailored to our Emirate. We expect to stay on track through policies, regulations, data, measurement and verification, government support and leadership, communication and engagement, all leading to acceleration of Dubai's transition towards a sustainable energy future.

The updated DSM Strategy brings forward enhancements to all previous programs as well as some new ones, combining the Integrated Water Resource Management (IWRM) Strategy and Green Mobility under the umbrella of demand side management, as we continue expanding our work into main areas of electricity, water and fuel consumption.

We look forward to collaborating further with all our stakeholder partners in undertaking actions in line with DSM Strategy updates and celebrating future achievements together.

HE Ahmad Buti Al Muhairbi

Secretary General of the Dubai Supreme Council of Energy

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1 EXECUTIVE SUMMARY

This report, in its sixth year of publication, presents the progress and performance of the Dubai Demand Side Management (DSM) Strategy 2030 for 2019.

In January 2020, the Updated DSM Strategy was officially announced now addressing different aspects of demand for electricity and water in Dubai with eleven main programmes. The implementation period for the Updated Strategy will start in 2020.

As in the original DSM Strategy, each programme has an assigned programme owner, a government entity responsible for its execution, and supporting entities (as needed) to ensure smooth implementation. Strategy implementation is managed by TAQATI, a dedicated programme management office, and is under the supervision of the Dubai Supreme Council of Energy (DSCE). The end goal of the strategy is to deliver 30% annual savings in electricity and water by 2030 compared to the business as usual consumption.

By the end of 2019, the DSM Strategy implementation resulted in 5.3 TWh of annual electricity savings and 9.6 billion imperial gallons of annual water savings, corresponding to 11.3% and 7.7% of the baseline consumption, respectively. The achieved electricity savings surpass the 4.2 TWh target for electricity by 26%, while the achieved water savings exceed the annual target of 6.8 billion imperial gallons by 42%. As most programmes are rapidly expanding, the results show a substantial growth from the savings achieved in 2018, an increase of 18% for electricity and 44% for water.

Avoided cost in generation capacity and natural gas consumption from DSM electricity and water savings since the initiation of the strategy in 2011, are estimated at around AED 6.6 billion.

These important achievements are a combination of efforts from all programme owners, who are committed to annual targets and a roadmap that extends to 2030, and for whom the DSM Strategy is increasingly becoming part of their core activities.

AMONG THE KEY ACHIEVEMENTS OF 2019:

- **10,000 new commissioned and permitted green buildings** by Dubai Municipality and free zone authorities
- **5,368 retrofitted facilities including major retrofit projects:** Dubai International Airport, Dubai Golf, Al Wasl Properties, executed by Etihad ES
- **5,000 national villas in Dubai now powered by solar energy as part of Shams Dubai, equivalent to 10% of Dubai's residential homes** in line with Article 7 - Self-sufficiency in Dubai homes of the 50-year Charter issued by HH Sheikh Mohammed bin Rashid Al Maktoum, Vice President, Prime Minister of the UAE and Ruler of Dubai
- **New guidelines developed by Dubai Municipality** to optimize landscape design concepts using hardscaping and xeriscaping
- **Continuous expansion of Dubai Municipality's TSE irrigation network,** and recycling capacity in the Jebel Ali and Warsan Plants
- **Development of Energy Management Guidebook** for government and businesses
- **Delivery of retailer workshops on energy efficient appliances** by ESMA and TAQATI
- **Launch of solar trainings in partnership with Solar Energy International (SEI)** to enhance market capabilities in the solar industry
- **Continuous improvement of systems and processes** for monitoring and evaluating DSM energy savings

The coming years will continue to see a steep increase in saving targets as well as a broadened scope for DSM with new programmes defined in the Updated DSM Strategy namely Consumer Behaviour, Efficient Mobility & Smart Charging, Fuel & Engine Efficiency to accelerate Dubai's transformation into one of the smartest cities in the world.

The DSM Strategy plays an important role in the sustainable growth of Dubai. It is generating real savings, improving awareness, building capabilities, and developing the energy efficiency market. The ongoing support received from the Dubai leadership and institutions gives confidence that the ambitious goals of the DSM Strategy will be achieved.

2 OBJECTIVES AND SCOPE OF THIS REPORT

The objective of this report is to present the progress and performance of the Dubai Demand Side Management (DSM) Strategy 2030: a strategy spearheaded by the Dubai Supreme Council of Energy (DSCE), implemented by key government entities in Dubai, and supported by TAQATI.

The report comprises a description of the Updated DSM Strategy (issued in January 2020), a presentation of the achievements in 2019, and key highlights for each programme. It highlights achievements in electricity and water savings attained from implementing DSM programmes in comparison with pre-set target savings, along with other performance indicators, such as changes in per capita consumption and monetary benefits of the strategy.

Data presented in this document are the result of a reporting system that the DSCE maintains through TAQATI in collaboration with the DSM programme owners: Dubai Electricity and Water Authority, Dubai Municipality, Roads and Transport Authority, the Regulatory and Supervisory Bureau for Electricity and Water in Dubai, Etihad Energy Services, Emirates Authority for Standardization and Metrology (ESMA) and Dubai Free Zone Council (DFZC).

Note that the results reported are based on the most recent data available at the date of report publication. As this is a continuous improvement process, if more accurate historical results are made available in the future, they will be used in future reports and could produce slight changes in reported historical figures year to year.

3 CONTEXT AND OVERVIEW OF THE DSM STRATEGY

3.1 POLICY CONTEXT

The Demand Side Management (DSM) Strategy is part of the Dubai Integrated Energy Strategy (DIES) 2030, whose main goals are to secure Dubai's uninterrupted energy supply and moderate its growing electricity and water demand *(see exhibit 1)*.

Optimising energy demand is a strategic priority for Dubai to reduce the need for next generation capacity and free up resources for strategic investments that promote economic growth. At the same time, DSM supports the growth of a green economy and the creation of green jobs, aligns with smart city objectives through the employment of smart technology, and contributes to a safer environment by reducing carbon emissions.

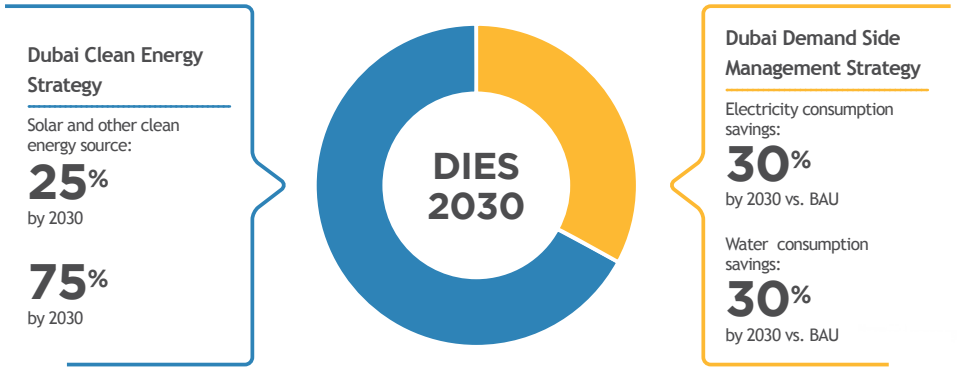


Exhibit 1: Demand Side Management Strategy as part of the Dubai Integrated Energy Strategy 2030

Building on the success of DSM Strategy implementation since 2013, the Dubai Supreme Council of Energy (DSCE), in collaboration with relevant stakeholders, refreshed the strategy in 2019 to ensure new developments in Dubai's social and economic landscapes are reflected and to address the need for evolving DSM measures and programmes. In fact, the Updated DSM Strategy aligns with the Dubai 50-year Charter and Dubai's Eight Principles of Governance announced by His Highness Sheikh Mohammed bin Rashid al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, and supports the Dubai Integrated Water Resources Management Strategy 2030, the Dubai Green Mobility Initiative as well as well other key national and local strategies and policies.

The Updated DSM Strategy was officially announced in January 2020 by H.H. Sheikh Ahmed bin Saeed Al Maktoum, Chairman of DSCE through "Directive No. 1 of 2020 on the Updated Dubai Demand Side Management (DSM) Strategy 2030" *(see exhibit 2)*. The implementation period for the Updated Strategy is from 2020 to 2030.

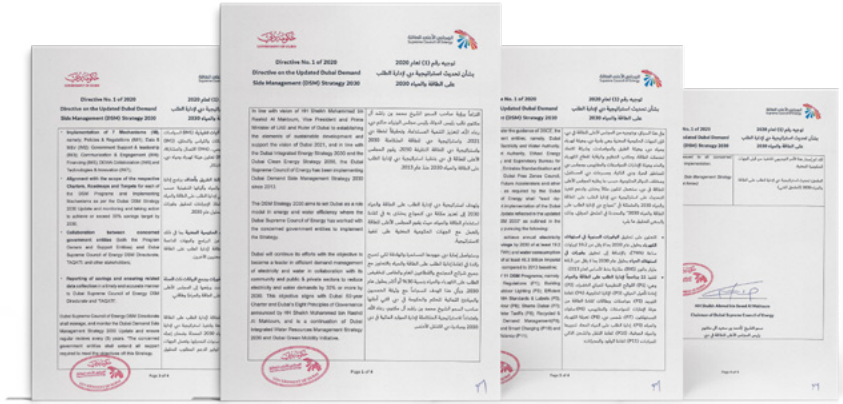


Exhibit 2: DSCE Directive No.1 of 2020 on the Updated DSM Strategy 2030

3.2 DEMAND SIDE MANAGEMENT STRATEGY AND TARGETS

DSM Strategy

The Updated DSM Strategy 2030 reinforces Dubai's goal of becoming a leader and role model in energy and water efficiency and comprises **eleven programmes** that address different aspects of electricity and water consumption in Dubai. Programmes are **supported by seven implementation mechanisms,** to stay on track through policies and regulations, data and measurement and verification, government support & leadership, boost programs through communication & engagement, and financing, and accelerate Dubai's translation into a smart city *(see exhibit 3 and 4)*.

Exhibit 3: Architecture of the Updated Dubai Demand Side Management Strategy

	Programme	Scope
1	Green Building Regulations	Increase energy and water efficiency in new buildings through building regulations and compliance (positioning Dubai to transition towards NZEB in the long-term)
2	Building Retrofits	Retrofit existing building stock & infrastructure with electricity & water efficiency measures
3	Outdoor Lighting	Adopt high efficiency lighting in public spaces in Dubai
4	Efficient Cooling	Promote efficient cooling technology use in Dubai buildings
5	ESMA Standards & Labels	Drive adoption and compliance with Minimum Energy Performance Standards (MEPS) and labels for airconditioners (ACs), home appliances and industry equipment in Dubai
6	Consumer Behaviour	Engage main user groups (residential and commercial) in electricity and water conservation through the promotion of smart devices and appliances delivered through new business models in Dubai
7	Shams Dubai	Promote use of building-level solar energy systems across Dubai building stock
8	Tariffs	Adjust tariff structure to be cost reflective, promote energy efficiency and give the right signal to reduce consumption
9	Recycled & Ground Water Demand Management	Promote recycled and ground water management based on network expansion and use of recycled water in line with the Integrated Water Resource Management Strategy (IWRMS)
10	Efficient Mobility and Smart Charging	Encourage the uptake of efficient mobility and smart charging in Dubai
11	Fuel & Engine Efficiency	Promote efficiency and demand abatement of transportation (fossil) fuels in Dubai

Exhibit 4.A: Scope of the Dubai Demand Side Management Strategy programmes

	Implementation Mechanism	Scope
1	Policies and Regulations	Enforce policies and regulations to drive the implementation of the updated DSM Strategy
2	Data and M&V	Ensure proper measurement, evaluation and monitoring of DSM savings to assess performance against targets. Consider the implementation of verification element
3	Government Support and Leadership	Ensure that Government entities lead-by-example the implementation of the updated DSM Strategy
4	Communication and Engagement	Develop and execute general and targeted information campaigns as well as education, home reporting and labelling schemes to change consumers' behaviour
5	Financing	Develop financing mechanisms that support the implementation of DSM initiatives in Dubai
6	DEWA Collaboration	Leverage DEWA's activities in developing Smart Grid capabilities, consumer analytics, sustainable consumer behaviour and technology research
7	Technologies and Innovation	Introduce and localize new efficient technologies and conduct key studies for DSM and enable DSCE to play a leadership role in supporting Dubai overall sustainability and smart cities strategy

Exhibit 4: B. Dubai Demand Side Management Strategy Implementation Mechanisms

DSM Targets

The Government of Dubai remains committed to achieving ambitious electricity and water savings by implementing the 11 DSM programmes. Based on the Updated Strategy, Dubai targets overall electricity savings of about 19.2 TWh and water savings of 46.3 billion imperial gallons, which correspond to 30% savings versus business as usual by 2030 *(see exhibit 5)*.

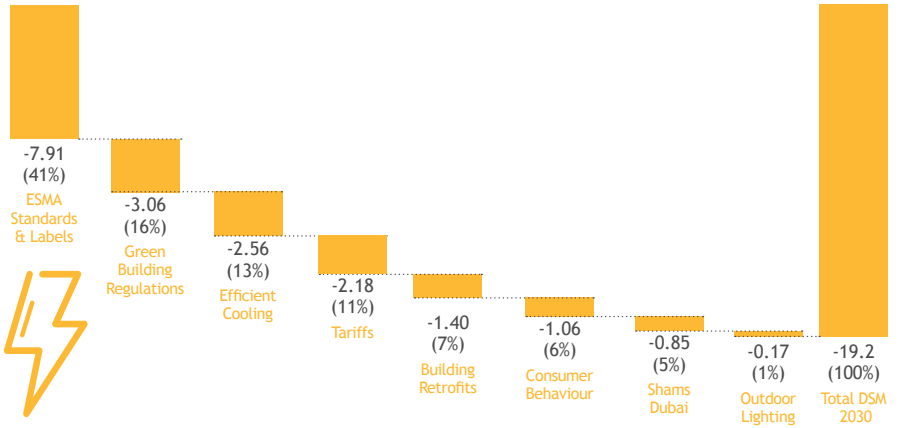
THE DSM STRATEGY TARGETS

30% SAVINGS BY 2030

VS. BUSINESS AS USUAL CONSUMPTION

Targeted electricity savings from DSM Programmes

2030, TWh



Targeted water savings from DSM Programmes

2030, Billion imperial gallons

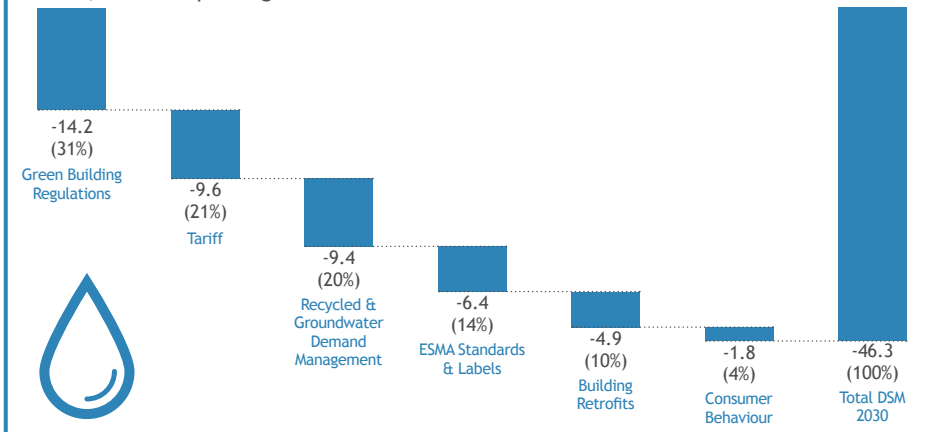


Exhibit 5: Electricity and water saving targets of the Updated Dubai Demand Side Management Strategy 2030

3.3 INSTITUTIONAL FRAMEWORK

Exhibit 6: Governance structure of the Dubai Demand Side Management Strategy

The DSM Strategy is managed by the DSCE, the policymaking entity for Dubai's energy sector. The DSCE is chaired by His Highness Sheikh Ahmed bin Saeed Al Maktoum and comprises top executives from key Dubai Government institutions, namely: Dubai Electricity and Water Authority (DEWA), Roads and Transport Authority (RTA), Dubai Municipality (DM), Emirates Global Aluminium (EGA), Emirates National Oil Company (ENOC), Dubai Supply Authority (DUSUP), Dubai Petroleum Affairs, Dubai Petroleum Establishment (DPE), and Dubai Nuclear Energy Committee.

The DSM Executive Committee, chaired by the DSCE and comprising senior representatives from all programme owner entities, provides direction and ensures collaboration between key DSM related entities. On the date of publication of this report, members of the DSM Executive Committee are:

HE Ahmad Al Muhairbi
Secretary General, DSCE
Chairman

Yousef Jebril
Executive Vice President, Power and Water Planning, DEWA
Vice Chairman

Faisal Rashid
DSM Director, DSCE
Secretary

Ali Al Jassim
CEO, Etihad Energy Services
Member

Shadi Al Kadi
Programme Management Director, TAQATI
Member

Yousef Al Saadi
Director, ESMA
Member

Fahed Al Awadhi
Director of Drainage Projects, DM
Member

Fida Alhammadi
Head of Researches and Building Systems, DM
Member

Graeme Sims
Executive Director, Regulatory & Supervisory Bureau for Electricity and Water in Dubai
Member

Mohammed Al Shamsi
Sr. Manager, Climate Change and Sustainability, DEWA
Member

Jason Pratt
Director, Health Safety and Environment, DP World
Member (on behalf of Dubai Free Zones Council)

Mustafa Al Yousuf
Board Member, Regulatory & Supervisory Bureau for Electricity and Water in Dubai
Member

Bassel Saad
Director, Roads and Facilities Maintenance, RTA
Member

Samer Khoudeir
Chief Sales and Marketing Officer, Empower
Member

Shamma Al Rahmah
Director, Strategic Planning and Portfolio Management, ENOC
Member

Taher Diab
Sr. Director, Strategy and Planning, DSCE
Member

TAQATI is the Program Management Office for the DSM Strategy, established to manage the implementation of the DSM Strategy on behalf of the DSCE and to provide implementation support to Program Owners.

Programme Owner or Owners, is/are assigned for each DSM programme, and is/are responsible for executing the programme and managing its day-to-day operations. The entities are selected based on mandate and reach, and focused on delivering results and addressing challenges specific to the programme *(see exhibit 6)*. In addition, Support entities are also assigned to programmes as needed.

TAQATI | DUBAI ENERGY EFFICIENCY PROGRAMME

TAQATI was established by the Dubai Supreme Council of Energy in 2016 as the dedicated Programme Management Office (PMO) to support the implementation of the DSM Strategy.

TAQATI's functions include:

- Providing advisory support to the programme owners in developing their DSM-related operational plans, and identifying associated risks and mitigation measures to meet annual targets.
- Monitoring and evaluating savings from DSM programmes and projects in Dubai, and reporting the results annually together with future forecasts.
- Implementing the DSM Integrated Awareness Strategy (IAS 2022) by working closely with DSM programme owners and their Marketing and Corporate Communication teams.
- Facilitating capacity-building activities to build expertise in the market and in relevant organisations, by leading the Dubai Energy Efficiency Training Programme in collaboration with renowned international training institutions.

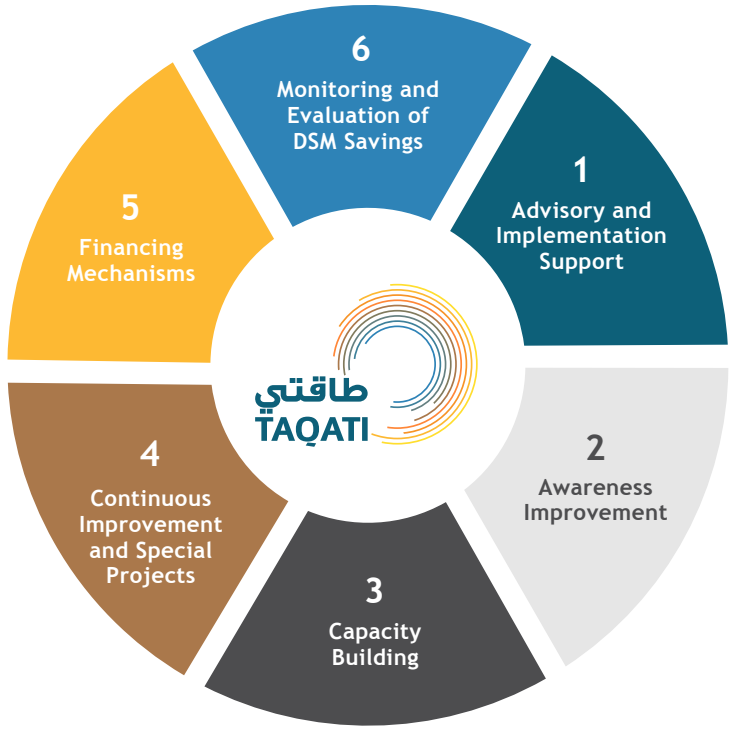


Exhibit 7: TAQATI Functions

4 DSM STRATEGY ACHIEVEMENTS

4.1 OVERVIEW OF THE MAIN ACHIEVEMENTS TO DATE

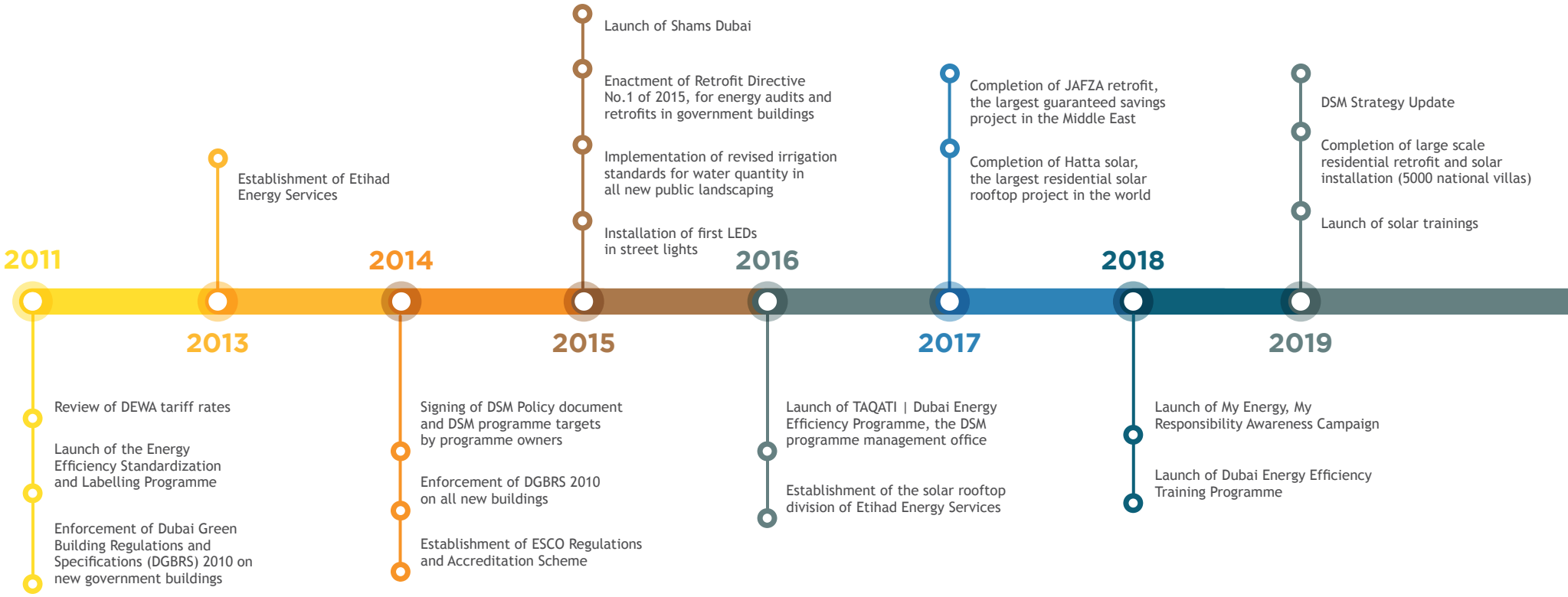


Exhibit 8: Timeline of main Dubai Demand Side Management Strategy achievements, from 2011 to 2019

4.2 OVERALL PERFORMANCE IN 2019

Electricity and Water Savings

The Demand Side Management (DSM) Strategy performance continues to produce positive results in 2019. At the end of 2019, DSM programmes have saved 5.3 TWh of electricity, 26% over the 4.2 TWh target for the year, and 9.6 billion imperial gallons (BIG) of water, far exceeding the 6.8 billion gallons target for the year. Compared to business as usual consumption, which is the reference for the 30% by 2030 target, those savings represent 11.3% and 7.7% of the total baseline consumption for electricity and water, respectively *(see exhibit 9)*.

IN 2019

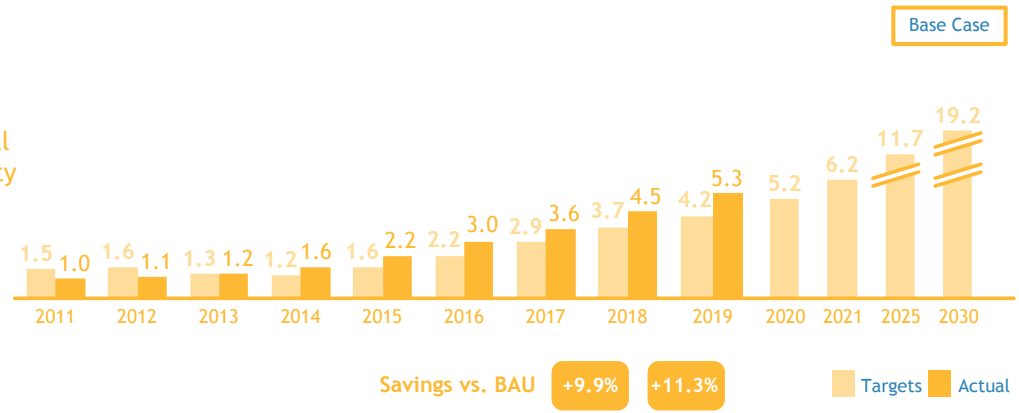
Savings of 5.3 Billion Kilowatt Hours (TWh)

Reduction of 11.3% vs. Business as usual

Savings of 9.6 Billion Imperial Gallons (BIG)

Reduction of 7.7% vs. Business as usual

A. Annual Electricity Savings (TWh)



B. Annual Water Savings (Billion imperial gallons)

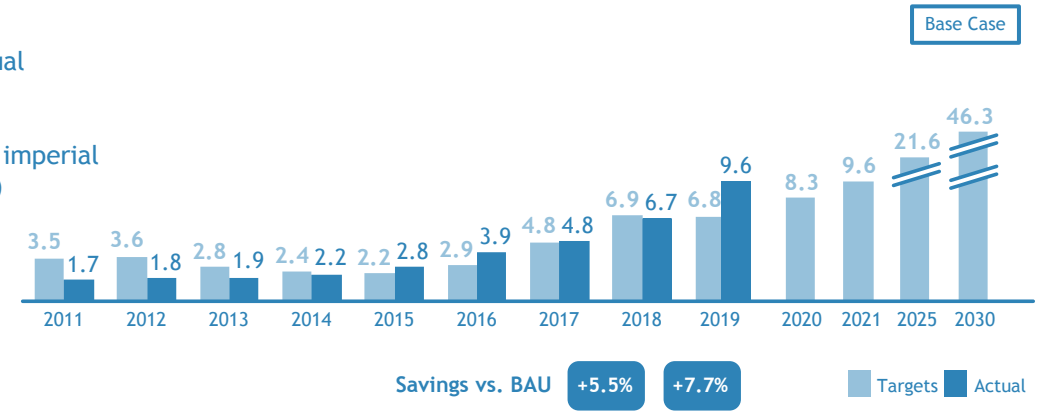


Exhibit 9: Actual annual savings achieved from the implementation of the Dubai Demand Side Management Strategy programmes, versus target savings (**A.** Annual electricity savings **B.** Annual water savings)

Note: 2019 targets are based on the Updated DSM Strategy 2030

Contribution of DSM Programmes to Savings

The impact of the tariff review applied in 2011 by Dubai Electricity and Water Authority (DEWA) is still significant, but its share of the overall DSM savings has been decreasing due to savings from other DSM programmes starting to pick up after initial setup between 2011 and 2014 *(see exhibit 10)*.

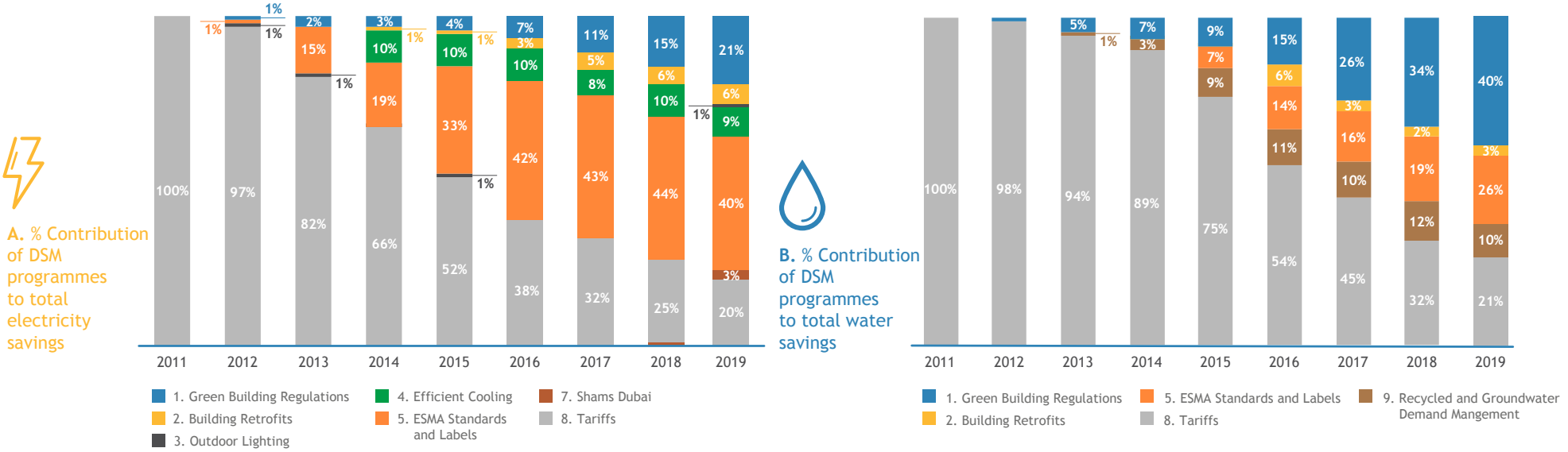


Exhibit 10: Percentage contribution of programmes to the total Dubai Demand Side Management Strategy savings, for years 2011 to 2019 (**A.** Electricity savings and **B.** Water savings)

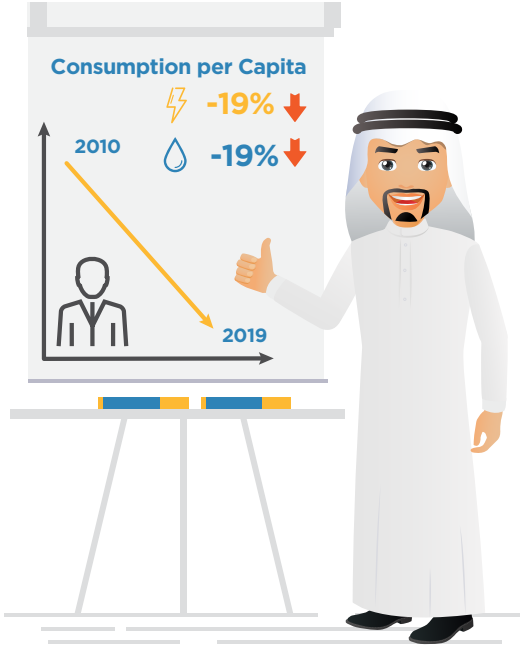
Reduction in Consumption per Capita

Unitary consumption confirms the positive impact of the DSM programmes, as per capita consumption for both electricity and water continues to decrease in line with previous years. Looking at long term trends, since the inception of the DSM Strategy, consumption per capita has decreased by an annual average of 2.3% for electricity and 2.4% for water *(see exhibit 11)*, a total reduction of 19% for electricity and 19% for water vs. 2010 consumption.

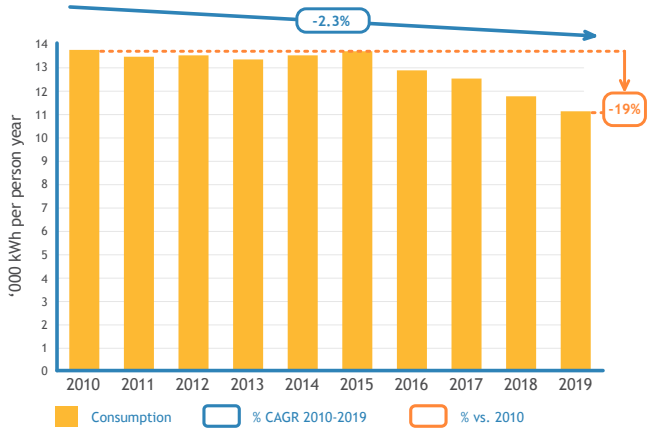
NOTES

1. Annual population used in the calculation is an estimate of the average Dubai population taking into account residents of Dubai, and a weighted contribution from people working in Dubai but residing in neighbouring emirates and from tourists.

2. Total consumption used is the consumption at end-user level and excludes power stations and desalination auxiliaries, as well as losses in the transmission and distribution networks.



A. Overall consumption per person -Electricity
('000 kWh, 2010-2019)



B. Overall consumption per person - Water
('000 IG, 2010-2019)

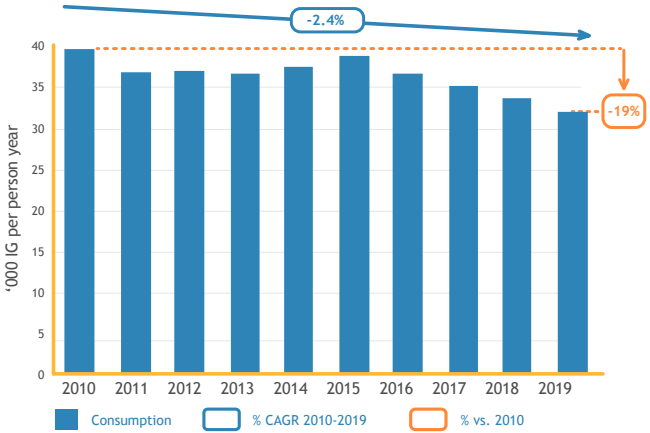


Exhibit 11: Trends of per capita consumption in Dubai, showing the compounded annual growth rate (CAGR) and total decrease in consumption from 2010 to 2019 (**A.** Electricity **B.** Water)

A. Annual Electricity Savings by DSM programme in 2019 vs 2018

DSM Programme	2018 Savings (GWh)	2019 Savings (GWh)	2019 Target (GWh)	Year-over-year growth (%)	Actual vs. target (%)	Notes on the results
Green Building Regulations	657	1,098	317	+67%	+246%	Savings based on commissioned green building data received by Dubai Municipality (DM), Trakhees, Dubai Silicon Oasis (DSO), Dubai South and Dubai Development Authority (DDA).
Building Retrofits	256	321	264	+25%	+22%	Savings result from steady growth in electricity retrofits executed by Etihad Energy Services (Etihad ES) and accredited energy services companies (ESCOs) in Dubai.
Outdoor Lighting	24	33	25	+38%	+32%	Savings include outdoor lighting installations and retrofits executed by Roads and Transportation Authority (RTA), Dubai Municipality (DM) and Free Zone Authorities.
Efficient Cooling	428	458	317	+7%	+44%	Savings based on data received from the five main district cooling operators in Dubai.
Standards and Labels	1,970	2,195	1,965	+11%	+12%	Savings result from enforced efficiency standards by the Emirates Authority for Standardization and Metrology (ESMA), for unit air conditioners (mostly), indoor lighting, refrigerators, washing machines, and water heaters.
Consumer Behaviour	N/A	N/A	131	N/A	N/A	Data collection for program savings to begin in 2020.
Shams Dubai	62	142	180	+129%	-21%	Increase in savings results from the connected capacity doubling from 71 MW in 2018 to 165 MW in 2019.
Tariffs	1,105	1,055	1,137	-5%	-7%	Savings based on the price response to the 2011 DEWA tariff review.
Grand Total	**4,502**	**5,302**	**4,205**	**+18%**	**+26%**	
Total as % of baseline	**9.9%**	**11.3%**				

Exhibit 12: A. Actual annual electricity savings by programme of the Dubai Demand Side Management Strategy in 2019, in comparison to 2019 targets and 2018 savings
Note: 2019 targets are based on the Updated DSM Strategy 2030

B. Annual Water Savings by DSM programme in 2019 vs 2018

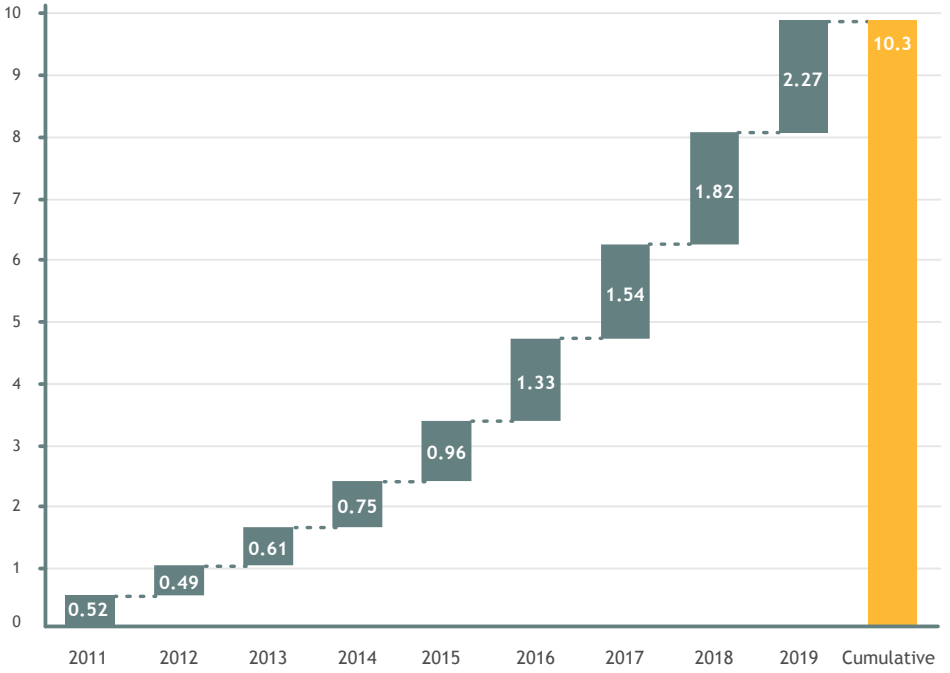
DSM Programme	2018 Savings (MIG)	2019 Savings (MIG)	2019 Target (MIG)	Year-over-year growth (%)	Actual vs. target (%)	Notes on the results
Green Building Regulations	2,294	3,825	1,245	+67%	+207%	Savings based on commissioned green building data received by DM, Trakhees, DSO, Dubai South and DDA.
Building Retrofits	161	258	278	+60%	-7%	Savings based on water retrofits carried out by Etihad ES and accredited-ESCOs. The Regulatory & Supervisory Bureau for Electricity and Water in Dubai is investigating the reasons for deviation from target (e.g., unaccounted for savings or lower business case).
Standards and Labels	1,280	2,564	1,426	+100%	+80%	Savings result mostly from enforced efficiency standards by ESMA for washing machines and water fixtures.
Consumer Behaviour	N/A	N/A	354	N/A	N/A	Data collection for program savings to begin in 2020.
Tariffs	2,143	2,006	2,556	-6%	-22%	Savings based on the price response to the 2011 DEWA tariff review.
Recycled & Groundwater Demand Management	797	976	902	+22%	+8%	Savings mainly from water efficiency measures applied to the irrigation of public landscapes by Dubai Municipality, and the use of treated water instead of desalinated water in other applications such as district cooling, and car wash systems.
Grand Total	**6,676**	**9,629**	**6,761**	+44%	42%	
Total as % of baseline	5.5%	7.7%				

Exhibit 12: B. Actual annual water savings by programme of the Dubai Demand Side Management Strategy in 2019, in comparison to 2019 targets and 2018 savings

Note: 2019 targets are based on the Updated DSM Strategy 2030

Reduction in Carbon Emissions

An important impact of savings on electricity and water consumption is the reduction in carbon dioxide (CO_2) emissions resulting from avoided electricity and water generation, which today relies in large part on non-renewable sources *(see exhibit 13)*.



CO_2 Emission Abatement
(million metric tons)

Exhibit 13: Cumulative carbon dioxide emission abatement from the implementation of the Dubai Demand Side Management Strategy, from 2011 to 2019

SINCE 2011

Avoided
10.3 Million Metric Tons of CO_2

Equivalent to emissions from
1.9 Million cars driven in Dubai for 1 full year

4.3 MONETISING DEMAND SIDE MANAGEMENT SAVINGS

Savings in electricity and water consumption from the DSM Strategy lead to economic savings in the form of avoided cost and freed up resources that can be diverted to other purposes.

The benefits of the DSM Strategy are determined as part of a Total Resource Cost (TRC) Test, i.e., from the perspective of all participants, including DSM programme owners (with DEWA as both utility and programme owner), implementing entities (developers, ESCOs, district cooling operators), and end users (DEWA customers).

Reduced demand in electricity and water since strategy initiation in 2011 and up to 2019, translate into approximately AED 6.6 billion: AED 1.6 billion of avoided capital investments and AED 5 billion of avoided operational costs. This is the equivalent of 5 x 200MW open cycle turbine units and 202,000 million standard cubic feet of natural gas.

Since 2011

Saved

6.6 Billion AED in operational costs and capital investments

Equivalent to

202,000 Million Standard Cubic Feet of natural gas

5 x 200 Megawatt open cycle gas turbine units

In addition to its direct benefits, the DSM Strategy brings several indirect benefits to Dubai. This more extended set of advantages includes, environmental conservation, positive impact on residents' health, job creation, reinvestment of saved resources, and higher attractiveness to investors resulting from a more sustainable and efficient city.

With all the valuable environmental, socio-economic, and financial benefits, Dubai Government is strongly committed to addressing any challenges the DSM Strategy may face along the way.

5 DEEP DIVE ON DSM PROGRAMMES AND INITIATIVES

P1:
GREEN BUILDING REGULATIONS

P2:
BUILDING RETROFITS

P3:
OUTDOOR LIGHTING

P4:
EFFICIENT COOLING

P5:
ESMA STANDARDS & LABELS

P6:
CONSUMER BEHAVIOUR

P7:
SHAMS DUBAI

P8:
TARIFFS

P9:
RECYCLED & GROUND WATER DEMAND MANAGEMENT

P10:
EFFICIENT MOBILITY & SMART CHARGING

P11:
FUEL & ENGINE EFFICIENCY

5.1 DSM PROGRAMME 1

GREEN BUILDING REGULATIONS

PROGRAMME OWNER

بلدية دبي
DUBAI MUNICIPALITY

PROGRAMME SUPPORT

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

Etihad الاتحاد
Energy Services لخدمات الطاقة

DFZC مجلس المناطق الحرة بدبي
DUBAI FREE ZONES COUNCIL

PROGRAMME OBJECTIVE

Increase energy and water efficiency in new buildings through building regulations and compliance (positioning Dubai to transition towards Near Zero Energy Building (NZEB) in the long term).

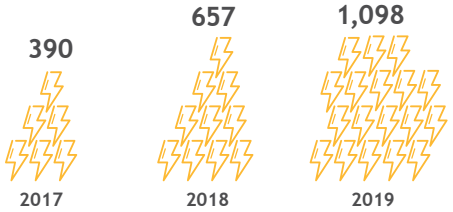
HE DAWOOD AL HAJIRI

Director General,
Dubai Municipality

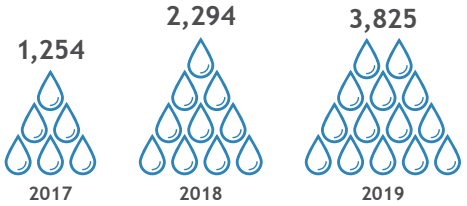
Visit www.dm.gov.ae

GREEN BUILDING REGULATIONS

PROGRAMME SAVINGS

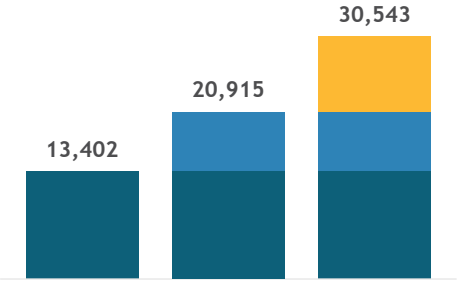


Electricity Savings (GWh)



Water Savings (Million imperial gallons)

OPERATIONAL DASHBOARD



Legend:
2017 2018 2019

Cumulative number of green buildings (includes buildings permitted by DM,Trakhees, Dubai Silicon Oasis, Dubai South and Dubai Development Authority)

PROGRAMME INTRODUCTION

At the current economic pace, Dubai is expected to continue its growth path, making new buildings one of the key contributors to energy consumption in the Emirate.

Dubai Municipality issued the first comprehensive compilation of green building regulations in 2010. In January 2011, the Dubai Green Building Regulations and Specifications (DGBRS) 2010 was made mandatory on all new government buildings, and in March 2014, after testing the code on more than 40 buildings, it was enforced on the private sector.

DGBRS 2010 is estimated to bring ~15% electricity and water savings in new buildings compared to pre-DGBRS buildings. The Building Regulations programme has one of the highest impacts among all DSM programmes for both electricity and water savings targets. To achieve the targets, the Demand Side Management (DSM) Strategy relies on the full implementation of green building codes across Dubai and an update to the regulations in 2022 that doubles the savings in future constructions.

GREEN BUILDING REGULATIONS

PROGRAMME HIGHLIGHTS

1 PENETRATION OF GREEN BUILDINGS IN DUBAI

Since the introduction of Dubai Municipality and Trakhees green building regulations for new buildings started around 10 years ago (2011 for DGBRS and 2008 for Trakhees), penetration of green buildings in Dubai has gradually increased. The number of constructed green buildings since then is around 30,000 buildings growing at a rate of ~50% per year since 2017 as new developments and replacing old inefficient buildings.

Dubai free zone authorities have also enforced green building regulations for new buildings constructed in free zones, some following DGBRS 2010 (e.g., Dubai Development Authority and Dubai South), whereas others developed separate prescriptive or performance based green codes (e.g., Trakhees and Dubai Silicon Oasis Authority). Beyond potential loss of energy saving opportunities resulting from lower efficiency standards in some free zones, differences in technical and permitting requirements may cause inefficiencies in the real estate value chain. Accordingly, a committee was established in 2018 for the unification of building regulations and permitting processes in Dubai. The Dubai Building Permit Development Committee is chaired by His Excellency Mr. Dawood Al Hajiri, Director General of DM, and includes members from each Dubai free zone authority. Shared regulations would bring benefits to all stakeholders: higher compliance to regulations for authorities, lower design and contractor service costs for developers, and eventually reduced final cost for customers.

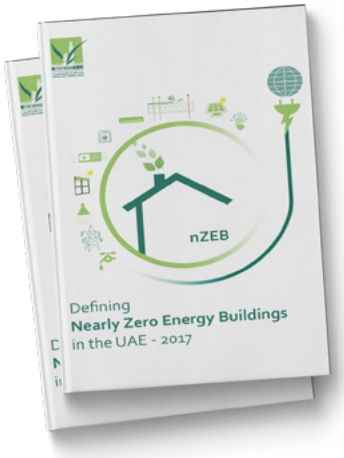
GREEN BUILDING REGULATIONS

2 ROAD TO NEARLY ZERO ENERGY BUILDINGS (NZEB)

Nearly Zero Energy Buildings (nZEB) are buildings that have a very high energy performance (i.e. low energy use intensity) and the low amount of energy that these buildings require comes mostly from renewable energy sources. nZEB represent the next paradigm in sustainable buildings and provide the stepping stone between current practices of green building codes and rating systems and the eventual adoption of net zero or positive energy buildings.

nZEB is a globally adopted concept and achieving near zero energy performance in buildings is a policy direction in developed countries around the world. In fact, the United States, Australia, and some European Union member states have set targets and a timeline for full implementation in new buildings by 2020 and 2030.

The current green building regulations represent a significant improvement over the previous generation of building codes and regulations; e.g. DGBRS 2010 reduced building consumptions by 15-20% for electricity and water on average. However, the energy use intensities (EUIs measured in kWh/m^2/year) achieved by implementing the latest regulations (e.g., 160 to 260 kWh/m^2/year for residential buildings) are still above achievable energy use intensities for nearly zero energy buildings (nZEBs) and net zero buildings.



In a 2017 study on “Defining Nearly Zero Energy Buildings in the UAE”, The Emirates Green Building Council (EmiratesGBC) defines nZEB in the UAE as a highly energy efficient building with a site Energy Use Intensity less than 90 kWh/ m^2/year.

For that reason, a periodic review of codes and regulations is necessary to push minimum requirements closer to nZEB. In fact, Al Sa’fat, the planned green building evaluation system of Dubai Municipality to be launched in 2020, aims to boost recognition of higher energy efficiency buildings in the market by developing different building energy performance levels. If the building meets the minimum requirements, it is awarded a Silver Sa’fa. However, if the building meets additional requirements, it is awarded higher ratings – a Gold or Platinum Sa’fa. As such, the evaluation system would provide visibility to energy efficiency investments in new buildings that can be reflected in the sales value and rent price.

Despite the absence of mandatory nZEB regulations in the UAE, the interest in implemeting the concept continues to grow as shown by early adopters (e.g. The Sustainable city, The Sustainable Autonomous House by the Mohammed Bin Rashid Space Centre). Research and innovation platforms are also active in studying and testing concepts for the future built environment in the region. These include Emirates Green Building Council’s “Net Zero Centre of Excellence” and the Solar Decathlon Middle East – SDME- competition led by DEWA.

CASE STUDY 1: SOLAR DECATHLON MIDDLE EAST (SDME)

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

SOLAR DECATHLON MIDDLE EAST

Solar Decathlon is an international competition in which universities from all over the world meet to design, build and operate sustainable solar-powered houses. The houses use renewable energy as the only energy source and are equipped with innovative technologies that permit maximum energy efficiency.

The Solar Decathlon Middle East (SDME) 2018 - 2020 was created through an agreement between the Dubai Supreme Council of Energy, Dubai Electricity and Water Authority (DEWA) and the Department of Energy of the United States Government in June 2015, with the aim of running two sustainable solar house competitions in Dubai, one in 2018, and another in 2020.

SDME 2018 took place in November 2018 at the Mohammed bin Rashid Al Maktoum Solar Park. The next Solar Decathlon Middle East 2020 will be held in November/ December 2020, offering the participating universities and their partners the best opportunity to be part of the most important global event of the year.

The key design considerations targeting energy efficiency seen in the competition houses in SDME 2018 include:

- Insulation and orientation:
  - High insulation materials in walls increasing R-values and reducing thermal bridging (e.g., glass wool and extruded polystyrene)
  - High reflective coating on rooftop or the use of shade canopy and screens reducing solar heat gains (e.g., middle eastern mashrabiya)
  - Orientation of windows on the northern house façade maximising daylighting
- Highly energy efficient appliances and equipment
- Solar generation and thermal storage:
  - Solar generation using Building Integrated Photovoltaic
  - Thermal (BIPV-T) roof tiles
  - Innovative cold thermal storage technology increasing
  - efficiency of air conditioning systems and reducing peak load
- Building systems and controls:
  - Building Management Systems ensuring optimal usage of renewable resources and maintaining comfortable indoor conditions
  - Energy efficient LED lighting system using smart controls and pre-programmed scenes (reading, cleaning, waking, or entertaining modes)
- Water conservation:
  - Advanced water recovery technology and use in nonpotable applications
  - Native plant specifications

CASE STUDY 2: DEWA'S NEW HQ: A ZERO ENERGY BUILDING

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

Dubai Water and Electricity Authority (DEWA) started construction of its new headquarters, called Al-Shera'a (Arabic for sail). Al Shera'a will be built in Jadaf in Dubai, and will be the tallest, largest, and smartest government Zero Energy Building in the world. Total energy used in the building during a year will be equal to or less than the energy produced on site during that year.

DEWA's new headquarters has been designed to receive a platinum rating by LEED (Leadership in Energy and Environmental Design) and a silver rating from the WELL Building Standard. The building will also use the latest technologies including IoT, Big Data and Open Data, AI, and the latest smart-building management technologies.

Key facts:

- **Built-up area is over 2 million square feet**
- **Number of floors:15 floors, a basement and 4 floors of car parking**
- **The building can house more than 5,000 people.**
- **Design:**
  - Inspired by the UAE's traditional houses, where enclosed spaces overlook an open courtyard.
  - To reduce heat in the open courtyard, a sail design is used to provide shaded areas.
  - Natural light during the day will stream through specific openings in the sail, giving sufficient light without the associated heat.
  - The courtyard will have sustainable gardens and will give occupants and visitors an outdoor feeling in an indoor setting.
- **Facilities:**
  - 500-people auditorium
  - Training halls
  - Creativity centre
  - Exhibition hall
  - Nursery for the children of female employees
  - Gym
- **Solar panels:**
  - Over 20,000 square metres of photovoltaic solar panels (including 1,000 square metres of Building Integrated Photovoltaic - BIPV) rated to over 4,000 kilowatts.
  - The building will generate over 6,500 megawatt hours (MWh) a year of renewable energy.
- **Connectivity and transportation: DEWA's new headquarters will be directly linked to Jadaf metro station by a bridge. This will encourage the use of public transport, to reduce traffic and the carbon footprint.**

5.2 DSM PROGRAMME 2

BUILDING RETROFITS

PROGRAMME OWNER

Etihad Energy Services الاتحاد لخدمات الطاقة

PROGRAMME SUPPORT

مجلس التنظيم والرقابة لقطاع الكهرباء و المياه
RSB FOR ELECTRICITY & WATER

PROGRAMME OBJECTIVE

Retrofit the existing building stock and infrastructure in Dubai with electricity and water efficiency measures in the aim of reducing the energy intensity of 30,000 buildings in Dubai by 2030.

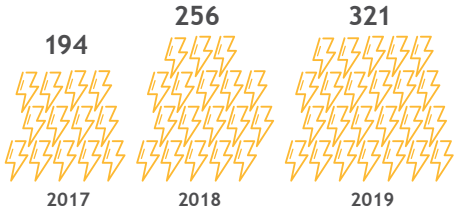
ALI MOHAMMED AL JASSIM

CEO, Etihad Energy Services

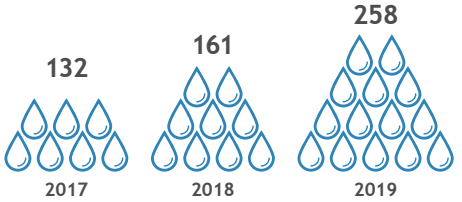
Visit www.etihadesco.ae

BUILDING RETROFITS

PROGRAMME SAVINGS



Electricity Savings (GWh)



Water Savings (Million imperial gallons)

PROGRAMME INTRODUCTION

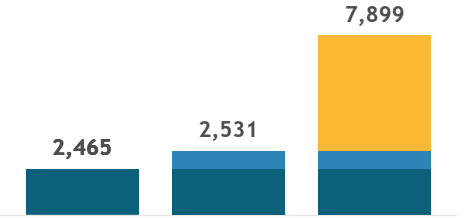
With buildings positioned as the highest consumers of energy, Dubai Government is strongly committed to improving energy efficiency in the built environment. Many old buildings have equipment, processes and materials that are not energy efficient and consume a large amount of electricity and water. Consequently, the Dubai Government initiated the Retrofit Programme in 2013 with the launch of Etihad Energy Services (Etihad ES), a Super Energy Service Company (super-ESCO) created to develop the energy performance contracting (EPC) market in Dubai and attract ESCOs to the market.

In parallel, the Regulatory and Supervisory Bureau for Electricity and Water in Dubai (RSB) regulated the EPC market by defining an accreditation scheme for ESCOs in 2014 and one for Energy Auditors a year later.

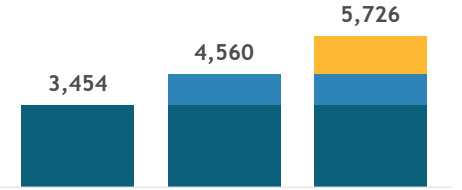
In early 2015, the Dubai Supreme Council of Energy (DSCE) enacted Directive No.1 of 2015, which mandates walkthrough energy audits in Dubai Government buildings above 1000 m^2. If the expected energy savings in the building are greater than 20%, detailed energy audits and retrofits must follow. The directive targets 20% water and electricity savings from government entities by 2021.

The Building Retrofits programme aims to improve Dubai's asset base where needed and at the same time establish energy management practices which will sustain saving benefits in the long run. Building retrofits target the main components of a building in an integrated manner: cooling, lighting, water, industrial processes, building envelope and other retrofits.

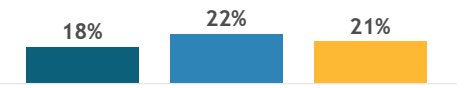
OPERATIONAL DASHBOARD



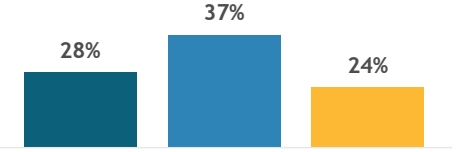
Cumulative number of retrofitted buildings



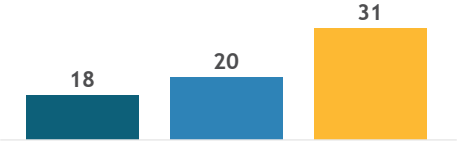
Cumulative number of building equivalents (average sized building)



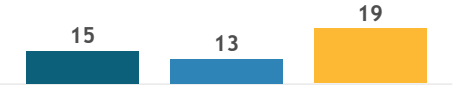
Average electricity savings from retrofit projects versus baseline consumption



Average water savings from retrofit projects versus baseline consumption



Number of accredited ESCOs



Number of accredited auditors

Legend:

2017 2018 2019

BUILDING RETROFITS

PROGRAMME HIGHLIGHTS

1 ENERGY SERVICE MARKET GROWTH

Since the first accreditation scheme for Energy Service Companies (ESCOs) and regulation of the Energy Performance Contracting (EPC) market in 2014, the market capabilities continue to grow. As of 2019, there are 31 accredited ESCOs and 19 accredited Energy Auditors serving the market.

Etihad ES and the accredited ESCOs have retrofitted 7,899 existing buildings in Dubai since 2014 with electricity savings from retrofit projects growing by 365% in the last 4 years.

The market has witnessed remarkable growth in retrofit projects and achieved savings in the past 4 years with a +54% CAGR *(see exhibit 14)*.

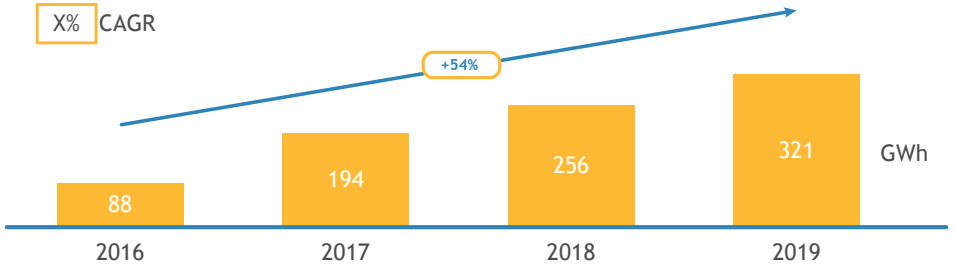


Exhibit 14: Overview of Dubai Energy Service Market - Growth of electricity savings (2016 - 2019)

The value of the ESCO market (cumulative investment in building retrofit projects) continues to show an increasing trend, almost doubling since 2017 *(see exhibit 15)*. Government and businesses are increasingly understanding and recognizing the benefits of retrofits and are growing more inclined to invest in retrofitting.

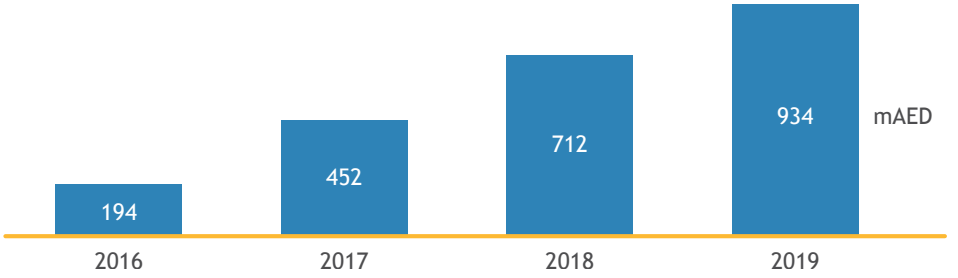


Exhibit 15: Overview of Dubai Energy Service Market - ESCO market cumulative investments (2016 - 2019)

Out of 248 retrofit projects completed to date, the majority was commercial facilities *(exhibit 16)*.

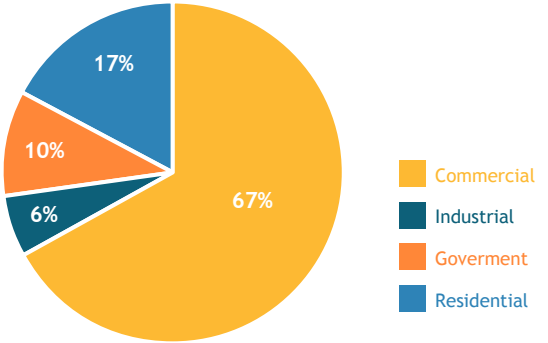


Exhibit 16: Retrofit project breakdown per sector (based on number of projects)

BUILDING RETROFITS

2 LARGE SCALE RETROFIT PROJECTS

Retrofitted Facility	Dubai Airport (Terminal 1, 2, 3 and Concourse B)	Dubai Golf	Wasl Properties (243 buildings)
			
Energy Conservation Measures	• HVAC system replacement • Solar PV rooftop installation • Water aerators installation	• HVAC system replacement • Lighting replacement • Solar PV rooftop installation • Water aerators installation	• HVAC system replacement • Lighting replacement • Solar PV rooftop installation
Project Value (EPC Guaranteed Savings)	EPC of AED 141.4 Million	EPC of AED 31.6 Million	EPC of AED 69.4 Million
Contractors	SIEMENS, SMART4POWER Empowering Energy Efficient Solutions, enerwhere Sustainable Energy. Anywhere.	ESCO QUANTUM EUROSTAR ENERGY SOLUTIONS	SMART AUTOMATION ENERGY
Payback time	7 years	8 years	5 years
Energy Savings	65.4 GWh/yr, 21 MIG/year	8.5 GWh/yr, 11.7 MIG/year	33.3 GWh/yr

Exhibit 17: Overview of large-scale retrofit contracts signed by Etihad Energy Services in 2019

BUILDING RETROFITS

Etihad ES uses a business model that aims to facilitate financing for retrofit projects in the government sector. It is a guaranteed savings model that provides financing through a Shari'a compliant structure, created in partnership with the National Bond Corporation. The model *(see exhibit 18)* was first applied to the JAFZA project in 2014, and has since been applied with some variations to other projects led by Etihad ES.

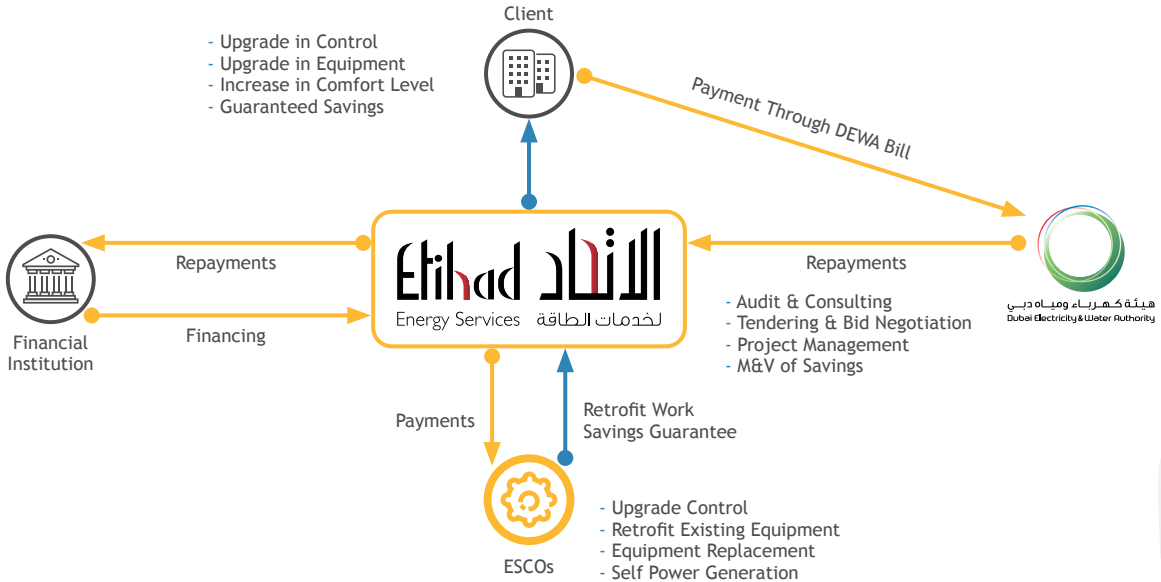


Exhibit 18: Etihad Energy Services' business model

INTERESTING FACTS

One of the city's most iconic energy efficient building - the Burj Al Arab hotel.

As part of Burj Al Arab retrofitting, a low-emissivity coating was installed to control heat transfer through its glass windows exterior. Placing this thin metal or metallic oxide layer on the glass surface can reduce energy loss by 30 - 50%. In addition, the building was connected to District Cooling (the most efficient cooling solution) through Empower.

BUILDING RETROFITS

3 NEW GREEN BUILDING RATING SCHEME

RSB initiated the development of a scheme to rate existing buildings in Dubai based on their electricity and water efficiency performance.

By making energy efficiency investments visible, the scheme aims at increasing the value of highly efficient buildings in the real estate market, and ultimately improving efficiency in the built environment.

In 2019, in lights of the Green Building Energy Rating Scheme preparation, EmiratesGBC launched the BEA Energy and Water Benchmarking Report evaluating the performance of hotels, schools and malls, and support the retrofit market.

Going forward, the scheme will be piloted on a voluntary basis with two calculation methods:

- **Asset based assessment:** for villas and apartments, with HVAC, lighting and façade criteria
- **Operational based assessment:** for building apartments, offices and labour accommodations with HVAC, lighting, façade, O&M, Installation & commissioning criteria

Once the scheme is issued, the building labels will show how much electricity and water are being consumed within that building. The building owner may be able to benefit in terms of financial rewards by selling the building or renting units within the building at a higher price compared to a similar building in a similar location due to lower operating costs stemming from energy efficiency.

5.3 DSM PROGRAMME 3

OUTDOOR LIGHTING

PROGRAMME OWNER

هيئة الطرق والمواصلات
ROADS & TRANSPORT AUTHORITY
RTA

PROGRAMME SUPPORT

DFZC مجلس المناطق الحرة بدبي
DUBAI FREE ZONES COUNCIL

PROGRAMME OBJECTIVE

Adopt high-efficiency lighting in public spaces in Dubai.

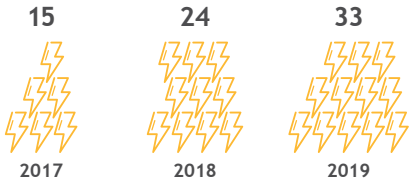
MAITHA BIN ADAI

Chief Executive Officer of Traffic and Roads Agency, Roads and Transportation Authority

Visit www.rta.ae

OUTDOOR LIGHTING

PROGRAMME SAVINGS

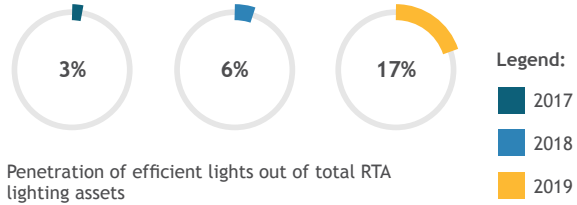


Electricity Savings (GWh)

PROGRAMME INTRODUCTION

A number of extensive applications has proved the effectiveness of LED (light - emitting diode) technology worldwide. The Roads and Transport Authority (RTA) and Dubai Municipality (DM) have also run pilot projects to assess its suitability in the environmental conditions of Dubai and the strict safety requirements of its roads. LED is now the technology of choice for new roads in Dubai. In addition, RTA, DM as well as private developers and Free Zone Authorities have initiated retrofit programmes to replace old lighting assets with LEDs and other high efficiency technologies.

OPERATIONAL DASHBOARD



Penetration of efficient lights out of total RTA lighting assets

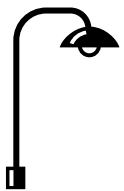
OUTDOOR LIGHTING

PROGRAMME HIGHLIGHTS

1 LEADERSHIP BY ROADS AND TRANSPORT AUTHORITY (RTA)

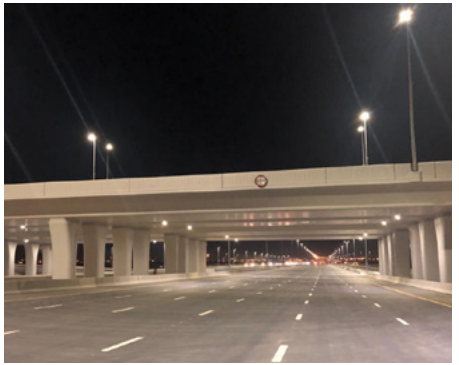
RTA has developed a Smart Street Lighting Retrofit Plan defining a 15 year implementation roadmap for the installation of LEDs and other efficient lighting technologies in new roads, and more importantly in existing roads through retrofit projects. As per the strategy, the programme is expected to reduce electricity consumption of RTA street lights in Dubai by 104 Gwh. RTA has also developed standards accompanying the roadmap to ensure road safety and quality while maintaining optimal efficiency.

RTA has initially installed LEDs in internal and collector roads, in new residential areas, e.g., ~2,000 in Barsha South 1 and 2, and through the retrofit of existing street lights, e.g., ~1,000 in Al Rashidiya and Nad Shamma. These pilot projects provided notable savings, which led the way to LED installations in larger roads including Sheikh Zayed Road Bridge over the Dubai Water Canal, the extension of Al Yalayis Street and the retrofit lights in King Salman Bin Abdulaziz Al Saud Street. In 2019, RTA completed a few other LED installations:



8,144	total number of LEDs installed
6,218	LEDs on the road leading to EXPO
1,532	Al Yalayis and Al Asayel Streets
394	other projects

Overall, LED lights represent 94% of RTA's total lighting assets installed in 2019



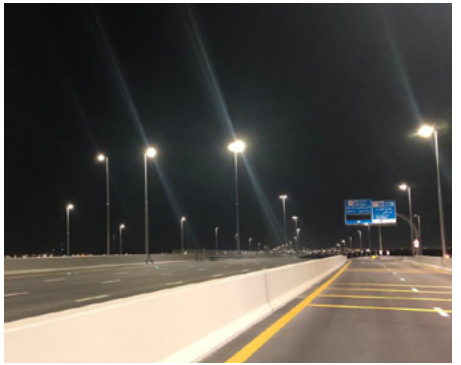


Exhibit 19: Highlights of the LED retrofit pilot projects carried out by the Roads and Transportation Authority in 2019: **A.** Roads network leading to EXPO **B.** Al Yalayis and Al Asayel Street Project

In addition, RTA is adopting smart lighting initiatives to facilitate maintenance and operation of lighting assets. That will also help better serve the residents of Dubai by improving road safety and quality, and by offering additional services through the lighting poles. Smart applications can further improve energy efficiency thanks to enhanced controls, e.g. complementing LED with controlled dimming can increase energy savings from LED retrofits and new installations in residential roads, while contributing to a better perception of energy efficiency measures in comparison with the currently adopted one-on one-off initiative.

OUTDOOR LIGHTING

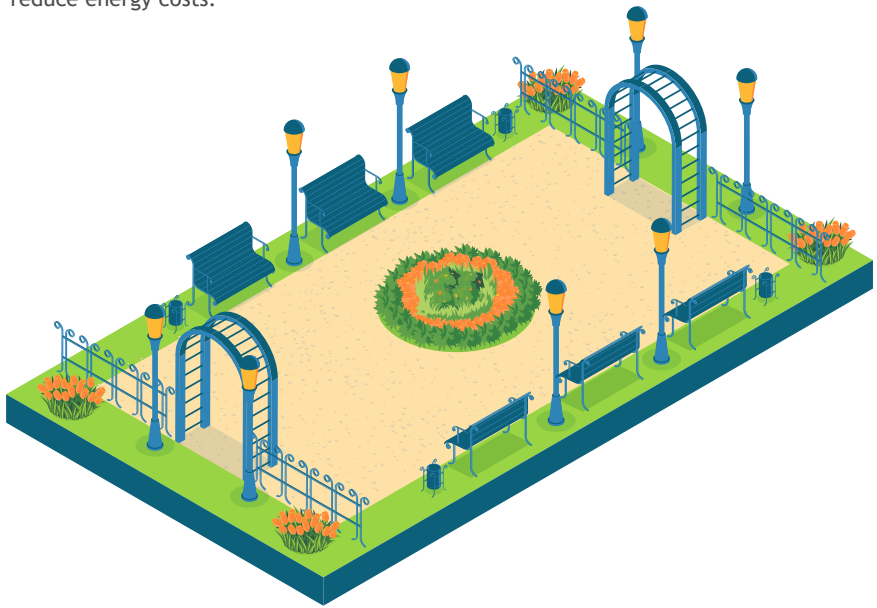
2 ENERGY EFFICIENCY OUTDOOR LIGHTING PROGRAMME IN DUBAI MUNICIPALITY'S PARKS AND PUBLIC FACILITIES

DM has undergone an energy efficiency transformation of its outdoor lights in public parks and facilities. The transformation consists of 100% adoption of LEDs in new projects partly in combination with solar energy supply, progressive replacement of existing conventional lamps with LEDs, and reduction in operating hours.

From 2012 to 2016, DM installed over 10,000 LED lights across Dubai parks; ~4,000 in new projects and ~6,000 through the retrofit of conventional lights. In addition, the municipality reduced its operating hours to a maximum of six hours per night, with switch-off after midnight.

3 EFFICIENT OUTDOOR LIGHTING IN FREE ZONES AND PRIVATE DEVELOPMENTS

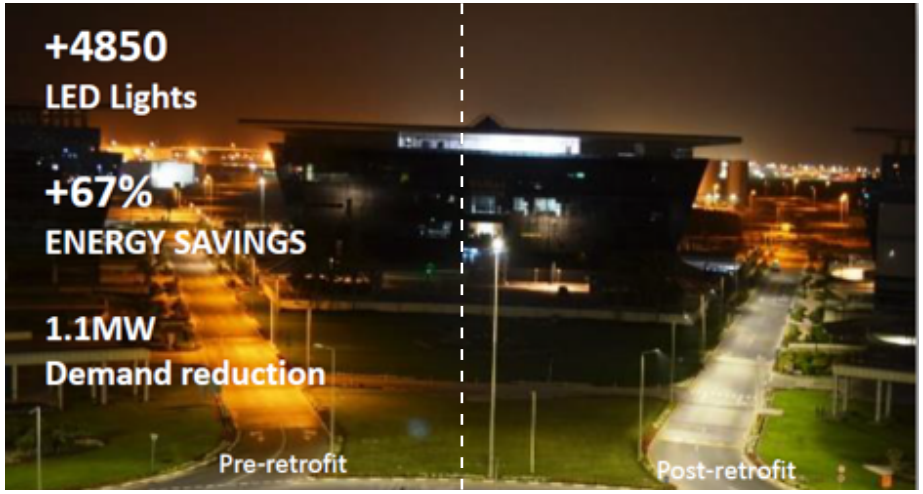
Roads covered by free zones and private developments (i.e. non RTA operated) are also embracing efficient outdoor lighting technologies both to improve operations and to reduce energy costs.



CASE STUDY 3: STREET LIGHTING PROJECTS AT DUBAI SOUTH

In line with Dubai South's vision of "Creating a vibrant society that invests, lives and works within a sustainable, healthy and happy environment" as well as to contribute to achieving the 30% energy demand reduction targets of the Dubai Supreme Council of Energy by 2030, Dubai South is focused on sustainability projects. These projects will bring benefits including energy savings, reduced maintenance costs, and positive environmental impacts.

As part of that strategy, South Energy, the energy solutions arm of Dubai South, is working to retrofit all Dubai South's street lighting with energy-efficient solutions to effectively replace ~5,000 conventional streetlights with LED lighting fixtures. South Energy will act as an energy services company (ESCO) providing all the aspects of the project for a duration of 10 years.



Number of lights retrofitted:
4,881
(including 2018 pilot project of 331 lights)

Annual savings from retrofit:
4,750,000 or 67%
savings vs. baseline

Exhibit 20: Overview of the ongoing lighting retrofit project by Dubai South on its roads

5.4 DSM PROGRAMME 4

EFFICIENT COOLING

PROGRAMME OWNER

مكتب التنظيم والرقابة لقطاع الكهرباء و المياه
RSB FOR ELECTRICITY & WATER

PROGRAMME SUPPORT

Association of DC Operators

PROGRAMME OBJECTIVE

Promote efficient cooling technology use in Dubai's buildings in the planning and construction stage and when buildings are retrofitted. Improve the efficient delivery of cooling of any technology.

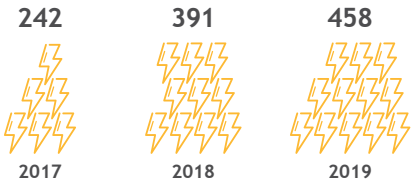
GRAEME SIMS

Executive Director,
Regulatory & Supervisory Bureau
for Electricity and Water in Dubai

Visit www.rsbdubai.gov.ae

EFFICIENT COOLING

PROGRAMME SAVINGS



Electricity Savings (GWh)

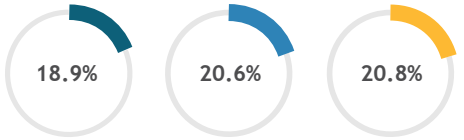
PROGRAMME INTRODUCTION

In Dubai's hot environment, cooling drives significant swings in electricity consumption between winter and summer. Cooling accounts for almost half of electricity consumption in Dubai and as much as 70% during peak times.

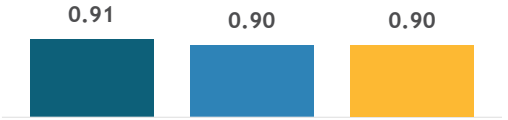
The updated DSM strategy, completed at the end of 2019, has widened the scope of this programme from "District Cooling" to "Efficient Cooling". It recognizes the wide range of technologies employed to deliver cooling and has set this programme to incentivize efficient delivery of cooling, no matter what technology is employed.

This is to be achieved through developing an association of district cooling (DC) Operators which will seek to deliver further energy savings, and through incentivizing facility management (FM) companies to deliver cooling energy savings for their clients.

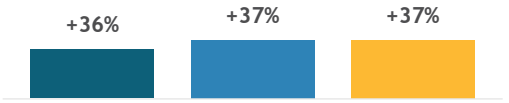
OPERATIONAL DASHBOARD



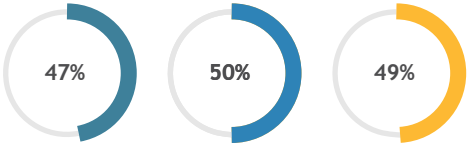
DC penetration out of total cooling capacity



DC efficiency (in kW/TR)



DC efficiency versus baseline air cooled technology



DC capacity utilisation at peak

Legend:
2017 2018 2019

EFFICIENT COOLING

PROGRAMME HIGHLIGHTS

1 ENERGY EFFICIENCY DRIVES PAY DIVIDENDS ON DISTRICT COOLING PERFORMANCE

Cooling companies have cemented the advances they made in energy efficiency in 2018 and increased output by serving more customers in an otherwise cooler year *(see exhibit 21)*.

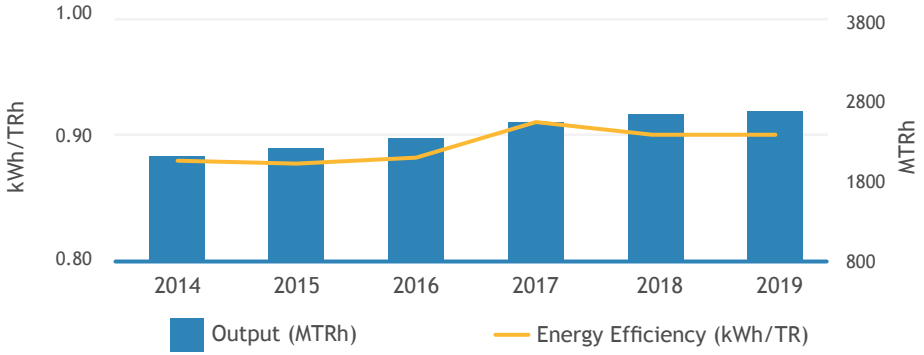


Exhibit 21:Increase of cooling efficiency from 2014 to 2019

2 ANOTHER RECORD YEAR FOR RECYCLED WATER USE

Lower cooling load density means that customers pay lower fixed charges for the cooling services they receive. New schemes reported in 2019 show cooling load density of under 3TR/100 m² *(see exhibit 22)*.

Lower cooling load density not only improves the appeal of district cooling to customers but it is more likely to result in the energy efficient operation of the scheme. Indeed, two of these new schemes are in the top three most energy efficient.

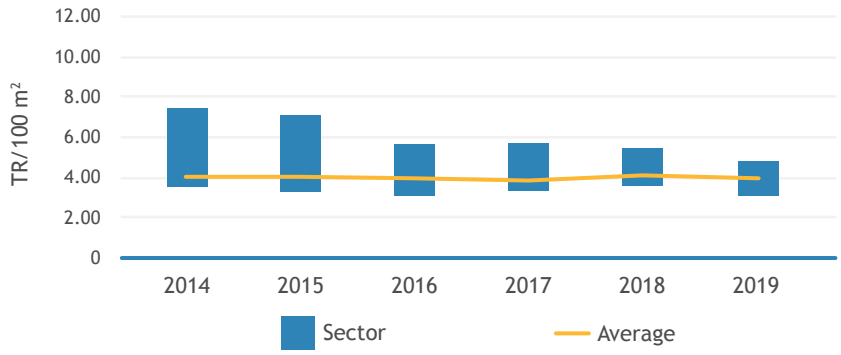


Exhibit 22: Cooling Load Density (2014-2019, TR per 100 m²)

DEEP DIVE ON DSM PROGRAMMES AND INITIATIVES

5.5 DSM PROGRAMME 5

ESMA STANDARDS AND LABELS

PROGRAMME OBJECTIVE

Drive adoption and compliance with Minimum Energy Performance Standards (MEPS) and labels for air conditioners, home appliances and industry equipment in Dubai.

HE ABDULLA AL MAEENI

Director General, Emirates Authority for Standardization and Metrology

Visit www.esma.gov.ae

PROGRAMME OWNER

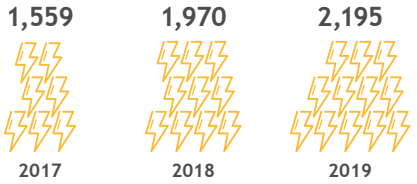
هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology

PROGRAMME SUPPORT

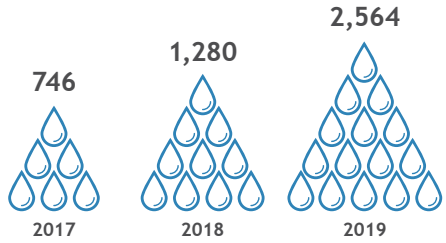
بلدية دبي
DUBAI MUNICIPALITY

ESMA STANDARDS AND LABELS

PROGRAMME SAVINGS



Electricity Savings (GWh)



Water Savings (Million imperial gallons)

PROGRAMME INTRODUCTION

The Emirates Authority for Standardization and Metrology (ESMA) introduced the Energy Efficiency Standardisation and Labelling (EESL) programme in 2011 to prevent the influx of electricity and water inefficient products to the UAE and to drive the market towards higher efficiency products.

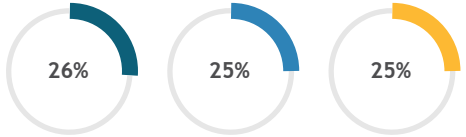
Regulated electricity and water appliances must comply with minimum energy performance standards (MEPS) and must be certified by the Authority to be legally sold. In addition, it encourages the adoption of the most efficient appliance and equipment (including outdoor lighting, motors, home appliances, etc.).

In fact, the ESMA Integrated Energy Efficiency Label highlight the efficiency level of each regulated appliance with a star rating system ranging from one to five (more stars means higher efficiency).

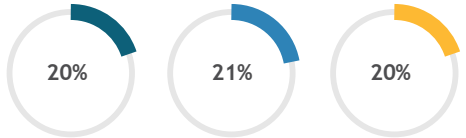
Standards are reviewed every 2-3 years for each product category through consultation with experts and industry players in order to gradually remove less efficient products from the market.

In addition to regulatory enforcement, meeting programme targets relies heavily on public education to promote adoption of efficient appliances.

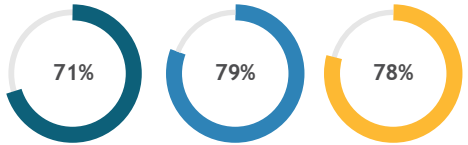
OPERATIONAL DASHBOARD



Share of four and five star air conditioners sold



Share of four and five star refrigerators sold



Share of four and five star washing machines sold

Legend:
2017 2018 2019

ESMA STANDARDS AND LABELS

PROGRAMME HIGHLIGHTS

1 CONTINUOUS IMPROVEMENT IN ENERGY EFFICIENCY STANDARDISATION AND LABELLING (EESL)

Standards and technical regulations are developed by ESMA through consultation with the industry, and new draft regulations are shared with the World Trade Organization (WTO) before being submitted to the UAE Cabinet for approval. Once the Cabinet approves the regulations, they are published in the UAE Official Gazette, and ESMA holds meetings with industry players to relay the technical and legal requirements for implementing them. OEMs (Original Equipment Manufacturers) and retailers are given a transition period to adjust to new regulations. Following the transition period, regulations are enforced on new products imported to the country only, and, at a later stage, on existing products already available for purchase.

Energy efficiency labels are a key enabler to achieving energy efficiency targets and key benefits such as energy security, reduced environmental impact, and sustainable development. The ESMA EESL programme currently covers a wide range of product categories and continues to grow *(see exhibit 23)*.

The ESMA labels also serve as an awareness tool to enable consumers to make informed purchasing decisions based on product features such as energy efficiency and capacity.

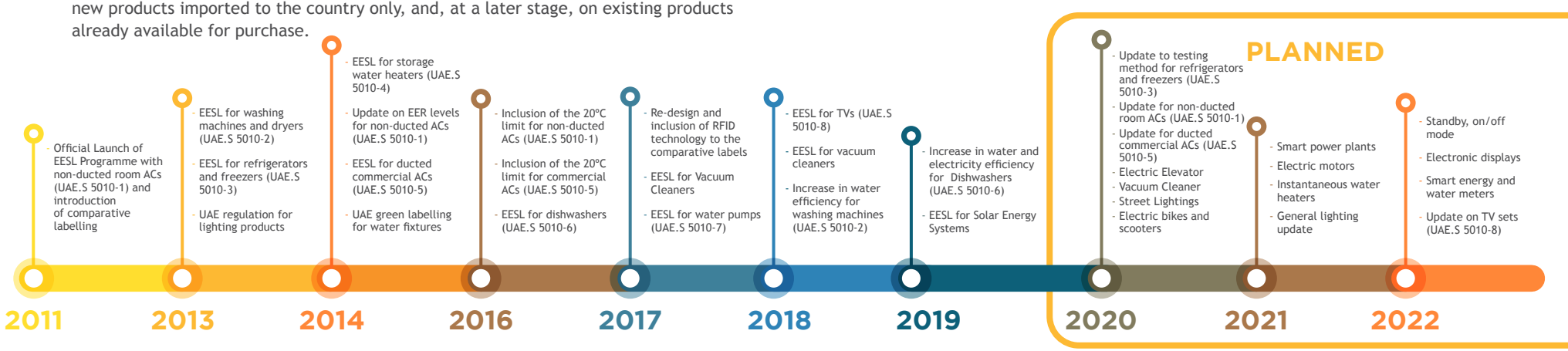


Exhibit 23: Implementation roadmap of the Energy Efficiency Standardization and Labelling Programme, showing year of publication of the regulation in the UAE Official Gazette

ESMA STANDARDS AND LABELS

In 2019, ESMA developed and issued regulations for dishwashers. In addition, ESMA has also worked on improving and raising energy efficiency standards for refrigerators and freezers, washing machines as well as residential, commercial and ducted ACs.

The new regulations have been submitted to the UAE Cabinet for approval.

In the next 2 years, ESMA has ambitious targets to develop EESL's for electric bikes and scooters, electric elevators, electronic displays, smart energy and water meters, and others.

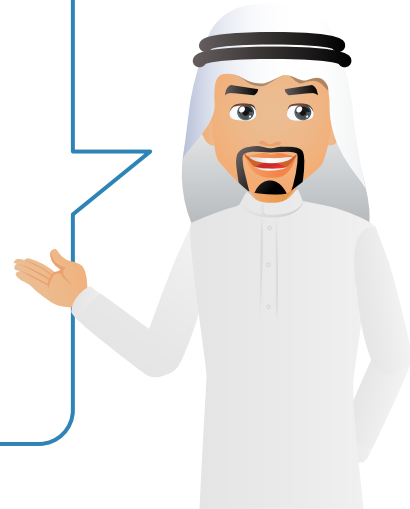
In terms of compliance, ESMA has put in place market surveillance mechanisms to remove non-compliant products from the market. ESMA and Dubai Municipality surveillance teams are conducting intensive inspections on showrooms and warehouses to protect consumers from unsafe products, reduce financial losses caused by non-compliant products and help reduce environmental impact and energy waste due to using non-compliant products. One of the ways that government inspectors, as well as the consumers, can check the product compliance is by scanning RFID tag on the ESMA label. All manufacturers, traders, importers, and retailers must sell, display, and store only compliant products which have a certificate of conformity. Failure to obtain a certificate of conformity is considered a violation and may result in legal actions such as product recall and financial penalties.

DID YOU KNOW?

What is RFID/QR code tag?

Radio Frequency Identification (RFID) is a technology that uses radio waves to automatically identify products. ESMA issues a RIFD tag *(see exhibit 24)* for regulated appliances and equipment to enable product tracking and ensure conformity with the standard. Consumers can scan the RFID tag to ensure that the product is compliant and registered with ESMA and that all information provided on the label is accurate.

Exhibit 24: RFID tag on ESMA Label



ESMA STANDARDS AND LABELS

2 UNIFICATION OF STANDARDS AND LABELLING IN THE GULF COOPERATION COUNCIL

ESMA is in direct collaboration with its counterpart members within the Gulf Standardization Organization (GSO) to develop a unified system of energy performance standardisation and labelling scheme. Unification would address cost and complexity implications faced by OEMs and retailers resulting from multiple technical and certification requirements in the region. Similar harmonisation efforts have already been implemented in the Gulf Cooperation Council (GCC). These include the GSO Conformity Tracking Symbol (GCTS) displayed on regulated low voltage equipment, and the unified fuel economy labels for vehicles. Standardisation authorities of the GSO, including ESMA, have been meeting to develop regional standards for air conditioners.

3 PROMOTION OF ENERGY EFFICIENT APPLIANCES

In order to improve awareness on the benefits of energy efficient appliances and increase penetration in the UAE market, ESMA, in collaboration with TAQATI, launched an awareness programme targeting major appliance retailers. The first initiative under the programme focuses on delivering orientation sessions to sales personnel of major retailers on the ESMA Integrated Energy Efficiency Labels to effectively communicate the benefits of efficient appliances to customers. A number of sessions took place in 2019 with key retailers/distributors, namely Carrefour, Lulu and Eros. ESMA plans to continue delivering these sessions in 2020 and to roll out subsequent awareness initiatives in the coming years (e.g. in-store promotions on efficient appliances).

Exhibit 25: Pictures from retailer workshops on energy efficient appliances

NEW

5.6 DSM PROGRAMME 6

CONSUMER BEHAVIOUR

(NEW PROGRAMME TO BE LAUNCHED IN 2020)

PROGRAMME OWNER

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

Etihad الاتحاد
Energy Services لخدمات الطاقة

PROGRAMME OBJECTIVE

Engage main user groups (residential and commercial) in electricity and water conservation through the promotion of smart devices and appliances delivered through new business models in Dubai. Utilise analytics to optimise behaviour of consumers.

PROGRAMME INTRODUCTION

The Consumer Behaviour programme encourages smart homes and businesses to act intuitively and intelligently through an ecosystem of communicating devices, software and services and utilize analytics to optimize their energy consuming behaviours. Through dedicated initiatives and campaigns, DEWA will encourage residential and commercial sector to adopt energy efficient smart devices.

5.7 DSM PROGRAMME 7

SHAMS DUBAI

PROGRAMME OWNER

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

PROGRAMME SUPPORT

Etihad الاتحاد
Energy Services لخدمات الطاقة

PROGRAMME OBJECTIVE

Promote use of building-level solar energy systems across Dubai building stock.

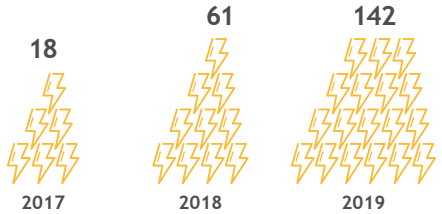
WALEED SALMAN

Executive Vice President,
Business Development and Excellence,
Dubai Electricity and Water Authority

Visit www.dewa.gov.ae

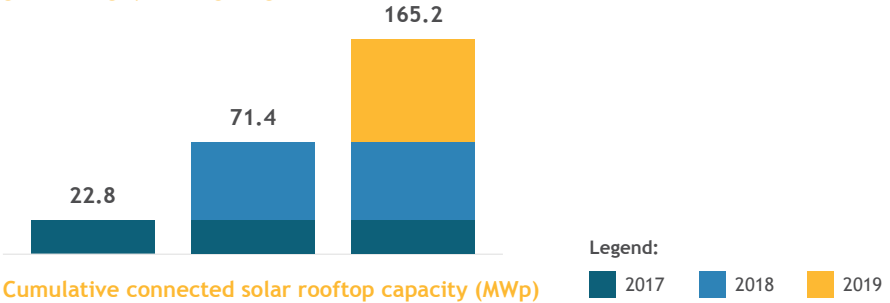
SHAMS DUBAI

PROGRAMME SAVINGS



Electricity Savings (GWh)

OPERATIONAL DASHBOARD



Cumulative connected solar rooftop capacity (MWp)

PROGRAMME INTRODUCTION

Shams Dubai supports the vision of His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, to make Dubai the smartest city in the world and to have a solar photovoltaic (PV) system on every roof in Dubai by 2030. Shams Dubai also supports the Dubai Clean Energy Strategy 2050 by promoting the use of clean and renewable energy sources to build a sustainable future for the Emirate and implements the Executive Council Resolution No. 46 of 2014 to regulate the connection of solar energy to Dubai's power grid.

The Shams Dubai initiative allows building owners (residential, commercial, industrial) to install solar PV panels to generate electricity, and connect them to DEWA's grid (following the guidelines). The generated electricity is exported to DEWA's network via net-metering scheme which is used to provide producers with credit for any electricity exported to the grid.

Dubai Electricity and Water Authority (DEWA) has also developed a scheme for Shams Dubai contractors and consultants (with more than 100 accredited companies), a permitting and connection process and guidelines as well as technical specifications for PV systems.

In parallel, towards the end of 2016, Etihad Energy Services (Etihad ES) launched Etihad Solar, a business unit focused on further stimulating the Solar Rooftop market in Dubai.

SHAMS
DUBAI

PROGRAMME HIGHLIGHTS

1 RAPID MARKET GROWTH

Dubai's solar rooftop market continues to witness steep growth. In 2019, the total connected solar rooftop capacity has almost doubled compared to 2018 reaching a total of 165.2 MWp.

In 2019, large projects (>5 MWp) executed by the government and the private sector on high consuming industrial and commercial buildings lead the market growth with multiple project models including direct ownership, Build-Operate-Transfer (BOT) or energy performance contracting.

In particular, Etihad ES completed the second phase of the Ghaffath project with a total of 18.1 MWp of solar capacity on the rooftops of DEWA's Ghaffath water reservoirs and Mai Dubai's water-bottling factory buildings. The project won the Middle East Solar Industry Association (MESIA) award for the "Best Industrial Solar Project of the Year" at the World Future Energy Summit in January 2019. In addition, Etihad ES completed a 5 MWp solar rooftop project in Terminal 2 of the Dubai International Airport.

On the private sector front, Nestle completed the installation of 7.2 GWh of solar panels at its Al Maha Factory. The solar installation is expected to supply 85% of the Al Maha factory's annual electricity consumption. In addition, DP World completed the installation of solar PV systems on 110 mid-rise staff accommodation buildings in Jebel Ali Free Zone (Jafza) East and West totalling 6.75 MWp. Other entities that have completed solar projects in 2019 include Dubai Refreshment, Dubai South, and Emirates Flight Catering.

While the overall market is rapidly growing, small-scale solar rooftop installations (<50 kWp) in the residential and SME sectors remain limited. Indeed, the residential and SME sectors still present a less attractive business case and a lack of third party funding in the form of micro-project financing. Solar rooftop projects in these sectors can be enabled by creating mechanisms to reduce the cost per kilowatt peak of small-scale installations. For example, residential installations can achieve economies of scale and benefit from bulk purchasing by combining a large number of micro-installations into one large project. This model was successfully implemented to install solar PV systems on 5,000 National villas (details in below case study). This can also be implemented for new developments at the construction phase (e.g. Sustainable city).

SHAMS DUBAI

PROGRAMME HIGHLIGHTS

DEWA Ghaffat Water Reservoirs & Mai Dubai Factory (Al Qudra)
One of the largest solar rooftop project worldwide

- **Capacity:** 18.1 MWp
- **Project model:** Direct ownership by DEWA
- **Connection Date:** September 2019 (Phase 2)
- **Executed by:** Led by Etihad ES and executed by E S E M E Energy L.L.C (Enerwhere Sustainable Energy)

Nestle - Al Maha Factory
Large-scale ground-mounted private solar plant

- **Capacity:** 7.2 GWh
- **Project model:** Solar Leasing (with Yellow Door)
- **Connection Date:** September 2019
- **Executed by:** ALEC Energy

Dubai Airport - Terminal 2

- **Capacity:** 5 MWp
- **Project Model:** Direct Ownership by Dubai Airports
- **Connection Date:** October 2019
- **Executed by:** Led by Etihad ES and executed by E S E M E Energy L.L.C (Enerwhere Sustainable Energy)

DP World - Staff Accommodations (110 mid-rise buildings) in Jebel Ali Free Zone (Jafza) East and West

- **Capacity:** 6.75 MWp (total across 2 sites)
- **Project Model:** Solar Leasing
- **Connection Date:**
- **Executed by:** Siraj Power

Exhibit 26: Examples of large Shams Dubai projects connected in 2019 by the Government and private sector

CASE STUDY 4: Solar PV Installations for 5,000 Villas

On 6 January 2019, HH Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE and Ruler of Dubai, issued the 50-Year Charter on the anniversary of his 50 years of service to the nation. The Charter includes nine articles that highlight some aspects of His Highness' vision for the future city of Dubai.

In line with "Article 7 - Self-sufficiency in Dubai homes" that aims to make at least a tenth of UAE citizens' homes self-sufficient in terms of water, food, and energy, DEWA launched a project to install photovoltaic solar panels on a tenth of the homes of Dubai's citizens, as part of the Shams Dubai initiative.

The project entailed installing PV Solar systems (3.9-4.5 MWp per villa) for 5,000 National Villas across multiple areas of Dubai including Khawaneej, Oud Muteena, Al Warqa, Nad Al Sheba, Muhaisnah, Mizhar, Al Quoz and Al Barsha.

The project was fully funded by DEWA and implemented by Etihad ES, with the support of six solar contractors. The project was completed in November 2019.

Facilities:
5,000 National Villas

Electricity Savings:
31 GWh per year

Capacity Installed:
3.9-4.5 MWp per villa

Monetary Savings:
AED 2.79 Million

Exhibit 27: Images of solar PV installations on National villas as part of the 5,000 villas project

SHAMS
DUBAI

2 GROWING MARKET CAPABILITIES AND ENABLERS

As demand for solar PV installations increases, solar market capabilities continue to grow and improve. In fact, 132 companies are currently enrolled with DEWA for Shams Dubai and DEWA has certified more than 650 solar photovoltaic professionals to date.

In addition, Etihad ESCO launched a series of internationally accredited solar trainings in November 2019 namely the PV Design Professional and PV Installation Professional certifications in partnership with Solar Energy International (SEI). These trainings aim to equip solar professionals with enhanced technical skills and a strong understanding of Solar PV systems to support the achievement of Dubai's ambitious clean energy targets (for more information, refer to Capacity Building section).

In parallel, Shams Dubai stakeholders are continuously working on initiatives to enable the market and increase awareness levels on the benefits of solar rooftop and to empower customers to make educated decisions, in particular:

- The Dubai Supreme Council of Energy has issued a directive mandating phased solar panel installations on government buildings (Directive No.1 of 2019) to encourage government entities to lead by example.
- Etihad ES is installing real time displays on their completed solar installations that showcase the electricity generated from the solar PV systems. These displays are placed in lobbies or reception areas to maximize visibility and reach.
- Etihad ES is in the process of designing a solar label to be granted to facilities that are powered by solar energy. The label can be used to promote the facility, as well as goods produced in the facility.

5.8 DSM PROGRAMME 8

TARIFFS

PROGRAMME OWNER

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

PROGRAMME SUPPORT

المجلس الأعلى للطاقة
Supreme Council of Energy

PROGRAMME OBJECTIVE

Adjust Tariff structure to be cost reflective, promote energy efficiency and give the right signal to reduce consumption.

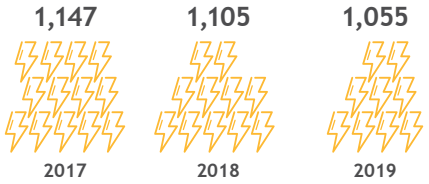
YOUSEF JEBRIL

Executive Vice President,
Power and Water Planning,
Dubai Electricity and Water Authority

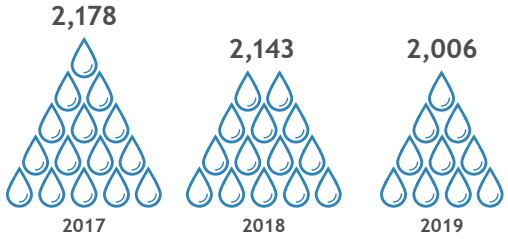
Visit www.dewa.gov.ae

TARIFFS

PROGRAMME SAVINGS



Electricity Savings (GWh)



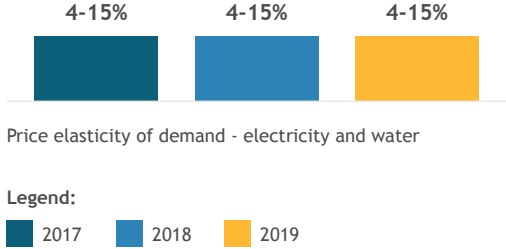
Water Savings (Million imperial gallons)

PROGRAMME INTRODUCTION

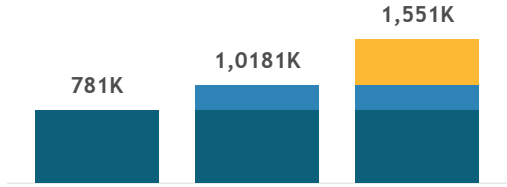
Price signalling is a key driver to encourage customers to be energy-efficient. The tariff currently in place is designed in an inclining slab structure, which moves consumers to a higher tariff slab as their consumption rises.

The last Dubai Electricity and Water Authority (DEWA) tariff review was in 2011. The increased tariff resulted in a 4% and 5% reduction in of electricity and water consumption respectively, in the first two years of implementation. The Tariff Rates Programme started the DSM Strategy 2030, as the major contributor to savings in the first years of strategy implementation.

OPERATIONAL DASHBOARD



Price elasticity of demand - electricity and water



Number of smart meters installed

TARIFFS

KEY HIGHLIGHTS

1 MAINTAINING THE IMPACT OF THE 2011 TARIFF REVIEW

The electricity and water tariff structure is slab-based for all customer sectors, and higher consumption slabs correspond to higher tariffs. The 2011 tariff increase to the slab-based pricing has been effective in curving demand trends towards more sustainable patterns *(see exhibit 28)*.

Pricing is a signalling tool that is often used to induce energy-efficient behaviour in customers and encourage them to optimise their usage. This has resulted in avoided capital investments in new generation capacity and reduced consumption of fossil fuels by conventional generation units, on which Dubai's energy supply still depends strongly.

A fuel surcharge component in the tariff structure has been added, which varies based on the actual fuel cost supplied to DEWA's generation plants. This allows for more transparency with consumers on drivers of price changes.

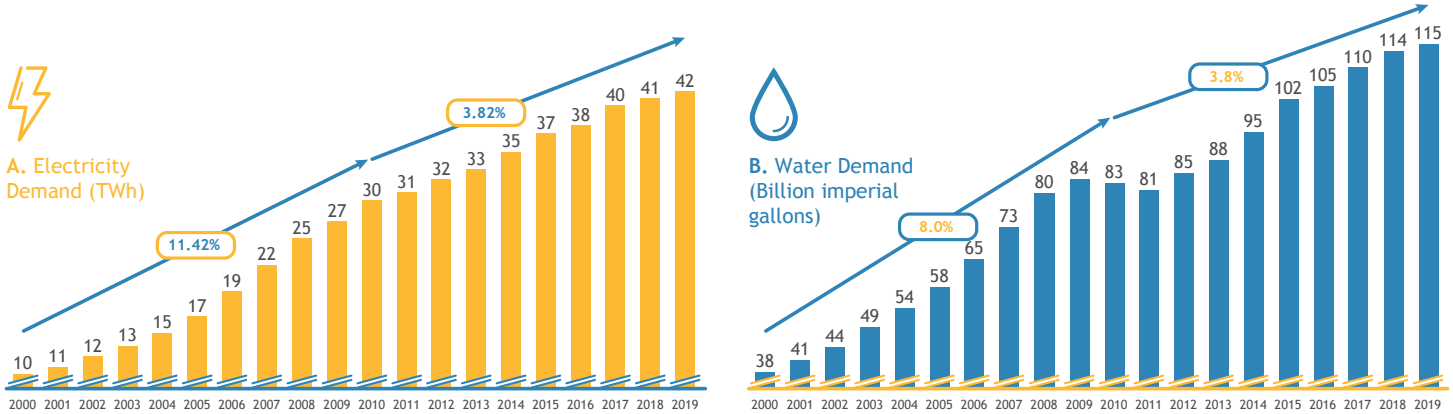


Exhibit 28: Electricity and water demand trends in Dubai, before and after the 2011 tariff review

To sustain changes until the next tariff review, DEWA is investing significant resources in awareness initiatives, (e.g., Ideal Home, Neighbourhood, and Green Summer Campaigns targeted at the residential sector).

NOTES

Total consumption is recorded at end-users. This excludes power stations, desalination auxiliaries, and losses in the transmission and distribution networks.

TARIFFS

2 REDUCING THE PEAK LOAD

In addition to overall consumption, another important factor affecting electricity generation infrastructure and cost is the electricity load profile. This is because peak demand defines generation capacity requirements and therefore capital expenditure.

The high variability of cooling loads between summer and winter results in an annual load swing of about 69%. The daily load profile in Dubai is characterised by three periods. During the summer, which is the high season, peak periods occur during the day and in the evening, while the valley period occurs late at night and in the early morning *(see exhibit 29)*.

Through its combination of programmes, the DSM Strategy helps to smooth down the load profile. For example, an increase in solar generation from Shams Dubai will support an abatement of the day-time peak, while the Outdoor Lighting Programme and ESMA standards (e.g. for indoor lighting) can help reduce the evening-time peak.

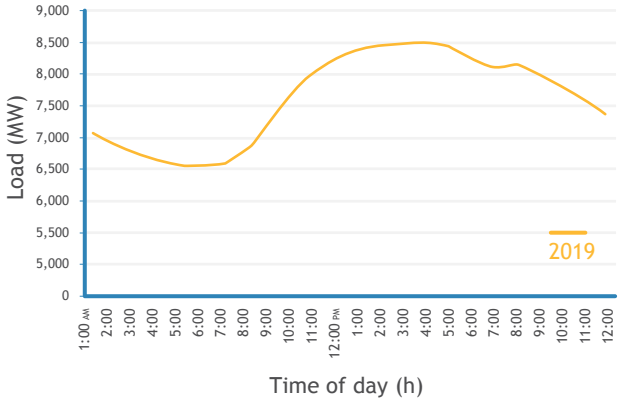


Exhibit 29: Dubai peak day electricity load profile (2019)

3 MODERNISING THE GRID

DEWA developed a Smart Grid Strategy to modernise the grid *(see exhibit 30)*. By the end of 2019, 100% of all water meters and 82% of all electricity meters in Dubai were replaced with smart meters. DEWA can monitor and manage customers' consumption and quality of service through a system that is fully-integrated with the Customer Happiness department. Today, smart meters are used for remote-meter reading and leakage detection, monitoring generation and consumption from solar rooftop photovoltaic systems, and identifying customers' consumption profile and running data analytics. In the future, smart meters can be used to raise customer awareness and induce behavioural change for reduced consumption.

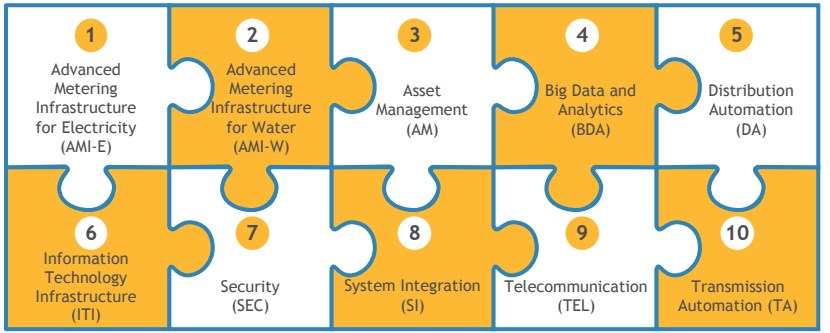


Exhibit 30: Dubai Electricity and Water Authority's Smart Grid Strategy with its ten programmes

5.9 DSM PROGRAMME 9

RECYCLED AND GROUND WATER DEMAND MANAGEMENT

PROGRAMME OWNER

بلدية دبي
DUBAI MUNICIPALITY

PROGRAMME SUPPORT

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

مجلس التنظيم والرقابة لقطاع الكهرباء والمياه
RSB FOR ELECTRICITY & WATER

PROGRAMME OBJECTIVE

Promote recycled and ground water management based on network expansion and use of recycled water in line with the Integrated Water Resource Management Strategy (IWRMS).

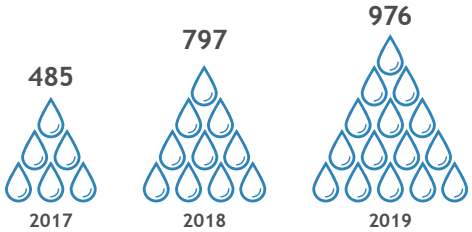
TALIB JULFAR

Chief Executive Officer,
Infrastructure Services Sector,
Dubai Municipality

Visit www.dm.gov.ae

RECYCLED AND GROUND WATER DEMAND MANAGEMENT

PROGRAMME SAVINGS



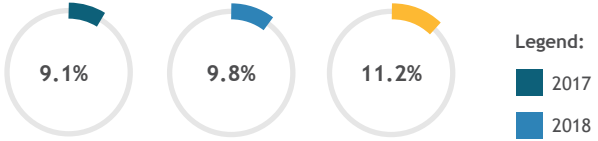
Water Savings (Million imperial gallons)

PROGRAMME INTRODUCTION

The Demand Side Management (DSM) Strategy recognises the value of Recycled water (Treated sewage effluent - TSE) as an asset for Dubai and seeks to optimise its consumption in the irrigation of public landscapes to divert excess volumes to other purposes that currently rely on desalinated water e.g. private irrigation, district cooling (DC), and other industrial uses. In fact, Executive Council Resolution No. 27 of 2008 dictates the use of TSE in DC plants.

Dubai Municipality (DM) has already started applying measures to reduce consumption of TSE for public irrigation and free up volumes for other purposes. Irrigation in some communities is reduced during summer following a one-day-per-week switch-off initiative. The Municipality has also defined lower irrigation quantities for each plant type in 2015, and has since been adopting the standards in new communities.

OPERATIONAL DASHBOARD



Penetration of efficient landscaping
(% of DM landscapes affected by DSM measures)

RECYCLED AND GROUND WATER DEMAND MANAGEMENT

PROGRAMME HIGHLIGHTS

1 RECYCLED WATER INFRASTRUCTURE UPGRADE AND NETWORK EXPANSION

The Dubai Municipality recycled water infrastructure includes two sewage treatment plants (STPs), one in Al Aweer and the other in Jebel Ali, as well as more than 1,200 km of distribution network lines.

To cope with increasing demand for recycled water (TSE), DM is progressively expanding the network and water recycling capacity.

- **Water recycling capacity:** Phase two of Jebel Ali STP was completed in 2019. The expansion project will increase the water treatment capacity by 675,000 m^3 per day, taking the combined capacity of the Warsan and Jebel Ali Plants to almost one million m^3 per day
- **Water storage:** to handle seasonality of demand vs a more stable supply, STP storage expansions are also considered to bring storage capacity to:
  - Jebel Ali STP TSE storage capacity of 90,000 m^3
  - Warsan STP TSE storage capacity of 34,000 m^3 with a planned expansion by 26,000 m^3

In addition to capacity expansions, Dubai Municipality is working on operational network enhancements which include pressure and flow monitoring stations on the existing irrigation network and the use of hydraulic modelling and calibration to identify the bottlenecks and weakest network segments using data from flow and pressure monitoring stations.

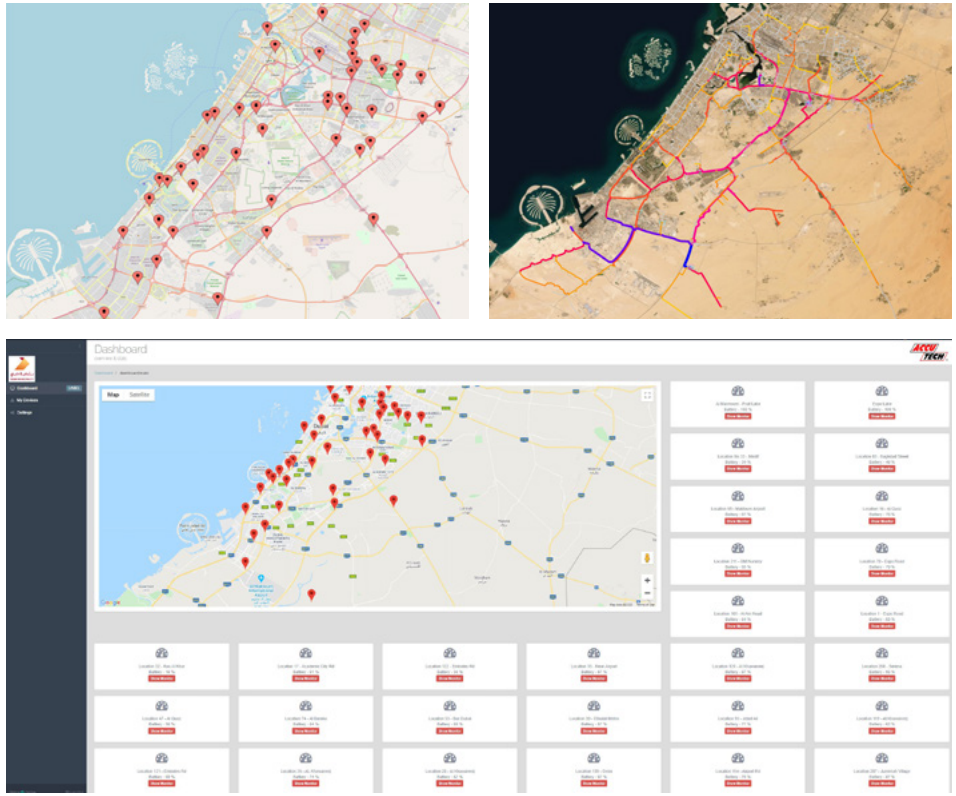


Exhibit 31: Examples of TSE network enhancements:
Pressure and flow monitoring and Network hydraulic modelling

RECYCLED AND GROUND WATER DEMAND MANAGEMENT

2 EFFICIENT IRRIGATION MEASURES

In line with the DSM Strategy, Dubai Municipality is applying measures to reduce consumption of TSE in public irrigation and free up volumes for other purposes. The Municipality implemented a one-day-per-week switch-off programme in some communities during summer and, since 2015, revised irrigation standards in all new developments. The new standards for trees and grass prescribe 20-50% lower water quantities in comparison to the previous standards. These revised design criteria are possible by introducing advanced technologies, and operation and maintenance practices such as:

- Automatic irrigation schedule adjustment according to prevailing local weather conditions
- Reduction of evaporation rates by introducing new advanced irrigation technologies and equipment (low volume / deep spread irrigation methods)
- Reduction of the water wastage percentage by implementing smart devices for operation and Maintenance

	Description	Planting Unit	Water Demand per unit (Till 2015)	Water Demand (Modified with implementation of new strategies) 2016 onwards
1	Palms	Nos	227 lit/day	120 - 150 lit/day
2	Trees	Nos	120 lit/day	50-70 lit/day
3	Shrubs	Nos	25 lit/day	15 lit/day
4	Ground covers & flowers	Sq.m	15 lit/day	12 lit/day
5	Lawn areas	Sq.m	15 lit/day	10 lit/day

Exhibit 32: Revised irrigation standards adopted in new developments

RECYCLED AND GROUND WATER DEMAND MANAGEMENT

Furthermore, DM developed guidelines to optimize landscape design concepts using hardscaping and xeriscaping, including:

- Rational adjustment of various landscape elements like Hardscape (40-60%) vs. Softscape (60-40%)
- Mandatory use of native plant palette and climate-adapted exotic species that are non-invasive, low-water consuming and saline tolerant species (around Al Qudra Lakes)

These guidelines have the potential to optimize irrigation demand by as much as 5-6 lit/day/m^2.

Exhibit 33: Use of Mulch in some Dubai Municipality new areas as a protective ground cover to save water and reduce evaporation

RECYCLED AND GROUND WATER DEMAND MANAGEMENT

3 USE OF RECYCLED WATER BEYOND PUBLIC IRRIGATION

Although the major use of recycled water is for Dubai public landscapes, demand in other sectors has been steadily growing in the past few years.

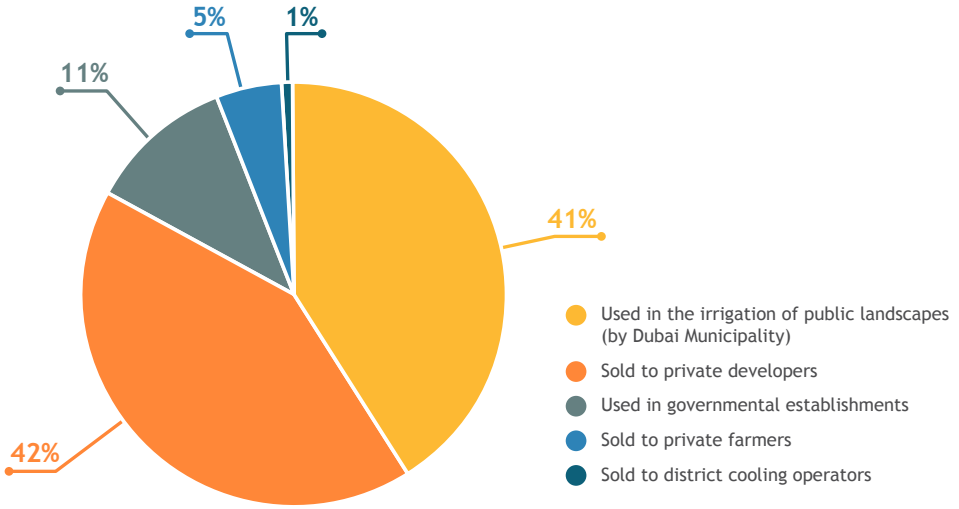
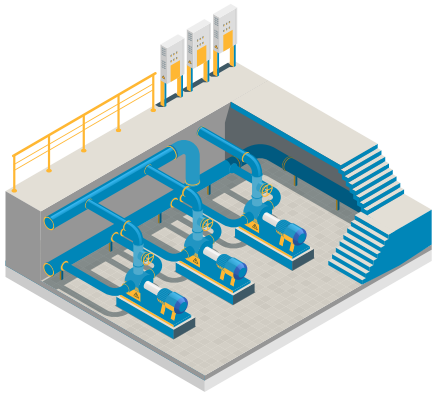
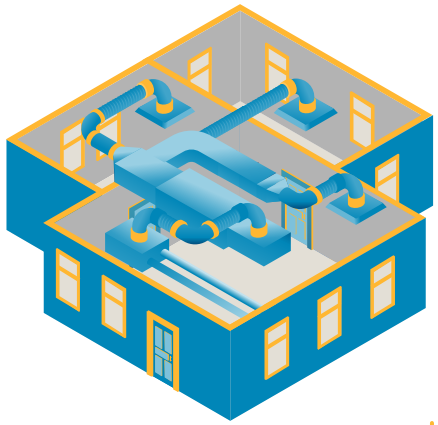


Exhibit 34: Share of treated sewage effluent usage in 2019, by application (Source: Dubai Municipality)

One area of growth was the use of Recycled water (TSE) in District Cooling, where network planning activities by Dubai Municipality was successful in identifying new demand early on to consider in the network expansion design:

- 8 additional DC connections were connected during 2019 (with a total potential demand of 95,000 m^3/day)
- An additional 23 connections are planned during the next 3 years 2020-2022 (with a total potential demand of 82,000 m^3/day)





NEW

5.10 DSM PROGRAMME 10

EFFICIENT MOBILITY AND SMART CHARGING

(NEW PROGRAMME TO BE LAUNCHED IN 2020)

PROGRAMME OWNER

هيئة الطرق والمواصلات
ROADS & TRANSPORT AUTHORITY
RTA
هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

PROGRAMME SUPPORT

اينوك enoc
الاتحاد Etihad Energy Services لخدمات الطاقة

PROGRAMME OBJECTIVE

Engage the uptake of efficient mobility (with the focus on Hybrid and Electric Vehicles) and smart charging in Dubai.

PROGRAMME INTRODUCTION

In support of the DSCE Directive 1 of 2016 which states that 2% of all cars purchased should be either electric or hybrid vehicles by 2020 and by 10% by 2030, the Dubai Supreme Council of Energy launched the Dubai Green Mobility initiative to encourage the use of sustainable transport and electric vehicles to achieve the Directive goals. The market for hybrid and electric vehicles aims to promote the use of sustainable transport, and encourage the use of environmentally-friendly vehicles by all citizens and residents in Dubai.

As part of the DSM Strategy Update that took place in 2019, the Dubai Supreme Council of Energy introduced a new objective to make Dubai a leader in clean and efficient vehicles and a dedicated programme for efficient mobility and smart charging (Programme 10). The programme will be launched in 2020 by RTA and DEWA and will focus on promoting electric/hybrid vehicles and the expanding charging point network.

NEW

5.11 DSM PROGRAMME 11

FUEL & ENGINE EFFICIENCY

(NEW PROGRAMME TO BE LAUNCHED IN 2020)

PROGRAMME OWNER

هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology

PROGRAMME SUPPORT

enoc ADNOC Emarat

PROGRAMME OBJECTIVE

Promote efficiency and demand abatement of transportation (fossil) fuels in Dubai.

PROGRAMME INTRODUCTION

As part of the DSM Strategy Update that took place in 2019, the Dubai Supreme Council of Energy introduced a new objective to make Dubai a leader in clean and efficient vehicles. To support the achievement of this objective, a new programme has been designed focusing on fuel and engine efficiency. ESMA, with the support of the national oil companies (ENOC, ADNOC, Emarat) will monitor and periodically update the Fossil Fuel Standards and Engine Specifications to ensure efficiency and demand abatement in Dubai and the UAE.

5.12 DSM AWARENESS IMPROVEMENT

Awareness improvement is a key enabler to the achievement of the Demand Side Management (DSM) targets. Behavioural changes can only happen when people and organisations are aware of their energy consumption and of measures and practices they can adopt to reduce their consumption.

5.12 DSM AWARENESS IMPROVEMENT

The DSM Integrated Awareness Strategy (IAS) 2022 was developed as a joint and collaborative effort between all DSM programme owners, namely Dubai Electricity and Water Authority (DEWA), Dubai Municipality (DM), Roads and Transportation Authority (RTA), Etihad Energy Services (Etihad ES), and Emirates Standardization and Metrology Authority (ESMA).

The DSM Integrated Awareness Strategy covers all DSM programmes and defines strategic objectives and measurable targets for each programme (from 2018 to 2022), with a focus on general awareness and willingness across key target segments *(see exhibit 35)*.

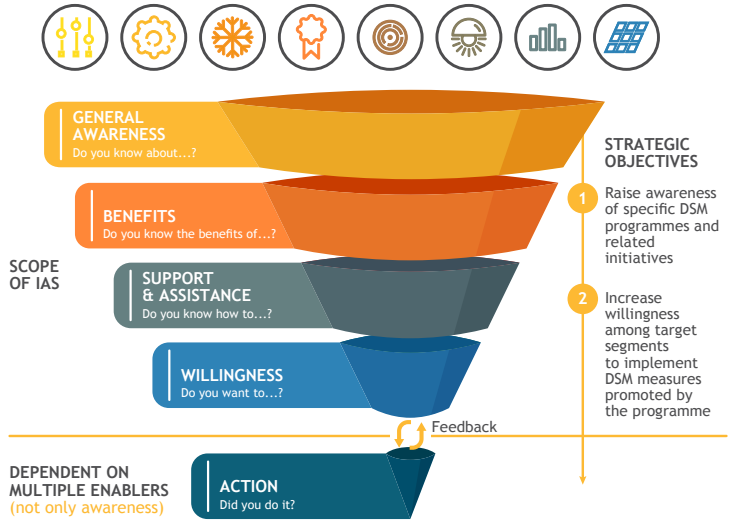


Exhibit 35: Illustrative strategic objectives of the Dubai Demand Side Management Integrated Awareness Strategy 2022

The strategy is implemented through the deployment of initiatives across five categories *(see exhibit 36)*.

Category	Main Sub-categories (non-exhaustive)
1. Networking Events and Activities	• Conferences • Workshops • Webinars
2. Awards and Recognition	• Awards and recognition
3. Technical Resources	• Sector-specific guidebooks • Tools and calculators • Training material
4. Marketing and Outreach	• Websites • Apps • In-store promotions • Interactive displays • Brochures, leaflets and banners
5. Public Awareness Campaign	• Digital media (social media, websites) • Traditional media (print, TV)

Exhibit 36: Integrated Awareness Strategy 2022 awareness initiative categories

Annual operational plans are developed for all DSM programmes to effectively implement IAS 2022 with implementation support from TAQATI. The operational plans are annually reviewed with programme owners, and updated to ensure best integration of efforts and effective implementation.

5.12 DSM AWARENESS IMPROVEMENT

KEY HIGHLIGHTS

1 ENERGY MANAGEMENT GUIDEBOOK FOR GOVERNMENT AND BUSINESSES

The Energy Management Guidebook provides a practical and systematic approach to formulating and implementing an effective energy management. The guidebook is tailor made for Dubai and aims to serve as a tool for organisations across sectors (government, commercial, industrial, etc.) seeking to improve energy performance. It can be used by top management, operations or facilities managers, engineers, or others embarking on their energy conservation and management journey.

The guidebook is available for download on the TAQATI website in English and Arabic.

5.12 DSM AWARENESS IMPROVEMENT

2 MY ENERGY, MY RESPONSIBILITY CAMPAIGN

The 'My Energy, My Responsibility' campaign, launched by DSCE in May 2018 seeks to encourage general members of the community to be responsible for their energy resources through cutting down usage, constant monitoring of consumption patterns and promoting energy efficiency behaviours.

MY ENERGY MY RESPONSIBILITY | طاقتي مسؤوليتي

The campaign is a joint government effort that brings Dubai Government's energy efficiency campaigns under one umbrella and aims to encourage and support Dubai residents to adopt energy efficient practices and behaviours. The campaign is supported by various government entities, namely **ESMA, DEWA, Dubai Municipality, RTA, Etihad ES, ENOC, Dubai Airports, Empower and others.**

My Energy, My Responsibility website

As part of the initiative, a one-stop shop website is made available to the general community to provide information on energy efficiency, along with measures that can help reduce their energy consumption. The website is continuously updated with new resources, such as guidebooks, calculators, marketing materials, updates on initiatives related to energy efficiency, etc.

The website is organized into two sections: At Home and At Work with relevant materials for different target segments and sectors (e.g. residential, government, commercial, and industrial).

Exhibit 37: My Energy My Responsibility Website (www.MyEnergyMyResponsibility.ae)

EXAMPLES OF CONTENT FROM MY ENERGY MY RESPONSIBILITY WEBSITE

- Energy efficiency material specially designed to be easy to understand by all ages and energy knowledge levels *(see example)*

Exhibit 38: Top 10 energy efficiency saving tips

- Easy guides for residents and businesses on how to understand and reduce their energy consumption, build an efficiency home/office, apply efficient landscaping, purchase efficient appliances, install solar panels, etc.

Exhibit 39: Easy energy saving guides for residential sector

- Special guidelines for businesses focusing on ways to save energy as employees and organisations

Exhibit 40: Guidelines to save electricity and water at work across key economic sectors

- Video tutorials and quizzes that teach the youth and adults about energy efficiency and how to conserve energy

Exhibit 41: Video tutorials and quizzes

- Interactive tools such as the EUI (Energy Use Intensity) calculator that enable consumers to compare their electricity and water consumption to similar facilities in Dubai

Exhibit 42: Energy Use Intensity Calculator

Social Media Campaigns

Daily energy efficiency tips and information are also available in images and videos through TAQATI social media platforms.

The tips are also shared and reposted by other government entities such as ESMA, DEWA and Etihad ES to increase the reach of these messages.

Exhibit 43: Examples of Social media posts and reposts for My Energy, My Responsibility

5.12 DSM AWARENESS IMPROVEMENT

3 SECTOR-SPECIFIC AWARENESS INITIATIVES

Industrial sector

To mitigate the energy consumption rise in Dubai's industrial sector, Dubai Exports, an Agency of the Department of Economic Development (DED), in collaboration with Dubai Electricity & Water Authority (DEWA), Etihad ES, and TAQATI developed and launched the **Dubai Green Industrial Award (Dubai Green Star Awards) in 2018.** The Award scheme seeks to reward industries that demonstrate appreciable reduction of their impact on the environment and electricity and water consumption.

The Award promotes companies for outstanding performance in energy efficiency and environmental sustainability, thereby highlighting them as leading role models in Dubai.

The award scheme is categorised in three levels: Gold, Silver and Bronze.

The second cycle of the award scheme took place in 2019, with an awarding ceremony during the Future Manufacturing and Trade Summit organised by Dubai Exports.

Exhibit 44: Dubai Green Industrial Award guidelines

Retail Sector

In an effort to tackle residential energy consumption, a number of initiatives related to energy efficient appliances took place in partnership with key retailers in Dubai, championed by ESMA.

- As sales staff are the main interface between consumers and their purchasing decisions, a crucial first step to improving penetration of efficiency appliances is to educate the appliances salesforce. In 2019, **orientation trainings have been delivered to sales staff from major appliance distributors and retailers.** The trainings focused on building an understanding of the ESMA energy efficiency labels, benefits of efficient appliances, and most importantly, on ways to convey the message to convince customers to purchase the more efficient models.
- In addition, a **"retailer pocket guide"** has been developed to serve as a user friendly reference sheet for sales staff to ensure they are delivering the right messages to their customers.

Exhibit 45: Training sessions on energy efficient appliances with top appliance retailers in collaboration with ESMA

In the coming years, ESMA in collaboration with TAQATI will continue to focus significant efforts on the retail sector through:

- **Display of educational materials in stores:** to help customers understand the benefits of purchasing efficient appliances through flyers, billboards, etc.
- **Efficient appliances month:** A month dedicated to promoting the purchase of energy efficient appliances (4-5 stars) through discounts, gift vouchers, promotions, etc.

5.13 DSM CAPACITY BUILDING

Ensuring the right expertise and human capabilities are available in Dubai's energy sector is a critical component to achieving the ambitious DSM targets.

5.13 DSM CAPACITY BUILDING

To support the continuous development of capabilities in Dubai, the Dubai Energy Efficiency Training Programme was launched in April 2018, mandated by the Dubai Supreme Council of Energy (DSCE) and led by TAQATI. The Programme is delivered in partnership with the British University in Dubai (BUiD), the Association of Energy Engineers (AEE) and the International Institute for Energy Training (IIET).

The training programme focuses on four key objectives:

The Dubai Energy Efficiency Training Programme offers an array of internationally and locally certified training programmes and modules to cater to the learning and development needs of various stakeholders in Dubai's energy sector. Various certification programmes are offered such as Certified Energy Manager (CEM®); Certified Energy Auditor (CEA®); Certified Measurement & Verification Professional (CMVP®); Advanced Measurement & Verification (AMV®); Performance Contracting & Funding (PCF®); Certified Building Commissioning Professional (CBCP®), as well as the LEED training suite and WELL AP. Each programme enables candidates to develop a set of skills with varying levels of competency and depth *(see exhibit 47)*.

- Build the **right capabilities** to achieve Dubai's ambitious target of **30% reduction in energy consumption by 2030**
- Improve **understanding and adoption** of new energy efficient technologies
- Foster a **community of innovators and thought leaders** on energy efficiency in Dubai
- Create **value for Dubai** by offering **continuous professional development opportunities**

Exhibit 46: Dubai Energy Efficiency Training Programme key objectives

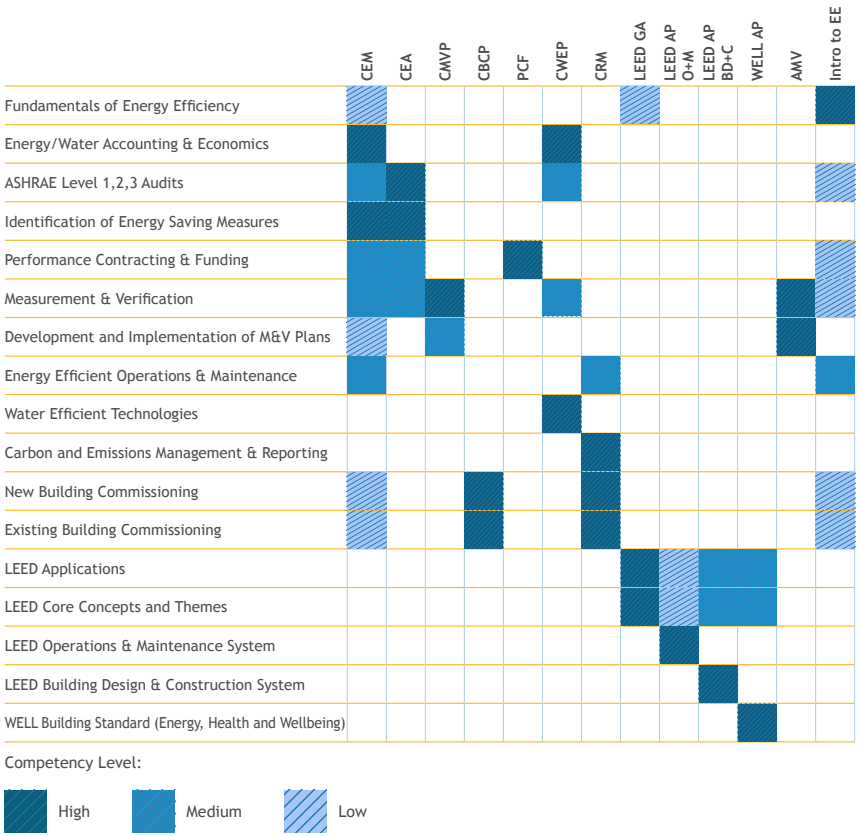


Exhibit 47: Skills from each course

5.13 DSM CAPACITY BUILDING

KEY HIGHLIGHTS

1 DUBAI ENERGY EFFICIENCY TRAINING PROGRAMME

The programme was launched in April 2018 with the agreement signature between Etihad Energy Services (Ali Al Jassim, CEO) and British University in Dubai (Prof. Abdullah Al Shamsi, Vice Chancellor). The programme yielded positive results in its first two years (2018-2019) *(see exhibit 48)*.

In order to broaden the coverage of the Dubai Energy Efficiency Training Programme in terms of focus areas and target audience, the Programme continues to explore new courses in response to market demand and gaps identified. In fact, the Certified Building Commissioning Professional Certification was delivered for the first time in the region in April 2019.

Looking forward to the coming years, the Programme will continue to deliver core energy efficiency certifications and look into expanding its offerings based on gaps identified in the market.

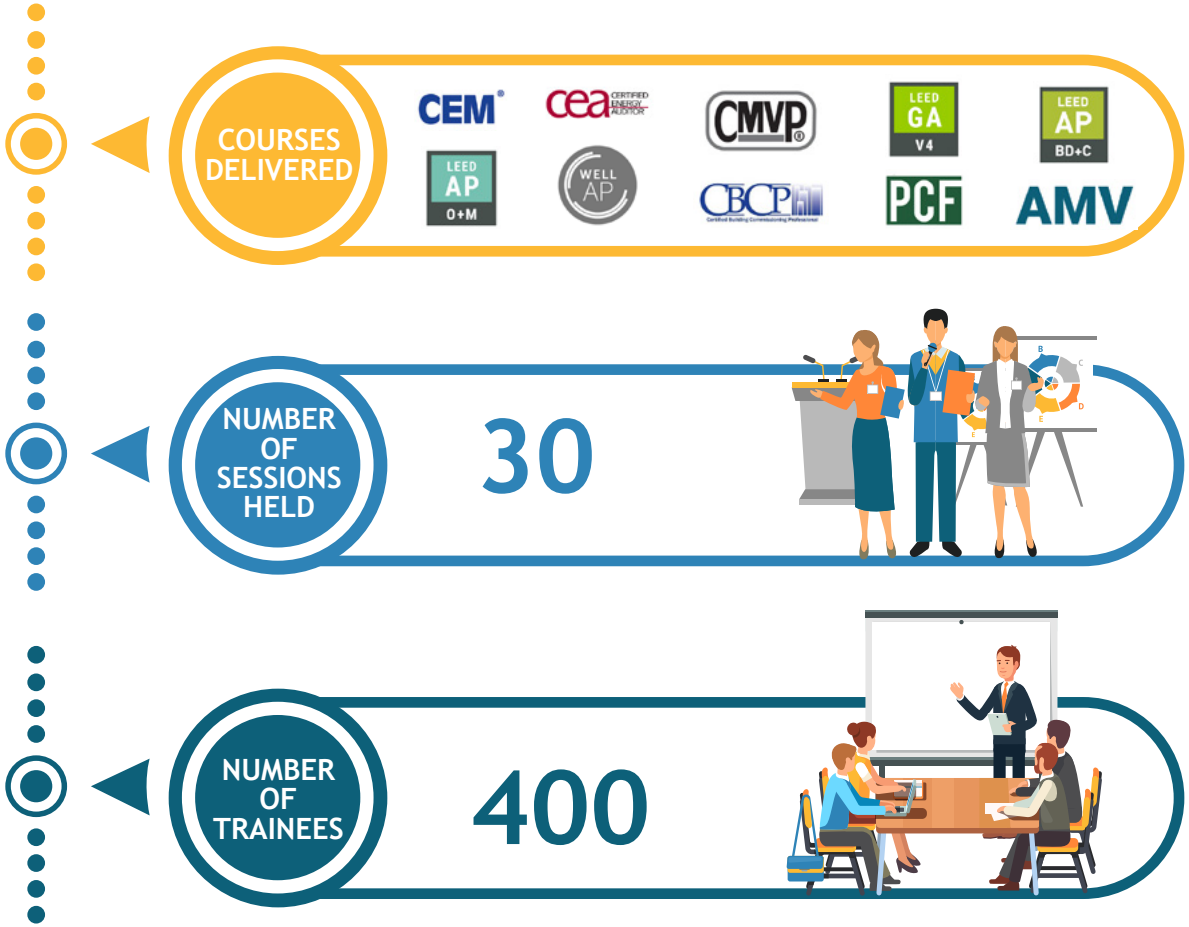


Exhibit 48: Dubai Energy Efficiency Training Programme – Results to Date (2018-2019)

5.13 DSM CAPACITY BUILDING

MAIN ACTIVITIES

2 LAUNCH OF SOLAR PV TRAININGS

To ensure the availability of qualified human capital to cater for the growing solar PV market in Dubai, Etihad Energy Services Company entered into a partnership with Solar Energy International for the delivery of internationally recognized solar PV training programmes in Dubai. The two programmes, Solar PV Design Professional and Solar PV Installation Professional, aim to equip solar professionals with enhanced technical skills and a strong understanding of Solar PV systems.

The first session of the Solar PV Design Professional certification took place in November 2019, while the first session of Solar PV Installation Professional is planned for 2020.

Exhibit 49: First Solar PV Design Certification Training in Dubai (Nov 2019)

Solar PV Professional Certifications

PV Design Professional

PV Installation Professional

SOLAR ELECTRIC DESIGN & INSTALLATION

- This module provides an overview of the three basic PV system applications, primarily focusing on grid-direct systems.
- The goal of the course is to create a fundamental understanding of the core concepts necessary to work with all PV systems, including: system components, site analysis, PV module criteria, mounting solutions, safety, and commissioning. The course will also cover the basics of sizing a grid-direct system, wire sizing, overcurrent protection, and grounding.

ADVANCED PV SYSTEM DESIGN

This module focuses on commercial-scale system design though the design parameters, and best practices are applicable to all types and sizes of PV installations.

Detailed lessons address:

- Requirements for disconnects
- Overcurrent protection and wire sizing
- Interconnection requirements and calculations
- Grounding and ground faults
- Calculations for system sizing, inverter selection, and electrical configuration
- Ground and roof mounting
- Commissioning and performance analysis procedures

PV SYSTEM OPERATIONS & MAINTENANCE

This module is geared towards training senior PV technicians to safely and effectively perform operations and maintenance (O&M) tasks including inspections, commissioning, performance verification, and troubleshooting.

Likewise, those managing fleet operations and system data will find this course challenging and valuable. Candidates will become familiar with a wide range of advanced analytical tools meters, and techniques, such as:

- Insulation resistance testers,
- IV curve tracers,
- Infrared cameras

Candidates will also learn the advanced skills required to ensure PV systems operate safely and reliably

Exhibit 50: Overview of Solar PV Certifications offered by Etihad ES in partnership with Solar Energy International (SEI)

6 ACKNOWLEDGEMENTS

We are grateful to the leaders, peers, and colleagues who have helped achieve the important targets of 2019. In particular, we express deep gratitude to DSCE Board chairman and members, DSM Executive Committee, Integrated Outreach and Awareness Strategy Committee members, executives and working groups from the entities listed below (in alphabetical order):

- Dubai Electricity and Water Authority
- Dubai Municipality
- Dubai Petroleum Establishment
- Dubai Supply Authority
- Emirates Authority for Standardization and Metrology
- Emirates National Oil Company
- Emirates Green Building Council
- Etihad Energy Services Company
- Regulatory and Supervisory Bureau for Water and Electricity in Dubai
- Roads and Transport Authority
- The Dubai Free Zone Council and its member authorities (including Trakhees, Dubai Silicon Oasis, Dubai South and Dubai Development Authority)

A special recognition as key contributors to the information contained in this report goes to (in alphabetical order):

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  HE Saeed Mohammed Al Tayer
  Sarah Alzarouni
  Sultan Al Zaabi
  Waleed Salman
  Yousef Jebril

- **Dubai Municipality**
  HE Dawood Al Hajiri
  Fahed Al Awadhi
  Fida Alhammadi
  Hassan Chamaysse
  Mansour Rafie
  Saeed Safar
  Salim Zid
  Sara Al Madad
  Talib Julfar

- **Roads and Transport Authority**
  Bassel Saad
  Hanan Saleh Alhemairy
  Odeh Odeh
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ABOUT THE DUBAI SUPREME COUNCIL OF ENERGY

The Dubai Supreme Council of Energy was formed in August 2009 under Law 19 of 2009, issued by His Highness Sheikh Mohammed bin Rashid Al Maktoum, Vice President and Prime Minister of the UAE, and Ruler of Dubai.

His Highness Sheikh Ahmed bin Saeed Al Maktoum was appointed Chairman for the Council, His Excellency Saeed Mohammed Al Tayer as Vice Chairman, and His Excellency Ahmad Al Muhairbi as Secretary General.

The Council consists of the following members: the Director General of the Department of Petroleum Affairs, the President and Chief Executive Officer of DUBAL Holding, the Chief Executive Officer of Emirates National Oil Company and a single representative from the Dubai Supply Authority, Dubai Petroleum Establishment, Dubai Municipality, Dubai Nuclear Energy Committee and Roads and Transport Authority.

The Council has an Advisory Committee from competent and specialised workforce.

The new Governing body seeks to ensure that the Emirate's growing economy will have sustainable energy while preserving the environment. The Authority is developing alternative and renewable energy sources for the Emirate, while increasing energy efficiency to reduce demand.

Under the visionary guidance of His Highness Sheikh Mohammed bin Rashid Al Maktoum, the Dubai Integrated Energy Strategy 2030 was developed in 2010 and deployed in 2011 to set the strategic direction of Dubai towards securing sustainable supply of energy and enhancing demand efficiency (for electricity, water and transportation fuel).

ABOUT TAQATI | DUBAI ENERGY EFFICIENCY PROGRAMME

TAQATI is the dedicated Programme Management Office for Dubai's Demand Side Management (DSM) Strategy which targets a reduction in energy consumption by 30% by 2030. It was established by the Dubai Supreme Council of Energy under Etihad Energy Services Company to provide implementation support and guidance to all relevant stakeholders for the DSM Strategy.

For more info on DSM Strategy 2030 and TAQATI, please visit TAQATI's website at www.taqati.ae or email: info@taqati.ae