حكومة دبي
GOVERNMENT OF DUBAI

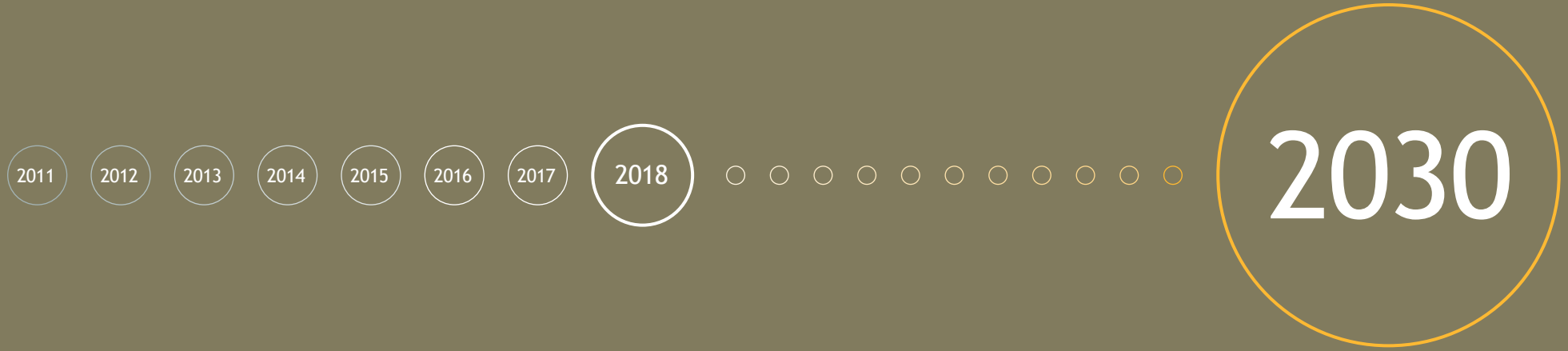
المجلس الأعلى للطاقة
Supreme Council of Energy

2018 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 targets of reducing energy and water 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 2018 DSM report shows another year of positive results from the implementation of the strategy; Dubai has successfully cut down electricity and water consumption by 9.9% and 5.5% respectively, compared to normal consumption rates. The 4.5 TWh of electricity and 6.7 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 5.1 billion in avoided generation costs, that can be used in other strategic investments that promote economic growth.

We thank all stakeholders for their efforts so far and are confident in reaching our leadership vision with their continued support and contribution.

HE Saeed Mohammed Al Tayer

Vice Chairman of the Dubai Supreme Council of Energy

MESSAGE FROM: SECRETARY GENERAL OF DUBAI SUPREME COUNCIL OF ENERGY

We are pleased to report robust progress in implementing the Demand Side Management Strategy (DSM). We are well ahead with the implementation of the strategy which was set in 2013 for the period until 2030.

Collaboration between all stakeholders, government entities leading the implementation of DSM programmes, industry players, and individuals resulted in savings in 2018 that continue to exceed the set targets. It is rewarding to see that the portfolio of initiatives we created over the years has shown so much growth potential. To ensure this continues and to reassure that our strategy and innovation programmes are aligned, we are looking to further expand our efforts on a number of concepts such as net zero energy building, smart home, smart metering, intelligent appliances and others.

The continued success of the DSM Strategy extends beyond regulations; it requires building strong foundations and supporting enablers, i.e., improving general awareness, strengthening market capability and creating innovative financing. In 2018, we launched 'My Energy, My Responsibility', a joint government campaign to enhance energy efficiency awareness and behaviour amongst Dubai residents, a key enabler to our energy saving targets. In addition, TAQATI launched the Dubai Energy Efficiency Training Programme. The programme, which offers an array of internationally and locally certified energy efficiency trainings, will ensure that market skills and overall competencies are up-to-date with global standards.

HE Ahmad Buti Al Muhairbi

Secretary General of the Dubai Supreme Council of Energy

Launch of the Demand Side Management Annual Report by
His Highness Sheikh Ahmed bin Saeed Al Maktoum,
Chairman of the Dubai Supreme Council of Energy (DSCE);
His Excellency Saeed Mohammed Al Tayer, Vice Chairman of DSCE;
His Excellency Ahmad Buti Al Muhairbi, Secretary General of DSCE;
and Members of the Board

(Picture taken for the launch of a previous report)

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1 EXECUTIVE SUMMARY

This report, in its fifth year of publication, presents the progress and performance of the Dubai Demand Side Management (DSM) Strategy 2030 for 2018. The strategy comprises eight main programmes addressing different aspects of demand for electricity and water in Dubai.

Each programme has an assigned programme owner, a government entity responsible for its execution. Strategy implementation is supported 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% yearly savings in electricity and water by 2030 compared to the business as usual consumption.

By the end of 2018, DSM Strategy implementation resulted in 4.5 TWh annual electricity savings and 6.7 billion imperial gallons annual water savings, corresponding to 9.9% and 5.5% of the baseline consumption, respectively. The achieved savings surpass the 3.7 TWh target for electricity by 22%, and are close to the 6.9 billion gallons water target for the year. As most programmes are rapidly expanding, the results show a substantial growth from the savings achieved in 2017, an increase of 25% for electricity and 39% for water.

Avoided cost in generation capacity and natural gas consumption from DSM electricity and water saved since the initiation of the strategy in 2011, are estimated at around AED 5.1 billion.

These important achievements are a combination of efforts from all programme owners, who are committed to yearly 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 2018:

- Increased share of green buildings in new buildings commissioned and permitted by Dubai Municipality and free zone authorities.
- New major retrofits planned by Etihad ES in the facilities of the Islamic Affairs and Charitable Activities Department (IACAD), Dubai International Airport, Seven Tides, and Drydocks World.
- Progressive expansion of Dubai Municipality's treated water irrigation network, and recycling capacity in the Jebel Ali plant.
- Considerable growth of Shams Dubai thanks to remarkable projects led by both Dubai Government and the private sector.
- Launch of 'My Energy, My Responsibility', a joint government campaign to raise awareness on energy efficiency in Dubai.
- Launch of Dubai Energy Efficiency Training Programme to build market capabilities in energy efficiency.
- Enhancement of systems and processes for monitoring and evaluating DSM energy savings.

The coming years will see a steep increase in saving targets, and hence several programmes are expected to step up their measures. This would involve, for example, updates to the green building regulations and expansion of their application to free zones, upgrades to the efficiency standards of the most energy intensive appliances, scale-up of retrofit activities, increased penetration of district cooling in high-density areas, broader implementation of efficient technologies in street lights, and adoption of solar photovoltaic (PV) on site to off-set building loads. Specific work will be dedicated to unlock synergies and enable growth of DSM programmes relying on collaboration between multiple stakeholders, such as District Cooling and Water Reuse and Efficient Irrigation. In parallel, efforts will be deployed to build financing enablers.

The DSCE will be conducting the next five-year update to the DSM Strategy in the first half of 2019, to validate the strategic priorities from now to 2030 and extend the vision to 2050. The revision will look into enhancing the scope of DSM in Dubai and targeting specific electricity and water consumer groups.

The DSM Strategy plays an important part in the sustainable growth of Dubai. It is generating real savings, improving awareness, building DSM capabilities, and developing the energy efficiency market. The ongoing support received from Dubai leaders and institutions, and anticipated in the future, gives confidence that the long term 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 DSM Strategy, a presentation of the achievements in 2018, and an outline of the priorities to be pursued in the next three years.

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, and Emirates Authority for Standardization and Metrology.

Note that the results reported are based on the most recent data available at the date of report publication. A project was carried out in 2018 to review the assumptions and methodologies used for the calculation of savings from the DSM programmes and increase the data collection points. 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.

As such, the DSM Strategy integrates well with both the local agenda of Dubai and the national agenda *(see exhibit 2)*.

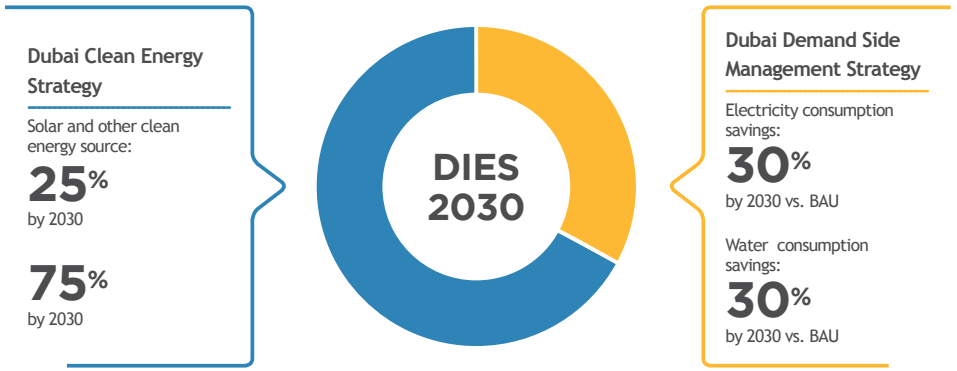


Exhibit 1: Demand Side Management Strategy as part of the Dubai Integrated Energy Strategy 2030

Exhibit 2: Dubai Integrated Energy Strategy and Demand Side Management Strategy in the context of the policy agendas of Dubai and the UAE

3.2 DEMAND SIDE MANAGEMENT STRATEGY, ROADMAP AND TARGETS

DSM Strategy

The DSM Strategy comprises eight programmes, designed to address different aspects of electricity and water consumption sources in Dubai. Programmes are supported by implementation mechanisms, mainly policies and regulations, capability building, awareness improvement, measurement and verification, and financing *(see exhibit 3 and 4)*.

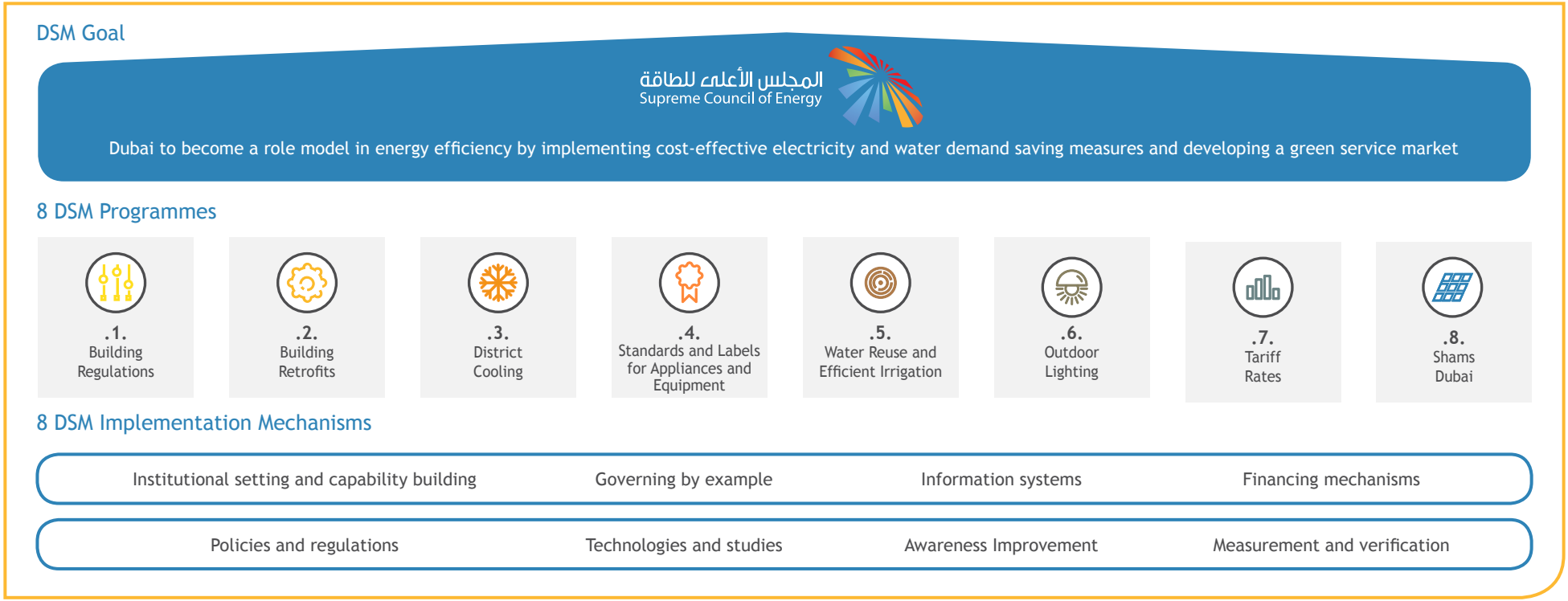


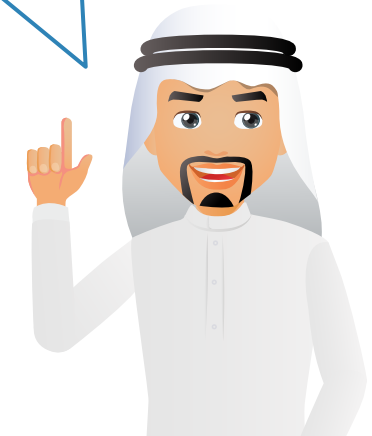
Exhibit 3: Architecture of the Dubai Demand Side Management Strategy with its eight programmes and eight implementation mechanisms

Programme		Scope
1	Building Regulations	Implement Dubai Municipality's (DM) existing green building regulations in new buildings and update the regulations to double electricity and water savings.
2	Building Retrofits	Retrofit the existing building stock in Dubai with electricity and water efficiency measures in the aim of reducing the energy intensity of 30,000 buildings in Dubai by 2030. Start with government buildings, followed by commercial and residential buildings.
3	District Cooling	Increase penetration of efficient cooling by regulating the district cooling (DC) sector in Dubai.
4	Standards and Labels for Appliances and Equipment	Develop, implement, and regularly update electricity and water efficiency standards and labels for high consuming appliances and equipment used in the UAE. Same paragraph with previous sentence.
5	Water Reuse and Efficient Irrigation	Irrigate all public areas with treated sewage effluent (TSE), implement efficiency measures in Dubai's green areas, and use excess capacity of TSE for other uses (e.g., private irrigation and DC).
6	Outdoor Lighting	Adopt high-efficiency lighting in roads and other public areas of Dubai, both in new installations and retrofits of the existing assets. Implement efficiency measures, such as dimming and partial switch-off in residential areas.
7	Tariff Rates	Adjust electricity and water tariff rates in Dubai to be cost-reflective, ensure economic efficiency, and align ratepayer with DSM objectives.
8	Shams Dubai	Encourage building and household owners in Dubai to install solar photovoltaic (PV) systems on their rooftop and connect them to Dubai Electricity and Water (DEWA) grid; and as a result, reduce their electricity bills and total demand on the grid.

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

DID YOU KNOW?

A key mechanism broadly adopted is the principle of **governing by example,** whereby the government takes the first steps in a new initiative and builds success cases to develop a market that the private sector can leverage in subsequent phases. The principle was tested in the implementation of the Dubai Green Building Regulations and Specifications 2010, which were made mandatory for new government buildings only, in initial years. The principle has also been applied to stimulate the retrofit market with the enactment of Directive No. 1 of 2015, mandating audits and retrofits in government buildings.



DSM Targets

The government of Dubai is committed to achieving ambitious electricity and water savings by implementing the eight DSM programmes. By 2030, Dubai targets overall electricity savings of about 19 TWh and water savings of 47 billion imperial gallons, which correspond to 30% savings versus business as usual *(see exhibit 5)*.

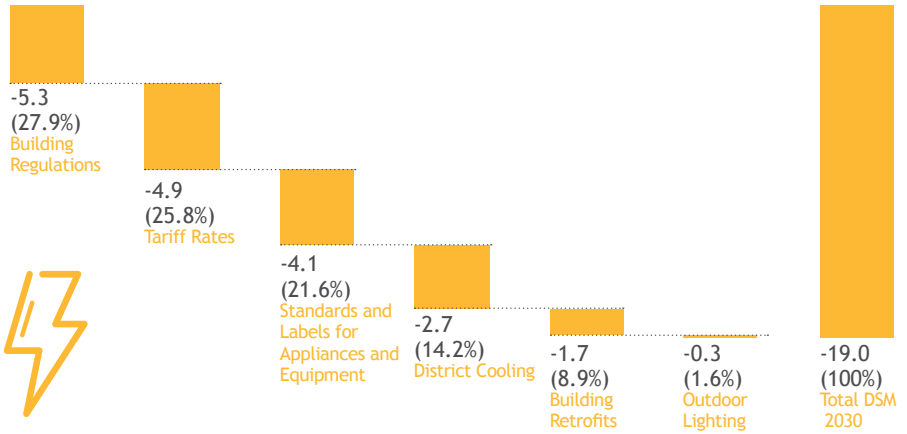
THE DSM STRATEGY TARGETS

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,

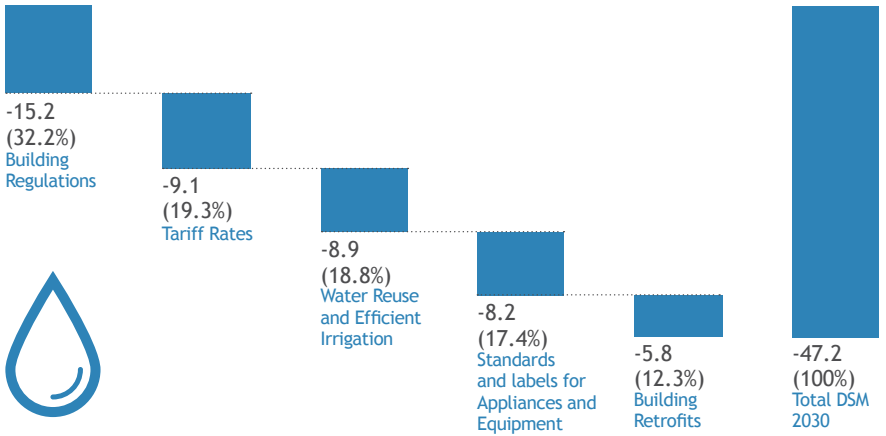


Exhibit 5: Electricity and water saving targets of the Dubai Demand Side Management Strategy 2030

DSM Roadmap

A strategic roadmap to achieve the 2030 targets was defined and agreed upon by programme owners and the DSCE in the DSM policy document. The preparatory and activation phases of DSM Strategy implementation were completed with institutional set-up, definition of goals and roadmaps, and activation of programmes *(see exhibit 6)*.

As per the agreed roadmap, in the ramp-up phase, the present phase of DSM Strategy implementation, emerging capabilities should consolidate and pilot projects should rapidly progress towards larger scale roll-out, as programmes start delivering substantial savings. In this phase, significant contribution from the government is still required to pioneer implementation, showcase success stories, and build the market; for an increased participation of the private sector in the coming years. At the end of the ramp up phase in 2020, savings are targeted to reach 8-10% versus business as usual.

While targets are fixed, a plan of such duration needs to be flexible. New technologies and best practices around the world continue to emerge and Dubai growth patterns evolve, hence, the DSM Strategy will undergo periodic revisions to fit a changing context. In fact, the DSCE is planning the next update of the DSM Strategy for the first half of 2019, to validate the strategic priorities from now to 2030 and extend the vision to 2050.

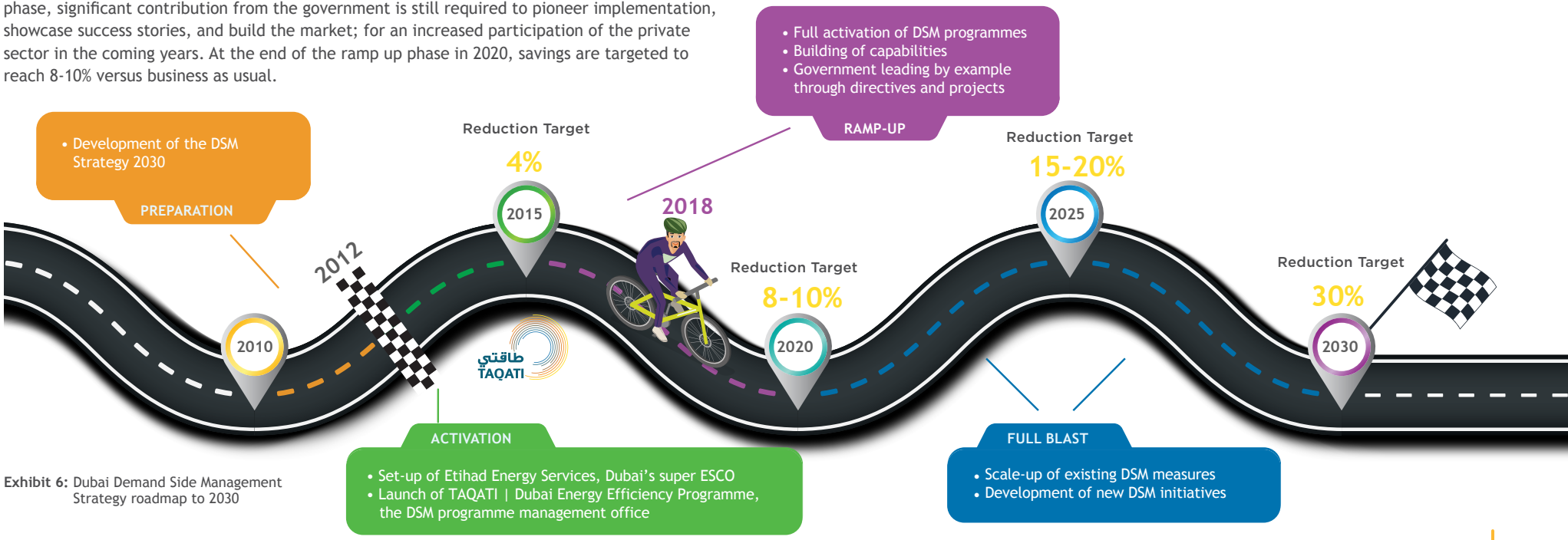


Exhibit 6: Dubai Demand Side Management Strategy roadmap to 2030

3.3 INSTITUTIONAL FRAMEWORK

Implementation of the DSM Strategy is supervised by the DSCE. The DSCE, which governs broad aspects of energy supply and demand in Dubai, is chaired by His Highness Sheikh Ahmed bin Saeed Al Maktoum and comprises top executives from key Dubai Government institutions: 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.

Each DSM programme has an assigned programme owner, a government entity responsible for its execution. The entity, which is selected based on its mandate and reach, is focused on delivering results and addressing challenges specific to the programme *(see exhibit 7)*.

Moreover, the DSM Executive Committee, chaired by the DSCE and comprising senior representatives from all programme owner entities, ensures collaboration and direction for DSM Strategy. 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

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

Exhibit 7: Governance structure of the Dubai Demand Side Management Strategy

TAQATI | DUBAI ENERGY EFFICIENCY PROGRAMME

TAQATI has been established by the Dubai Supreme Council of Energy in 2016 as the dedicated programme management office 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 (IAS2022) 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 8: TAQATI's six functions

4 DSM STRATEGY ACHIEVEMENTS

4.1 OVERVIEW OF THE MAIN ACHIEVEMENTS TO DATE

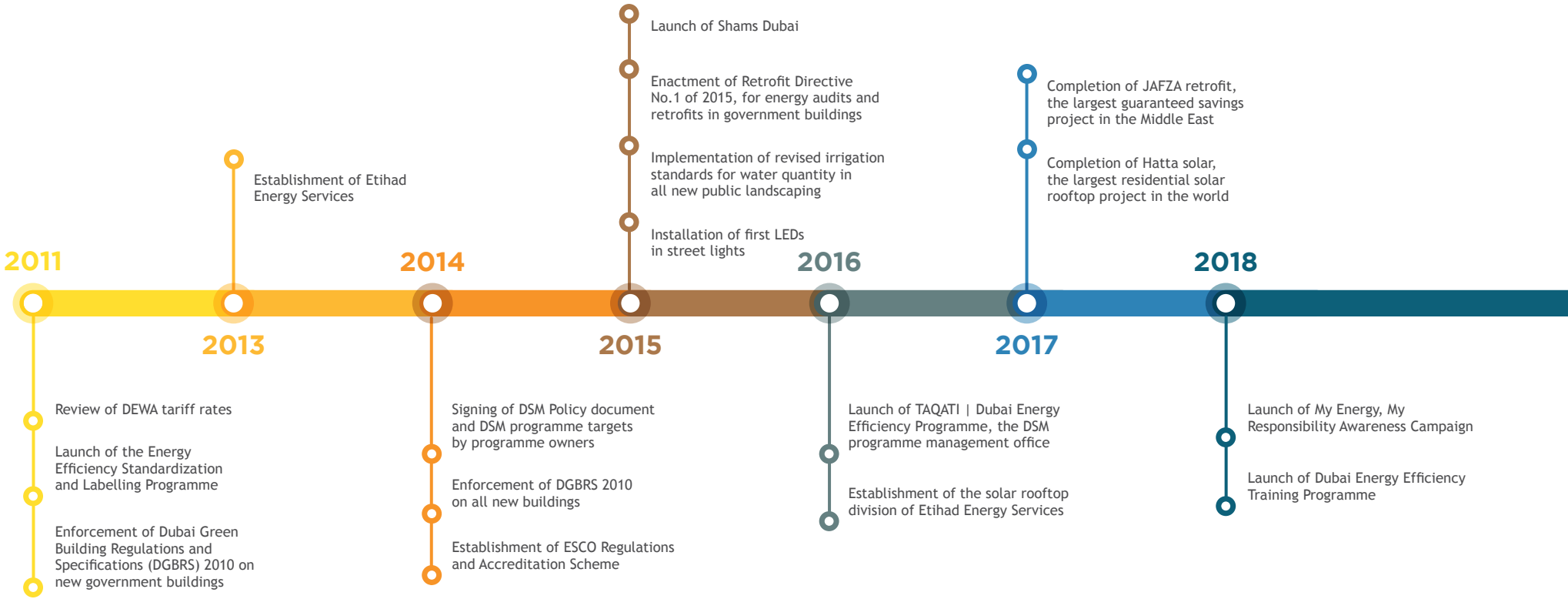


Exhibit 9: Timeline of main Dubai Demand Side Management Strategy achievements, from 2010 to 2018

4.2 OVERALL PERFORMANCE IN 2018

Electricity and Water Savings

The Demand Side Management (DSM) Strategy performance continues to grow in 2018. At the end of 2018, DSM programmes have saved 4.5 TWh of electricity, 22% over the 3.7 TWh target for the year, and 6.7 billion imperial gallons of water, close to the 6.9 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 9.9% and 5.5% of the total baseline consumption for electricity and water, respectively *(see exhibit 10)*.

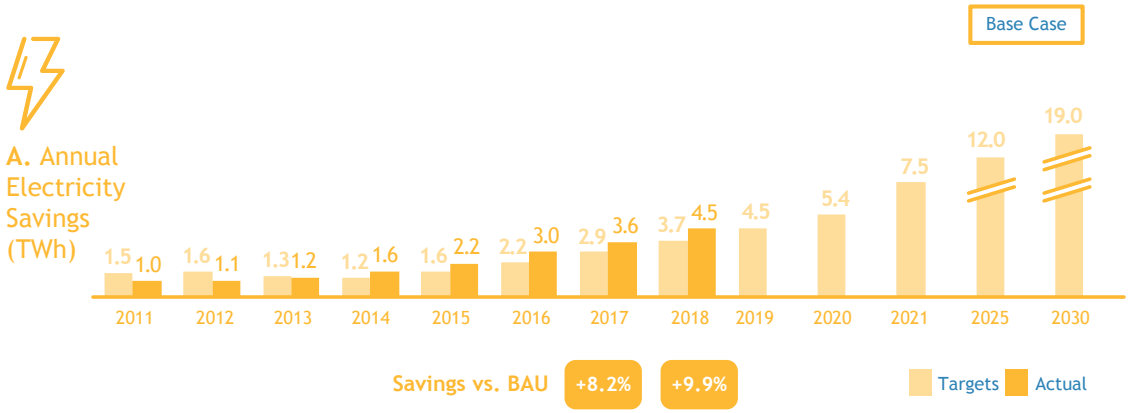
IN 2018

Savings of 4.5 Billion Kilowatt Hours

Reduction of 9.9% vs. Business as usual

Savings of 6.7 Billion Imperial Gallons

Reduction of 5.5% vs. Business as usual



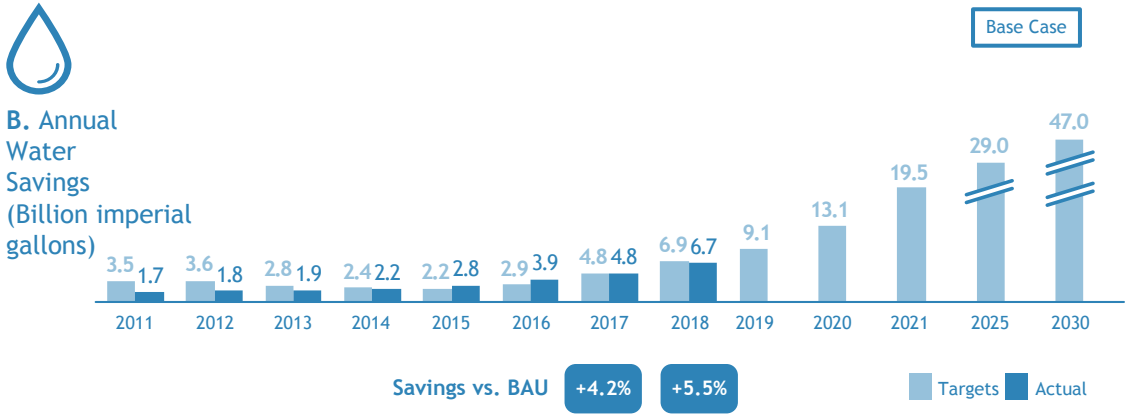
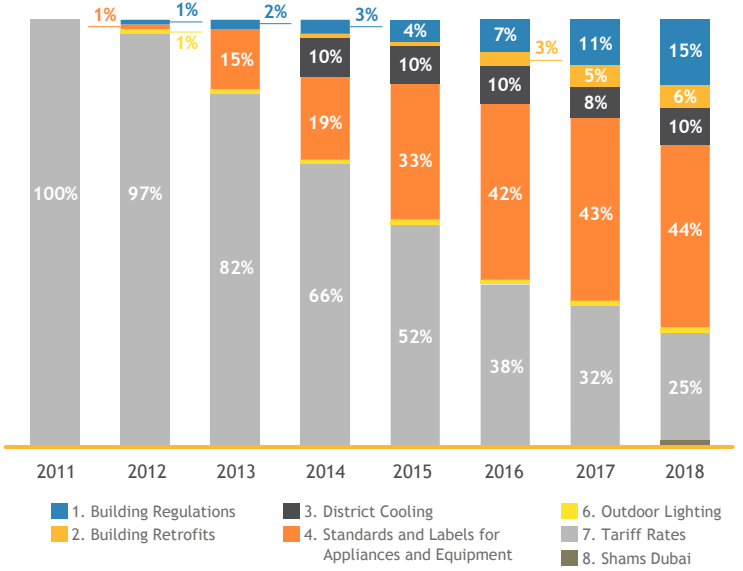


Exhibit 10: Actual annual savings achieved from the implementation of the Dubai Demand Side Management Strategy programmes, versus target savings (**A.** Annual electricity savings **B.** Annual water savings)

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 11)*.

A. % Contribution of DSM programmes to total electricity savings



B. % Contribution of DSM programmes to total water savings

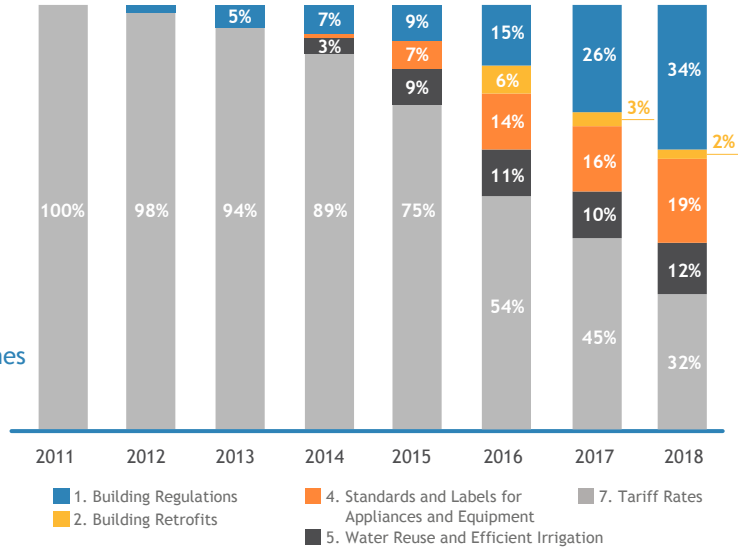


Exhibit 11: Percentage contribution of programmes to the total Dubai Demand Side Management Strategy savings, for years 2011 to 2018 (**A.** Electricity savings and **B.** Water savings)

Reduction in Consumption per Capita

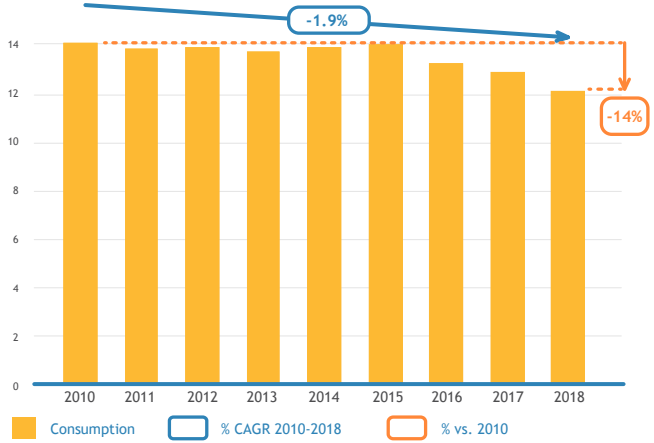
An encouraging trend confirming the programme level savings is the consistent reduction in per capita consumption for both electricity and water. The sustained results confirm the positive impact of DSM programmes on unitary consumption. Looking at long term trends, since the inception of the DSM Strategy, consumption per capita has decreased by an annual average of 1.9% for electricity and 2.0% for water *(see exhibit 12)*, a total reduction of -14% for electricity and -15% 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. Electricity Consumption per capita year ('000 kWh)



B. Water Consumption per capita year ('000 Imperial gallons)

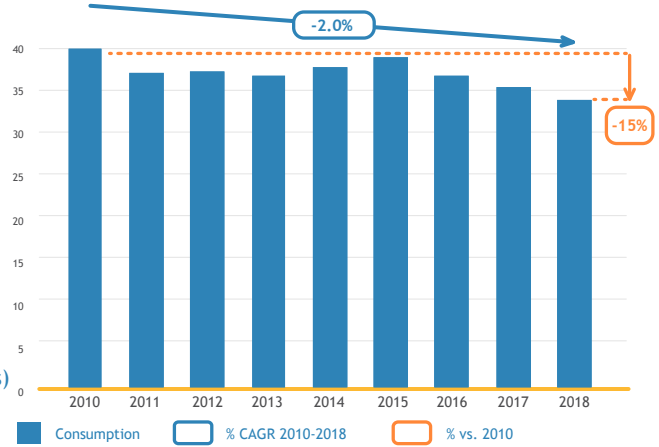


Exhibit 12: Trends of per capita consumption in Dubai, showing the compounded annual growth rate (CAGR) and total decrease in consumption from 2010 to 2018 (**A.** Electricity consumption per capita **B.** Water consumption per capita)

A. Annual Electricity Savings by DSM programme in 2018 vs 2017

DSM Programme	2017 Savings (GWh)	2018 Savings (GWh)	2018 Target (GWh)	Year-over-year growth (%)	Actual vs. target (%)	Notes on the results
Building Regulations	390	657	483	+68%	+36%	Savings based on commissioned green building data received by Dubai Municipality (DM), Trakhees, Dubai Silicon Oasis (DSOA), and Dubai Development Authority (DDA).
Building Retrofits	194	256	131	+32%	+95%	Savings result from steady growth in electricity retrofits executed by Etihad Energy Services (Etihad ES) and accredited energy services companies (ESCOs) in Dubai.
District Cooling	277	428	359	+54%	+19%	Savings based on data received from the five main district cooling operators in Dubai.
Standards and Labels	1,559	1,970	1,603	+26%	+23%	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.
Outdoor Lighting	15	24	37	+61%	-35%	Savings include outdoor lighting installations and retrofits executed by the Roads and Transportation Authority and DM. Free zone authorities and private developers' projects to be added in future years.
Tariff Rates	1,147	1,105	1,073	-4%	+3%	Savings based on the price response to the 2011 DEWA tariff review.
Shams Dubai	23	62	n/a	209%	n/a	Increase in savings results from the connected capacity tripling in 2018, 72 MW in comparison to 23 MW in 2017.
Grand Total	**3,604**	**4,501**	**3,687**	+25%	+22%	
Total as % of baseline	8.2%	9.9%				

Exhibit 13: A. Actual annual electricity savings by programme of the Dubai Demand Side Management Strategy in 2018, in comparison to 2018 targets and 2017 savings

B. Annual Water Savings by DSM programme in 2018 vs 2017

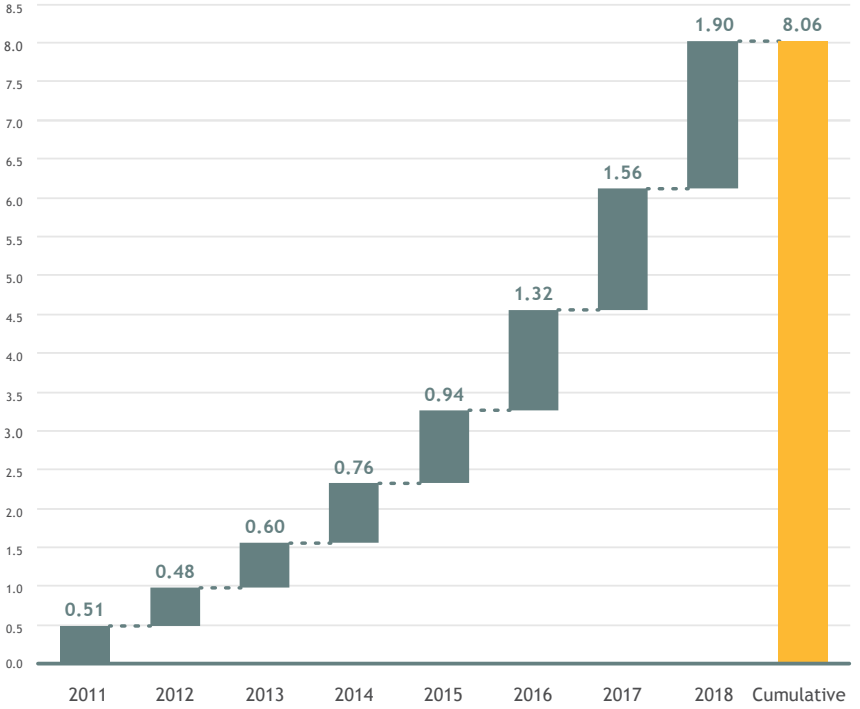
DSM Programme	2017 Savings (MIG)	2018 Savings (MIG)	2018 Target (MIG)	Year-over-year growth (%)	Actual vs. target (%)	Notes on the results
Building Regulations	1,254	2,294	1,602	+83%	+43%	Savings based on commissioned green building data received by DM, Trakhees, DSOA, and DDA.
Building Retrofits	132	161	458	+22%	-65%	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., reasons could include unaccounted for savings or a lower business case).
Standards and Labels	746	1,280	2,203	+72%	-37%	Savings result mostly from enforced efficiency standards by ESMA for washing machines. Deviation from target is due to a limited implementation of ESMA standards for indoor water fixtures and dishwashers.
Water Reuse and Efficient Irrigation	485	797	531	+64%	+50%	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.
Tariff Rates	2,178	2,143	2,289	-2%	-6%	Savings based on the price response to the 2011 DEWA tariff review.
Grand Total	**4,795**	**6,676**	**6,904**	+39%	-3%	
Total as % of baseline	4.2%	5.5%				

Note: MIG refers to million imperial gallons.

Exhibit 13: B. Actual annual water savings by programme of the Dubai Demand Side Management Strategy in 2018, in comparison to 2018 targets and 2017 savings

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 15)*.



CO_2 Emission Abatement
(million metric tons)

Exhibit 15: Cumulative carbon dioxide emission abatement from the implementation of the Dubai Demand Side Management Strategy, from 2011 to 2018

SINCE 2011

Avoided

8 Million Metric Tons of CO_2

Equivalent to emissions from

1.5 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 2018, translate into approximately AED 5.1 billion: AED 1.3 billion of avoided capital investments and AED 3.8 billion of avoided operational costs. This is the equivalent of four 200MW open cycle turbine units and 160,000 million standard cubic feet of natural gas.

Since 2011

Saved

5.1 Billion AED in operational costs and capital investments

Equivalent to

160,000 Million Standard Cubic Feet of natural gas

4x 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

BUILDING REGULATIONS

BUILDING RETROFITS

DISTRICT COOLING

STANDARDS AND LABELS

WATER REUSE AND IRRIGATION

OUTDOOR LIGHTING

TARIFF RATES

SHAMS DUBAI

DSM PROGRAMME 1:

BUILDING REGULATIONS

PROGRAMME OWNER

بلدية دبي
DUBAI MUNICIPALITY

PROGRAMME SCOPE

Implement Dubai Municipality's existing green building regulations in new buildings and update regulations to double electricity and water savings.

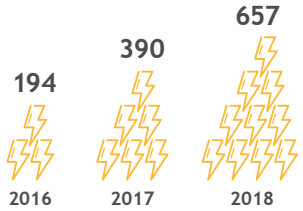
HE DAWOOD AL HAJIRI

Director General, Dubai Municipality

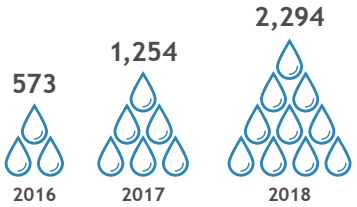
Visit www.dm.gov.ae

BUILDING REGULATIONS

PROGRAMME SAVINGS



Electricity Savings (GWh)



Water Savings (Million imperial gallons)

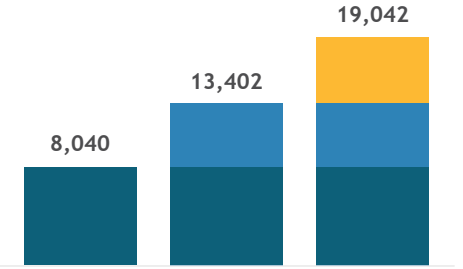
PROGRAMME INTRODUCTION

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

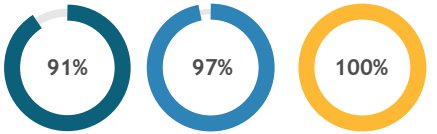
Dubai Municipality (DM) issued the first comprehensive compilation of green building regulations in 2010. In January 2011, the Dubai Green Building Regulations and Specifications (DGBRS) 2010 was made mandatory on all new government buildings, and in March 2014, after testing the code on more than 40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

DGBRS 2010 is estimated to bring 15-20% electricity and water savings in new buildings compared to pre-DGBRS buildings. The Building Regulations Programme has the highest impact among all DSM programmes, about 30% of overall targets. To achieve the targets, the Demand Side Management (DSM) Strategy relies on the full implementation of DGBRS 2010 and an update to the regulations in 2022 that doubles the savings in future constructions.

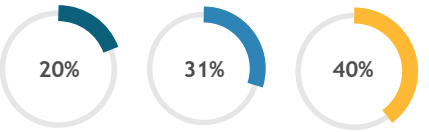
OPERATIONAL DASHBOARD



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



Penetration of DGBRS 2010 in total gross floor area of buildings permitted by DM in the respective year



Penetration of DGBRS 2010 in total gross floor area of commissioned buildings that were permitted by DM

Legend:
2016 2017 2018

BUILDING REGULATIONS

MAIN ACHIEVEMENTS

1 INCREASED PENETRATION OF GREEN BUILDINGS IN DUBAI

Since the introduction of the DGBRS in 2011, penetration of green buildings in Dubai has gradually increased. Green buildings make up 40% of all buildings commissioned in the market in 2018, and almost all buildings permitted by DM in that year are compliant to the latest regulations. As some of the buildings commissioned today were granted a construction permit pre-regulation enforcement in 2014, it will take a few more years to reach 100% penetration of green buildings in new construction.

2 IMPROVED GREEN BUILDING DATA COVERAGE

Dubai free zone authorities have also enforced green building regulations for new buildings in free zones, some following DGBRS 2010 (e.g., Dubai Development Authority), whereas others developed separate prescriptive or performance based codes (e.g., Trakhees and Dubai Silicon Oasis Authority).

In fact, Trakhees green buildings have been included in the calculation of Demand Side Management Strategy savings in the past years and, in 2018, the market coverage has increased to include Dubai Silicon Oasis and Dubai Development Authority.

BUILDING REGULATIONS

PRIORITY AREAS

1 RAISING GREEN BUILDING REQUIREMENTS AND PROMOTING HIGHER EFFICIENCY BUILDINGS FOR A GRADUAL TRANSITION TO NEARLY ZERO ENERGY INTENSITIES

DGBRS 2010 reduces 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.

DGBRS 2010 prescribes minimum electricity and water efficiency requirements but does not include a rating system, giving higher ratings to higher energy efficiency buildings. Al Sa'fat, the planned green building evaluation system of Dubai Municipality, aims to boost recognition of higher energy efficiency buildings in the market. The system will prescribe mandatory energy efficiency requirements that are similar to DGBRS 2010. If the building meets these requirements, it will be 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 will provide visibility to energy efficiency investments in new buildings that can be reflected in the sales value and rent price.

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. Early adopters of nZEB already exist in Dubai with a number of demonstrable cases in the market (see an example in Case Study 1). It is important for Dubai's buildings to begin moving towards a near zero energy consumption in order to remain in line with global developments and support the targets of the Dubai DSM Strategy.

2 UNIFYING GREEN BUILDING REGULATIONS ACROSS FREE ZONES

DGBRS 2010 is only applied in few free zones which rely on DM for building permitting. Other free zones adopt different green building regulations, even if these are partially in line with DGBRS 2010 or achieve similar savings. Beyond the loss of energy saving opportunities resulting from lower efficiency standards in some free zones, differences in technical and permitting requirements cause inefficiencies in the real estate value chain.

Accordingly, a committee was established for the unification of building regulations and permitting processes in Dubai. The Dubai Building Permit Development Committee is headed 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.

CASE STUDY 1: THE SUSTAINABLE CITY, THE FIRST NEAR ZERO ENERGY DEVELOPMENT IN DUBAI

The Sustainable City, a residential and mixed-use community by Diamond Developers is on its path to reach net-zero energy consumption and has become an international case study for sustainable living. This community located in Dubailand comprises 500 villas and 89 apartments, a mixed use development, an urban farm, an equestrian club, and a school. Future buildings include a 143-room rehabilitation facility and an innovation centre.

The villas employ intelligent design features and technologies that exceed the requirements of the Dubai Green Building Regulations and Specifications. These include:

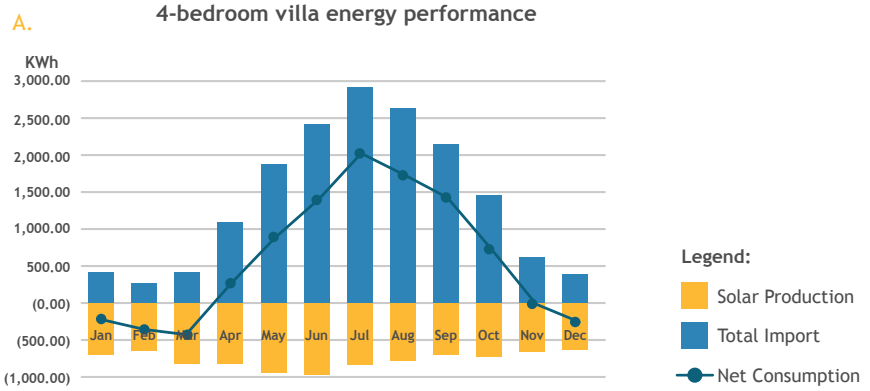
- North-orientation to avoid sun and minimise demand for air conditioning
- High efficiency variable refrigerant flow air conditioners and appliances
- Highly insulated precast walls (0.32 W/m^2.K) and windows (1.3 W/m^2.K)
- Light-emitting diode (LED) lighting

Additionally, the development is installing 10 MWp of solar PV on rooftops and car parks (5.4 MWp connected so far). PV capacity in the villas ranges between 5.2 kWp and 9.8 KWp based on typology and built-up area, offsetting up to 40% of total annual consumption.

The active and passive design elements in the villas, combined with aggressive community education and awareness programmes, have resulted in electricity use intensities (EUI) that are 65% lower than conventional and similar-sized villas in Dubai. Specifically, the mean EUI value in 2018 was 100 kWh/m^2/year for 4-bedroom villas before solar*. After solar, the EUI values drop to 79 kWh/m^2/year. Such energy performance values demonstrate the cost-effectiveness of sustainable design and renewable energy uptake in the UAE.

* Based on a sample size of 53% (120 units).

A.



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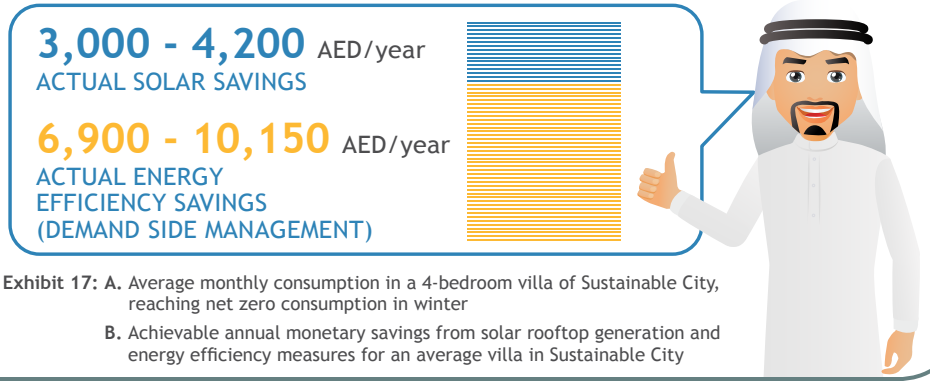


Exhibit 17: A. Average monthly consumption in a 4-bedroom villa of Sustainable City, reaching net zero consumption in winter

B. Achievable annual monetary savings from solar rooftop generation and energy efficiency measures for an average villa in Sustainable City

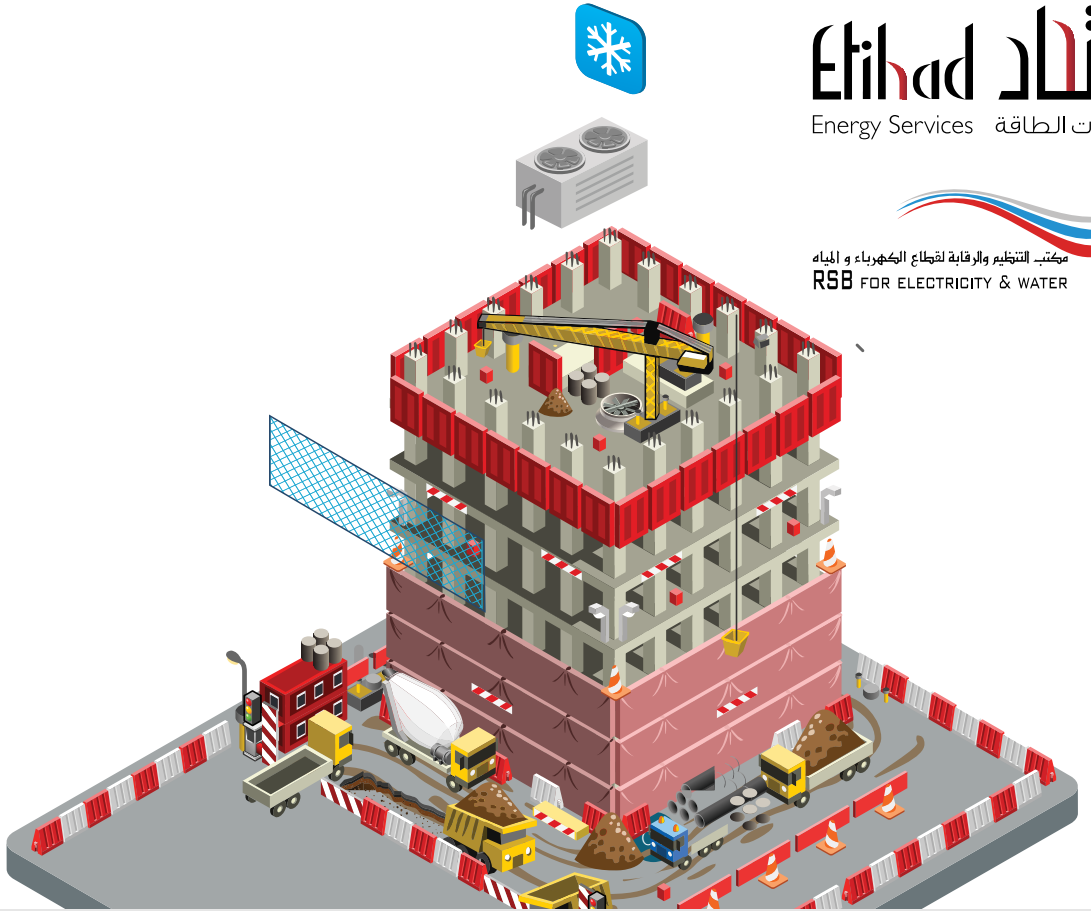
DSM PROGRAMME 2:

BUILDING RETROFITS

PROGRAMME OWNER

Etihad Energy Services
الاتحاد لخدمات الطاقة

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



PROGRAMME SCOPE

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

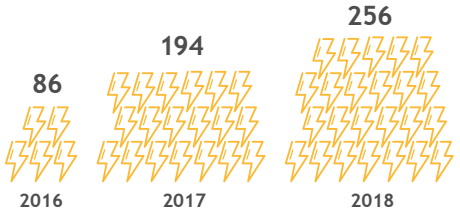
ALI MOHAMMED AL JASSIM

CEO, Etihad Energy Services

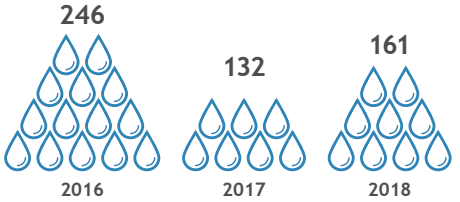
Visit www.etihadesco.ae

BUILDING RETROFITS

PROGRAMME SAVINGS



Electricity Savings (GWh)



Water Savings (Million imperial gallons)

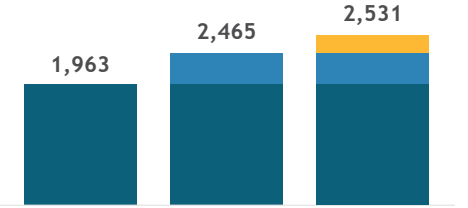
PROGRAMME INTRODUCTION

The Building Retrofits Programme was initiated by Dubai Government in 2013 with the launch of Etihad Energy Services Company (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.

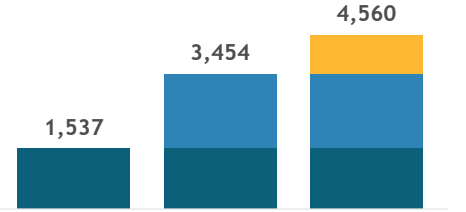
In parallel, the Regulatory and Supervisory Bureau for Electricity and Water in Dubai (RSB) regulated the EPC market by defining an accreditation scheme for ESCOs in 2014 and one for energy auditors a year later.

Governing by example, the Dubai Supreme Council of Energy (DSCE) enacted Directive No. 1 of 2015 in the aim of stimulating market demand. The Directive mandates walkthrough energy audits in all government buildings larger than 1000 m^2, and detailed energy audits and retrofits if expected energy savings are greater than 20% and payback is lower than 10 years. The directive targets 20% water and electricity savings from government entities by 2021.

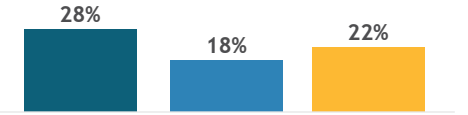
OPERATIONAL DASHBOARD



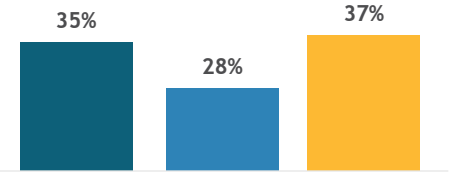
Cumulative number of retrofitted buildings



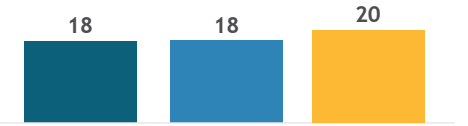
Cumulative number of building equivalents (average sized building)



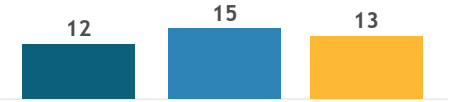
Average electricity savings from retrofit projects versus baseline consumption



Average water savings from retrofit projects versus baseline consumption



Number of accredited ESCOs



Number of accredited auditors

Legend:
2016 2017 2018

BUILDING RETROFITS

MAIN ACHIEVEMENTS

1 MARKET GROWTH AND LARGE SCALE RETROFIT PROJECTS

The regulated EPC market has seen substantial growth since the regulation of the market in 2014. Etihad ES and the accredited ESCOs (who submit annual reports to the RSB) have retrofitted 2,531 existing buildings in Dubai and electricity savings from retrofit projects tripling in the last three years.

In 2018, Etihad ES completed the retrofit of 243 residential buildings for Al Wasl Properties. The project targeted the consumption of common areas and included 95,000 light replacements, HVAC system retrofits, and 5 MWp combined capacity solar rooftop installations. The super-ESCO also finalised a lighting retrofit project for Dubai International Financial District with the replacement of 22,600 lights across all facilities.

In addition, Etihad ES signed four major contracts this year. Etihad will be retrofitting 23 labour accommodations for Dry-docks and 117 mosques across Dubai in the first phase of a larger retrofit agreement with the Islamic Affairs and Charitable Activities Department. Etihad ES will also be working on two important projects; a lighting retrofit in several zones of Dubai International Airport and a retrofit of residential and hospitality buildings owned by Seven Tides *(see details in exhibit 18)*.

	Project Scope	Project Structure	Project Execution	Project Savings
Dubai International Airport lighting retrofit project	Retrofit of 150,000 lights with LEDs in Terminals 1,2, and 3, Concourse B, and the outdoor areas	EPC of AED 78.7 million	Led by Etihad ES and to be executed by Philips and Sharaf Electronics	Seven year guaranteed saving contract of AED 23 million or 52 GWh / year
Seven Tides residential retrofit project	Retrofit of 22 facilities • Significant HVAC retrofit • Lighting retrofit • Optimisation and control	EPC of AED 29 million	Led by Etihad ES and to be executed by Smart Automation Energy	Seven year guaranteed saving contract of AED 7.3 million / year or 15% savings on utility bills

Exhibit 18: Overview of large-scale retrofit contracts signed by Etihad Energy Services in 2018

BUILDING RETROFITS

Etihad ES uses a business model that aims at facilitating 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 was first applied to the JAFZA project, and has since been applied with some variations to other projects led by Etihad ES *(see exhibit 19)*.

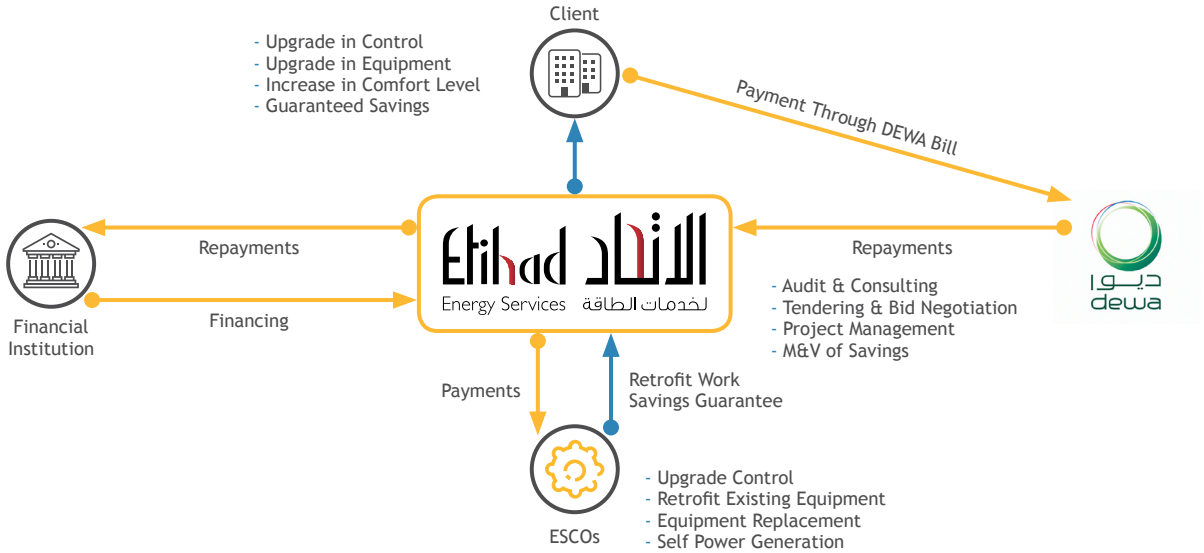


Exhibit 19: Etihad Energy Services' business model

2 STUDY ON BUILDING ENERGY RATING SCHEME FOR DUBAI

In parallel, in 2017 the RSB initiated the work for the development of a scheme to rate existing buildings in Dubai based on their electricity and water efficiency performance. The scheme is one of the major upcoming initiatives planned in the DSM Strategy. 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 2018, the RSB commissioned a benchmarking exercise to define the scale for the rating scheme.

BUILDING RETROFITS

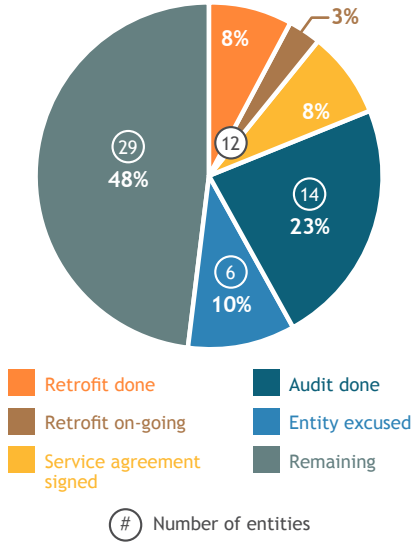
PRIORITY AREAS

1 STIMULATING THE MARKET FOR WATER RETROFITS

Water savings from reported projects have only grown 22% in 2018 and are below the 458 IG pre-set target savings for the year. As water retrofits are easier to implement, the majority of retrofits are suspected to be carried out by facility managers rather than accredited ESCOs, and are hence not reported to the RSB. The gap between actual and target savings could also be the result of other factors specific to water retrofits. The return on investment is lower in comparison to the return for electricity retrofits and the target market is more difficult to tap into (e.g., residential sector consumes 62% of water in Dubai). It is therefore important to investigate the causes further and stimulate water retrofit projects in the coming years.

2 GOVERNING BY EXAMPLE, IMPLEMENTING DIRECTIVE NO.1 OF 2015

Of the 61 local government entities included in the scope of Directive No.1 of 2015, 50% have so far taken action by auditing their facilities for energy consumption, 20% of which have either retrofitted their facilities or signed an agreement with Etihad ES for the retrofit project. Nevertheless, 70% of entities have yet to initiate the retrofit of their facilities *(see exhibit 20)*. Etihad ES will continue to follow up on the progress of the directive's implementation in the coming years.



(1) Government entity excused from the energy audit, as energy conservation measures have already been applied or the building is not owned or managed by the entity occupying it

Exhibit 20: Status of Directive No. 1 of 2015, for energy audits and retrofits in government buildings

3 SUPPORTING RETROFIT PROJECTS IN OTHER SECTORS OR SUBSECTORS

While Etihad ES has been facilitating retrofit projects in the government sector, accredited ESCOs have been penetrating the commercial and residential sectors. In apartment buildings, retrofits typically target consumption of common areas since they are initiated by building owners to reduce their utility bills. On the other hand, energy efficiency improvements in villas and small medium enterprises (beyond government-sponsored projects in national villas) are still low. The low penetration is explained by the long-term payback periods of impactful retrofits (i.e., HVAC replacements and solar panel installations) coupled with low awareness and lack of organized support mechanisms.

In addition, the high share of tenanted residential units in Dubai creates a challenge for the penetration of energy efficiency measures. There is a lack of incentive for owners who do not pay the utility bill to invest in energy efficiency measures. At the same time, for tenants, payback time typically exceeds average tenancy period.

In response, Etihad ES is examining measures to target the residential and SME sectors (e.g., promotional programmes).

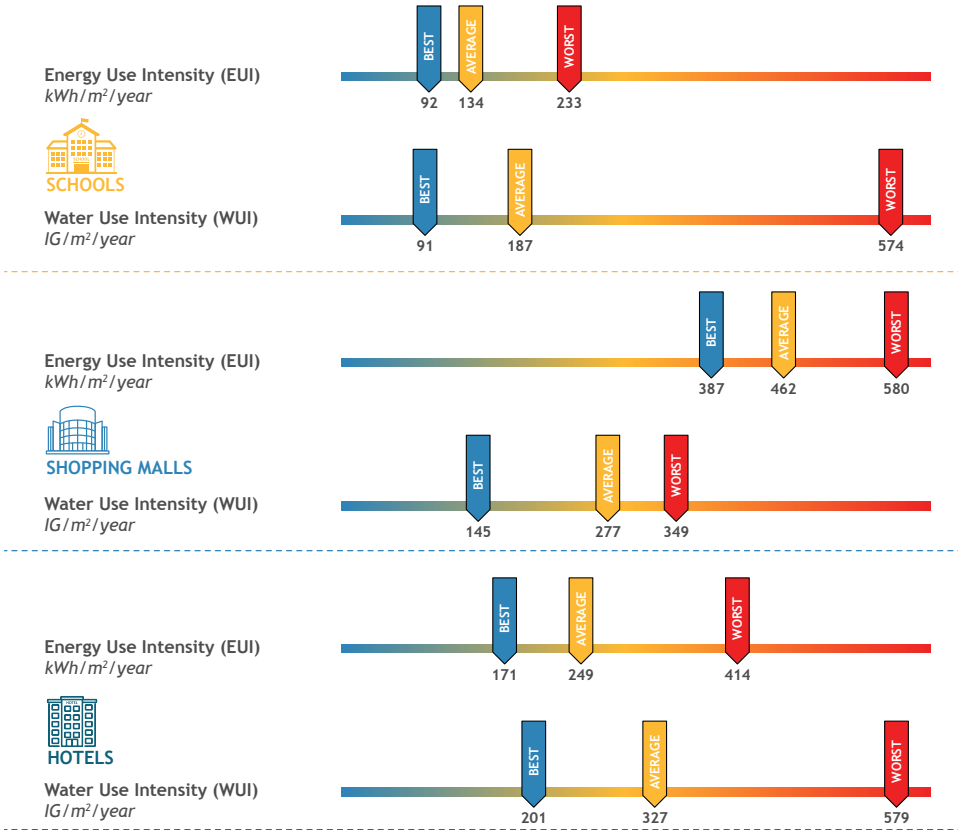
CASE STUDY 2: DUBAI'S BUILDING EFFICIENCY ACCELERATOR PROJECT

In 2018, the Emirates Green Building Council (EGBC), as appointed by the Dubai Supreme Council of Energy, carried out a benchmarking project on the energy performance of schools, hotels, and shopping malls in the UAE with the majority of buildings (100) located in Dubai. The project falls under the umbrella of the Building Efficiency Accelerator (BEA) global initiative, a public-private initiative to accelerate the implementation of building efficiency policies and programmes by local governments. The BEA project is one of the six tools under Sustainable Energy for All, a programme of the United Nations that aims to double the global rate of building energy efficiency by 2030.

The results of the benchmark show that there is a performance disparity amongst all the participating buildings with a large gap between the best and worst performance *(see exhibit 21)*. The EGBC reports that this indicates a large opportunity to implement market leaders' best practices across the sectors and drive resource efficiency. Actions can include energy management, energy audits, training and capacity building, behavioural changes and retrofits.

The project is the first publicly available benchmark of this kind in Dubai. Schools, hotels, and shopping malls can use this benchmark to evaluate the energy and water use intensities of their buildings. In addition, building energy performance benchmarks will be useful for ESCOs in initial audits and as an education tool with the building owners.

Link to report: www.emiratesgbc.org/building-efficiency-accelerator/



Note: IG refers to imperial gallons.

Exhibit 21: Lowest, average, and highest electricity use intensities and water use intensities for schools, hotels, and shopping mall in Dubai, as per the benchmarking project conducted by the Emirates Green Building Council in 2018

DSM PROGRAMME 3:

DISTRICT COOLING

PROGRAMME OWNER

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

Etihad الاتحاد
Energy Services لخدمات الطاقة

PROGRAMME SCOPE

Increase penetration of efficient cooling by regulating the district cooling sector in Dubai.

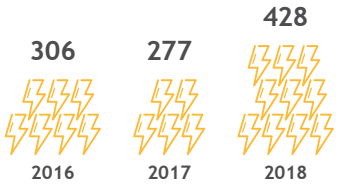
GRAEME SIMS

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

Visit www.rsbdubai.gov.ae

DISTRICT COOLING

PROGRAMME SAVINGS



Electricity Savings (GWh)

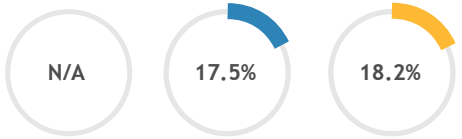
PROGRAMME INTRODUCTION

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

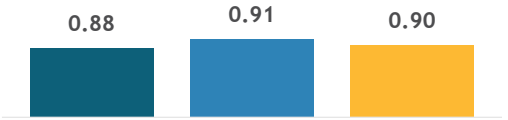
Cooling can be delivered through a range of technologies. A study carried out by the Regulatory Supervisory Bureau for Electricity and Water in Dubai (RSB) showed that, on average, water-cooled solutions offer superior energy efficiency, 35% to 45% better, compared to air-cooled alternatives. In circumstances of high cooling load density and steady demand, water-cooled technology is normally the most appropriate solution. Hence, the District Cooling Programme aims at raising district cooling (DC) in Dubai to 40% of the cooling market in 2030, by adopting the technology in new construction projects and retrofitting old developments.

The programme also assumes that DC firms will continue to improve efficiency of plant against a baseline. Since peak demand is less than 60% of the installed district cooling capacity, new connections can be made at limited incremental cost.

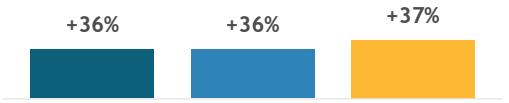
OPERATIONAL DASHBOARD



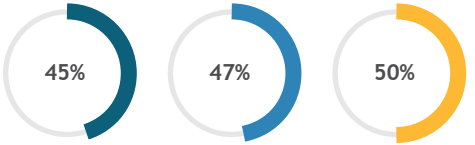
DC penetration out of total cooling capacity



DC efficiency (in kW/TR)



DC efficiency versus baseline air cooled technology



DC capacity utilisation at peak

Legend:
2016 2017 2018

DISTRICT COOLING

MAIN ACHIEVEMENTS

1 ENERGY EFFICIENCY DRIVES PAY DIVIDENDS ON DISTRICT COOLING PERFORMANCE

In 2018 most district cooling companies reported that they were embracing the Demand Side Management District Cooling Programme drive in terms of energy efficiency and this has been borne out in the year's data. Demand from customers was down and this is due to improved operational arrangements with building owners and end-users. Chilled water production efficiency improved from last year, with the sector average figure now at 0.90 kWh/TRh *(see exhibit 22)*.

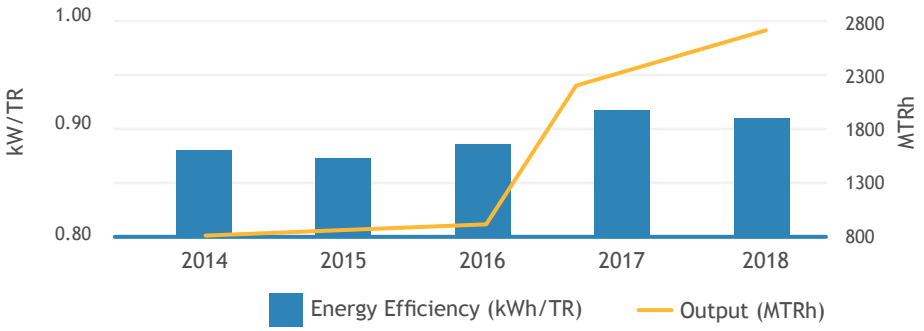


Exhibit 22: Trends in output and energy efficiency of the five main district cooling operators in Dubai (2014 to 2018)

2 ANOTHER RECORD YEAR FOR RECYCLED WATER USE

Increasing the volume of treated sewage effluent made available for district cooling alleviates demand on high quality water from DEWA. RSB's analysis shows that it also improves the overall energy efficiency of the sector. With additional data received in 2018, the total recycled water supplied to the cooling sector by Dubai Municipality exceeded one billion imperial gallons *(see exhibit 23)*.

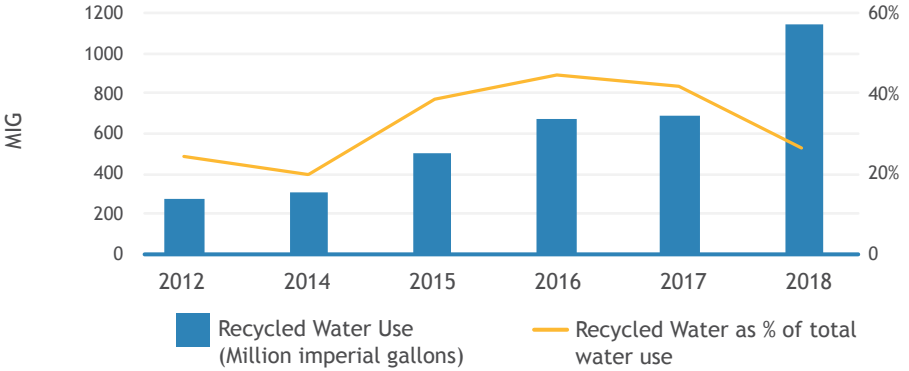


Exhibit 23: Growth in annual usage of recycled water in district cooling plants in Dubai (2012 to 2018)

DSM PROGRAMME 4:

STANDARDS AND LABELS FOR APPLIANCES AND EQUIPMENT

PROGRAMME OWNER

هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology

PROGRAMME SCOPE

Develop, implement, and regularly update electricity and water efficiency standards and labels for high consuming appliances and equipment used in the UAE.

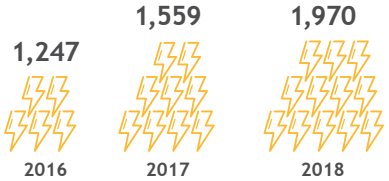
HE ABDULLA AL MAEENI

Director General, Emirates Authority for Standardization and Metrology

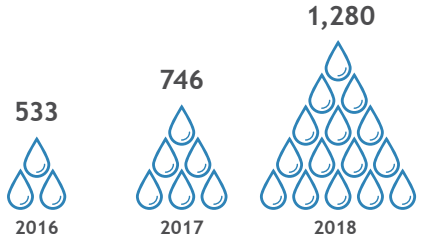
Visit www.esma.gov.ae

STANDARDS AND LABELS FOR APPLIANCES AND EQUIPMENT

PROGRAMME SAVINGS



Electricity Savings (GWh)



Water Savings (Million imperial gallons)

PROGRAMME INTRODUCTION

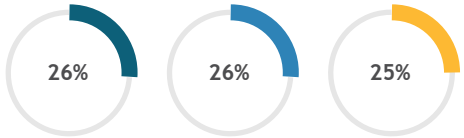
In 2011, the Emirates Authority for Standardization and Metrology (ESMA) introduced the Energy Efficiency Standardisation and Labelling (EESL) Programme to prevent the influx of electricity and water inefficient products to the UAE and drive the market towards higher efficiency products.

The programme's key mechanisms are the Minimum Energy Performance Standards (MEPS) and the Comparative Labelling Scheme. Regulated electricity and water appliances must comply with minimum performance criteria and be certified by the authority to be legally sold in the market. Additionally, they need to display a one to five star label, outlining their level of efficiency (more stars means higher efficiency).

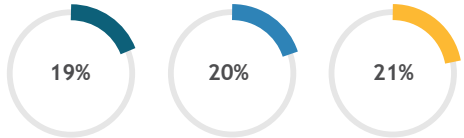
Standards are raised every two to three years for each product category, through consultation with experts and industry players, thus strategically removing less efficient products from the market.

The savings from this programme make up 22% and 17% of the overall Demand Side Management (DSM) Strategy 2030 electricity and water targets. In addition to regulatory enforcement, programme's success relies heavily on public education to promote adoption of efficient appliances.

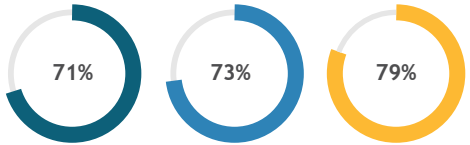
OPERATIONAL DASHBOARD



Share of four and five star unit air conditioners sold



Share of four and five star refrigerators sold



Share of four and five star washing machines sold

Legend:
2016 2017 2018

STANDARDS AND LABELS FOR APPLIANCES AND EQUIPMENT

MAIN ACHIEVEMENTS

1 NEW MINIMUM ENERGY PERFORMANCE STANDARDS

Since its launch, with the introduction of minimum standards for non-ducted room air-conditioners and the adoption of comparative labels, the EESL Programme has strategically expanded to include other high consuming product categories and has undergone several steps of improvement *(see exhibit 25)*.

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 with 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.

In 2018, ESMA developed regulations for vacuum cleaners and televisions. Standards for televisions will include standby and off-mode requirements in addition to MEPS. ESMA has also revised the water MEPS for dishwashers to allow for a more gradual transition to higher efficiency products as well as promote the use of dishwashers. The new regulations have been submitted to the UAE Cabinet for approval.

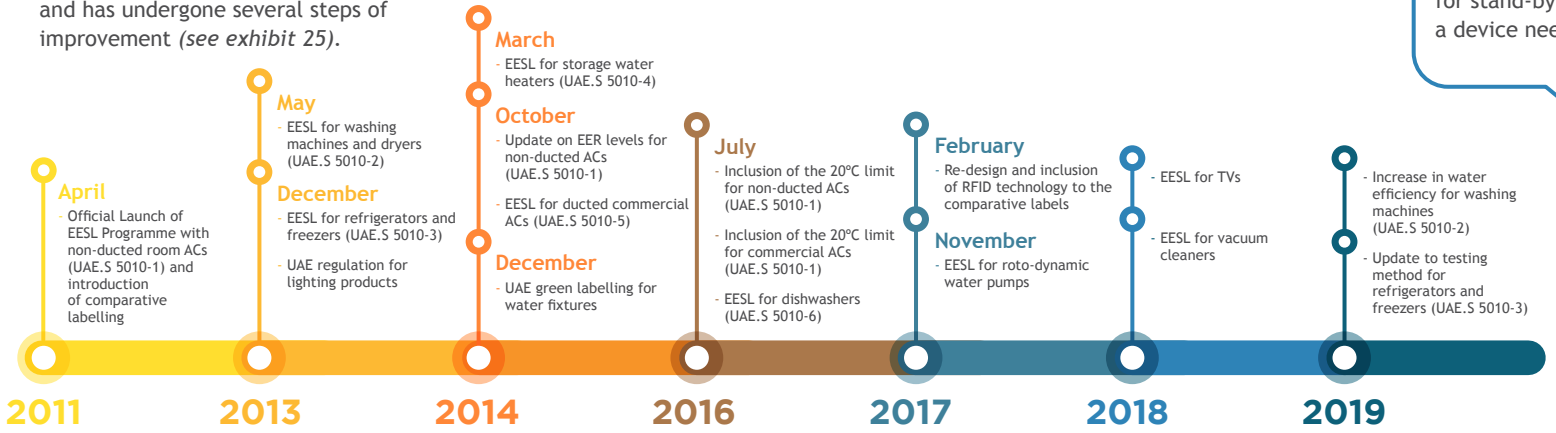


Exhibit 25: Implementation roadmap of the Energy Efficiency Standardisation and Labelling Programme, showing year of publication of the regulation in the UAE Official Gazette

DID YOU KNOW?

A wide range of equipment, including televisions, computers, audio, video equipment, and toys, use standby and off-mode power. This means they consume power when not in use, unless unplugged from the utility outlet. Studies conducted in the early 2000s, found that **standby and off-mode power** make up 3-10% of total home and office electricity use. Governments of developed countries have since limited allowable standby power and off-mode consumption rates. For example, in 2013, the European Commission defined a limit of 0.5 W for stand-by power and a time limit after which a device needs to switch to a low power mode.

STANDARDS AND LABELS FOR APPLIANCES AND EQUIPMENT

2 CRITICAL SUCCESS FACTORS AND ESTABLISHED INITIATIVES ACROSS THE SUPPLY CHAIN

Effective implementation of the programme requires action along the entire supply chain, from import of appliances and equipment to consumer purchase and usage. It consists of enforcing regulation, building awareness and educating consumers to guide their purchases towards higher class appliances, and monitoring and controlling improvement in electricity and water efficiency in the market *(see exhibit 26)*.

ESMA works in accordance with a national surveillance plan defined to improve compliance to energy efficiency standards and labels in the market. The authority inspects point of sales across the UAE, issues fines against violations, replaces labels, and recalls incompliant products from the market. Some models are also sent to accredited labs for testing (including the Dubai Central Laboratory). In Dubai, Dubai Municipality and the Department of Economic Development support ESMA's enforcement efforts by reporting violations to the authority.

In 2018, ESMA verified compliance to the EESL Programme for more than 1,000 appliances in the UAE, 10% through laboratory inspection and the remaining 90% through point of sale verification. Resulting compliance to the programme in 2018 was 92% among the products verified at point of sale.

Additionally, in early 2017, ESMA enhanced the comparative label by incorporating RFID (Radio Frequency Identification) and Quick Response (QR) code technologies. The improved label provides better security by preventing tampering and facilitating inspection, and the QR code enables consumers to verify information on the EESL label directly from ESMA's secure database.

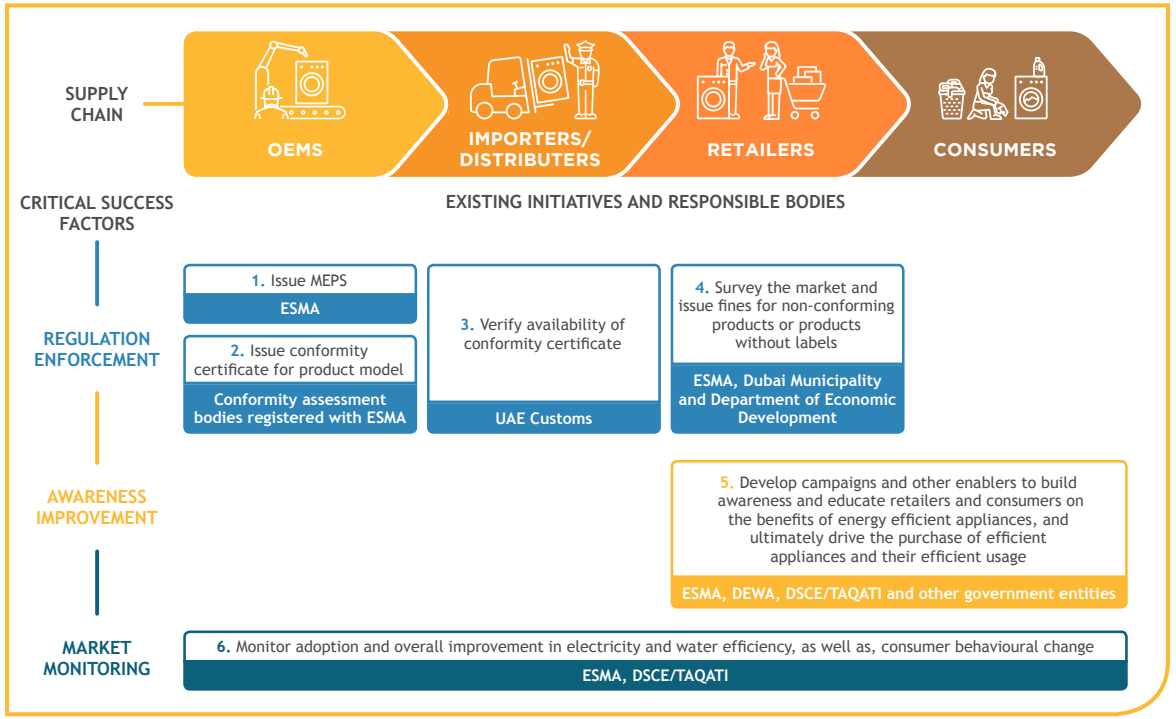


Exhibit 26: Existing Energy Efficiency Standardisation and Labelling initiatives in Dubai across the supply chain of appliances and equipment

STANDARDS AND LABELS FOR APPLIANCES AND EQUIPMENT

PRIORITY AREAS

1 INTRODUCING HIGHER STANDARDS AND NEW REGULATIONS

The EESL Programme aims at achieving optimum efficiency in the market by expanding its scope to new product categories, on one side, and gradually raising the MEPS for products already included in the programme, on the other. Raising the MEPS for the most energy intensive and used products (e.g., air conditioners) has a disproportionately higher impact on energy savings. It is thus important to continuously monitor technological advancements in the market and test methods to ensure standards in the UAE are aligned with global standards.

In 2018, ESMA has reviewed standards for washing machines. The revised standards will include increased water efficiency requirements and a star rating for water efficiency. ESMA has also updated the energy performance testing method for refrigerators in line with the latest international testing methods. The federal authority plans to issue both updates in 2019.

2 UNIFYING 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 different 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. In 2018, standardisation authorities of the GSO, including ESMA, have been meeting to develop regional standards for air conditioners.

3 PROMOTING HIGHER EFFICIENCY PRODUCTS

Despite the on-going efforts led by ESMA, DEWA, and other entities to cultivate public awareness, diffusion of higher efficiency appliances (four and five star models) is low for some product categories. One, two, or three star rated models make up 75% of all unit air conditioners and 79% of all refrigerators bought in Dubai in 2018. A public awareness market survey conducted by TAQATI in 2017, finds that only 46% of Dubai residents take energy efficiency performance into consideration when buying an appliance, while 27% of respondents say they are aware of ESMA labels *(see DSM Annual Report 2017)*.

ESMA and other stakeholders are working on both increasing the availability of higher efficiency models in the market and promoting these models to consumers.

DSM PROGRAMME 5:

WATER REUSE AND EFFICIENT IRRIGATION

PROGRAMME OWNER

بلدية دبي
DUBAI MUNICIPALITY

PROGRAMME SCOPE

Irrigate all public areas with treated sewage effluent water, implement efficiency measures in Dubai's green areas, and use excess capacity of treated water for other uses (e.g., private irrigation and district cooling).

TALIB JULFAR

Chief Executive Officer,
Infrastructure Services Sector,
Dubai Municipality

Visit www.dm.gov.ae

WATER REUSE AND EFFICIENT IRRIGATION

PROGRAMME SAVINGS

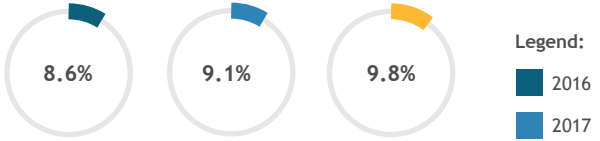
Water Savings (Million imperial gallons)

PROGRAMME INTRODUCTION

The Demand Side Management (DSM) Strategy recognises the value of treated sewage effluent (TSE) as an asset for Dubai and seeks to optimise its consumption in the irrigation of public landscapes and divert excess volumes to other purposes that currently rely on desalinated water: 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. The low TSE prices, which are more than 80% below desalinated water rates for most customer groups, drive significant market demand for this water source.

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)

WATER REUSE AND EFFICIENT IRRIGATION

MAIN ACHIEVEMENTS

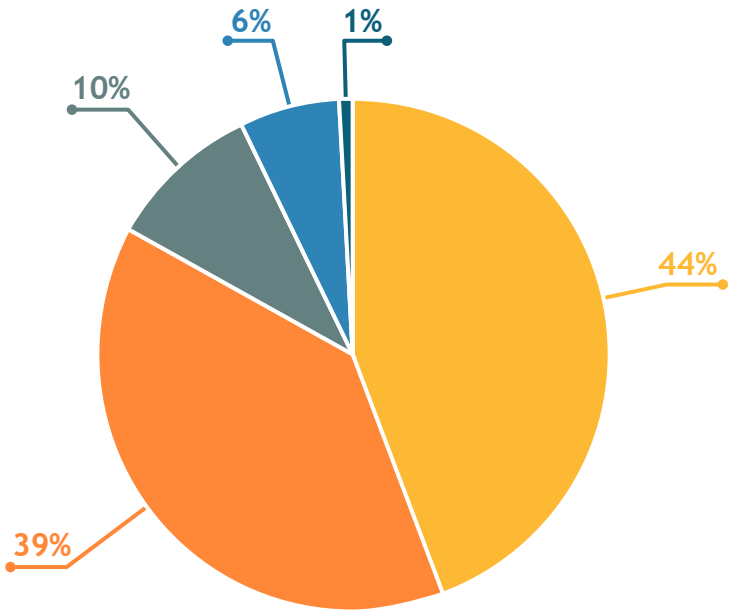
1 USE OF EXCESS TREATED SEWAGE EFFLUENT BEYOND PUBLIC IRRIGATION

DM produced 60 BIG of TSE in its sewage treatment plants, in 2018. The use of recycled water in other applications beyond the irrigation of Dubai's public landscapes has increased in the past few years. In fact, TSE sold to private consumers and animal feed farmers has almost doubled since 2011, and made up 45% of TSE used in 2018 *(see exhibit 27)*. Water sold to private consumers is still mostly used to irrigate public spaces in private developments. Demand for TSE is also increasing in DC plants *(see exhibit 23)*.

2 SEWAGE SYSTEM EXPANSION PROJECTS

Today, DM's TSE is distributed along 1,150 km of irrigation network lines. Water is recycled in two sewage treatment plants (STPs), one in Al Aweer and the other in Jebel Ali, with a total treatment capacity of 149 million imperial gallons/day.

As demand for TSE increases, DM is progressively expanding the irrigation network and water recycling capacity. Phase two of Jebel Ali STP, which DM initiated in 2017, will be complete in mid-2019. The expansion project will increase the water treatment capacity by 80% in the STP, from 82 to 148 million imperial gallons/day. It will reduce the load on the plant in Al Aweer and increase available TSE for new demand. Side products of the process include compost that can be sold for farming and irrigation, and methane that can be used by the municipality in its future biogas to energy plans, adding to the economic value of STPs.



Source: Dubai Municipality

Exhibit 27: Share of treated sewage effluent usage in 2018, by application

WATER REUSE AND EFFICIENT IRRIGATION

3 ADOPTION OF EFFICIENCY MEASURES IN NEW LANDSCAPE PROJECTS

Since 2014, DM has adopted 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, it revised irrigation standards in all new developments. The new standards for trees and grass prescribe 20-50% lower water quantities in comparison to previous standards.

To reduce irrigation demand further, DM has started increasing the share of ornamental hard materials (e.g., gravel, glass) in landscape projects. The new landscape project on Al Khail Road features 60% hardscaping and 40% greenery *(see exhibit 28-A)*. Additionally, where suitable, DM is opting for local species that have very low water requirements, as can be seen around Al Qudra Lakes. In other peripheral roads of Dubai, the municipality is testing landscaping designs using discrete and dispersed softscape and hardscape elements, in the aim of achieving beautification goals at minimal irrigation requirements *(see exhibit 28-B)*.

Recipe for reduced water usage in irrigation: efficient and smart irrigation technology, local species, and hardscape elements.

A.

Al Khail Road landscape project, between Business Bay Bridge and Za'abeel Interchange 1:

Hardscape elements will cover over 60% of the landscape area. This contributes to lower water consumption, while it fulfills beautification goals. Additionally, revised irrigation standards for water quantity are applied to the other 40% of the landscape.

Solar panels will be used as a source of renewable energy for landscape lighting at night.

B.

Landscape and Irrigation System for Dubai Parks Entrance from Sheikh Zayed Road:

Hardscape elements will cover over 22% of the landscape area, while softscape cover 16%, and the remaining area is untreated. This design also reduces water consumption while fulfilling beautification goals.

Irrigation demand is reduced to 0.5 imperial gallons/m2/day from the normal standard of 1.1 imperial gallons/m2/day in other projects.

Exhibit 28: Examples of water efficiency measures in new landscapes around Dubai, using A. hardscaping and B. dispersed landscaping

WATER REUSE AND EFFICIENT IRRIGATION

PRIORITY AREAS

1 TREATED SEWAGE EFFLUENT INFRASTRUCTURE UPGRADE

Although potential savings from TSE measures could be massive, a few challenges need to be overcome to translate these savings into higher desalinated water savings.

Today, annual TSE supply exceeds demand on an overall basis. However, demand is not stable. Seasonal and daily imbalances lead to shortages in supply in some periods. To increase demand for TSE and optimise its usage, DM is working on expanding the network needs (e.g., towards DC plants), and at the same time, stabilising TSE supply.

2 EFFICIENT IRRIGATION OF LANDSCAPES

As demand for desalinated water reduces following the implementation of DSM measures, availability of TSE per capita is expected to decrease. On the other hand, irrigation needs are expected to increase with DM's plans to expand green areas in Dubai.

For this reason, it is important to improve irrigation efficiency in DM and non-DM landscapes. This can be done by enforcing efficient irrigation technologies, hardscape elements, and adoption of local species in new projects, as well as financing irrigation retrofits in existing landscapes. There is a limited business case for DM to execute irrigation retrofits given the current low price of TSE. However, benefits are much larger from the perspective of the entire emirate as TSE savings would displace equal quantities of desalinated water.

CASE STUDY 3: ENOC'S ECO-FRIENDLY CAR WASH SYSTEMS

The Emirates National Oil Company (ENOC) is another example for water sustainability, where saving water and recovering used water is a priority.

The company has implemented water recycling car wash systems in 37 of their retail stations *(see exhibit 29)*. Two types of systems are used, the Self Purging Filtration Technology and the Membrane Bio-Reactor (MBR).

In 2018, the advanced systems saved 291,667 m^3 of water (~64 million imperial gallons), ~40% of the total water consumed in the retail stations. The Self Purging Filtration Technology recycles about 80-85% of wash water and the latest MBR technology installed in the newer sites recycles close to 100% of water used.

Moreover, these car wash recycling systems consume minimal power by integrating advanced control and variable frequency drive (VFD) to pumps. At peak time, the car wash recycling system uses only 7 kW. It is also uniquely engineered with ozone injection to eliminate odour typically associated with water recovery systems.

Exhibit 29: **A.** Water recycling car wash system in Emirates National Oil Company's retail stations
B. Car wash system water meter

CASE STUDY 4: DUBAI SILICON OASIS'S WATER REUSE AND EFFICIENT IRRIGATION PROJECTS

Water reuse and efficient irrigation initiatives have also been carried out in free zones. Dubai Silicon Oasis Authority (DSOA) has treated 2.5 billion imperial gallons of water in its sewage treatment plant since its installation *(see exhibit 30)*. The treated water on site is used for irrigation of the free zone's public landscape. Dubai Municipality supplies treated water for the remaining irrigation need in the free zone.

Exhibit 30: Dubai Silicon Oasis' sewage treatment plant

In parallel to water re-use for irrigation, DSOA has a smart subsurface irrigation system that was implemented in 2015 to reduce the irrigation demand. The smart system prevents water losses from evaporation and spillage that occur in traditional spray irrigation systems. The innovative system currently waters more than 3,000 palm trees and a landscape area of a 70,000 m^2. Additionally, DSOA is targeting to expand the area coverage to 200,000 m^2 by 2020, which represents around 20% of the public green area in the free zone *(see exhibit 31)*. The system was also implemented in some residential houses of the community, upon request. By ensuring a consistent flow of water through the soil, the system achieves water irrigation savings of 30-40% and irrigation and operation cost savings of 55%.

Exhibit 31: Public landscape in Dubai Silicon Oasis using subsurface irrigation system

DSM PROGRAMME 6:

OUTDOOR LIGHTING

PROGRAMME OWNER

هيئة الطرق والمواصلات
ROADS & TRANSPORT AUTHORITY
RTA

بلدية دبي
DUBAI MUNICIPALITY

PROGRAMME SCOPE

Adopt high-efficiency lighting in roads and other public areas of Dubai, both in new installations and in the retrofit of the existing assets. Implement efficiency measures, such as dimming and partial switch-off in residential areas.

MAITHA BIN ADAI

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

Visit www.rta.ae

OUTDOOR LIGHTING

PROGRAMME SAVINGS

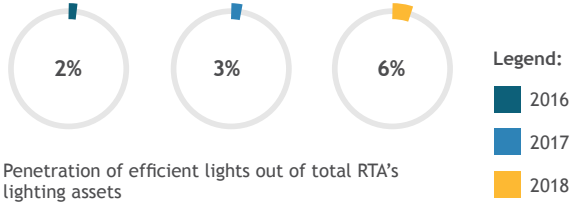
Electricity Savings (GWh)

PROGRAMME INTRODUCTION

The effectiveness of LED (light-emitting diode) technology has been proven by a number of extensive applications 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; both RTA and DM have initiated retrofit programmes to replace old lighting assets with LEDs and other high efficiency technologies. The target for the Outdoor Lighting Programme is to install high efficiency lights in 75% of Dubai's street lights by 2030.

In the meantime, RTA has implemented measures to minimise the consumption of its existing conventional street lights. In 2011, operating hours at dawn and sunset were reduced by a total of 20 minutes a day (10-10 initiative), and in 2013, a switch-off programme was implemented to turn off every second light in designated residential areas (one-on, one-off activation). DM has also adopted switch-off measures in the public parks and facilities it manages.

OPERATIONAL DASHBOARD



Penetration of efficient lights out of total RTA's lighting assets

OUTDOOR LIGHTING

MAIN ACHIEVEMENTS

1 ENERGY EFFICIENT STREET LIGHTING PROJECTS IN DUBAI

RTA has initially installed LEDs in internal and collector roads of residential areas, including the installation of ~2,000 new lights in Barsha South 1 and 2, and the replacement of ~1,000 lights in Al Rashidiya and Nad Shamma. These pilot projects provided notable savings and outstanding quality standards, which led the way to LED installations in larger roads. Sheikh Zayed Road Bridge over the Dubai Water Canal is an example of initial testing in larger roads and shows benefits on multiple dimensions: energy efficiency, quality, community service, and landscape beautification. RTA installed approximately 2,700 LED lights in 2018. LED installations include ~350 luminaires on the extension of Al Yalayis Street with an expected power saving of 300 MWh/year, and the retrofit of ~450 lights in King Salman Bin Abdulaziz Al Saud Street *(see exhibit 32)*.

A.

B.

Exhibit 32: LEDs installed on **A.** the extension of Al Yalayis Street and **B.** King Salman Bin Abdulaziz Al Saud Street

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

DM is undergoing an energy efficiency transformation of its outdoor lights in public parks and facilities. The transformation targets 100% adoption of LEDs in new projects partly in combination with solar energy supply, progressive replacement of existing lamps with LEDs, and reduction in operating hours. DM aims to complete the installation of energy efficient lights in all parks by 2021.

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 a day, with switch-off after midnight.

OUTDOOR LIGHTING

PRIORITY AREAS

1 EXPANDING RETROFIT PROJECTS IN ROADS

RTA has developed a Smart and Efficient Outdoor Lighting Strategy 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 street lights in Dubai by 62%. RTA has also developed standards accompanying the roadmap to maintain road safety and quality while achieving optimal efficiency.

2 SMART DUBAI AND DEMAND SIDE MANAGEMENT OBJECTIVES ALIGNED IN STREET LIGHTING PROJECTS

Connected streets are at the core of smart cities. By being powered, connected, and located, each light pole can be used to receive and send information across the city. In fact, RTA's Smart and Efficient Outdoor Lighting Strategy aligns Smart Dubai objectives with Demand Side Management objectives.

Smart applications will facilitate maintenance and operation of lighting assets for RTA since direct defect detection removes the need for patrolling. It will also help better serve the residents of Dubai by improving road safety and quality, and offering additional services through the lighting poles. Examples of potential services can be seen in the Dubai Water Canal boardwalk and footbridges, where street light poles provide pedestrians with WiFi, phone charging outlets, and other interactive features.

In addition, smart applications can further improve energy efficiency thanks to enhanced controls. 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 activation.

3 EXPANDING THE PROGRAMME TO FREE ZONES AND PRIVATE DEVELOPMENTS

A priority for the next few years is to better understand the current situation and plans for efficient outdoor lighting in free zones and private developments of Dubai, and improve collaboration with those developers to implement efficient outdoor lighting in their areas (see case study 5 for an example of successful efficient street lighting projects in free zones).

In that respect, RTA is seeking to work with the Emirates Standardization and Metrology Authority (ESMA) to develop energy efficiency standards for outdoor lights. The minimum energy efficiency requirements would ensure that all new street light installations in Dubai, including in free zones and private developments, are energy efficient.

CASE STUDY 5: STREET LIGHTING PROJECTS IN DUBAI SILICON OASIS

Dubai Silicon Oasis Authority (DSOA), the regulatory body for Dubai Silicon Oasis (DSO), the integrated free zone technology park, is leading several initiatives in the Smart Environment dimension of its Smart City Strategy, of which the replacement of its traditional lights with efficient lights. The free zone developer replaced all street lights in the main roads with LEDs in 2018, saving over 50% of baseline consumption *(see exhibit 33)*. DSOA had already retrofitted, in 2015, 440 lights in residential streets with solar panels.

Exhibit 33: Overview of the lighting retrofit project completed in 2018 by Dubai Silicon Oasis on its main roads

DSOA is also studying the feasibility of implementing a smart system on the 2,000 replaced light poles. Interconnected street lights to DSOA's integrated building management system will allow:

- Continuous, seamless, and autonomous street lighting operation;
- Remote control of lighting output and scheduling of lighting profiles, reducing consumption;
- Monitoring and reporting of lamp performance and identification of errors, enabling predictive maintenance; and,
- Monitoring of weather and air quality.

Number of lights retrofitted
2,000

Average monthly consumption
before retrofit - Sodium Vapour
107,310 kWh

Average monthly consumption
after retrofit - LED
51,288 kWh

Monthly savings from retrofit
56,023 kWh or 52%

DSM PROGRAMME 7:

TARIFF RATES

PROGRAMME OWNER

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

PROGRAMME SCOPE

Adjust electricity and water tariff rates in Dubai to be cost-reflective, ensure economic efficiency and align ratepayer with Demand Side Management (DSM) objectives.

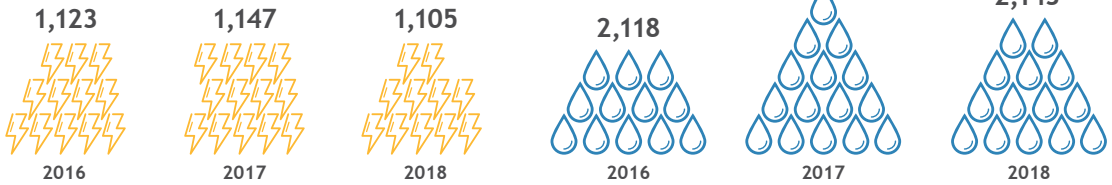
YOUSEF JEBRIL

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

Visit www.dewa.gov.ae

TARIFF RATES

PROGRAMME SAVINGS

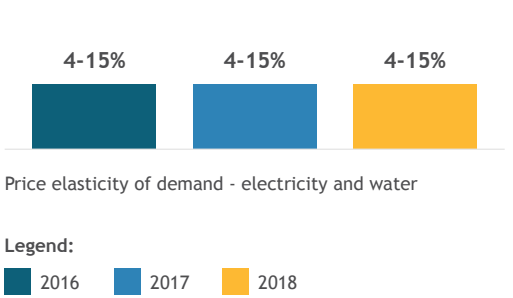


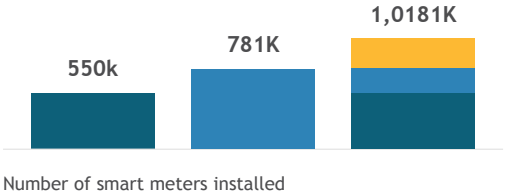
PROGRAMME INTRODUCTION

Price signalling is key in driving energy efficient behaviours from customers. 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 latest Dubai Electricity and Water Authority (DEWA) tariff review was in 2011. The increase in tariff resulted in 4% to 5% reduction in consumption of electricity and water, respectively, in the first two years of implementation. The Tariff Rates Programme kicked off the DSM Strategy 2030, being the major contributor to savings in the first years of strategy implementation.

OPERATIONAL DASHBOARD





TARIFF RATES

MAIN ACHIEVEMENTS AND PRIORITY AREAS

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 34)*.

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.

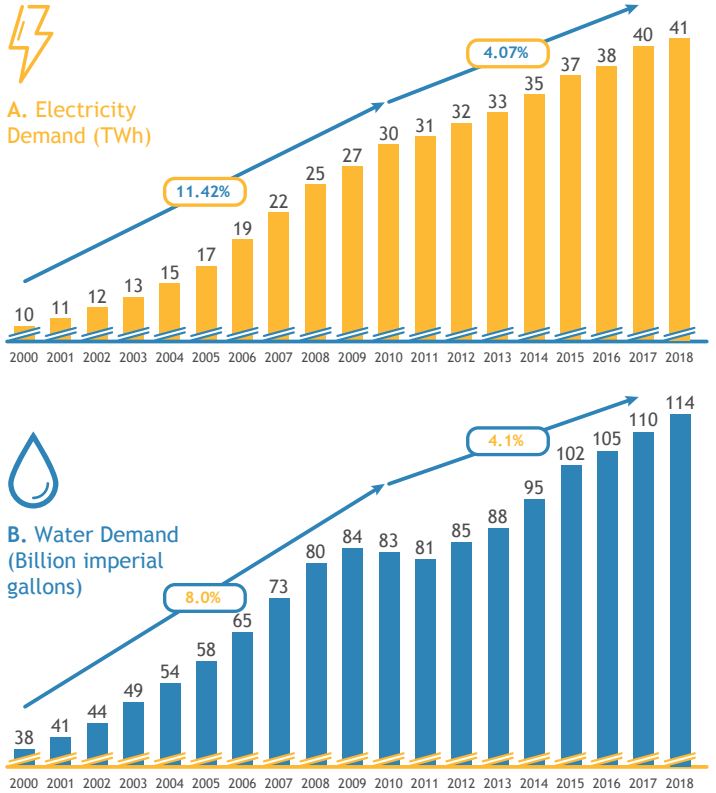


Exhibit 34: Electricity and water demand trends in Dubai, before and after the 2011 tariff review

NOTES

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

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).

TARIFF RATES

2 REDUCING THE PEAK LOAD

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

Due to high variability of cooling load between the summer and winter seasons, the annual load swing is about 70%. The daily load profile in Dubai is characterised by three periods. During the summer, the high season, peak periods occur during the day and in the evening, and the valley period occurs late at night and in the early morning *(see exhibit 35)*.

Through its combination of programmes, the DSM Strategy helps smooth down the load profile. For example, an increase in on-grid solar rooftop generation will support abatement of the day-time peak, while efficient outdoor lighting and energy efficiency standards for home appliances and equipment (e.g. for indoor lighting) can help reduce the evening-time peak.

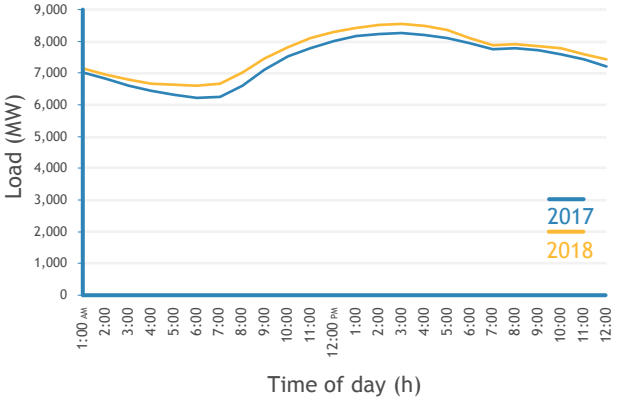


Exhibit 35: Dubai peak day electricity load profile, 2017 and 2018

3 MODERNISING THE GRID

DEWA developed a Smart Grid Strategy to modernise the grid (see exhibit 36). By the end of 2018, 64% of all DEWA meters were replaced with smart meters. With smart meters, DEWA can monitor and manage customers' consumption and quality of service through a system that's 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.

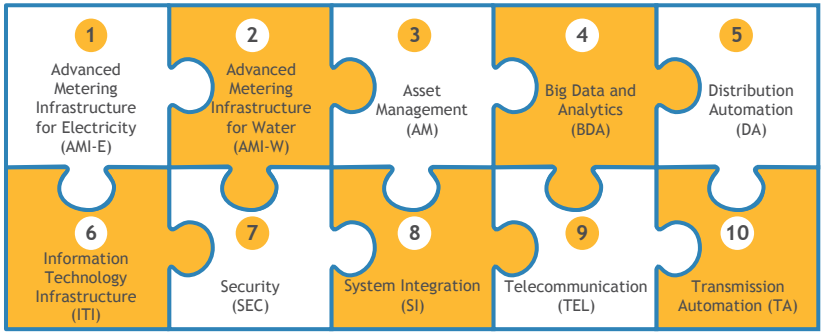


Exhibit 36: Dubai Electricity and Water Authority's Smart Grid Strategy with its ten programmes

DSM PROGRAMME 8:

SHAMS DUBAI

PROGRAMME OWNER

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

Etihad الاتحاد
Energy Services لخدمات الطاقة

PROGRAMME SCOPE

Encourage building and household owners in Dubai to install solar photovoltaic systems on their rooftop and connect them to Dubai Electricity and Water grid; and as a result, reduce their electricity bills and total demand on the grid.

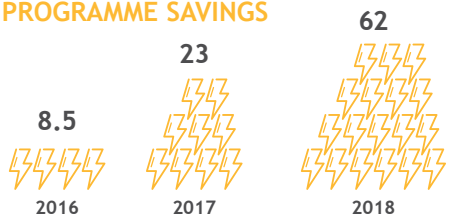
WALEED SALMAN

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

Visit www.dewa.gov.ae

SHAMS DUBAI

PROGRAMME SAVINGS



Electricity Savings (GWh)

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 have a solar photovoltaic (PV) system on every rooftop in Dubai by 2030.

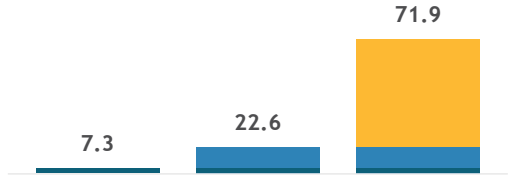
Shams Dubai was the first comprehensive framework for solar rooftop in the GCC (Gulf Cooperation Council). It implements the Executive Council Resolution No. 46 of 2014 and is built on a net-metering scheme. It allows consumers to generate electricity for their needs, connect their PV systems to the grid, and offset any excess generation from their electricity bills. Under this scheme, solar generation can address the majority of a building's electricity need in some cases.

Installed solar capacity cannot exceed the electrical load of a customer's land plot and generated electricity can only be consumed in the land plot where is generated. These connection conditions and the net-metering scheme are the regulatory elements shaping the growth of the market in Dubai.

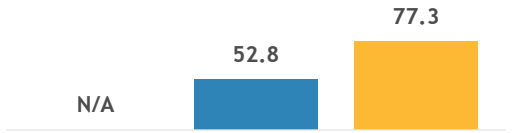
In addition to the regulatory framework, Dubai Electricity and Water Authority (DEWA) has defined technical specifications for PV systems, an accreditation scheme for contractors and consultants, and a permitting and connection process, which institutionalise programme quality. Today, more than 100 contractors are enrolled in the Shams Dubai Programme.

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.

OPERATIONAL DASHBOARD



Cumulative connected solar rooftop capacity (MWp)



Pipeline of approved solar rooftop projects to be installed (MWp)

Legend:
2016 2017 2018

SHAMS DUBAI

MAIN ACHIEVEMENTS

1 PROJECTS OF REMARKABLE SIZE IN A RAPIDLY GROWING MARKET

Dubai's solar rooftop market continues to grow. The total connected solar rooftop capacity has again tripled this year as it did in 2017. Sizable projects (>500 kWp), some executed by the government and others by the private sector on high consuming industrial and commercial buildings, lead the market growth *(see exhibit 37)*.

In 2018, Etihad ES and Enerwhere completed the first phase of the Ghaffath project by installing 10.4 MWp of solar panels on the rooftops of DEWA's Ghaffath water reservoirs and Mai Dubai's water-bottling factory buildings. The project won the MESIA award for the "Best Industrial Solar Project of the Year" at the World Future Energy Summit in January 2019. Once completed, the 18.1 MWp project will be the second largest solar rooftop project in the world.

The pipeline for the coming years is also very promising. In addition to the second phase of the Ghaffath project, Etihad ES is working on a 5 MWp solar rooftop project in Terminal 2 of the Dubai International Airport, and a 2.9 MWp installation for the Museum of the Future. Projects conducted in the private sector are also advancing. Studies conducted by leading industry players looking at existing rooftop surface area where solar could be economically deployed, confirm the long-term growth potential of Shams Dubai.

There are a few project arrangements that can been seen in the market today. Depending on the customer's specific situation and project scope, solar companies have adopted direct ownership, leasing, or energy performance contracting *(see an example of each in exhibit 37)*.

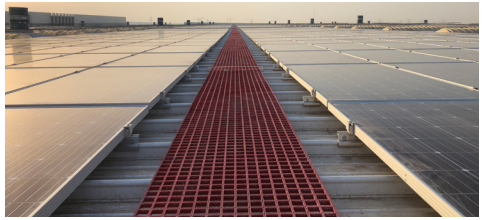
DEWA Al Ghaffath and Mai Dubai, second largest solar rooftop project in the world

- **Capacity:** Phase 1 – 10.4 MWp
- **Connection date:** in 2018, in phases
- **Location:** DEWA's Ghaffath water reservoirs and Mai Dubai water-bottling factory in Al Qudra
- **Project model:** direct ownership by DEWA
- **Executed by:** Led by Etihad ES and executed by Enerwhere

Al Wasl Properties, solar installation on 44 residential buildings

- **Capacity:** 5 MWp
- **Connection date:** in 2018, in phases
- **Location:** 44 residential buildings of Al Wasl Properties
- **Project model:** part of a five year guaranteed savings energy performance contract
- **Executed by:** Led by Etihad ES and executed by Smart Automation Energy

Aramex, large solar rooftop installation for a private company



- **Capacity:** 3.2 MWp
- **Connection date:** February 28, 2018
- **Location:** Aramex building in Dubai Logistic City
- **Project model:** direct ownership by Aramex
- **Executed by:** IMG Solar FZE

Al Barakah, solar installation for a locally-owned factory

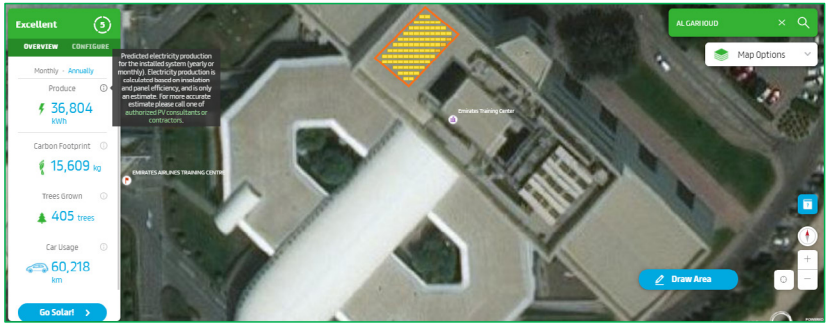
- **Capacity:** 1 MWp, covers 100% of electricity demand in the facility
- **Connection date:** January 2019
- **Location:** Al Barakah Dates Factory in Dubai Industrial Park
- **Project model:** 20 year lease agreement with Enviromena
- **Executed by:** Enviromena Power Systems

Exhibit 37: Overview of large Shams Dubai projects connected in 2018 by the government and the private sector

SHAMS DUBAI

2 ENFORCED MARKET ENABLERS AND CAPABILITIES

Market capabilities are increasing. The number of DEWA approved contractors has doubled in 2018; there are today over 100 approved contractors and 570 DEWA trained and certified Solar PV Experts. In parallel, DEWA and other Shams Dubai stakeholders are continuously working on initiatives to increase awareness levels on the benefits of solar rooftop and the available options in the market *(see exhibit 38)*. Empowering customers to make educated decisions is key to the success of the programme.



Link to calculator: www.dewa.gov.ae/en/customer/innovation/smart-initiatives/solar-calc

Exhibit 38: Shams Dubai Calculator by Dubai Electricity and Water Authority. By locating the building, drawing the installation area, and adjusting PV parameters, customers can get a preliminary estimate of their generation potential

PRIORITY AREAS

1 GOVERNING BY EXAMPLE

Dubai Government prides itself in governing by example, a principle that has already been applied in phases to develop the green building and building retrofit markets. For the solar rooftop market, DEWA has been an instrumental driver by carrying out large solar rooftop projects. In addition, a number of government entities have already installed solar panels on their buildings. That being said, continuous contribution by all government entities through the solar transformation of their facilities will help strengthen the solar rooftop market in Dubai. For this reason, in 2018, the Dubai Supreme Council of Energy has worked on a directive mandating phased solar panel installations on government buildings (Directive No.1 of 2019 is enforced starting January 2019).

2 CREATING A BUSINESS CASE FOR THE RESIDENTIAL AND SME SECTORS

While the overall market is rapidly growing, diffusion of small-scale solar rooftop installations (<50 kWp) in the residential and SME sectors is limited. Beyond government-sponsored projects, market expansion is driven by larger scale installations on commercial and industrial buildings. The high electricity bill payed by these private businesses and the solar generation potential of their sites create a business case for solar rooftop installations *(see exhibit 39)*.

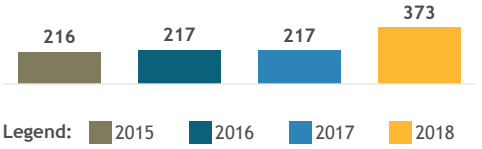


Exhibit 39: Average size of Shams Dubai projects by installation year (kWp/project)

On the other hand, the residential and SME sectors suffer from a low business case and a lack of third party funding in the form of micro-project financing. Adoption of solar rooftop in these sectors can be enabled by streamlining the business model and creating mechanisms to reduce the cost per kilowatt peak of small-scale installations. An example of potential mechanisms was implemented in the government led Hatta Solar Project, which consisted of the installation of 5 kWp systems on 640 national villas. By combining a large number of micro-installations in one go, the project was able to achieve economies of scale. Bulk purchasing can be easily implemented in the construction phase of new residential communities, as was done in The Sustainable City.

CASE STUDY 6: SOLAR DECATHLON MIDDLE EAST, INNOVATION FOR THE REGION'S FUTURE BUILT ENVIRONMENT

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. During the final phase of the competition, participating teams assemble their houses in a main expo area, open them to the general public, while undergoing 10 different contests.

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 in collaboration with the Dubai EXPO 2020. By challenging teams to adapt their designs to the heat, dust, and high humidity in the region, as well as the social context, SDME is a platform of innovation and testing for the future built environment in the region.

SOLAR DECATHLON MIDDLE EAST 2018:

SDME 2018 took place in November at the Mohammed bin Rashid Al Maktoum Solar Park. Fifteen teams gathering 28 international universities competed in the event *(see overview of the top three winners in Exhibit 41)*.

Exhibit 40: Solar Decathlon Middle East 2018 - Solar Village

1. FutureHAUS

Team Virginia Tech, USA

> "A New Way to Build. A New Way to Live"

Inspired by best practices from the automotive and aerospace industries, FutureHAUS is an energy positive home designed and built using modular structures that integrate smart technologies, energy efficient systems, and new materials. The objective of adopting modular construction is to achieve affordable highly efficient houses that can be mass-produced.

2. Desert Rose

Team University of Wollongong, Australia and United Arab Emirates (UAE)

> "A House for Life"

Following a human centred design approach and "aging in place" principle, Desert Rose is not only a sustainable house but it is considerate and adaptive to the changing needs of occupants as they continue to age and start developing age related disabilities such as dementia.

3. BaityKool

University of Bordeaux – France, Amity University – UAE, and An-Najah National University – Palestine

> "Connecting Architecture & Engineering, Efficiency & Comfort, and People"

BaityKool integrates state of the art solar and energy efficiency designs and technologies to achieve net zero energy solar performance and test self-sufficient building expertise that can be transferred to the construction industry in the region.

The key design considerations targeting energy efficiency seen in the competition houses 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 non-potable applications
  - Native plant species selected for their suitability to the climate

Exhibit 41: Overview of the top three winners of the Solar Decathlon Middle East 2018

For more information on the teams, and the new special edition of the competition, SDME 2020, please visit www.solardecathlonme.com

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.

DSM AWARENESS IMPROVEMENT

INTRODUCTION TO DSM INTEGRATED AWARENESS STRATEGY 2022

The DSM Integrated Awareness Strategy (IAS) 2022 was developed as a joint and collaborative effort between all DSM programme owners under the guidance and direction of a dedicated committee, the DSM Integrated Outreach and Awareness Committee (IOAC). The Committee is led by Dubai Supreme Council of Energy (DSCE) and TAQATI and includes members from all the DSM programme owner entities, 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 42)*.

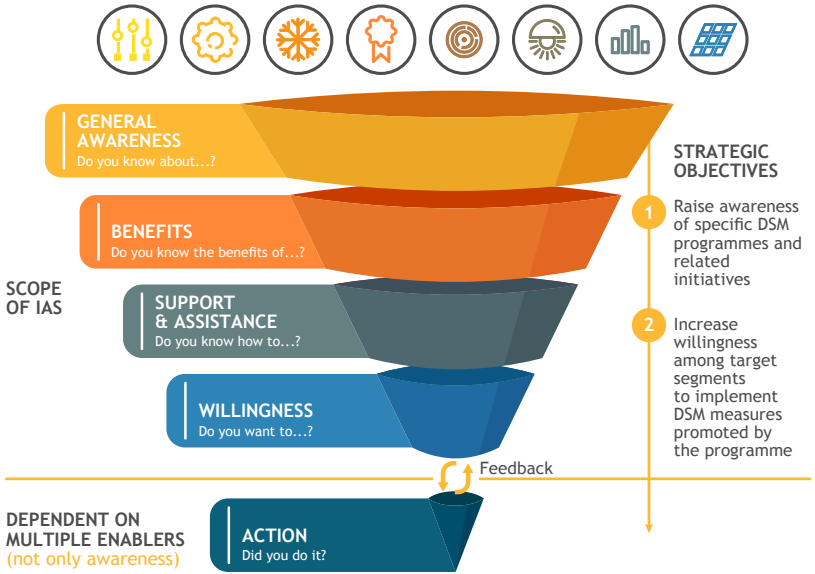


Exhibit 42: Illustrative strategic objectives of the Dubai Demand Side Management Integrated Awareness Strategy 2022

The strategy is implemented through the deployment of initiatives across five categories *(see exhibit 43)*.

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

Exhibit 43: Integrated Awareness Strategy 2022 awareness initiative categories

A policy statement for the DSM IAS 2022 implementation was signed by the IOAC members on behalf of the DSM programme owners, highlighting their commitment to jointly execute the strategy and its targets. In addition, annual operational plans are developed for all DSM programmes to effectively implement IAS 2022 and the implementation support was assigned to TAQATI to ensure annual awareness targets are met by each programme owner. The operational plans are annually reviewed with programme owners, and updated to ensure best integration of efforts and effective implementation. The DSM IAS 2022 Strategy has been activated in 2018.

DSM AWARENESS IMPROVEMENT

MAIN ACHIEVEMENTS

1 LAUNCH OF MY ENERGY, MY RESPONSIBILITY CAMPAIGN

As part of the IAS 2022 implementation, DSCE officially unveiled its flagship public awareness campaign under the name 'My Energy, My Responsibility' in May 2018. The campaign seeks to encourage general members of the community to be responsible for their energy resources.

MY ENERGY MY RESPONSIBILITY | طاقتي مسؤوليتي

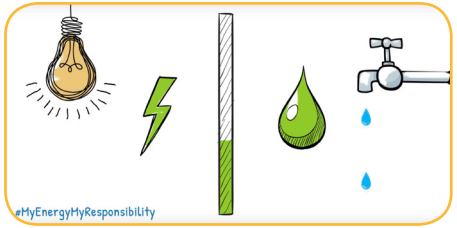
Exhibit 44: My Energy, My Responsibility Campaign official logo

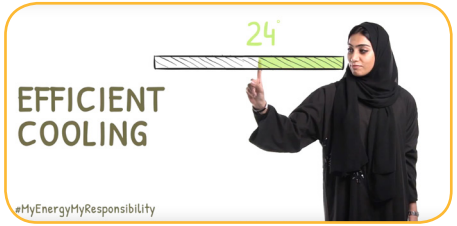
The joint government campaign aims to encourage and support Dubai residents to adopt energy efficient practices and behaviours and brings Dubai Government's energy efficiency campaigns under one umbrella 'My Energy, My Responsibility' with collaborations and contributions from various government entities, including, ESMA, DEWA, Dubai Municipality, RTA, Emirates National Oil Company (ENOC), Dubai Airports, Etihad ES, Empower and others.

The campaign video and flagship poster

The campaign launch included a community-based video and an informative flagship poster displayed in key government customer happiness centres and landmarks across Dubai *(see exhibit 45)*. In particular, Dubai Airports featured the Campaign on Immigration screens and smart stations *(see exhibit 46)*, and ENOC displayed campaign posters on all 125 petrol stations *(see exhibit 47)*.

A.





B.

Exhibit 45: A. My Energy My Responsibility Campaign Video (Source: TAQATI Videos - available on YouTube)
B. My Energy My Responsibility Campaign Flagship Poster

Exhibit 46: Dubai Airports contribution to My Energy, My Responsibility campaign

Exhibit 47: Campaign poster displayed on Emirates National Oil Company petrol stations

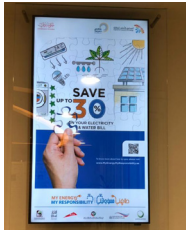


Exhibit 48: Campaign poster displayed in Dubai Electricity and Water Authority headquarters

My Energy, My Responsibility Campaign reach is estimated at over six million views resulting from the contributions of the campaign partners.

My Energy, My Responsibility website

As part of this campaign, 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.

Exhibit 49: My Energy My Responsibility Website (www.MyEnergyMyResponsibility.ae)

The website targets residential, government, commercial, and industrial sectors and includes educational materials (tips and conservation measures), highlighting the benefits of applying energy efficiency at home or at work. It includes:

- Energy efficiency material specially designed to be easy to understand by all ages and energy knowledge levels *(see example on exhibit 49 showing the top 10 efficiency tips)*.
- Helpful guides for residents and businesses on how to understand and reduce their energy consumption, build an efficient home or office, apply efficient landscaping, purchase efficient appliances, install solar panels, etc.
- Interactive tools, video tutorials, and quizzes that teach the youth and adults about energy efficiency and energy conservation.
- Special guidelines for businesses focusing on ways employees and organisations can save energy.

Daily energy efficiency tips and information are also available through TAQATI social media platforms: Instagram, Facebook, Twitter and LinkedIn.

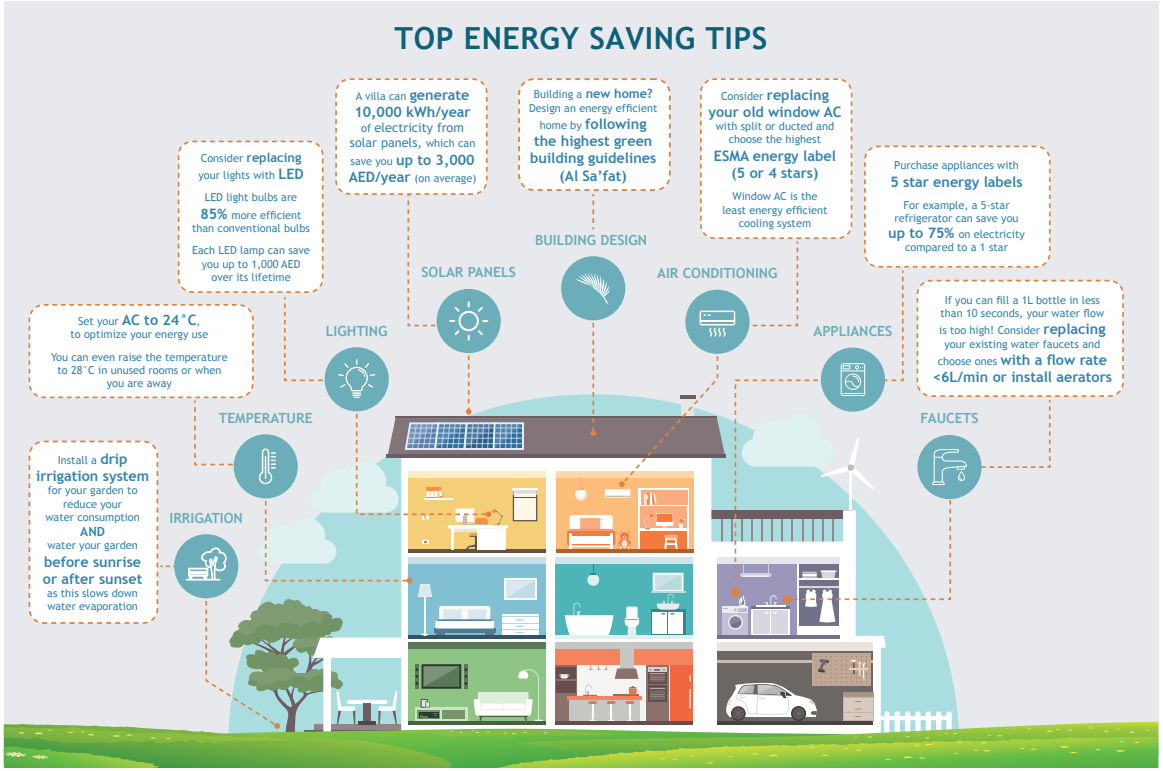


Exhibit 50: Top energy efficiency tips downloadable on www.MyEnergyMyResponsibility.ae

DSM AWARENESS IMPROVEMENT

2 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 (DEWA), Etihad ES, and TAQATI developed and launched the Dubai Green Industrial Award (Dubai Green Star Awards). 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 role models in Dubai.

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

The first cycle of the award scheme took place in 2018, with an award ceremony during the Future Manufacturing and Trade Summit organised by Dubai Exports.

Construction and Building Sector

Etihad ES, with the support of TAQATI, organised the Dubai Retrofit and Developers Awareness Workshop in September 2018 to raise awareness about energy efficiency and to discuss ways to address challenges, including financing which impedes the widespread adoption of building retrofits by developers.

The workshop underscored the importance of collaboration between developers and energy service companies and the need to retrofit existing buildings in order to reduce emissions from the building sector. The importance of solar energy in enhancing energy performance of buildings was also highlighted. Etihad ES presented successful solar case studies from the region and drew attention to the potential of solar rooftops and car parks *(see exhibit 52)*.

Exhibit 52: Ali Al Jassim, CEO Etihad ES, highlighting the importance of developers' involvement in achieving the Dubai energy efficiency targets

Exhibit 51: Dubai Green Industrial Award guidelines

Hospitality Sector

Sustainability has a significant role in the efforts to drive down operational costs across various sectors in the emirate, especially in Dubai's thriving tourism and hospitality sectors.

Etihad ES and TAQATI participated in the Dubai Green Hotel Innovation Conference as key partners to encourage the industry to adopt energy efficient solutions. The conference took place in November 2018 and focused on the following key areas:

- Currently available technologies and solutions that can help promote sustainability and provide dependable benchmarks against international standards
- Industry best practices and the latest innovations aimed at reducing operating costs and improving performance through sustainability and retrofitting programmes
- Understanding how existing building components can improve energy efficiency within the hotel sector

DSM AWARENESS IMPROVEMENT

PRIORITY AREAS

1 ENERGY MANAGEMENT GUIDEBOOK FOR GOVERNMENT AND BUSINESS ORGANISATIONS

The energy management guidebook will provide a practical and systematic approach to formulating and implementing an effective energy management plan for government and businesses. The guidebook is tailor made for Dubai and aims to serve as a useful and easy to understand tool for organisations embarking on their energy conservation and management journey.

2 EFFICIENT APPLIANCE INITIATIVES WITH RETAILERS

In an effort to tackle residential electricity and water consumption, a number of initiatives to promote energy efficient appliances (four and five star ESMA rated models) are planned to take place in partnership with key retailers in Dubai, championed by ESMA. The initiatives include:

- **Orientation for sales staff on energy efficient appliances:** Sales staff are the main interface between consumers and their purchasing decisions. As such, it is critical to educate retail sales staff on 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.
- **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 (four and five star models) through discounts, gift vouchers, promotions, etc.

3 DSM AWARENESS SURVEY

As part of monitoring and reporting, TAQATI will commission an awareness survey covering the eight DSM programmes and related awareness initiatives to measure the impact of awareness efforts that took place since the launch of the DSM IAS 2022. The survey results will enable the monitoring of progress against the awareness and willingness targets set in the DSM IAS 2022 for each DSM programme and will serve as a tool to define awareness priority areas moving forward.

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.

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:

Exhibit 53: Dubai Energy Efficiency Training Programme 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 54)*.

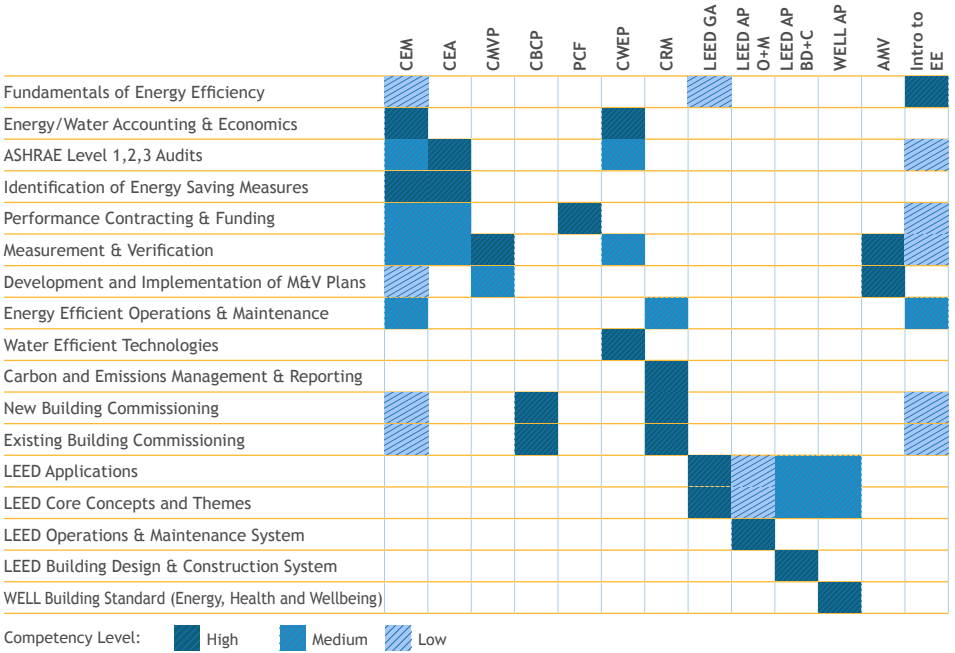


Exhibit 54: Skills from each Dubai Energy Efficiency Programme training course

In addition, trainings are organised into tracks for executives, technical engineers, technicians and financiers to support the industry in selecting the right trainings based on their job functions and focus areas *(see exhibit 55)*.

Exhibit 55: Training programme tracks

DSM CAPACITY BUILDING

MAIN ACHIEVEMENTS

1 LAUNCH OF THE 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), *(see exhibit 56)*.

Exhibit 56: The launch of an integrated training programme

In its first year of operation (April-December 2018), the programme achieved positive results and received strong interest from the market. Over the nine-month period, 18 training sessions were delivered to ~200 professionals from the public and private sector in Dubai, the United Arab Emirates (UAE), and beyond.

PRIORITY AREAS

1 CONTINUOUS IMPROVEMENT AND EXPANSION OF THE DUBAI ENERGY EFFICIENCY TRAINING PROGRAMME

The Dubai Energy Efficiency Training Programme plans to introduce new courses in 2019 in response to market demand and gaps identified. This will broaden the coverage of the programme in terms of focus areas and target audience. New courses will cover areas such as water efficiency, lighting efficiency, and carbon reduction, as well as a beginner level course on energy efficiency.

6 DSM STRATEGY FUTURE OUTLOOK

Strategic priorities that support the scale-up of the Demand Side Management (DSM) programmes and address identified risks to achieving saving targets are defined and amended on an annual basis. In addition, the DSM Strategy undergoes periodic revisions. In fact, the Dubai Supreme Council of Energy will be conducting the next five-year update to the DSM Strategy in the first half of 2019, to validate the strategic priorities from now to 2030 and extend the vision to 2050. The revision will look into enhancing the scope of DSM in Dubai and targeting specific electricity and water consumer groups.

7 ACKNOWLEDGEMENTS

We are grateful to the leaders, peers, and colleagues who have helped achieve the important targets of 2018. 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 Global Aluminium
- Emirates Green Building Council
- Etihad Energy Services Company
- Regulatory and Supervisory Bureau for Water and Electricity in Dubai
- Roads and Transport Authority
- The Executive Council of Dubai
- The Dubai Free Zone Council and its member authorities (including Trakhees, Dubai Silicon Oasis, and Dubai Development Authority)

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  Waleed Salman
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  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**
  Ali Abdul Kareem
  Bassel Saad
  Hanan Saleh Alhemairy
  Odeh Odeh
  Salim Al Rimawi

- **Regulatory and Supervisory Bureau for Water and Electricity in Dubai**
  Elie Matar
  Graeme Sims
  James Grinnell
  Zaineb Al Amin

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8 CONTACT INFORMATION

Publisher of the DSM Annual Report

المجلس الأعلى للطاقة
Supreme Council of Energy

Dubai Supreme Council of Energy
P.O. Box.121555, Dubai,
United Arab Emirates
Tel: +971 4 322 9666
Email: Info1@dubaisce.gov.ae

Editor and DSM Programme Manager

طاقتي
TAQATI

TAQATI
P.O. Box 37578, Dubai
United Arab Emirates
Tel: + 971 4 322 0773
Email: info@taqati.ae

Programme Owners

هيئة كهرباء ومياه دبي
Dubai Electricity & Water Authority

Dubai Electricity and Water Authority
P.O. Box 564, Dubai
United Arab Emirates
Tel: +971 4 601 9999
Email: customercare@dewa.gov.ae

هيئة الطرق والمواصلات
ROADS & TRANSPORT AUTHORITY
RTA

Roads and Transport Authority
P.O. Box 118899, Dubai
United Arab Emirates
Tel: +971 4 284 4444
Email: ASK@rta.ae

Etihad الاتحاد
Energy Services لخدمات الطاقة

Etihad Energy Services
P.O. Box 37578, Dubai
United Arab Emirates
Tel: +971 4 322 0383
Email: etihad.info@etihadesco.com

بلدية دبي
DUBAI MUNICIPALITY

Dubai Municipality
P.O. Box 67, Dubai
United Arab Emirates
Tel: +971 4 221 5555
Email: info@dm.gov.ae

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

Regulatory and Supervisory Bureau for Water and Electricity in Dubai
P.O. Box 121555, Dubai
United Arab Emirates
Tel: + 971 4 322 9853
Email: info.rsb@rsbdubai.gov.ae

هيئة الإمارات للمواصفات والمقاييس
Emirates Authority For Standardization & Metrology

Emirates Authority for Standardization and Metrology
P.O. Box 48666, Dubai
United Arab Emirates
Tel: +971 600 565 554
Email: customercare@esma.gov.ae

المجلس الأعلى للطاقة
Supreme Council of Energy

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