

MEE Dubai Daily

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Energy transition takes centre stage at MEE 2020

45th edition of region's largest power exhibition kicks off with high-level panel discussion on the key issues and challenges facing the global energy sector

Meeting the world's energy needs during the energy transition is the central theme being addressed at Middle East Energy (MEE) 2020, which opened today at Dubai World Trade Centre (DWTC). Previously known as Middle East Electricity, the region's largest gathering of buyers and sellers in the power industry has been rebranded for its 45th edition to reflect the rapidly changing energy sector.

Held under the patronage of the UAE's Ministry of Energy, MEE kicked off with a high-level panel discussion on 'Energy in transition – connecting the world through decarbonisation and digitalisation'. Running from 3-5 March, the event is bringing together more than 1,100 exhibitors and more than 20,000 visitors from more than 100 countries to find solutions to the challenge of meeting the world's growing energy needs.

The Middle East and North Africa's power sector is undergoing an unprecedented transformation, with the shift towards renewable energy and digital innovation at the heart of ambitious energy diversification programmes. As governments seek to increase energy security and maximise returns from hydrocarbon resources, utilities are pressing ahead with some of the most ambitious renewable energy schemes in the world.

REGIONAL FOCUS

The bold steps being taken across the Middle East and North Africa to introduce clean energy are being led by the falling costs of clean energy, with the cost of installing PV solar and wind having fallen by more than 70 per cent over the last decade. The region has driven much of the sharp fall in tariffs for renewables projects, with the UAE, Saudi Arabia and Egypt all having set records for solar and wind power tariffs in the last five years.

Informa's Energy & Utilities estimates that 130GW of clean energy projects are



already planned in the Middle East and North Africa, which will require \$300bn-plus of investment to successfully deliver.

While the fall in cost of physical components has been a major factor behind the decline of prices of renewable energy, the digitalisation of power infrastructure is expected to drive efficiency and reduce the costs of both clean and thermal energy production in the future. The global market for digitalisation in the energy sector is expected to grow to \$64bn by 2025, with the shift of focus from hardware to software expected to revolutionise the utilities sector.

In response to increased sensors and data points from power plants and networks, internet of things (IoT) operating systems and artificial intelligence (AI) will also play an increasingly important role in improving efficiency and reducing economic and carbon costs in the production and distribution of electricity in the coming years.

In addition to the main plenary sessions, MEE is featuring a Digital Showcase which will run concurrently from 3-5 March. Intersolar Middle East will be running in parallel to MEE, and will feature some of the region's key players in the renewables sector. A special focus on private sector opportunities in Africa's solar energy

markets will take place on 5 March at 11:30am.

The energy transition is not just about implementing new sources of power, however. For utilities to successfully navigate the path to sustainable energy production, balancing the introduction of renewable energy with efficient gas power will be a critical component of delivering stable and reliable grids.

The recent discovery of potentially one of the region's largest gas reserves in the UAE will play a key part in the country securing energy self-sufficiency and boosting energy security in an era of increasing global geopolitical and economic uncertainty.

Moreover, Saudi Aramco's recent announcement that it will invest \$110bn in developing unconventional gas resources in Jafurah illustrates the importance gas will play in meeting energy demands during the energy transition throughout the Middle East and beyond. Successfully integrating new intermittent renewable energy resources with conventional thermal resources will form a key part of discussions this week at MEE.

REGULATORY REFORM

Establishing the correct regulatory environment and policies to support the energy transition is vital if grid stability is to be achieved and ambitious energy

targets met. While large-scale utility projects will contribute the major share of the region's clean energy capacity, the adoption of appropriate feed-in-tariff, net-metering and wheel-in agreements will play an important role in delivering renewable energy programmes.

The key issues and challenges to regulatory reform will be discussed in the 'Policy v technology' plenary session on 4 March at 1pm.

PRIVATE SECTOR ROLE

The growing role of the private sector in delivering energy infrastructure across the region will also form a key part of discussions this week. Governments throughout the Middle East and North Africa (MENA) are entrusting development of important power and water production to the private sector.

Informa Market's Energy & Utilities estimates that independent power producer (IPP) projects accounted for more than 70 per cent of the total power generation contracts awarded in 2019, and this share is likely to increase with governments seeking to balance fiscal budgets.

The opportunities for further private sector participation in the region's power sector will be addressed by a panel of experts from the public and private sector in the plenary session on March 5 at 10:30am.



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Outlook 2025: Mena region will require 76GW of additional power capacity by 2025

Region's governments are increasingly turning to renewable energy to meet rising demand for electricity

By Andrew Roscoe

The Middle East and North Africa (Mena) region will need to install an estimated 76GW of new power generation capacity by 2025 to ensure electricity supply remains above demand.

According to the latest data from Energy & Utilities, installed capacity will need to increase from the 341,523MW installed in 2018 to 417,904MW by 2025, an increase of 22 per cent, to meet expected power demand and deliver the recommended minimum reserve margin of 15 per cent.

In reality, there is likely to be a requirement for even more additional power capacity than this, with ageing and inefficient infrastructure a characteristic of some of the region's largest electricity sectors.

Much of the new capacity is set to be met by renewable energy and other alternative energy sources as governments push ahead with ambitious programmes to diversify their energy sectors and reduce reliance on liquid hydrocarbons to meet power demand.

SUPPLY SHORTFALL

If analysing the Mena region as a whole, the installed generation capacity of 342GW in 2018 was significantly higher than the 181GW peak demand recorded that year. However, unsurprisingly given the vastly differing natural resources and political climates in each state, the power situation varies significantly from country-to-country.

Out of the 15 countries analysed, Iraq, Libya and Lebanon all recorded a higher demand for power than available supply in 2017/18. Perhaps not unexpected, due to the numerous conflicts in each of these countries, significant investment is required to secure reliable sources of power for people and industries in these states.

Iraq, in particular, is facing a major challenge to meet growing demand for power across the country, with installed capacity, 15GW, significantly lower than the 23.5GW peak demand recorded in 2018.

As a result of the shortfall, many areas of the country only have access to a few hours of electricity a day. According to the government, it is estimated that electricity shortages are costing Iraq's economy as much as \$40bn a year.

With budget for capital expenditure set to continue to be a problem for the country's Electricity Ministry, Baghdad has inked a handful of contracts with major international energy firms GE and Siemens to assist with financing and development of generation capacity and upgrades to the country's inadequate transmission and



distribution networks.

While the GE and Siemens deals will add some much needed power to the grid, Iraq will need to push ahead with a much wider capacity building programme in the coming years if it is to reduce its power deficit and ensure a stable supply of electricity for its people.

Lebanon has faced electricity shortages for decades following the protracted civil war and conflicts. The migration of more than 1 million Syrian refugees has exacerbated the problem over the past eight years, with peak power demand in 2018 reaching 3,500MW, almost 1.5GW greater than installed capacity.

As with most countries in periods following conflict, the electricity sector has also been starved of budget to adequately address the problem. In response to the growing crisis, the Ministry of Electricity & Water (MOEW) is pushing ahead with plans to develop IPP projects in partnership with the private sector.

Two of the projects planned include gas-fired IPPs at Zahrani and Selaata, which will have capacities of between 600MW and 800MW. The gas will come from floating

liquefied natural gas vessels, for which contracts were tendered in 2019.

TIGHTENING SUPPLY

While the afore mentioned three countries faced electricity shortages in 2018, two GCC countries are facing a race to develop new capacity to stay ahead of growing demand, with installed capacity in 2018 lower than the recommended 15 per cent reserve margin.

Installed capacity in Bahrain in 2018 was only 483MW above peak demand, giving a reserve margin of only 12 per cent. The capacity situation will improve significantly when the under-development Al-Dur 2 independent water and power project (IWPP) is operational, however the plant is not expected to be commissioned before 2022. An additional 100MW is expected to be connected to the grid by the end of 2021 from the Al-Askar solar IPP, Bahrain's first utility-scale renewables project.

If peak demand jumps significantly before then, state utility Electricity & Water Authority (EWA) may have to increase imports, from state aluminium company Alba and/or GCC grid, or resort to

temporary power generation resources to meet demand.

The other GCC market with a reserve margin falling below the recommended level is Oman, with a reserve margin of 983MW, 14 per cent, in 2018.

As a result of the increasingly tight reserve margins, state utility Oman Power & Water Procurement Company (OPWP) has signed contracts to receive electricity imports of up to 180MW from Sohar Aluminium and 200MW from the UAE through the GCC interconnection.

Pressure on the sultanate's grid was reduced in late 2019 when the Sohar 3 and Ibri IPPs were commissioned, adding 3,283MW to the grid. An additional 500MW is planned to be commissioned in 2022 with the advent of the sultanate's first utility-scale solar project, the Ibri 2 500MW PV solar project.

However, peak demand growth for electricity is expected to remain robust, at 6 per cent a year, up to 2025 as the government pushes ahead with major projects to diversify the country's economy away from its dependence on hydrocarbons and expand its industrial sector.

As a result, Oman Power & Water Procurement Company (OPWP) is planning to push ahead with a number of renewable energy projects to boost capacity and reduce pressure on tightening gas supplies. In total, the sultanate has set a target for developing 2.2GW of renewable energy by 2025, with PV solar contributing to 2GW and wind and waste-to-energy projects both each accounting for 100MW.

ENERGY DIVERSIFICATION

Oman’s move towards integrating renewable energy is a trend which is becoming prevalent across the Mena region.

The move towards energy diversification and the drive for developing renewable energy is already having an impact on the Mena region’s power sector, with almost every country analysed having set a renewable energy target of some sort.

The Mena region’s integration of renewable energy is still in a nascent stage, with clean energy accounting for 28,330MW, about 8.3 per cent, of the 341,523MW installed capacity in 2018. The total figure, however, can be regarded as artificially high, with hydropower in Iran, Egypt and Morocco accounting for 17,756MW of the renewable energy total.

Installed solar and wind capacity in the Mena region in 2018 reached 3,910MW and 3,186MW respectively.

While renewable energy accounts for a small percentage of the total installed generation capacity, this is starting to change with the region’s utilities having set some of the most ambitious renewable energy targets in the world.

The impending energy transition is already having a significant impact on contract awards, with 45 per cent, about \$3.4bn, of the top 15 contract awards for generation projects in the Mena region in 2019 for renewable energy projects. Frost and Sullivan estimate that the value of renewable energy projects underway in the Middle East could rise to \$20bn by 2024.

Morocco and Egypt have already made impressive starts in developing diversified clean energy sectors, with both countries having the largest installed solar and wind capacities to supplement sizable hydropower schemes. As of 2018, Egypt had installed wind and solar capacities of 1,125MW and 770MW respectively, with Morocco having 1,200MW and 735MW installed respectively.

As a result of its success in developing its maiden solar and wind projects, Morocco has set a target for 52 per cent of its total energy needs to come from renewables by 2030. By this date, Rabat has set a target for solar and wind energy to both account for 19 per cent of total power generation, with hydropower to provide 14 per cent of the country’s electricity.

REGIONAL FOCUS

Saudi Arabia is expected to emerge as one of the most lucrative markets for renewable energy in 2020 after lagging behind many of its GCC neighbours in pushing ahead with clean energy projects in recent years.

The kingdom has set a target for delivering 58.7GW of clean energy projects by 2030, by far the largest target in the region. With only 442MW installed, following the recent commissioning of the 300MW

Project	Country	Client	Estimated value (\$m)
Noor Midelt IPP	Morocco	Masen	785
Jumat al-Jandal wind IPP	Saudi Arabia	Repdo	500
Hatta pumped storage project	Dubai, UAE	Dewa	391
Ibri solar IPP	Oman	OPWP	400
Kom Ombo solar IPP	Egypt	EETC	330
Askar PV solar IPP	Bahrain	EWA	200
West Bakr wind IPP	Egypt	EETC	250
Beeah waste-to-energy PPP	Sharjah, UAE	Sewa	200
PDO Oman solar IPP	Oman	PDO	100
Al-Husainiyah solar IPP	Jordan	Nepco	74

2025 MENA power capacity additions

	Installed capacity 2018 (MW)	Required capacity 2025 (MW)
UAE	31,271	44,153
Bahrain	3,920	4,858
Kuwait	19,420	19,765
Oman	7,794	12,164
Qatar *	10,170	13,004
Saudi Arabia	69,000	87,750
Egypt	55,213	43,739
Algeria	20,968	24,175
Morocco	10,937	8,930
Tunisia	5,547	7,389
Libya*	4,900	8,540
Jordan	5,259	4,031
Lebanon	2,050	4,807
Iraq	15,000	49,466
Iran	80,074	85,135

MENA capacity and demand 2018

	Peak demand (MW)	Installed capacity (MW)
UAE	24,567	31,271
Bahrain	3,437	3,920
Kuwait	14,070	19,420
Oman	6,811	7,794
Qatar *	7,855	10,170
Saudi Arabia	62,000	69,000
Egypt	30,800	55,213
Algeria	13,680	20,968
Morocco	6,310	10,937
Tunisia	4,282	5,547
Libya*	6,500	4,900
Jordan	3,100	5,259
Lebanon	3,500	2,050
Iraq	23,500	15,000
Iran	57,097	80,074

Sakaka PV IPP, and contracts for about another 2,500MW having been awarded under the NREP and PIF development programmes to date, Riyadh will need to start making swifter progress if it is to make inroads into its ambitious target.

Saudi Arabia’s Renewable Energy Project Development Office (Repdo) received bids for the 1.6GW second round of its National Renewable Energy Programme (NREP) on 20 January. Just prior to this, the renewables body had invited developers to prequalify for the third round, which will include four PV solar projects with a total capacity of 1.2GW.

In January last year, Riyadh ramped up its clean energy targets to 27.3GW by 2024 and 58.7GW by 2030, far superseding the previous 9.5GW by 2023 target.

Repdo will be overseeing the development of 30 per cent of this ambitious target through competitive tendering, while the Public Investment Fund (PIF) is expected to appoint developers through direct negotiations for the remaining 70 per cent.

In addition to developing significant renewable energy capacity, Saudi Arabia is also planning to develop a comprehensive supply chain of manufacturing of PV panels and other components as part of localisation targets set out in its Vision 2030 masterplan.

SOLAR PROGRESS

The UAE will remain an active market for clean energy projects as it works towards a goal of 44 per cent of its energy to come

from renewable energy sources by 2050.

Abu-Dhabi based Emirates Water & Electricity Company is set to award the contract for the planned 1.5GW Al-Dhafra PV solar IPP in the first quarter of 2020. The utility company received bids from five international consortiums in late November, and held a number of clarification meetings with bidders in January.

In June last year, Abu Dhabi commissioned the world’s largest single-site solar project, the 1,177Mw Sweihan IPP. The project was developed by a consortium led by Japan’s Marubeni Corporation and China’s Jinko Power. Ewec is already planning to develop its third major PV solar project, which is planned to have a capacity of up to 2.5GW. The planned project is currently in the design stages, but the client is expected to begin the tender process before the end of the year.

In Dubai, state utility Dewa is preparing to commission the final phase of an 800MW photovoltaic (PV) solar project in April.

The 300MW final stage of the 800MW third phase of the Mohammed bin Rashid (MBR) solar park is currently undergoing initial testing before beginning full commercial operation in April. The 800MW third phase project achieved a world record tariff for PV solar production of \$cents 2.99 per kilowatt-hour (kWh) when it was tendered in 2016.

The impending 300MW addition to the grid will take the total capacity of the MBR park to 1,013MW, with 713MW currently operational. Contracts for an additional 2,150MW of capacity at the MBR park have already been awarded, which includes 700MW of concentrated solar power (CSP) capacity.

In September 2017, a consortium led by Saudi Arabia’s Acwa Power was appointed by Dewa to develop the \$3.8bn fourth phase, which will include 700MW of CSP and 250MW of PV capacity. The developer had submitted a tariff of 7.3\$cents/kWh for the CSP component during a competitive bidding process, the lowest unsubsidised tariff for utility-scale CSP solar in the world.

Dewa is due to sign the final project agreements for the planned 900MW fifth phase of its Mohamed bin Rashid (MBR) solar park in the first quarter of this year after selecting Saudi Arabia’s Acwa Power as the preferred bidder in November.

The Acwa Power consortium submitted a world-record-low tariff of \$1.695 cents a kilowatt hour (\$c/kWh) for the fifth phase of the MBR solar park in October.

When commissioned, the initial five phases will bring the total installed capacity of the MBR park to 2,863MW. Dewa has set a target for the park to have a capacity of 5,000MW by 2030, which will required a total investment of about AED50bn (\$13.6bn). The park will be the primary contributor to the emirate’s target of 30 per cent clean energy by 2030.

"The UAE will remain an active market for clean energy projects as it works towards a goal of 44 per cent of its energy to come from renewable energy sources by 2050. "



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Regulatory reforms key to next phase of region's renewables push

In conversation with: **Suresh Bhaskar**, Executive Vice President & Head of Business Development for Engie in the Middle East, South and Central Asia, Turkey

In the second half of the last calendar decade, renewable energy finally started to make a breakthrough in the Middle East and North Africa (Mena).

Following a number of record low tariffs for solar and wind projects across the region, utilities are embarking on some of the most ambitious clean energy projects in the world.

Energy & Utilities caught up with Suresh Bhaskar, regional Executive Vice President & Head of Business Development for France's Engie, to hear his thoughts on the shift towards alternative sources of energy sweeping across the region's utilities sector.

"The shift towards renewable energy has become much more pronounced in last four or five years, in terms of the scale and size of projects we are seeing coming out especially in the UAE and Saudi Arabia for example," says Bhaskar. "Each of these countries is pushing ahead with large projects in terms of solar, both PV and CSP, and wind."

According to Bhaskar, the Middle East and North Africa region offers an optimum environment for deploying large-scale renewable energy technologies.

ECONOMIC VALUE

"These countries have realised the economic value of natural energy sources, and with the cost advantages of

proceeding with projects at scale coupled with high solar irradiation levels and abundance of land in the Middle East, there are enough economically compelling reasons for off takers to integrate renewables into the grid – and this is the way it should be," he explains.

Engie's first major renewable energy project in the Mena region was the 262.5MW Ras Ghareb wind project in Egypt, which it developed in partnership with Japan's Toyota Tsusho Corporation and Egypt's Orascom Construction. The wind project was commissioned in October 2019.

While the Ras Ghareb wind farm is being operated under a long-term PPA contract with a state utility, the standard model for PPP power projects in the Mena region, Engie has also signed a power purchase agreement (PPA) directly with a private company in Saudi Arabia, one of the contracts of its kind in the GCC.

Engie entered into a contract with Saudi-listed National Agricultural Development Company (Nadec) in July last year to develop a 30MW PV solar plant in Nadec City, Haradh. Engie will develop the solar plant to feed directly into Nadec's own micro-grid.

"Nadec was meeting its energy needs through liquid fuel using diesel engines – and given the rising price of liquid fuels in the last few years as subsidies are being

phased out, any energy needs that can be met through renewables is a positive impact to their bottom line," says Bhaskar.

DECENTRALISED MARKET

While the Nadec project offers an interesting insight into the future of possibilities for distributed solar in the Middle East, Bhaskar says that the renewables market in the region will continue to be dominated by utility-scale projects until sufficient progress has been made with establishing an adequate regulatory environment.

"The shift in the energy landscape is happening, but mostly in the utilities space," says Bhaskar. "For it to happen in the distributed space – it will depend on a regulatory revolution."

"Across the world, the growth of renewables is being driven by decentralisation – but here [Middle East] it is not the case, partly because the various government entities have control over power generation and the grid."

"For this revolution to happen, you need energy to be bought by the ultimate customer for the real cost – and the price will be determined on a real-time basis," says Bhaskar. "We are already seeing Oman trying to implement a spot market – but I think ultimately when others follow there will be the potential for a GCC energy market."

Gas power plants will play an important role in supporting the development of intermittent energy resources.

"In the short-to-medium term, gas plants will be required," says Bhaskar. "It is not just about intermittent resources, but also about grid stability and energy security – I don't think an offtaker would want its grid dominated by one particular source of energy at any given point in time, it is always a balancing arrangement."


GAME-CHANGER

Although gas will continue to play an important role in meeting the region's power needs in the near future, the game-changer will be when battery storage for renewables become cost-efficient at scale. Bhaskar says that regulatory reforms will also be key to allow the region's utilities and power providers to reap the benefits of battery storage.

"To use battery storage only for peak shifting or energy shifting is limiting, and you aren't using the full potential of the battery. There are so many other ancillary services you can benefit from – but you need a regulatory framework with an acceptable compensatory mechanism for this," he explains.

"Today most of the grids are dominated by capacity compensation, when it moves to energy compensation you will see the full potential of batteries being unleashed."





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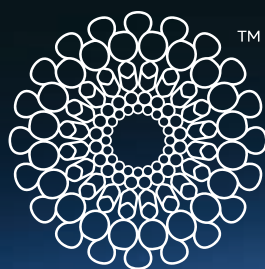
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A new decade begins for renewable power in the Middle East and North Africa

By Dr. Steven Griffiths

The Middle East and North Africa (Mena) energy sector continues to grow while at the same time adjusting to a global energy transition toward much higher shares of clean energy, particularly in the power sector. According to the Arab Petroleum Investments Corporation (Apicorp), Mena energy systems investments will reach as

high as \$1 trillion between 2019 and 2023 with more than a third of this investment coming from the regional power sector. Within the power sector, approximately one third of new generation capacity is expected to come from renewable energy, predominantly in the form of solar and wind power. While this is impressive for a region that still is predominantly powered by the combustion of fossil fuels, it pales

in comparison to the 68 per cent of new power generation capacity that derived from renewables globally in 2018.

Although the Mena region is somewhat lagging compared to global benchmarks for renewable energy in the power sector, or renewable power, progress is being made. The driving force for renewable power across the region is its cost competitiveness relative to other forms of power generation.

A rapid decline in the tariffs quoted for bids received in renewable power tenders, particularly in the Gulf countries, has made renewables increasingly attractive for new power generation capacity. The United Arab Emirates (UAE) and Saudi Arabia continue to award tender bids for utility-scale solar PV projects with quoted tariffs that just a few years ago would have been considered impossibly low.





The most recent such award was announced by the Dubai Water and Electricity Authority (Dewa) for a 25-year, utility-scale solar PV power purchase agreement to deliver electricity in 2021 at approximately 1.7 \$cents/kWh for the 900MW Phase V of the Mohammed bin Rashid Al Maktoum (MBR) Solar Park. The award was made to Saudi energy company ACWA Power and has an electricity tariff that is about 70 per cent lower than the 5.84 \$cents/kWh tariff of the winning bid for Phase II of the MBR Solar Park, which in 2015 was considered by many as unrealistically low.

The sub-2 \$cents/kWh tariff in Dubai follows Saudi Arabia's awarded bid tariff of 2.34 \$cents/kWh for the 300MW Sakaka solar PV project, which itself was a record low utility-scale solar PV tariff as recently as February 2018. Abu Dhabi's Emirates Water & Electricity Company (Ewec) will be announcing in early 2020 the tender award winner for its planned 2GW solar PV plant (Solar PV2) that will commence operation in 2022. There is almost no doubt that the awarded electricity tariff will be close to, if not lower than, the awarded tariff for MBR Phase V. Importantly, it is not just the wealthy Gulf countries that are benefiting from such low renewable energy prices. In North Africa, Tunisia and Egypt both awarded utility-scale solar PV projects in October 2019 with electricity tariffs of less than 2.5 \$cents/kWh.

The rapidly falling cost of renewable power in the region relates in part to the continued cost reduction of established technologies. However, new technology innovations, such as the higher-efficiency bifacial solar panels being used in recently awarded Egyptian tenders, are also being introduced to drive down costs. In addition to technology considerations, access to low-cost financing is important given that financing costs typically account for about half of the levelised cost of electricity for a utility-scale PV or onshore wind project.

While inexpensive debt financing for renewable energy projects has become the norm for Gulf countries, the ability to obtain such financing is anything but certain for less politically and economically stable MENA countries. Therefore, sustainable investment finance will be an important consideration for many MENA countries in the coming years. In 2018, 69 per cent of Mena clean energy investment was from foreign investors with 65 per cent of this investment from development banks. Therefore, sustainable financing from the region's major development investors, such as the European Investment Bank, World Bank, KfW (Germany), AFD (France) and the European Bank for Reconstruction and Development, is needed. As a promising sign, the European Investment Bank has stated that it will end financing for

fossil fuel energy projects from the end of 2021 and focus on clean energy. Such sustainable finance ambitions are building globally as climate concerns mount. This will in turn support further progress in renewable power across the region.

Looking ahead to 2020, the growth of renewable power in the MENA region will undoubtedly continue, underpinned by positive developments in technology, policy and financing. Countries such as Jordan and Morocco, both ranked by Bloomberg New Energy among the top 10 emerging markets for clean energy investment in 2019, will continue to progress with renewable power based on their leadership in policy, regulation and supportive electricity sector structures.

However, the MENA region's advance in renewable power depends significantly on those countries with the largest regional

electricity markets. Within this context, the UAE, Saudi Arabia and Egypt will be deploying the most new power generation capacity in the region in the coming five years and are among the MENA countries with the most ambitious long-term plans for renewable power. Specifically, the UAE has a target of 44 per cent of its power capacity from renewables by 2050, Saudi Arabia has a target of 27.3GW of renewable power by 2023 and 58.7GW by 2030, and Egypt has a target of 20 per cent of its power capacity from renewables by 2022 and 42 per cent by 2035.

These three countries, with continued growth in their power sectors and demonstrated abilities to acquire low cost renewable power, are well positioned to make significant contributions to the region's renewables progress in the coming decade. However, they will need to prepare their electricity sectors for the flexibility required to integrate the high shares of intermittent renewable energy that are planned. In recognition of this need, Ewec in the UAE has already allowed an optional bid for battery storage capacity in its tender for Solar PV2.

While such energy storage will be increasingly prevalent in regional renewable power tenders, it is just one means of achieving electricity system flexibility. Other options that electricity system planners will need to consider include flexible operation of existing power plants, electricity grid reinforcement and extension, smart grid technologies and demand response from electricity consumers. Hence, in the decade ahead, system-level planning will be the key focus for Mena countries with the strongest commitments to renewable power.

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Delta sees opportunities in Middle East's clean energy programme

Increasing energy efficiency and developing clean energy and smart grids will be key themes in region's power sector in 2020

A BIG PART OF DELTA'S FOCUS IS ON PROVIDING TECHNOLOGICAL INNOVATIONS FOR GREEN ENERGY SOLUTIONS. ARE YOU SEEING A REAL SHIFT TOWARDS CLEAN ENERGY AND EFFICIENCY IN THE MIDDLE EAST?

While the Middle East remains heavily dependent on oil and gas, investment in green energy has picked up in recent years, driven by a combination of demographics, economics, and concerns over limited resources. For the many Middle Eastern countries without massive reserves of fossil fuels and others who realise that their oil and gas reserves are finite, green energy offers a key opportunity to meet growing energy demand, all while alleviating various environmental concerns.

At Delta, we see significant potential for renewable energy in the Middle East region. Solar energy, for example, has enormous potential in GCC countries. Long hours of sunshine in this region are well suited for solar photovoltaic (PV) installation. According to our research, solar PV technology performance in the Middle East and Africa (MEA) region registered a compound annual growth rate (CAGR) of 36% between 2014 and 2018.

In addition to the shift towards clean energy in the Middle East region, we expect the next decade to give rise to a wide range of technologies that will continue to transform our day-to-day lives. These will include everything, from 5G mobile networks and smart building automation solutions, to IoT-based smart industrial applications and solar and EV charging solutions. With a mission "to provide innovative, clean, and energy-efficient solutions for a better tomorrow", Delta is well-positioned to leverage its core competencies in high-efficiency power electronics to enable the future of green energy and nurture the development of sustainable cities and smart manufacturing facilities across the Middle East region over the next few years.

WHERE DO YOU SEE THE MOST OPPORTUNITIES FOR YOUR BUSINESS IN 2020? HOW IMPORTANT IS THE MIDDLE EAST TO YOUR BUSINESS AND PLANNING FOR 2020 AND THE YEARS AHEAD?

Demand for energy-efficient solutions across many verticals is growing, and so is our business in the Middle East region. Today, we see a lot of interest among organisations in the Middle East

and North Africa, both in the private and public sectors, in energy-saving solutions in preparation for the roll-out of new technologies such as 5G networks.

One of the major challenges that come with 5G deployment is the increase in energy consumption. The roll-out of 5G networks will lead to three times more demand for energy and up to five times the demand for new or updated hardware. The infrastructure industry giants have been hard at work for quite some time getting ready to tackle the challenges that come with the vast amounts of possibilities that 5G will allow. With so many connected IoT technologies taking advantage of 5G, the challenge will be to process the expected high volumes of data at high speeds consuming the least energy possible, and the best telecom operators will be those who dedicate their time and resources to invest in energy-saving equipment and solutions.

The demand for cloud and IoT-based green solutions that can achieve energy efficiency in smart cities is also growing across the Middle East region, and has led to an increase in the demand for different data center applications, including modular and edge data centers. In fact, of all the trends shaping future data center development, the demand for edge computing is expected to be one of the most significant.

As for manufacturing, the manufacturing vertical will require smarter IoT-based industrial automation solutions, and we are already witnessing a huge demand for these solutions across the Middle East region. Delta is helping enable smart industrial transformation by paving the way for newer technologies, satisfying the demands of manufacturers, and enabling faster, more flexible small-volume and large-variety production, as well as mixed-model production. Today, we offer our customers across the Middle East and Africa (MEA) region a wide array of smart manufacturing products and solutions.

HOW IMPORTANT IS R&D AND TECHNOLOGICAL DEVELOPMENT TO YOUR BUSINESS? WHAT AREAS ARE YOU FOCUSING ON CURRENTLY?

Delta invests 6% to 7% of the group's annual sales revenue in R&D, and has worldwide R&D facilities in China, Japan, Singapore, Thailand, the US, and Europe. Today, Delta has over 9,000 R&D engineers spread throughout the world with R&D activities coordinated on a global scale.

Our capability for innovative design is what sets us apart from the competition.

With our core competence in power management, we are rapidly expanding into several related businesses such as power systems for data centres, cooling fans and thermal solutions, industrial automation systems, powertrain solutions and power electronics components for EVs/HEVs, high-end projection systems, LED lighting, and renewable energy. We are also actively pursuing development in new areas such as medium voltage drives (MVD), converters for wind turbines, and green buildings.

Delta's telecom power supplies specifically lead the industry with an energy conversion efficiency reaching 98%. In 2012, Delta developed the world's first titanium-grade server power supply with an efficiency rating of up to 96%. For onboard chargers for electric vehicles, Delta takes advantage of high power efficiency of up to 96% with greater user-friendliness, protection, and network integration. In recent years, we have developed high-density and high-efficiency products and solutions which allow the general public to enjoy our innovative green technology. For fan and thermal management, Delta is actively leveraging low-power consumption and low-noise designs to extend our product lines into smart air exchange fans, hot-air blowers, and thermal exchangers.

WHAT DO YOU THINK WILL BE THE KEY THEMES IN THE REGION'S ENERGY SECTOR IN 2020?

When we talk about the key themes in the region's energy sector in 2020, we have to look at three different aspects of energy:

energy production, energy distribution, and energy consumption.

Energy production is one of the key battlegrounds of global sustainability as the race to provide more power for growing populations comes with an inevitable environmental cost.

The focus here will be on renewable energy, as well as energy storage. With a range of dynamic battery energy storage systems, Delta offers an effective and efficient approach that enables energy produced to be stored and then used when required. The Delta lithium-ion battery has proved to be an excellent energy source with a long service life for various applications, including telecom, data center, and residential power backup.

On the distribution side, we expect the focus to be on smart grid and micro grid systems. Smart grid systems enable the network to function like the internet. By using computers, automation and new technologies, the grid can respond in a quicker timeframe, thus, saving costs and responding quickly to potential problems. By utilising the full potential of smart meters, utility companies can remotely switch on and off certain consumers, balancing supply and demand in their grid.

Finally, and as far as energy consumption is concerned, energy efficiency will arguably be one of the most important themes of 2020.

As renewables increase their share of the energy mix across the Middle East, the region will need to increase efficient power consumption and retire older power plants or plants with lower efficiency levels.





Abu Dhabi appoints Japanese developer for major power project

Abu Dhabi-based Emirates Water & Electricity Company (Ewec) has awarded a contract to Japan's Marubeni Corporation to develop the 2.4GW Fujairah 3 (F3) independent power project (IPP).

The Japanese developer signed the power purchase agreement (PPA) and Shareholder's agreement with Ewec on 16 February.

Marubeni will hold a 40 per cent stake in the special purpose vehicle (SPV) set up to develop and operate the plant, with the Abu Dhabi government to hold the remaining 60 per cent stake.

First power from the project is scheduled to come online in summer 2022, with the full capacity to come online by the summer of 2023.

Energy & Utilities reported in early February that Marubeni had been selected as the preferred bidder for the F3 IPP.

Marubeni submitted the second lowest bid in October last year during a competitive tendering process. The Japanese developer's bid of 16.812 7901 fils a kilowatt hour (fils/kWh) was slightly higher than the AED16.7901 fils/kWh second lowest bid submitted by France's Engie.

Ewec was established in 2018 to replace Abu Dhabi Water & Electricity Company (Adwec) as part of plans to unify water production and power generation between Abu Dhabi and the Northern Emirates. Ewec falls under the umbrella of Abu Dhabi Power Corporation.

The F3 IPP will add additional capacity to ADPower's generation asset portfolio. Energy & Utilities recently reported that ADPower had offered to transfer billions of dollars-worth of power and water assets to Abu Dhabi National Energy Company (Taqa) as part of a takeover deal.

Under the proposal submitted by ADPower, the utilities company would transfer the majority of its water, electricity generation and transmission and distribution assets in return for 106 billion convertible shares.

If completed, the combined companies would have power generation assets of 49GW and a total desalination capacity of 58 million imperial gallons a day (MIGD).

Oman to invite bids for 1GW of photovoltaic solar capacity in March

Oman Power & Water Procurement Company (OPWP) is planning to issue tender documents for two planned 500-600MW photovoltaic (PV) solar independent power producer (IPP) projects in March.

After having received prequalification entries from 14 groups in August, OPWP prequalified nine groups in December last year to participate in the upcoming bidding round for the Manah 1 and Manah 2 projects.

According to sources close to the projects, the client is preparing to issue the request for proposals (RFP) to prequalified groups in March.

The following nine groups have been prequalified:

- Abu Dhabi Future Energy Company (Masdar), EDF Renewables (France)
- Acwa Power (Saudi Arabia)
- Eni (Italy), SB Energy (Japan)
- Jinko Power (China)
- Korea Western Power Company (South Korea), Hanyang Corporation (South Korea), Solar Reserve (US), Nafath Renewable Energy (Oman)
- Marubeni Corporation (Japan)
- Power Construction Corporation of China
- Tag Energy, Al-Shanfari Group (Oman)
- Total Solar International (France)

The PV solar plants will be developed at Manah, 150km southwest of the capital Muscat. US/Indian Synergy Consulting has been appointed as financial adviser by OPWP, with DLA Piper providing legal advisory services and Germany's Fichtner providing technical advisory services.

Oman's government is planning for renewable energy to contribute 10 per cent of the country's total generating capacity in the main interconnected system by 2025.

The first 500MW is due to come online in 2022. A consortium led by Saudi Arabia's Acwa Power is developing the Ibri 2 IPP project, having signed the final project agreements in May last year.



EXCLUSIVE: Saudi Arabia receives four bids for 1.4GW second solar round

Saudi Arabia's Renewable Energy Project Development Office (Repdo) received bids from four groups for the Category B projects under the second round of its National Renewable Energy Programme (NREP).

The bidders are:

- Acwa Power (local)/ GIC (Kuwait)
- Marubeni (Japan)
- Masdar (UAE)/ EDF (France)/ Nessma (local)
- Total (France)/ Al-Gihaz (local)

The four Category B projects under the second round have a combined capacity of 1.4GW, and will all be developed as independent power producer (IPP) projects.

Repdo prequalified 60 firms to participate in the bidding process for the second round of the NREP. The prequalified firms include managing partners, technical members

and local managing members for category A projects and managing and technical members for category B schemes.

Repdo's advisers for the second and third rounds are Japan's Sumitomo Mitsui Banking Corporation (SMBC) as lead and financial adviser, Germany's Fichtner as technical adviser and the UK's DLA Piper as legal adviser.

In February, Repdo started the prequalification process for the third round of the NREP, which is planned to include four PV solar projects with a total combined capacity of 1.2GW. Saudi Arabia has set an ambitious target to install 58.7GW of renewable energy capacity by 2030, with Repdo to oversee the development of 30 per cent of this through a competitive IPP tendering programme.



Construction starts on Egypt 250MW wind project

Egypt's Electricity Minister Mohamed Shaker attended the ground-breaking of a 250MW wind power project in the Jabal al-Zeit area of Egypt on 20 February.

The build, own, operate (BOO) West Bakr wind project is being developed by Dutch developer Lekela. Lekela signed the power purchase agreement (PPA) for the project in February last year, and the scheme reached financial close in August.

Lekela signed the initial memorandum of understanding (MoU) for the project in November 2015. The West Bakr wind farm is scheduled to be operational before the end of 2021.

Financing for the project will be provided by the Overseas Private Investment Corporation (Opic), the US government's development finance group, the International Finance Corporation (IFC) and the European Bank for Reconstruction and Development (EBRD).

International financial organisations have played a key role in Egypt's renewable energy programme to date, with IFC and EBRD having provided financing for 30 projects with a total capacity of more than 1,400MW under the second round of the country's ambitious feed-in-tariff (FIT) programme. IFC provided financing of \$500m for 16 projects, while EBRD secured \$635m of funding for 13 projects. Egypt has set a target for 42 per cent of its energy to come from renewable sources by 2035, the second largest target in the region after Morocco.

Artificial intelligence to play key role in building management systems

By Anna Sliwon-Stewart

Senior Analyst & Research Manager, Security and Building Technologies
Technology Research Products & Solutions, HIS Markit

Artificial intelligence (AI) has the power not only to automate buildings but also to make them truly adaptive, smart, and agile, with the use of AI analytics helping to improve operations, reduce inefficiencies, and lower costs across building platforms in a wide range of industries.

While buildings have traditionally been perceived as stiff, fixed forms that merely provided a shell for its inhabitants and for the activities being conducted inside, structures outfitted with building management systems (BMS) are becoming more interactive and responsive to their occupants. As a result, building owners are increasingly interested in what transpires inside buildings at any given time, utilizing the knowledge and insights they obtain to improve building management, create better staffing plans, and reduce the operational costs of maintaining their business infrastructure in the hope of achieving higher profits.

In an ideal scenario, BMS platforms would run building systems based on conclusions drawn through the use of artificial intelligence, machine learning, and other complex statistical methods. The platform would then automatically adjust various subsystem settings without requiring involvement of the facilities manager, except for the approval of fundamental platform-level changes in specific circumstances. While most AI solutions currently available are incapable of operating in such a model scenario, machine learning is increasingly being used across the buildings industry for more efficient operations.

These and other findings can be found in my new report, *Artificial Intelligence in Smart Buildings – 2019*, a comprehensive examination of the potential presented by artificial intelligence in smart buildings, as well as a roadmap showing both opportunities in the market and barriers to the wider adoption of AI-based solutions across a variety of end-user sectors.

MARKET REVENUE AND SEGMENTS

The market for AI analytics in smart buildings was worth \$220.2 million in 2018, equivalent to approximately 9% of worldwide revenue for BMS platforms. But while there is wide acknowledgement that artificial intelligence can offer numerous benefits and efficiency gains for building systems, the adoption of BMS platforms with AI analytics will be relatively slow.

This protracted adoption can be attributed to a number of obstacles, including mistrust of AI, the significantly higher cost of deploying AI-powered platforms, and the limited functions of currently deployed machine-learning

algorithms. Nonetheless, the use of AI in building management is a strong trend, and adoption of AI-powered BMS platforms is projected to increase, especially in new construction projects.

AI ANALYTICS AND BMS PLATFORMS

AI analytics can help improve BMS platform functions in three ways—through analytics built into the platform, via analytics embedded in equipment, and from supplemental analytics software intended to augment specific building operations, such as energy management, comfort control, or predictive maintenance.

Of the three categories, analytics in equipment was the largest, accounting for nearly 50% of global AI analytics revenue in 2018. Examples of equipment covered by this category include AI-powered video surveillance cameras connected to BMS systems, as well as HVAC controllers with machine-learning capabilities. Incorporating AI into equipment is an easy way of adding advanced analytical functionality to the BMS, especially if the end-user is mistrustful of AI or of what it can do to enhance building operations.

Meanwhile, BMS platforms can be classified into three types: energy management (EM), security and safety management (SSM), and all building systems (ABS). The largest is the SSM platform, mainly because these systems are more likely to be integrated with AI-powered video surveillance cameras.

Energy management, however, is the building function most often enhanced by AI analytics, with results from an enhanced system most evident in the form of lower electricity bills.

BENEFITS, CONCERNS, AND CHALLENGES

AI analytics can be used in various industries to realize specific benefits.

For facilities in general, AI-enabled systems can aid in gathering data on day-to-day site elements such as the signing in or signing out of staff, floor occupancies, contractor traffic, and logistical operations. In retail, AI analytics can help improve temperature and humidity control in shopping centers, providing more comfortable conditions to shoppers. In education, end-users are adopting smart building technologies with AI capabilities to modernize facilities for students.

And in facilities that manufacture highly sensitive IT equipment components or medical components, AI and machine learning can help with climate control. If the system is integrated with fire safety, access control, and video surveillance, control of various building processes and operations could be achieved, preventing

incidents that could disrupt production and negatively affect business. Such a comprehensive solution could be highly beneficial for sensitive installations like nuclear power plants, averting accidents that may have potentially devastating or lethal consequences.

Even so, concerns abound on the suitability of using AI analytics for critical infrastructure projects or in the daily operation of a building in which end-users process sensitive data. Proponents of AI analytics argue, however, that deploying the technology can go a long way toward enhancing situational awareness in managers responsible for the safety of facilities, thereby improving security overall.

A big challenge in creating AI-powered solutions that can work with all integration protocols and the various types of equipment used in smart buildings is the standardization of data gathered from every system. Machine learning algorithms and more advanced statistical algorithms can perform increasingly complex learning processes, but the data must be presented through a uniform standard. For the data to be ready for feeding to the smart algorithm, manufacturers may have to add an element to their software that pre-processes the data in real time.

The *Artificial Intelligence in Smart Buildings – 2019* report from Omdia is a component of the Smart Buildings Intelligence Service and is offered in the Building, Home & City Technology research category, under the Smart Building & Building Automation research category. Contact us for more details on the report or if you wish to become a subscriber.

SPOTLIGHT ON AI FOR ENERGY MANAGEMENT

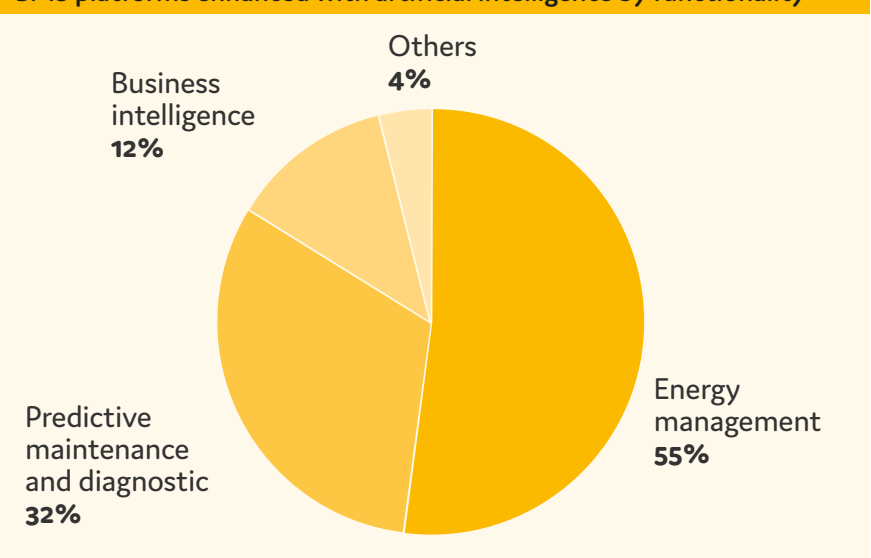
There are a number of smart building platforms available on the market currently. Very often players involved in production of energy management software have

been expanding the functionality of those to include other building processes and make their products more versatile. Energy management integration platforms are designed with the capability to monitor energy domains, such as building automation systems, connected lighting and metering systems in a building. The primary utility of these platforms is to minimize energy consumption and promote greater energy efficiencies.

The functionality managed by BMS platforms which is most often enhanced by AI is energy management, and in 2019 it accounted for 52% of BMS Platform revenues. This is because energy savings and efficiencies that can be gained from enhancing these systems with AI can be most readily realized and are therefore much easier to justify from the budgetary perspective. New buildings are most likely to choose energy management platforms with AI already integrated into the platform, while existing buildings are likely to benefit from analytics thanks to supplemental software platforms that can be attached to the core Building Management System.

There are also a number of sensitive applications where AI-enhanced energy management is strongly beneficial and even desirable. In facilities that manufacture highly sensitive IT equipment components or medical components, AI and machine learning can help with climate control. If the system is integrated with fire safety, access control, and video surveillance, control of various building processes and operations could be achieved, preventing incidents that could disrupt production and negatively affect business. Such a comprehensive solution could be highly beneficial for sensitive installations like nuclear power plants, helping to avert accidents that may have potentially devastating or lethal consequences.

BMS platforms enhanced with artificial intelligence by functionality





Prospects for renewables in water production

Dr Corrado Sommariva, Founder and CEO at SWPC (Sustainable Water and Power Consultants)

A RUN TOWARDS EFFICIENCY

With approximately forty percent of composition of water tariffs being represented by energy, photovoltaic (PV) solar has recently become the winning tool in recent desalination bids.

In recent tenders, developers have been allowed to install solar PV inside the desalination plant premises. This is designed to self-generate part of the electricity required for the desalination process, and therefore mitigate the electricity demand from the grid for values of up to approximately 10 per cent of the overall specific energy consumption. Figure 1 below schematically shows the roadmap towards sustainable desalination in the GCC in the last 20 years : from subsidised energy tariffs that have discouraged the application and development of energy efficient desalination, the industry has gradually opened to seawater reverse osmosis (SWRO). However, it was only recently, in 2017, when SWPC (Saudi Water Partnership Company) introduced a minimum power efficiency of 3.5 kwh/m3 as a mandatory requirement for the new independent water projects (IWPs) in the Kingdom of Saudi Arabia.

Achieving a specific power consumption of 3.5 kwh/m3 seemed extremely challenging to many of the EPC contractors in the industry at the time, but advancements in technology led to this threshold largely being surpassed –

with specific energy consumption today set around 3.1 to 3.2 kwh/m3. Thanks to the installation of solar PV in allowable areas in the power system, plant energy demand from desalination plants has further decreased to below 2.90 kWh/ m3 and we are seeing the development of more efficient PV panels allowing further savings in the networks.

Power savings have, in turn, enabled developers to achieve extremely competitive water tariffs. The same concept is starting to be applied to waste water treatment plants along with the beneficial use of the sludge produced for energy generation. If these developments are applied, the domestic wastewater treatment plant sector may soon become energy and carbon negative.

THE FUTURE: SWRO AND A RENEWABLE ENERGY GRID

On the other hand, with power tariffs as low as 2 US cent/m3, the strive to reduce specific energy consumption in the desalination process may lose importance. In future, the emphasis would be to generate load, rather than to save energy, and to judiciously connect a mainly PV powered grid to desalination plants for sustainable water generation.

The options available to the industry in this case would be endless, and may start with the opportunistic use of SWRO to take advantage of the cheap PV energy generated during the day in order to produce more water during the peak sun

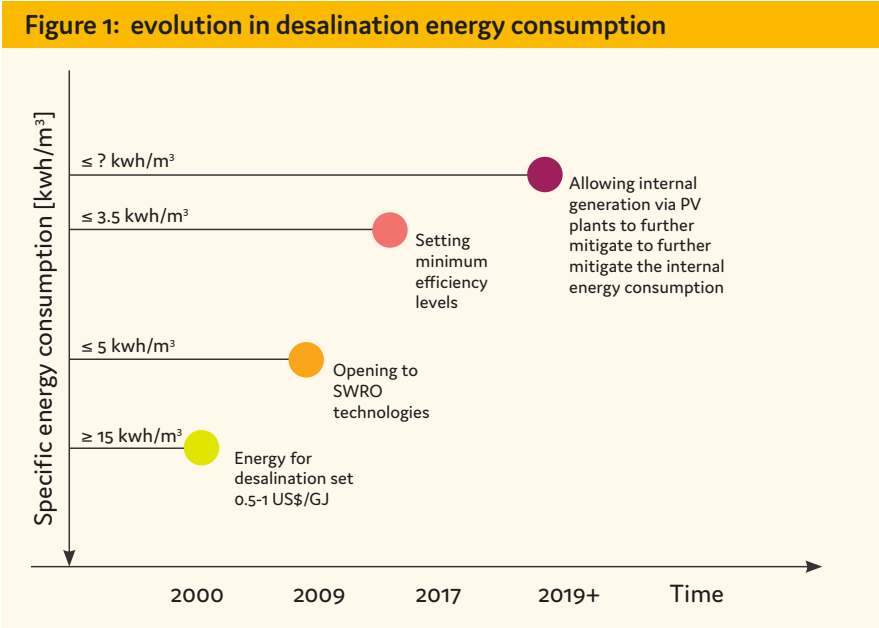
hours when electricity availability exceeds grid demand.

Furthermore, if potable water storage is managed correctly, SWRO can be regarded as an energy absorber - producing more energy when excess electricity is available and producing less when there is significant demands on the grid.

Clearly this scenario would involve a larger installed SWRO capacity and lower plant availability. This mode of operation would reduce the electricity costs, the criticality of pre-treatment and the hurdles of the steady state operation. All this would still result in a lower tariff and no GHG emission.

SMALL CAPTIVE PLANTS SUSTAINABLE AND RENEWABLE OPERATION AND POTENTIAL FOR GROWTH

In parallel, the industry has developed more solutions to combine renewable energy with the process of water desalination. Existing state-of-the-art solar panels face physical limits on the amount of sunlight that can be actually turned into electricity. Normally about 10 per cent to 20 per cent of the sun that reaches the panel becomes power. The rest of this heat is considered as waste. The warmer the panel, the poorer the electricity conversion.



In order to try and combat this, Desolinator, for instance, has developed a new concept using closed-circuit cooling water to control the temperature of the solar PV. The heat harvested from the solar field is in turn transformed in hot water and then used as feedstock for an MED plant. The electric energy is used to operate a variable speed mechanical vapor compressor. The combined use of heat storage and battery accumulators enables a continuous operation of the desalination plant.

A similar concept can be used to many of the new technologies available in the market from low temperature distillation (LTD) to Forward Osmosis (FO) to membrane distillation. A significant amount of heat could theoretically be harvested from all of the installed solar PV fields, and this, in principle, could become an alternative sustainable energy source to a new generation of low temperature thermal driven processes.

POWER FROM SALINITY GRADIENT

Very encouraging results have been obtained in several pilot plants generating power through salinity gradients. The process applied is reverse electrodialysis, a process that, thanks to the application of anodic and cathodic membrane, can generate power using the difference in salinity between two streams.

All desalination plants, but in particular SWRO facilities, generate a reject stream



that is about 30 g/l more saline than the seawater salinity.

Dispersion of this salinity plume often poses environmental issues for natural habitats and diffusers are generally applied in order to decrease the mixing area

between the two streams.

Few power plants in Europe have been commissioned to take advantage of the salinity gradient in river estuaries largely as a result of costs, both CAPEX and OPEX, were not affordable. However, if

technology continues to progress, energy consumption and the environmental impact of the desalination process may drastically decrease – significantly strengthening the relationship between renewables and desalination.

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Tuesday March 3 Programme Highlights

PLENARY SESSIONS Al Multaqa Ballroom	ENERGY DIGITALISATION CONFERENCE Sheikh Saeed Hall 2	RENEWABLE ENERGY CONFERENCE Sheikh Saeed Hall 3
<div><div>Mercedes Vela Monserrate Associate Director - International Affairs Abu Dhabi Global Market (ADGM)</div></div>	<div><div>Katherine Bruce Senior Sustainability Consultant AESG</div></div>	<div><div>Hisham Sumayli Technology Localisation Director KACARE King Abdullah City of Atomic and Renewable Energy Saudi Arabia</div></div>
<div><div>Dr. Waddah S. Ghanem Al Hashmi Hon Chairman Energy Institute - Middle East</div></div>	<div><div>Stuart Harrison CEO Emrill</div></div>	<div><div>Jenny Chase Manager, Solar Insight Bloomberg New Energy Finance, Switzerland</div></div>
<div><div>Yousif Al Ali Executive Director Masdar Clean Energy</div></div>	<div><div>Marc Helfter Disruptive Innovation Director, Corporate Strategy – Innovation & Business Development Hager Group</div></div>	<div><div>Silvia Macri Senior Analyst IHS Markit</div></div>
<div><div>Graeme Lindsay Sims Executive Director RSB for Electricity & Water</div></div>	<div><div>Henrique Pereira Senior Manager, Energy Services Energy Efficiency and Renewable Energy Office Ras Al Khaimah Municipality</div></div>	<div><div>Cornelius Matthes CEO Kuwekeza Holdings + SVP Dii Desert Energy</div></div>
<div>Don't miss:<ul style="list-style-type: none">• Demand, digitalisation and decarbonisation• Policy vs. technology• Decarbonisation and sustainability development goals</div>	<div>Don't miss:<ul style="list-style-type: none">• Smart buildings in action• Enhancing workplace wellness through the office environment• Adopting technologies that can drive energy efficiency, optimisation, and occupant health and productivity</div>	<div>Don't miss:<ul style="list-style-type: none">• Opening session• Expert panel - identifying market leaders and trends by segments - seeing tomorrow's market today</div>



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