DEWA R&D
The Dubai Electricity and Water Authority (DEWA) was formed on 1st January, 1992, by a decree issued by His Highness Sheikh Maktoum bin Rashid Al Maktoum.

**Key Highlights & Statistics**

- More Than 5 decades of activities
- Power Generation: 10,200 MW Capacity
- Water Production Capacity: 470 MIGD
- More than 11,000 Employees
- More than 700,000 Daily Customers
2050 Dubai Clean Energy Strategy Pillars

**Infras-tructure**
- MbR Solar Park
- R&D Center
- Innovation Center
- Dubai Green Zone

**Environment Friendly Energy Mix**

**Dubai Clean Energy Strategy Pillars**

**Legislation**
- Solar PV
- Green Fund
- Dubai Green Zone

**Funding**
- Up to AED 100bn clean energy funding to 2030

**Building Capacities and Skills**

75% clean energy by 2050

Through international partnerships

**Government of Dubai**

Dubai Electricity & Water Authority
Mohammed bin Rashid Al Maktoum Solar Park

Approx. 5000 MW

Solar park total installed capacity by 2030

- **13 MW**
  - First phase (PV) Completed
  - Lowest Price Worldwide USD 5.4 Cent/kWh

- **200 MW**
  - Second phase (PV) Completed

- **800 MW**
  - Third phase (PV) In Progress
  - Lowest bid worldwide in 3rd phase USD 2.99 Cent/kWh

- **700 MW**
  - Fourth phase (CSP) In Progress
  - Record bid of USD 7.3 Cents/kWh (night storage)
“Without a vision to guide our path, and without ambition that knows no limits, we can never build a bright future for generations to come”

His Highness Sheikh Mohammed bin Rashid Al Maktoum
Vice President and Prime Minister of the UAE and Ruler of Dubai
HH Sheikh Mohammed bin Rashid Al Maktoum, Vice-President and Prime Minister of the UAE and Ruler of Dubai, launched a National Innovation Strategy on October 2014 with the aim of making the UAE one of the most innovative nations in the world within seven years.

**TRACKS**

- stimulating environment for innovation
- government innovation
- private sector innovation
- prepare individuals STEM

**Priority Sectors**

- Renewable Energy
- Transport
- Education
- Health
- Water
- Technology
- Space
R&D at DEWA

- Part of the Business Development and Excellence Division
- Development of infrastructure at MBR solar park and projects portfolio from 2014
  - R&D center
  - Outdoor testing facility operational since 2015
  - 3D printed R&Drone lab operational by Q1 2018
  - SGI lab operational by approx. Q3 2018
  - R&D areas
- Total investment of AED 500 Mn up to 2020
- Growing research team
R&D department – areas of research

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

- Robotics and AI
- Infrastructure management
- PMO
Existing partnerships and memberships
R&D department – areas of research

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

Robotics and AI

Infrastructure management

PMO
Infrastructure

Details

1. R&D Center
   - 4,500 sqm facility at MBR park. Indoor laboratories and Research support facilities. Reliability lab

2. SGI Lab
   - SGI and Energy Storage Testing facilities, both indoor and outdoor for validation test: 1.5 MW grid simulator, 6 slots for testing energy storage systems

3. R&Drone Lab
   - In-situ 3D printed lab (first in the world) for drones and robotics R&D activities

4. Outdoor Testing Facilities
   - OTF at the MBR solar park with focus currently on solar, water and energy efficiency

5. Lab Equipment
   - Testing equipment for laboratories across all research areas

6. IT Infra
   - Development of a R&D IT network, incl. the physical layout, database management and data analytics
R&D Center

- Location: MBR Solar Park (Qudra area), close to the OTF facilities
- Surface area: ca. 4,500 sqm
- Status: Under construction, planned completion by Q1 2018, operational by Q1 2018 (exp.)
- R&D focus: DEWA’s R&D activities and personnel, incl. Solar, Water, EE, SGI, excl. drones and 3D printing (separate lab) and some separate SGI activities
- Other functions: space dedicated for clean tech incubator and SME activities
2 Smart Grid Integration lab

- Location: MBR Solar Park within R&D Center
- Status: Under development - operational by Q3 2018 (exp.)

- Main R&D focus: validation test-rig for energy storage technologies, incl. grid simulator and multiple slots (6x) for testing ESS in parallel (each 250 kW)
Location: MBR Solar Park (Qudra area), R&D Center
Surface area: ca. 100 sqm
Status: Completed, operational since Q4 2017)

R&D focus: DEWA's R&D activities and personnel on drones (prototyping, electronic systems, mechanical and SW labs)
Others: includes outdoor testing area for drones and rovers, with nets for safe drone operations
3D printed R&Drone Lab

- **Drones:** Sensors / Actuators (Robotics) / Electronics / System integration / Regulation

- **R&D area focus**

- **Capabilities & support:**
  - Prototyping Lab
  - Electronic Systems Lab
  - Mechanical Lab
  - Software Lab
Outdoor Testing Facility – OTF
Existing and planned pilots and equipment at OTF:

- Advanced Solar Resource station
- Solar PV/BIPV testing
  - PV testing facility for modules
    - 30 PV modules (testing since 2015)
    - Solar trackers
    - Etc.
  - BIPV (cube) testing facility
- CSP (Dish Stirling) test site
- PV RO and AWG pilots
- Other pilots from DEWA acceleration and incubation programs
Outdoor Testing Facility – OTF

OTF Expansion – Project completed

BIPV Cube
Lab equipment

Equipment

1. Performance characterization
2. Accelerated aging
3. Mechanical testing
4. Electrical safety testing
5. Support facilities
6. 3D printing laboratory
IT infrastructure
R&D department – areas of research

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

Robotic and AI

Infrastructure management

PMO
R&D areas

Solar
- Resource Analysis
- Soiling Analysis & Dust Modeling
- PV/BIPV testing (outdoor / indoor reliability)
- Technology Pilot program
  - Solar thermal testing
  - CPV testing
  - Hybrid CSP/PV systems

Water
- Drinking water, reclaimed water, waste water technologies
- PV+solar technologies
  - PV reverse osmosis
  - Atmospheric water generation
  - Forward Osmosis

Smart Grid Integration
- Grid Integration
  - Smart grids
  - Mini / micro grids
  - VPP
- Energy Storage
- Load modeling
- EV Chargers

Energy Efficiency
- Solar Decathlon Middle East 2018 and 2020
- DSM / Demand Response
- Smart Energy management
- Energy-efficiency: G, T, D

Special R&D projects & others
- Other topics
  - Hydrogen
  - others
- Special initiatives
  - Dubai 10X
  - Expo2020
  - DFA, DFUC
  - Free electrons

Robotics and AI
- Robotics (incl. sensors/actuators, IoT)
- Drones
- Artificial Intelligence
- Modelling and Forecasting, big data
- 3D print prototyping
- Additive manufacturing
Solar Projects

R&D Program

- PV Module Performance and Reliability Testing
- Soiling Effect on PV modules
- Solar Resource Assessment and Forecasting
- Other Solar Technology Performance Testing
- Others

R&D Projects

- Evaluation/benchmarking of different PV technologies
- Evaluation/benchmarking of BIPV technologies
- Assessment of performance of commercial PV installations in UAE
- Solar Dust
- Testing of Robotic Cleaning Systems
- Self-Cleaning Coatings
- Ground based Solar Resource Assessment
- Satellite based modelling of Solar Resource and System performance
- Solar radiation spectrum study
- Evaluation of CSP-Stirling system
- Evaluation of CPV Technologies
- Development of solar hybrid demonstrator
- Solar App
- Support to DEWA Solar operations
Solar Projects
R&D department – areas of research

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

- Robotics and AI
- Infrastructure management
- PMO
## Water Projects

<table>
<thead>
<tr>
<th>R&amp;D Program</th>
<th>R&amp;D Projects</th>
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</table>
| **PV RO**   | ▪ Testing of 100 kW PV RO facility for decentralized water desalination (pilot set up operating since Jan 2017)  
▪ Membrane fouling and operation modelling |
| **Atmospheric Water Generator** | ▪ Testing of AWG setup (pilot under procurement) |

**Collaboration with Suqia – UAE Water Aid Foundation**
R&D department – areas of research

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

- Robotics and AI

- Infrastructure management

- PMO
## Smart Grid Integration projects

<table>
<thead>
<tr>
<th>R&amp;D Program</th>
<th>R&amp;D Projects</th>
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<tbody>
<tr>
<td>Power Electronics</td>
<td>▪ Virtual Power Plant (VPP)</td>
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<td>▪ Mobi and Wireless chargers for Electric Vehicles</td>
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<td>▪ Interfacing the grid</td>
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<td>Energy Storage</td>
<td>▪ Utility-Scale ESS Field Test Evaluation</td>
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<td>▪ Residential scale battery testing</td>
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R&D department – areas of research

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

- Robotics and AI

- Infrastructure management

- PMO
Energy Efficiency projects

Solar Decathlon Middle East (2018 and 2020)

http://solardecathlonme.com/
Energy Efficiency projects
Overview of R&D department

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

R&D areas

- Robotics and AI

Infrastructure & support functions

- Infrastructure management
- PMO
Special R&D projects

**R&D Projects**

- Development and testing of solar-driven MW-scale PEM electrolyzer pilot at MBR facilities for grid-services, mobility and other industrial uses

- Preliminary evaluation of alternative resources

1. Incl. wave, tidal, stream/current, no ocean thermal
2. e.g., fusion-fission, and feasibility study for nuclear research and educational reactor development in UAE
Overview of R&D department

- Solar
- Water
- Smart Grid Integration
- Energy Efficiency
- Special R&D projects & others

Robotics and AI

Infrastructure management

PMO
Robotics and AI projects

R&D Program

- AI and data analytics
- Drones and robotics
- 3D Printing and Additive Manufacturing

R&D Projects

- Predictive Analysis for Load Management
- Drone Bird Management
- Drone for Good Competition
- Image processing
- Buildings construction
- Critical spare parts development
- Rapid prototyping
Research for Knowledge growth

DEWA R&D CENTER
THANKS