SEU
Sustainable Energy Unit
Kingdom of Bahrain
وحدة الطاقة المستدامة
مملكة البحرين

The Kingdom of Bahrain

National Renewable Energy Action Plan (NREAP)

EXECUTIVE SUMMARY

January 2017

Endorsed by Cabinet Resolution No 2384-08 (2016) and No 2392-2 (2017)

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"**Bahraini nationals and residents enjoy a sustainable and attractive living environment**

Protecting our natural environment will include directing investments to technologies that reduce carbon emissions, minimize pollution and promote the sourcing of more sustainable energy"

- Bahrain Economic Vision 2030


SUSTAINABLE DEVELOPMENT GOALS
1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS

EXECUTIVE SUMMARY

BACKGROUND

The Kingdom of Bahrain, despite being a small island country, possesses abundant renewable energy resources, including solar and wind that have been largely untapped. Renewable energy is a clean, non-exhaustible, and local source of energy, an important component for building a reliable, resilient, and sustainable energy system. Today the Kingdom's power generation system relies exclusively on natural gas, which is a scarce and diminishing resource. Current projections on the availability of gas reserves suggest that Bahrain will no longer be able to meet its domestic consumption, and will have to rely on imported gas as early as 2018. By introducing renewable energy into the energy mix and adopting energy efficiency policies, Bahrain can reduce its reliance on imported energy, prolong the lifetime of the indigenous gas resource, and optimize its economic value.

In clear recognition of the benefits of renewable energy, the Kingdom of Bahrain is committed to the development of renewable energy initiatives by harnessing the country's renewable energy resources. The National Renewable Energy Action Plan (NREAP) represents the Kingdom's efforts to deliver the sustainable energy transition envisioned in the Economic Vision 2030 and the Government Action Plan 2015-2018. This Plan also represents the implementation of the Kingdom's regional and international commitments under the Paris Agreement, the United Nations Sustainable Development Goals, and the League of Arab States Renewable Energy Framework.

The Plan identifies feasible renewable energy options for Bahrain, sets the targets, and proposes policies and actions to harness the identified renewable energy opportunities. The NREAP has been prepared by the Sustainable Energy Unit (SEU) through broad consultations with key stakeholder groups, including the Electricity and Water Authority, the National Oil and Gas Authority, the Ministry of Housing, the Ministry of Works, Urban Planning and Municipalities, the Ministry of Industry, Commerce and Tourism, the Supreme Council for Environment, the Economic Development Board, the Bahrain Defense Force, large industry groups, academia, and others.

TARGETS

Based on a broad survey of Bahrain's resource potential, economic viability of various renewable energy technologies, the current energy situation, and the country's unique geographical conditions, the Plan sets a national renewable energy target of:

-5% by 2025

-10% by 2035

The targets are based on the projected peak load electricity capacities, excluding industry's own generation, and equate to 255 MW of installed capacity by 2025, and to 710 MW by 2035. The targets will be met by a proposed renewable energy mix consisting of solar, wind, and waste to energy technologies.

BENEFITS AND IMPACT

Integrating renewable energy in the energy mix can help Bahrain optimize the use of indigenous gas resources, reduce greenhouse gas emissions, make the economy more competitive, decrease electricity peak demand, and improve energy security in the long-term. Achieving the 5% renewable energy target will result in:

- Clean energy generation of approximately 480 GWh per year
- Annual savings of 5,700,000 MMbtu of natural gas
- Annual financial savings of BD 1.6 million
- Reduction in greenhouse gas emissions by 392,000 tonnes of CO2 per year
- Attraction of more than BD 140 million of investment.

POLICIES TO ACHIEVE TARGETS

To achieve the stated targets and attract private sector investment in renewable energy technologies, the following complementary policies are proposed:

	Policy 1	Policy 2	Policy 3
	Net Metering	**Tender-based Feed-in Tariffs**	**Renewable Energy Mandate for New Buildings**
Objective	Enable **consumers** to generate on-site, grid-connected, renewable energy power	Attract **private investors** to develop renewable energy projects through a competitive procurement process	Require **new buildings** and real estate developers to integrate renewable energy technologies in the building design
Target group	Residential, commercial and industrial electricity customers	Renewable energy developers and large electricity customers	New building and real estate developers
Incentive for target group	Reduced electricity bill through on-site power generation and the ability to credit the excess electricity fed back to the grid	Long-term power purchase agreement	Reducing energy demand of the building from the grid (reduced electricity bill)

The details of each policy will be outlined in relevant documents and regulations.

RENEWABLE ENERGY DEPLOYMENT STRATEGY AND PROJECTS

In Bahrain, land is a scarce resource, as such the deployment strategy of renewable energy focuses on decentralized urban generation, large-scale generation on available land, and offshore generation.

I. DECENTRALIZED URBAN GENERATION (100-150 MW)

Decentralized renewable energy applications, such as rooftop solar photovoltaic (PV), building integrated PV, solar lighting, biogas plants, and micro wind turbines, can be successfully integrated in the urban environment. This allows not only transitioning to a more sustainable energy system, but also engages all members of the society, including households, businesses, academia, and governmental authorities in building smart, modern, and resilient cities and communities. Viable opportunities for decentralized urban generation include:

- Solar systems for new housing units
- Solar systems for government buildings
- Decentralized solar in urban developments (solar lighting, solar parking)
- Decentralized rooftop solar on existing residential and commercial buildings
- Other decentralized renewable energy systems (biogas, micro wind).

II. LARGE-SCALE GENERATION ON AVAILABLE LAND (50-100 MW)

Economies of scale favor the development of large-scale renewable energy power plants. Therefore, it is prudent to consider the deployment of large-scale renewable energy where land is available. Viable opportunities for large-scale generation on land include:

- Solar farm on Askar landfill site
- EWA renewable energy initiative (5 MW hybrid solar and wind project)
- Utility-scale renewable energy plants by large industry groups
- Solar farms in new town developments
- Waste to energy plant at the Tubli wastewater treatment plant
- Renewable energy plants on other available land.

III. OFFSHORE GENERATION (50 MW)

Offshore renewable energy development presents an opportunity to pursue large-scale generation and achieve higher renewable energy targets. Bahrain has a good wind regime and shallow waters, therefore pursuing offshore wind power could be a cost-competitive option. Other offshore renewable energy options include integrating renewable energy in offshore large infrastructure projects connecting Bahrain and its GCC neighbors. This will not only generate clean energy, but also strengthen the regional partnerships in building a more sustainable future. Identified offshore generation opportunities include:

- Near shore or offshore wind farms
- Integrating renewable energy technologies in large infrastructure projects (causeways and railway systems).

GOVERNANCE

I. SUSTAINABLE ENERGY UNIT

The Sustainable Energy Unit (SEU) was established in November 2014 and is the designated agency for promoting sustainable energy policies and practices in the Kingdom of Bahrain. As such, the SEU will lead the coordination efforts in implementing the NREAP, and will provide technical assistance in the deployment of renewable energy projects. The SEU's responsibilities are to:

- Coordinate implementation activities among all stakeholders through developing partnerships and organizing regular coordination meetings;
- Inform stakeholders on the progress of implementation of the NREAP;
- Draft renewable energy policy regulations and support the establishment of standard operating procedures for their implementation;
- Carry out feasibility studies, resource potential assessment, cost-benefit analysis of various technology options and business models, as well as oversee the implementation of pilot projects;
- Provide technical assistance in developing tendering documents, drafting requests for proposals, evaluating bids, and assessing outcomes of pilot projects;
- Carry out information dissemination and awareness raising campaigns through launching a dedicated website, organizing press conferences, promoting renewable energy at various public events;
- Organize and support capacity building and training activities for government and non-government stakeholders.

II. NREAP IMPLEMENTATION FOLLOW-UP COMMITTEE

The Committee will be composed of high-level representatives of key government and non-government institutions who would play the role of change agents to provide guidance, support and oversight of the implementation process of NREAP. The Committee will be chaired by the Minister of Electricity and Water Affairs, and may include representatives from the Electricity and Water Authority, the Ministry of Finance, the Office of the First Deputy Prime Minister, the Ministry of Industry and Commerce, the Ministry of Housing, the Ministry of Works, Urban Planning and Municipalities, the Ministry of Oil, and the Supreme Council for Environment. The Committee will meet on a quarterly basis. The Committee's responsibilities are to:

- Oversee the implementation of the NREAP and facilitate its execution;
- Identify action items to overcome implementation issues and challenges;
- Put recommendations and suggest vactions to relevant ministries;
- Decide on making changes in the NREAP if required;
- Discuss the progress in the implementation process.

SETTING PLAN INTO MOTION

This section presents the top ten actions to set the Plan into motion. Some of these are fundamental activities that should be implemented quickly to enable further progress, others have already begun and are in the process of implementation. The top ten actions are set out below:

- Develop and approve net metering regulations;
- Deve lop grid code, and other technical requirements for small-scale solar PV systems;
- Designate 50-100 government buildings with large roof areas for the private development of solar PV systems through the tender-based feed-in tariff scheme;
- Based on available wind speed data compile a detailed wind atlas for Bahrain;
- Launch a feasibility study on integrating renewable energy sources in large infrastructure projects such as causeways;
- Designate a batch of new housing units to implement solar systems as pilot projects;
- Designate Askar landfill site for the development of the large-scale solar PV farm;
- Explore the possibility of extracting energy from sludge at the sewage treatment plants;
- Launch a prefeasibility study for offshore wind power generation;
- Launch a pilot waste to energy project.

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