



مؤسسة قطر
Qatar Foundation
للتربية والعلوم وتنمية المجتمع
for education, science and community development

Unlocking human potential. لإطلاق قدرات الإنسان.

Qatar Environment and Energy Research Institute (QEERI)

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Senior Research Director



القطر
Qatar Foundation

Unlocking human potential.

QATAR NATIONAL RESEARCH STRATEGY (QNRS)

Qatar's Research Priority Areas – In support of Qatar 2030 Vision

**Energy &
Environment**



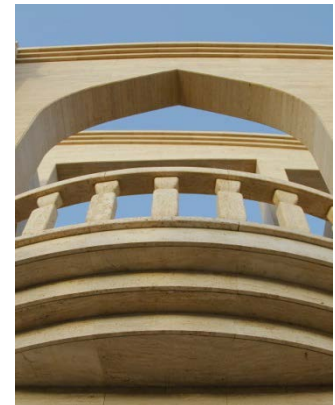
**Computing &
Information
Technology**



**Health &
Biomedical**



**Social
Sciences,
Arts and
Humanities**



QEERI – National Research Institute

Research & Development Spectrum



- Established in 2011
 - Mission – Driven Research
 - 120+ Research Staff – Rapid Growth
 - Hamad Bin Khalifah University (HBKU)
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QEERI Overview

Vision

To become a leading research center with global impact through addressing the national energy and water security grand challenges

Strategic Objectives

1

Assist and expedite the introduction of off-grid and grid-integrated photovoltaic and energy storage technologies by providing scientific and engineering solutions to the deployment of 1GW solar power in Qatar

2

Enhance the sustainability of water resources by providing scientific and technological solutions basis for energy-efficient water desalination, co-produced and waste water treatment and reuse, Qatar's aquifers recharge, and climate change impact

3

Catalyze the creation of an industrial ecosystem for energy and water security through local and international partnerships

4

Enhance research culture and build a pool of Qatari researchers in Energy and Water in Qatar



QEERI Overview

Research Thrust Areas

Energy Security Grand Challenge

1.1 Smart Grid

1.2 Photovoltaics

1.3 Energy Storage

1.4 Energy conservation

Water Security Grand Challenge

2.1 Desalination & Water Treatment

2.2 Water Reuse

2.3 Water Recharge

2.4 Climate Change & Atmospheric Science

2.5 Water conservation

Research Projects

- Grand Challenges
- Seed
- ED Directed
- Sponsored Projects

QEERI Overview

Capabilities

Energy Sciences & Technology Division

Materials Science and Engineering Group

Energy Storage/ Electrochemistry Group

Solar Energy Group

Water & Environmental Science & Technology Division

Water Desalination and Reuse Group

Environment and Chemical Sciences group

Climate Change

Simulations & Measurement Sciences & Technology

Theory and Modeling Group

Measurement Sciences Group

Characterization Group

Energy Security GC

Active Projects

Total EGC : 16

Smart Grid

- 1) Demand Response for Efficient Operation and Peak Load Reduction
- 2) Forecasting Methods for PV Power and Load Prediction
- 3) Smart microgrid Pilot at QSTP**
- 4) Development of a Smart High Efficiency Photovoltaic Inverters for Qatar Environment
- 5) Power electronics and System Modeling (GC)

Photovoltaics

- 1) Material: Crystalline silicon fabrication, defects engineering and simulation
- 2) Silicon and tandem solar cells
- 3) Photovoltaic Modules reliability in desert environment at QSTP and w/ Kahramaa**
- 4) Solar Atlas**
- 5) Synthesis of Perovskite materials (low cost & high efficiency)
- 6) Interfacial Stability and Charge Transport in Perovskite Solar Cells
- 7) Perovskite based solar cells: device optimization

Energy Storage

- 1) Battery materials and molecular design and discovery: sodium- and sulfur-based**
- 2) Battery technology development for flow and solid state
- 3) Battery Engineering & Diagnostics
- 4) Battery Technology Deployment

Water Security GC and Environment

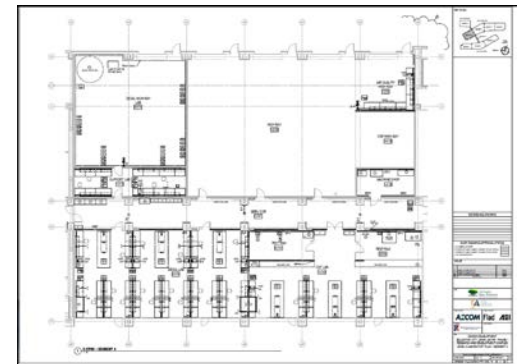
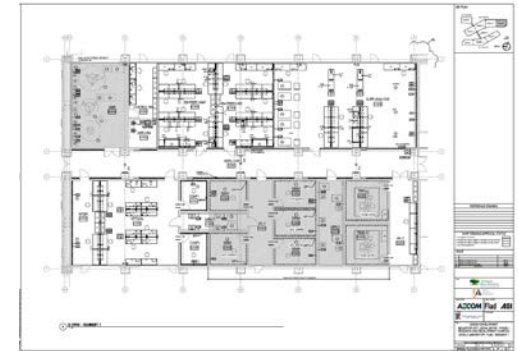
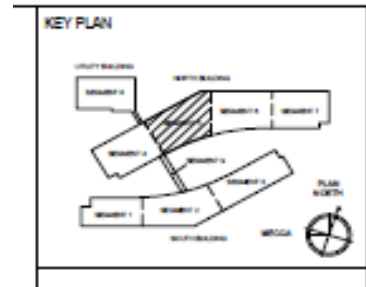
Active projects

Total WGC : 9, Seed: 2, ED: 2

Desalination & Water Treatment	<ol style="list-style-type: none">1) Design, Development and Fabrication of Membranes for Water Treatment and Desalination Technologies2) Feasibility of using Forward Osmosis (FO) for MSF pretreatment with QEWC3) Characterization, Optimization and Implementation of a Novel Forward Osmosis Based Seawater Desalination Process.4) Modeling of Forward Osmosis for Desalination (seed) to engineer new membranes5) New Frontiers for Characterization of Emerging Contaminants in Water (seed)6) Constrains on Desalination Plants and the Challenge to Water Security (GC)
Water Reuse & Conservation	<ol style="list-style-type: none">1) Advanced Treatment of Co-Produced Water from Oil & Gas fields and Enhanced Oil Recovery with Low Salinity Water Injection with RasGas, Total and QP2) Water Quality and Reuse3) Water Conservation and Demand Management Practices & Technologies (GC)
Water Recharge	<ol style="list-style-type: none">1) Ground water flow modeling2) Property measurement and multiscale models
Climate Change & atmospheric Science	<ol style="list-style-type: none">1) Atmospheric Photochemical Exchange & Transport Modeling with QMD2) Climate Change Impact s & Adaptations for Arid Environments (ED)

State of the Art Laboratories

- Electron Microscopy
- Spectroscopy
- Materials Synthesis
 - Wet chemical
 - Physical and CVD
- Catalysis and Environmental Chemistry
- Membranes development
- Desalination capabilities
- Nanofabrication capabilities
- Silicon Growth facility (GEN 2) and wafering
- Solar cell fabrication capabilities
- Clean room
- Dry room
- Grid Integration Laboratory



Collaboration

- **Objective: Buy down scientific, technical and deployment risk in the two grand challenge projects**
- Organize a joint workshop in Doha between Hungarian and Qatari Researchers to identify Collaborative Projects of Mutual Interest
- Initiation and operation of joint collaborative projects for potential funding from **Qatar National Research Fund – QNRF** (www.qnrf.org)
- Research opportunities for university faculty and graduate students at QEERI working on core programs
- Sabbaticals or adjunct appointments for University faculty at QEERI
- Use of facilities and new tools
- Shared programs that leverage funding from international/ Qatari agencies