# Hybrid Renewable Energy-RO Desalination System and Three phase Mini grid for remote desert Areas in Egypt

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# Content of Presentation

- Introduction: RE barriers, First HEEPF project, Second HEEPF project and HYRESS Project
- STDF Project: 100 Kw Hybrid PV/Wind system
- RDI project
- Future Activities: Energy Water and Food Nexus
- Other projects
- Our Dream

# RENEWABLE ENERGY BARRIERS

- Lack of Awareness
- Lack of Successful Examples to be imitated (Lack of showcases)
- Lack of Incentives

**Problems In The Desert:**

- LACK OF WATER AND ELECTRICITY
- NON-SUSTAINABLE ENERGY

# Innovation and Ex-novation

# Lack of Awareness

Awareness can be achieved by:

- Educational Programs
- Training pro grams including On Job Training (OJT)
- Continuing education Programs

**REC Activities:**

- Development of lab course in the agricultural application of solar and wind energy (First HEEPF project)

(First HEEPF project)

# Lack of Awareness

Activities:

2- Development of RE Center (www.areac-agr.com) - ( Second HEEPF Project)

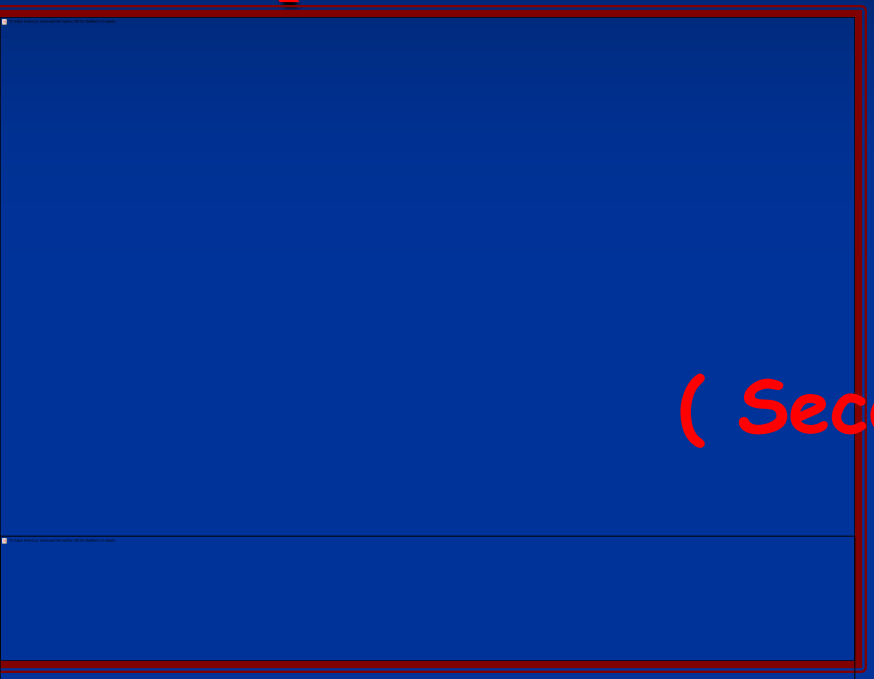
# Lack of Awareness

Activities:

2- Development of RE Educational Program and courses – Second HEEPF Fund

3- Development of e-learning program in RE – Second HEEPF Fund

# E-learning in 5-RE Courses (www.areac-agr.com)





( Second HEEPF Project)

( Second HEEPF Project)

www.areac-agr.com

E-Learning Lab

تم انشاء جمعية للطاقة
المتجددة

# Successes Tools

**Doing things better is not enough – we have to do better things**

**This leads to Sustainability**

# Lack of Successful Examples to be imitated (showcases)

**Activity:** The HYRESS Project (FP6)

Hybrid Renewable Energy Systems to Supply Services in Rural Settlements of Mediterranean Partner Countries

# The HYRESS consortium

- Agricultural University of Athens, Greece
- Alexandria University, Egypt

- ISET, Germany
- University Cadi Ayyad, Morocco

- ITER, Spain
- ANME, Tunisia

- WIP, Germany
- Clean Power, Greece

# HYRESS project objectives

- Design and install hybrid RE system in remote areas
- Apply modular system architecture:
  - all generators and loads AC coupled
- Perform technical and social monitoring and evaluation of the system

# Site Justification

The selected site “ East of EL-Gaar Village” at  Wadi El-Natroon.

The site has both predictable wind energy as well as an abundance of sunlight. Thus, this is a natural application for a hybrid system.

# HYRESS Site at Wadi El-Natroom

# Why hybrid?

- Hybrid RE systems, (i.e. systems that combine more than one renewable energy technologies), are more versatile than single systems and thus most promising for remote areas far from the grid

# Hybrid energy system configurations: The Modular System

The modular hybrid power supply concept proposes the coupling of all sources of energy, storage media and loads on the AC-side.

# Advantages of the Modular Hybrid RE systems

- Simplicity in System Design
- Expandable, can be run autonomously or be connected to a larger grid
- Offer higher reliability and supply security
- Lower power cost for the consumers
- Production of AC single phase
- The AC-side structure provides standardization, quality assurance and serial production
- The coupling on the generation technologies on the AC side offers the possibility of placing the generators far apart from each other (distributed generation)

# Lay out of the Hybrid system

5 kW wind

7.6 kWp PV

Wind inverter

PV inverter

Sunny sensor box

Diesel gen 5 kVA

Batteries and management inverter

Loads (pump, RO, houses)

Battery 1500 Ah, 48 V

Computer Phone line

# AU HYRESS system site

# Hyress system

PV

Batteries

Wind Turbine

SMA Inverters

Smart Mini Grid

RO Desalination Units

# System components

PV Sharp Technology

Wind Turbine

SMA Inverters

Batteries

# The electric loads

1- Water Pump

2- Water RO Desalination Unit

3- Mini Grid  and houses

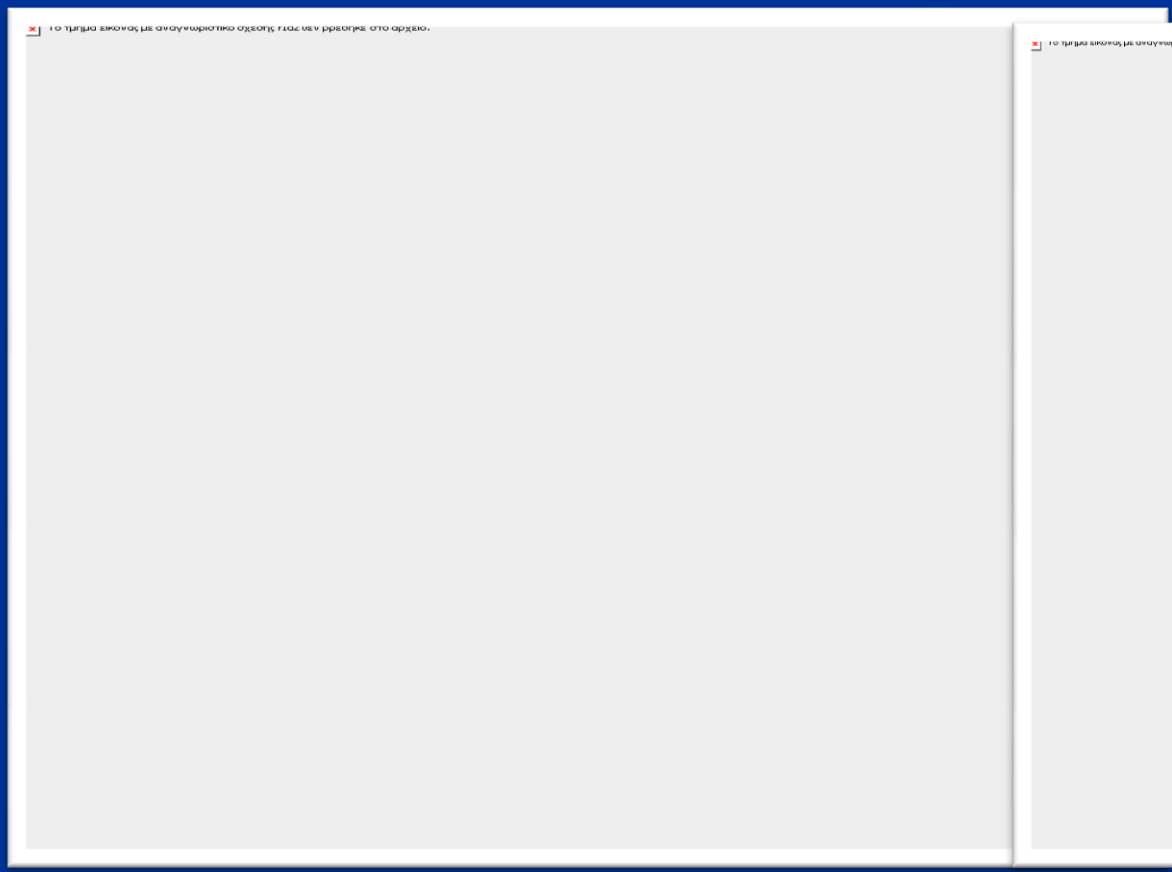
Smart Micro Grid

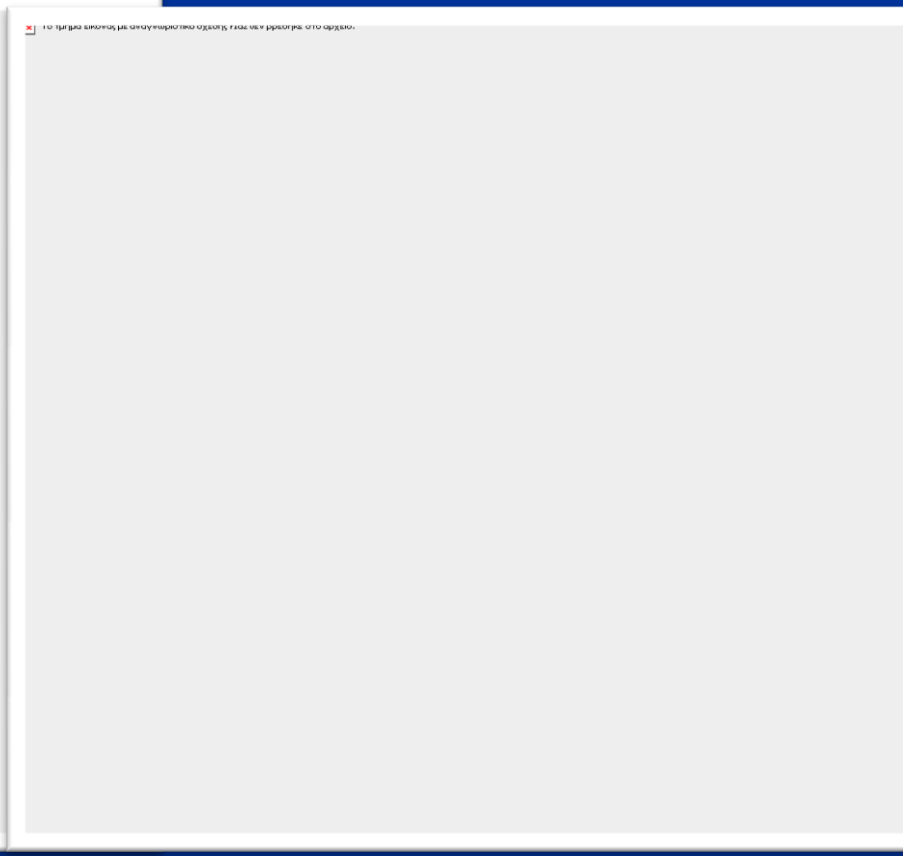
RO Desalination Unit

# HYRESS SYSTEM as a Training Unit and Showcase

*HYRESS Team and farmers during Workshop activities*

# AU president Visit to the site during student training program





# RDI Visit During a training program to Sudanese Engineers

**Lack of Successful Examples to be imitated(showcases)**

# STDF Project: Development of Three Phase Mini-Grid – PV-Wind Hybrid System for Water Desalination

# Objectives (Develop a showcase)

- 1- Develop, combine, install commission and operate an Autonomous RO desalination- Hybrid RE unit

- 2- Develop, combine, install, test and assess the performance of low-cost three phase- mini grid- hybrid RE system to provide remote communities with reliable grid-quality electricity.

# Lay out of the HYRESS Hybrid system

5 kW wind

7.6 kWp PV

Wind inverter

PV inverter

Sunny sensor box

Diesel gen 5 kVA

Batteries and management inverter

Loads (pump, RO, houses)

Battery 1500 Ah, 48 V

Computer Phone line

# 100 KW HYBRID WIND/PV SYSTEM
# (50 KW PV AND 50 KW WIND)

# REC is planed to be a host of different RE technologies and different RE-Desalination technologies

Old HYDESS station

New STDF system

- Hybrid RE technologies( solar, wind, biomass, Hydrogen and fuel cell,… etc.
- Hybrid Desalination technologies ( RO, MSF, NF,…. Etc
- Different types of solar cell technologies (thin film, Mono crystalline , Polycrystalline cells,… etc)
- Different solar energy applications ( PV, CSP, Solar water heating systems, solar dryers, .. Etc)
- Solar Greenhouses

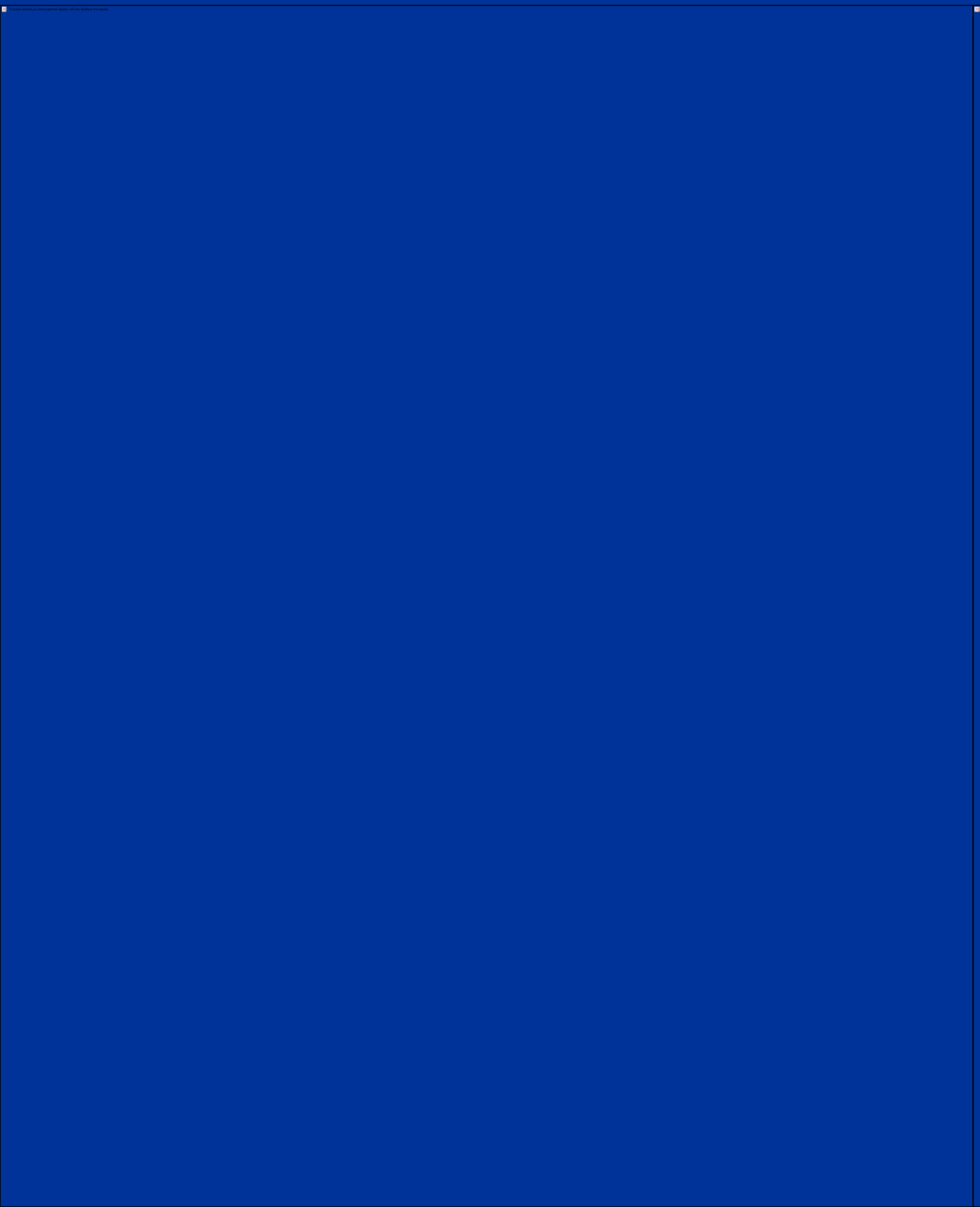
Wind inverters

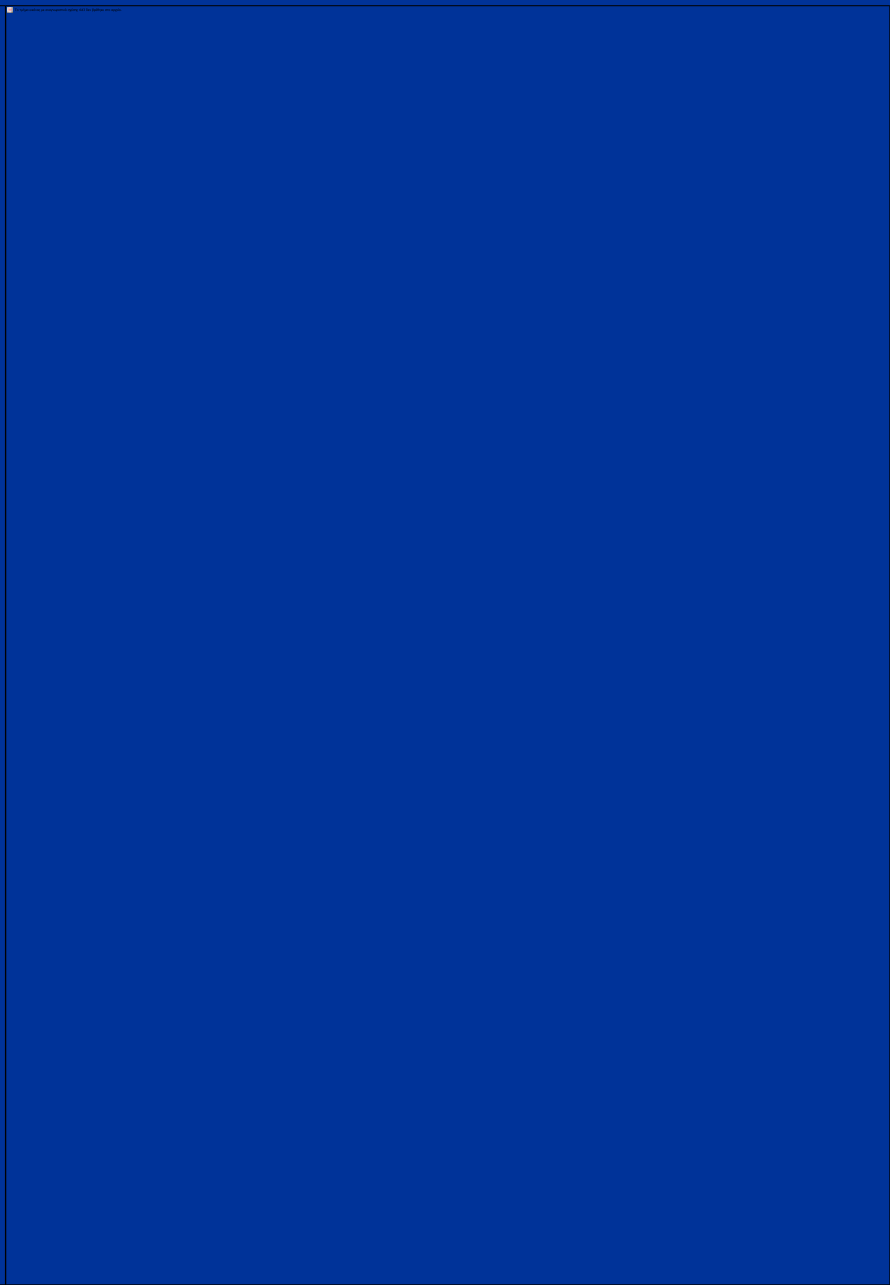
Sunny Island inverters

Batteries

Three phase solar inverters

# Desalination Unit





# REC site is planed to be a host of different RE technologies and different RE-Desalination technologies

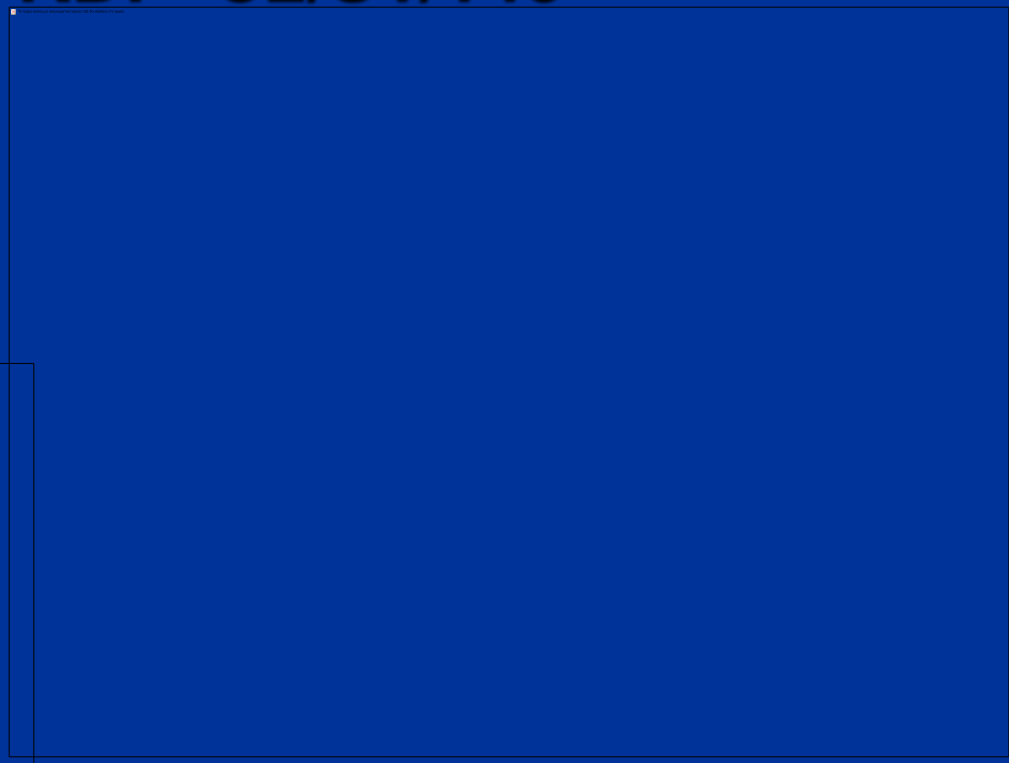
- Hybrid RE technologies( solar, wind, biomass, Hydrogen and fuel cell,… etc.
- Hybrid Desalination technologies ( RO, MSF, NF,…. Etc
- Different types of solar cell technologies (thin film, Mono crystalline , Polycrystalline cells,… etc)
- Different solar energy technology ( PV, CSP, Solar water heating systems, solar dryers, .. Etc)
- Solar Greenhouses

# LACK OF WATER AND ELECTRICITY

**Activity:**

**Innovative Renewable Energy (RE) Driven - Multi Stage Flash (MSF) System with Salts Precipitator and Nano Filtration (NF) Feed Water pre Treatment (RE-NF-MSF)-, contract # RDI - C2/S1/148**

# Innovative Renewable Energy (RE) Driven - Multi Stage Flash (MSF) System with Salts Precipitator and Nano Filtration (NF) Feed Water pre Treatment (RE-NF-MSF)-, contract # RDI - C2/S1/148

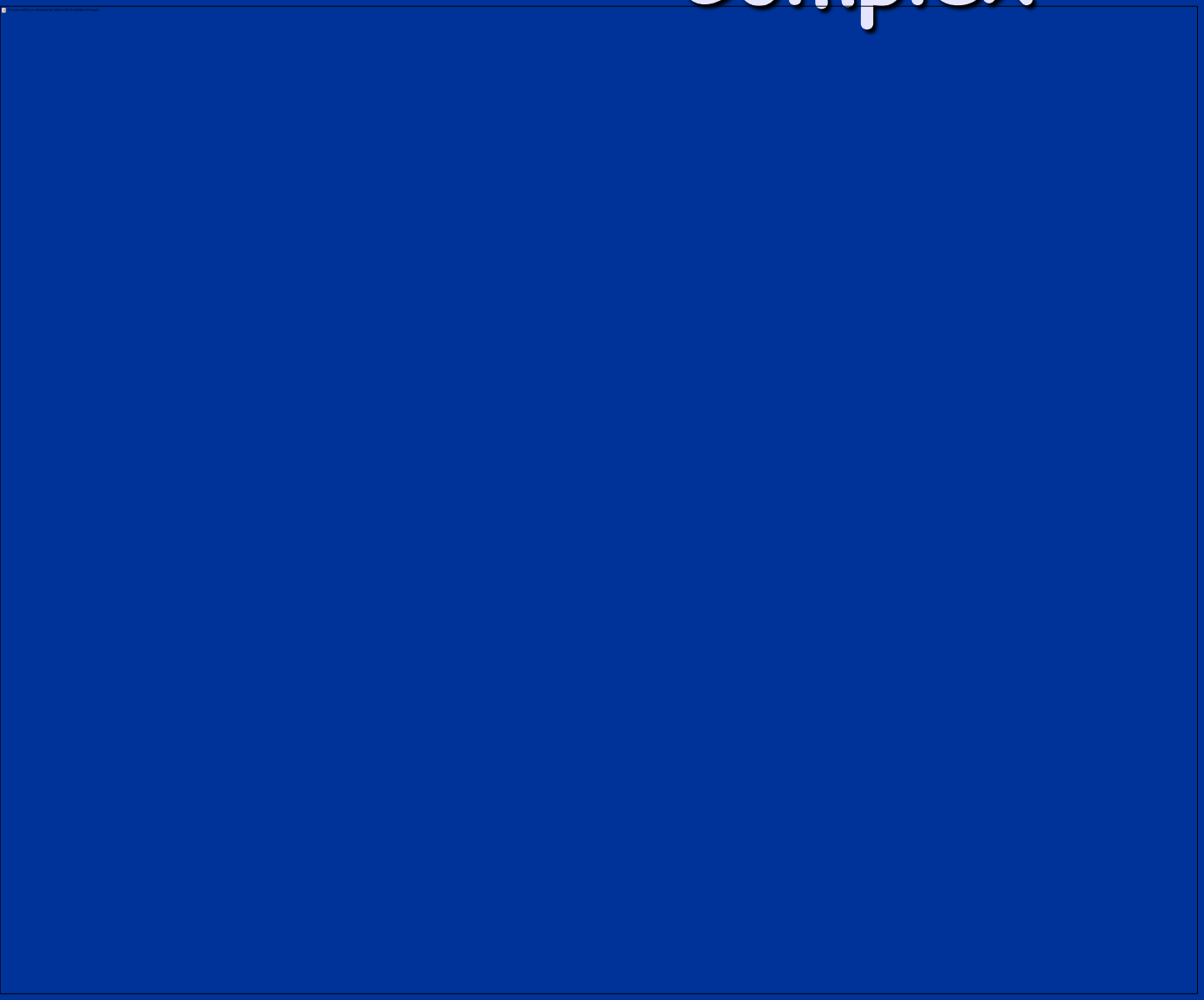


# *What Our Hybrid  System would be after 5 Years?*

# Nexus Approach

**Energy, water and Food Nexus**

# Integrated Water/Food/Energy Complex



Brine water is pumped to Evaporation ponds inside Greenhouse

# Water: Use It, Reuse It or Lose It

fertilizer

# هل هناك حلول؟
# رؤية مركز الطاقة المتجددة

- لابد من وجود وعى عام وسياسة للدولة لدعم الطاقة المتجددة
- تحديد تعريفة شراء الطاقة المتجددة
- اعطاء قروض طويلة الأمد بدون فوائد لشراء أجهزة الطاقة المتجددة
- إعفاء ضريبى بقيمة القرض
- السماح بربط النظم الكهربية للطاقة المتجددة بالشبكة الموحدة والسماح ببيع الكهرباء المولدة من تلك النظم لشركات توزيع الكهرباء (الدولة)
- إعفاء جميع مكونات نظم الطاقة المتجددة من جميع الضرائب والجمارك بما فيها ضريبة المبيعات

# هل هناك حلول؟ رؤية مركز الطاقة المتجددة

- اصدار التشريعات لألزام الشركات الصناعية والمنتجعات السياحية بتوفير 20 % من احتياجاتها من الطاقة من الطاقة المتجددة
- لابد من اطلاق العديد من المبادرات التى تشجع استخدام الطاقة المتجددة مماثلا "لمبادرة حاسب لكل بيت"

على سبيل المثال " مليون بيت شمسى "Million Solar Roof"

- تشجيع البحوث التطبيقية فى مجال الطاقة المتجددة
- ادخال مقررات أو مناهج الطاقة المتجددة ضمن برامج التعليم فى مصر لزيادة وعى الخريج بتقنيات الطاقة المتجددة
- اعداد نشرات ارشادية لتوعية المواطنين و طلاب المدارس و القيادات التنفيذية فى الأحياء والمحافظات ومتخذى القرارات وراسمى السياسات- بأهمية الطاقة المتجددة

# What else?

## 1- New FP7 project:

Mediterranean Science, Policy, Research & Innovation Gateway (Med Spring)

Three societal Challenges:

- Food security
- Water scarcity
- Renewable energy

## 2- New ENPI Project: Green Energy for Green companies (GRENCO)

## 3- BIPV ?????

# OUR DREAM

1- محور قناة السويس
2- أستصلاح 4 مليون فدان
3- تنمية الساحل الشمالى

# Thank you and have a Solar Day