NATO ‘Science for Peace’
SfP-982620


Follow-up meeting
Al Akhawayn University of Ifrane February 12-13, 2009

Khalid Benhamou - PPD (Morocco)
NATO: Network of Cooperation

- **NATO Countries (26)**
  Belgium, Bulgaria, Canada, Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Turkey, United Kingdom, United States.

- **Partner Countries (23)**
  Albania, Armenia, Austria, Azerbaijan, Belarus, Bosnia & Herzegovina, Croatia, Finland, Georgia, Ireland, Kazakhstan, Kyrgyz Republic, Moldova, Montenegro, Russia, Serbia, Sweden, Switzerland, Tajikistan, the former Yugoslav Republic of Macedonia(*), Turkmenistan, Ukraine, Uzbekistan.

- **Mediterranean Dialogue Countries (7)**
  Algeria, Egypt, Israel, Jordan, Mauritania, Morocco, Tunisia.

- **Total: 56 countries**
NATO SfP-982620 PROJECT OBJECTIVES

• Applied research capacity building around common strategy
  • Sustainable Energy
  • Technology integration through industrial Synergies
  • Leverage human resources

• Reinforce role of education and research in national energy decision choices

• Develop competence in (renewable) energy branches of the future, through integrated applications (centralized and distributed)
NATO SfP-982620 PROJECT OBJECTIVES

• Complementary Working Teams through a Science for Peace Project Platform on a regional level (Academic and Industrial network) in Morocco and Mauritania.

• This Partnership can benefit from other Mediterranean Partnership dialogue countries of NATO, and contributions of NATO member Countries (Europe and North America)

• Success measured not only in terms of intellectual property production, number of patents, etc. but also in terms of relevant partnerships essential in all applied research activities.

Technology – University/R&D Platform - Industry
PROJECT PROGRESS
Wind Resource Assessment

• Wind Resource Assessment of the Trade Winds --- Status 2/5
  ✓ Instruments Acquisition
  ✓ Installation of Instruments
• Data Collection
• Data Processing / Wind Mapping
PROJECT PROGRESS
Small Wind Turbine Deployment Program

• Assessment of Small Wind Turbine Technologies --- Status 2/5
  ✓ Identify type of Equipment (Small Wind Turbine)
    ✓ Technology used and reliability
    ✓ Quality materials and design
    ✓ Costs
• Visit Equipment Manufacturers
  • Availability
    • Collaboration interests/potential
  ✓ Establish Manufacturer agreement
• Equipment Procurement
  ✓ Competitive bidding
  • Thorough Evaluation
• Installation of wind turbines in test benches
• Systems integration
• Deployment (Maroc Telecom & ONE-PERG / MAURITEL & APAUS)
PROJECT PROGRESS
Wind Energy Industrial Applications

• Wind Energy Industrial Applications --- Status 2/5
  • Centralized
    • Power production (CERPHOS, SNIM, SONELEC)
    ✓ Desalination (CERPHOS, ONEP, SNDE)
    • Electrolysis (CERPHOS, SNIM)
  • Distributed
    • Telecom infrastructures (MAURITEL-MAROC TELECOM)
    ✓ Remote electricity access (APAUS)
    • Desalination (ONEP-SNDE)
    • Electrolysis (ONEP-SNDE)
PROJECT PROGRESS
Hydrogen Applied Research

• Hydrogen Applied Research --- Status 1/5
  ✓ Hydrogen Integrated Production
    ✓ PEM, Alkaline, Hypochlorite & Chlor-Alkali Electrolysis
  • Hydrogen Storage
    • Pressurized Hydrogen tanks (all uses)
    • Metal Hydrides (distributed energy only)
  • Hydrogen Utilization
    • Energy
      • Fuel Cells (Maroc Telecom, Mauritel)
      • Internal Combustion Engines (CERPHOS, SNIM)
    • Non-Energy
      • Phosphate processing (CERPHOS)
      • Iron-Ore processing (SNIM)
## PROJECT PROGRESS
Criteria for Success Table

<table>
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<td>Intermittent Energy Storage alternatives</td>
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8/25 32%
NATO MEDIEVANEAN DIALOGUE PARTNERS

MOROCCO:
SAHARA WIND INC. (PPD)
AL AKHAWAYN UNIVERSITY OF IFRANE
ENSA - ECOLE NATIONALE SUPÉRIEURE DES ARTS ET MÉTIERS
EMI - ECOLE MOHAMMEDIA DES INGENIEURS
ENSET-ECOLE NORMALE SUPERIEURE DE L'ENSEIGNEMENT TECHNIQUE MOHAMMEDIA
FST – FACULTÉ DES SCIENCES DE TETOUAN
FSR - FACULTÉ DES SCIENCES DE RABAT
FSM - FACULTÉ DES SCIENCES ET TECHNOLOGIES DE MOHAMMADIA
FST – FACULTÉ DES SCIENCES DE KENITRA
CERPHOS: OCP GROUP
ONEP - OFFICE NATIONAL DE L'EAU POTABLE

MAURITANIA:
UNIVERSITE DE NOUAKCHOTT - FACULTE DES SCIENCES ET TECHNIQUES
CRAER – CENTRE DE RECHERCHE APPLIQUE ENERGIES RENOUVELABLES
ISET ROSSO – INSTITUT SUPERIEUR D'ENSEIGNEMENT TECHNOLOGIQUE
MAURITEL MOBILE – MAURITEL S.A.
APAUS – AGENCE DE PROMOTION POUR L'ACCES UNIVERSEL AUX SERVICES
SNDE – SOCIETE NATIONALE DE L'EAU
ANEP – AGENCE NATIONALE DE L'EAU POTABLE ET D'ASSAINISSEMENT
SNIM – SOCIETE NATIONALE INDUSTRIELLE ET MINIERES
SAFA – SOCIETE ARABE DES FERS ET D'ACIERS.

NATO COUNTRIES PARTNERS

UNITED STATES: (NPD)
U.S DEPARTMENT OF STATE -OFFICE OF GLOBAL CHANGE – BUREAU OF OCEANS AND INTERNATIONAL ENVIRONMENTAL AND SCIENTIFIC AFFAIRS (OES)
FRANCE:
COMMISSARIAT A L'ENERGIE ATOMIQUE CEA
GERMANY:
MINISTRY OF ECONOMIC AFFAIRS AND ENERGY OF THE STATE OF NORTH RHINE-WESPHALIA - M.NRW
TURKEY:
UNITED NATIONS INDUSTRIAL DEVELOPMENT ORGANIZATION – INTERNATIONAL CENTRE FOR HYDROGEN ENERGY TECHNOLOGIES UNIDO-ICHET

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