Solar Thermal Cooling in Morocco
Feasibility Study & Pilot Project

American Moroccan Competencies Network Forum

New York – June 23, 2012

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المملكة المغربية
ROYAUME DU MAROC
الوزارة المكلفة بالمغاربة المقيمين في الخارج
Ministère Chargé des Marocains Résidant à l'Étranger

EMBASSY OF
THE KINGDOM OF MOROCCO
Washington DC

Consulate General of the Kingdom
Of Morocco
New York
U.S.A

American-Moroccan Competencies Network
AMCN

Thank You
&
Welcome

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SOLAR HEATING & COOLING PROGRAMME
INTERNATIONAL ENERGY AGENCY

Task 48
Quality Assurance and Support Measures for Solar Cooling

International Energy Agency
Solar Heating and Cooling Program

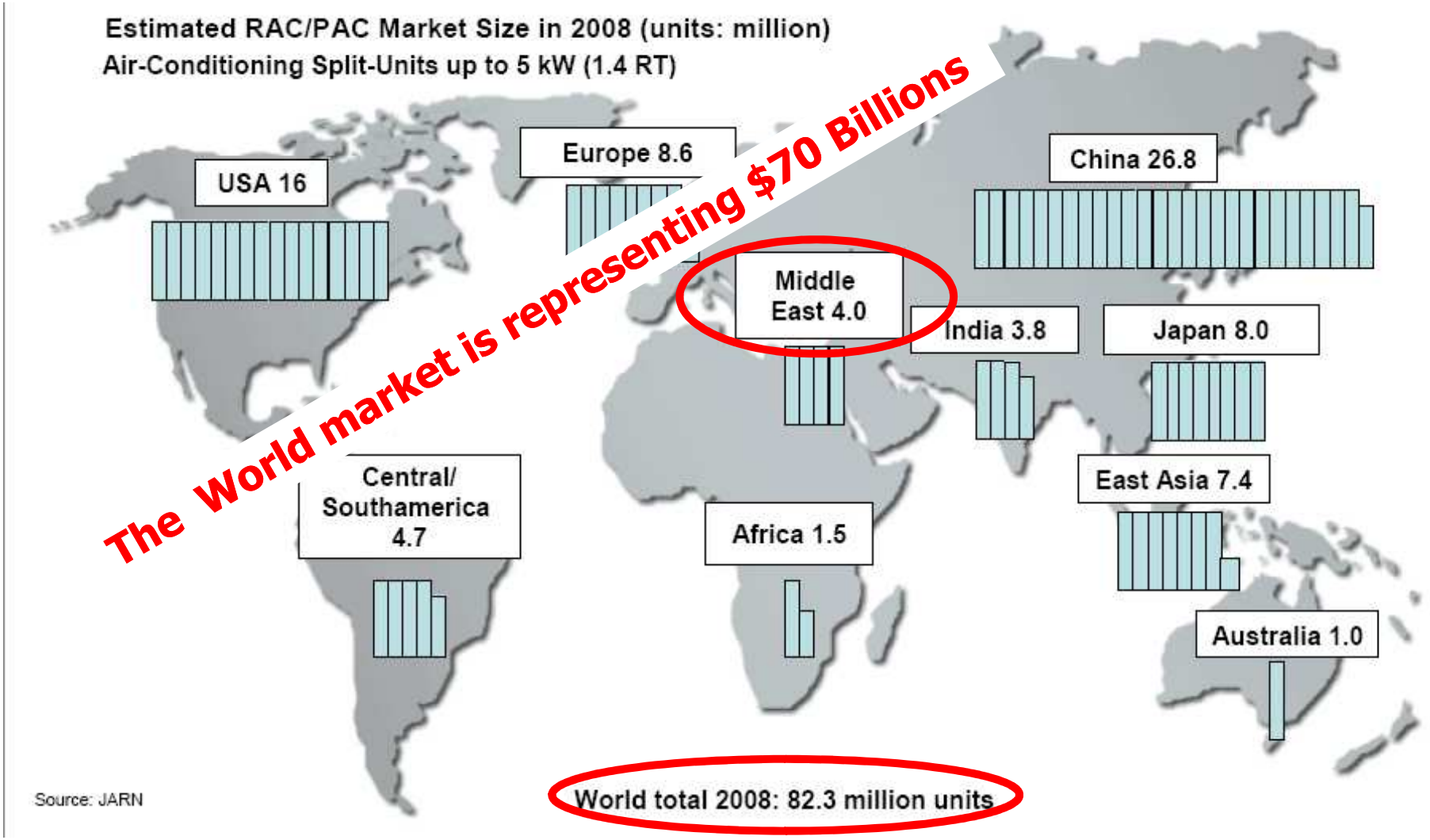
IEA SHC TASK 48:

"Quality assurance and support measures for solar cooling"

Duration: 3.5 years (October 2011 - March 2015)

- Subtask A: Quality procedure on component level
- Subtask B: Quality procedure on system level
- Subtask C: Market support measures
- Subtask D: Dissemination and policy advice

Introduction



Source : Uli Jakob, SOLARNEXT 2009

Morocco’s Climate and the need for AC

The number of installed electric Air-Conditioning split-units are in constant increase that put a huge burden on our national electric grid, and therefore on the nation energy budget

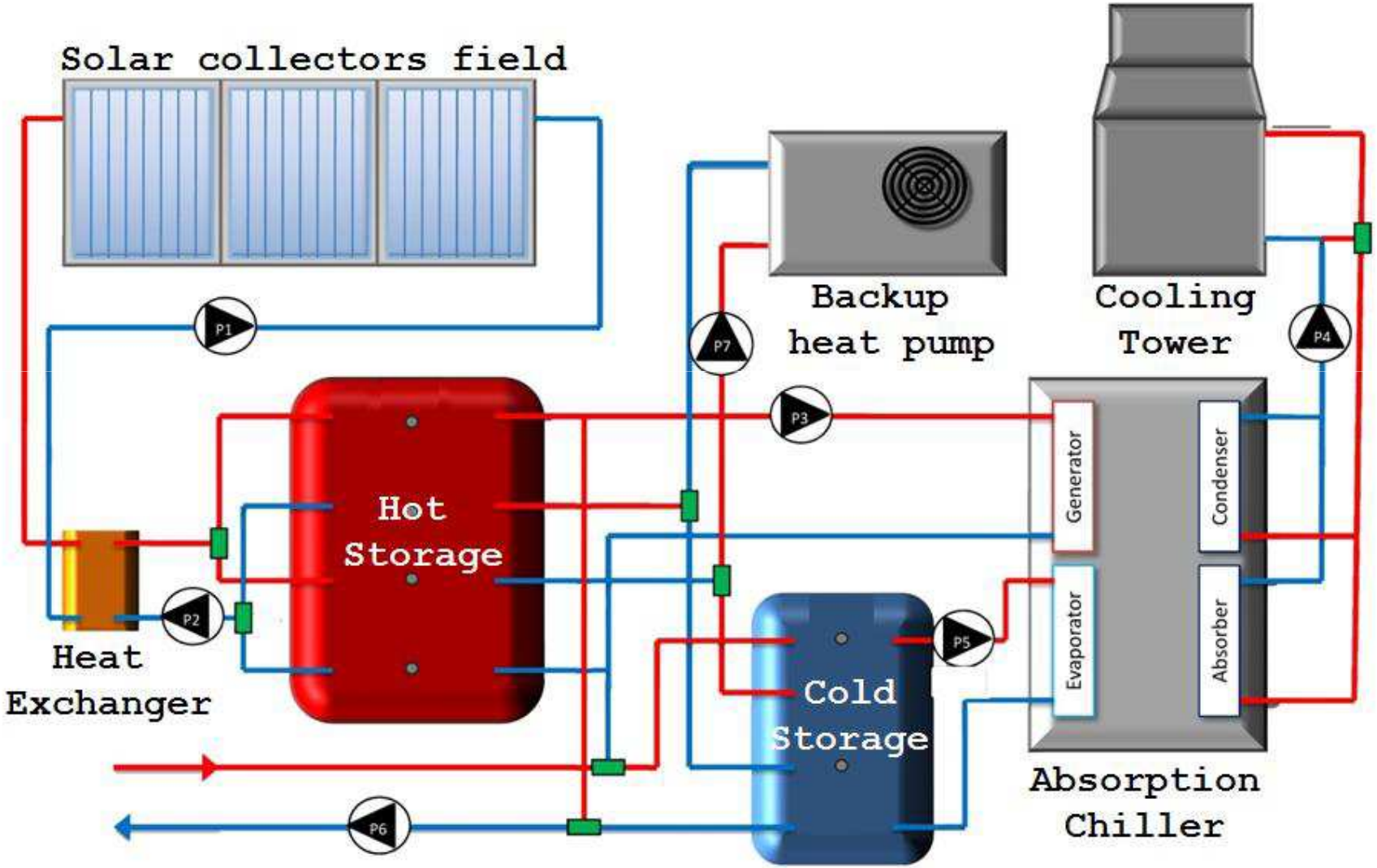
Project Description

1. Design of a complete solar thermal cooling system (Pilot Project) with the collaboration with two senior students from one of the Moroccan engineering schools that concentrate in renewable energies.

2. System will be installed at the school where it can be monitored and data collected for further analysis.

3. Analysis of solar cooling technology in the fruit processing sector.

Typical STC Piping System



Small Capacity Chillers

Sortech

Invensor

SonnenKlima

Pink

Climatewell

EAW

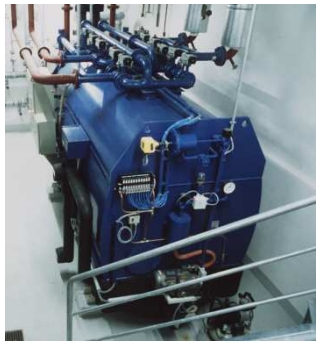
Ago AG

Robur

Medium and Large Capacity Chillers

Broad (China)

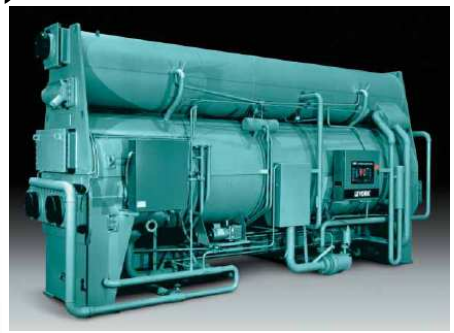
SWAC-10 (China)



Maekawa (Japan)

Yazaki (Japan)

Thermax (India)

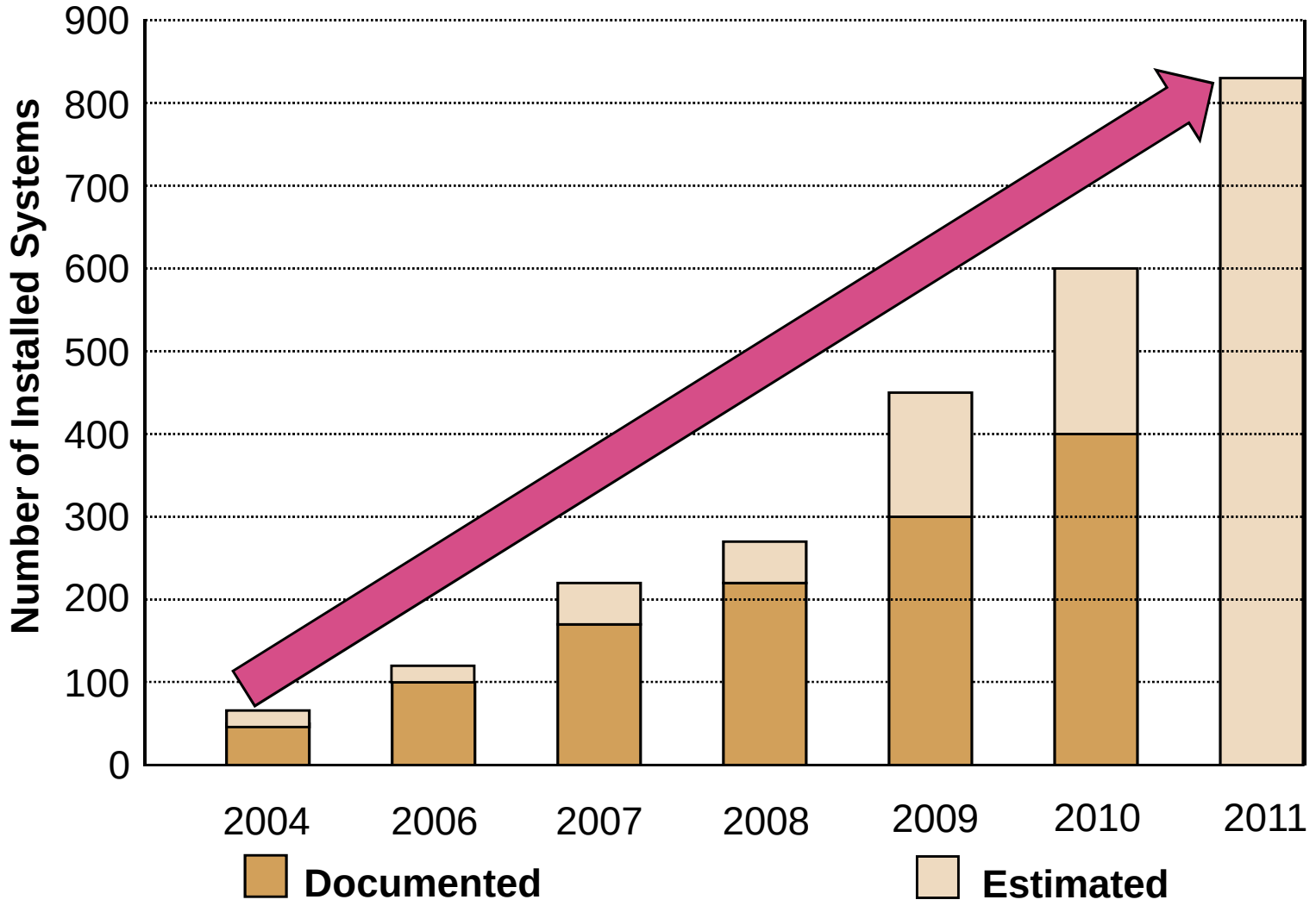


York (USA)

Dunham Bush (Russia)

Kawasaki (Japan)

Worldwide Estimated Market of STC



About 150 new installations in 2010 and 2011 (+30%)

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Project Objectives

1. Evaluate the feasibility of thermally driven solar air conditioning in Morocco considering local climate, energy and water costs.

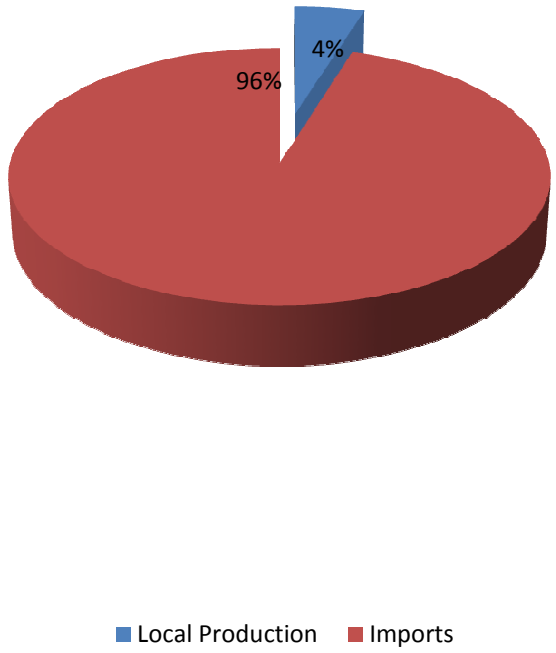
2. Identify local capabilities for technology development and deployment.

3. Analyze most cost-effective applications and technologies considering Moroccan economy and technology availability.

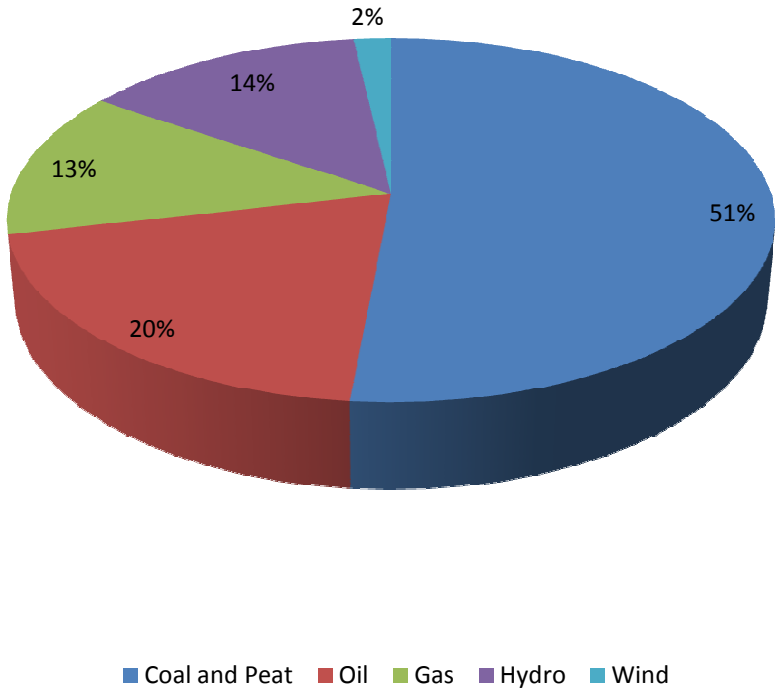
4. Organize and publish real pilot performance data, validating feasibility analysis assumptions.

Morocco's Energy Portfolio

Total Energy Consumption in 2009 (16.46 MTOE)

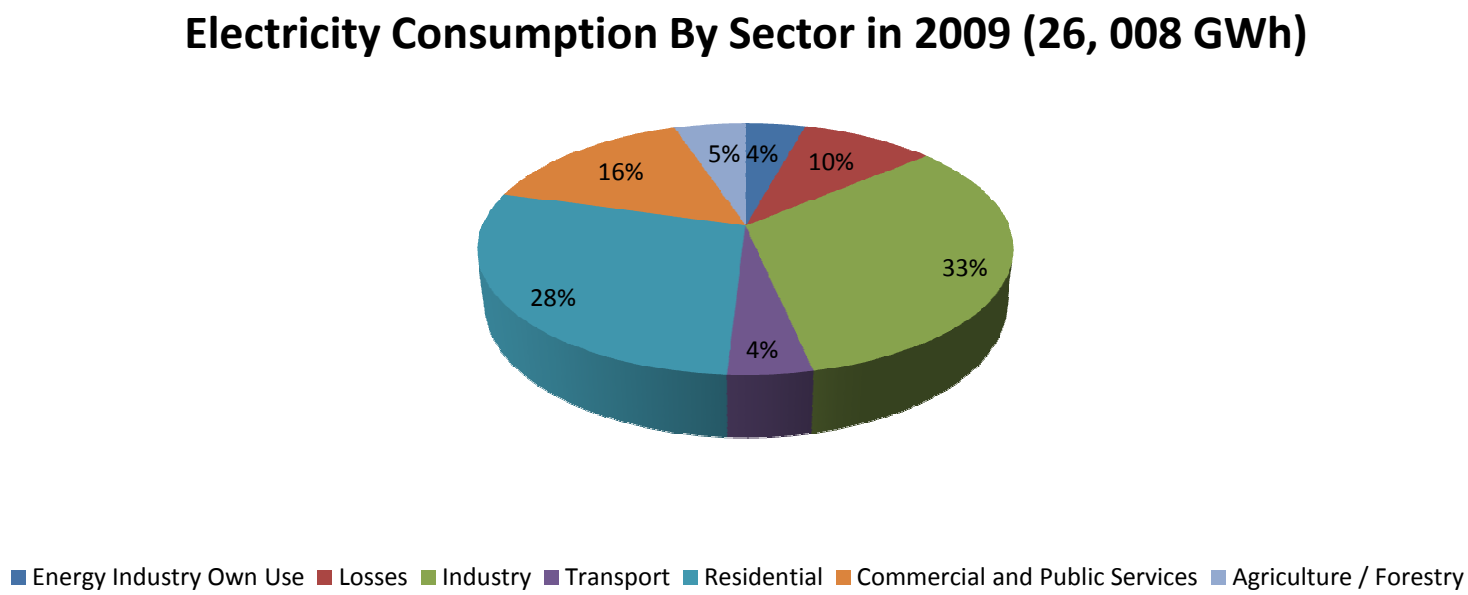


Electricity Production By Different Fuels in 2009 (21,785 GWh)



Source : IEA / 2009 Energy Balance for Morocco

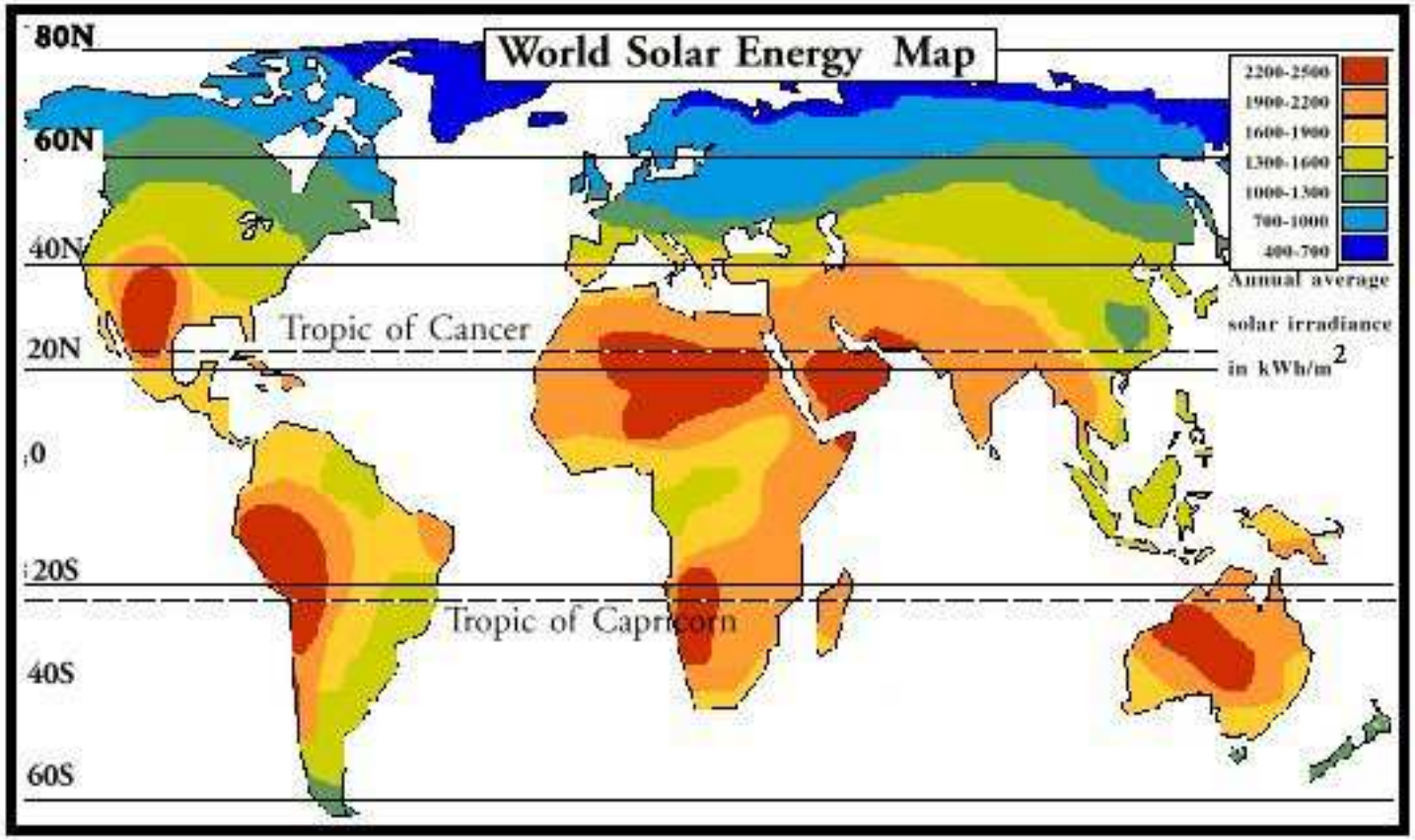
Morocco's Energy Portfolio



- Our annual electricity consumption is rising by almost 7%, therefore, by the year 2020, our consumption would reach 34.6 MTOE.

Source : IEA / Electricity in Morocco in 2009

Morocco Solar Resources



- Average Solar Potential: 5.5 kWh/m^2/day.
- More than 3000 hours of sunshine in some areas.

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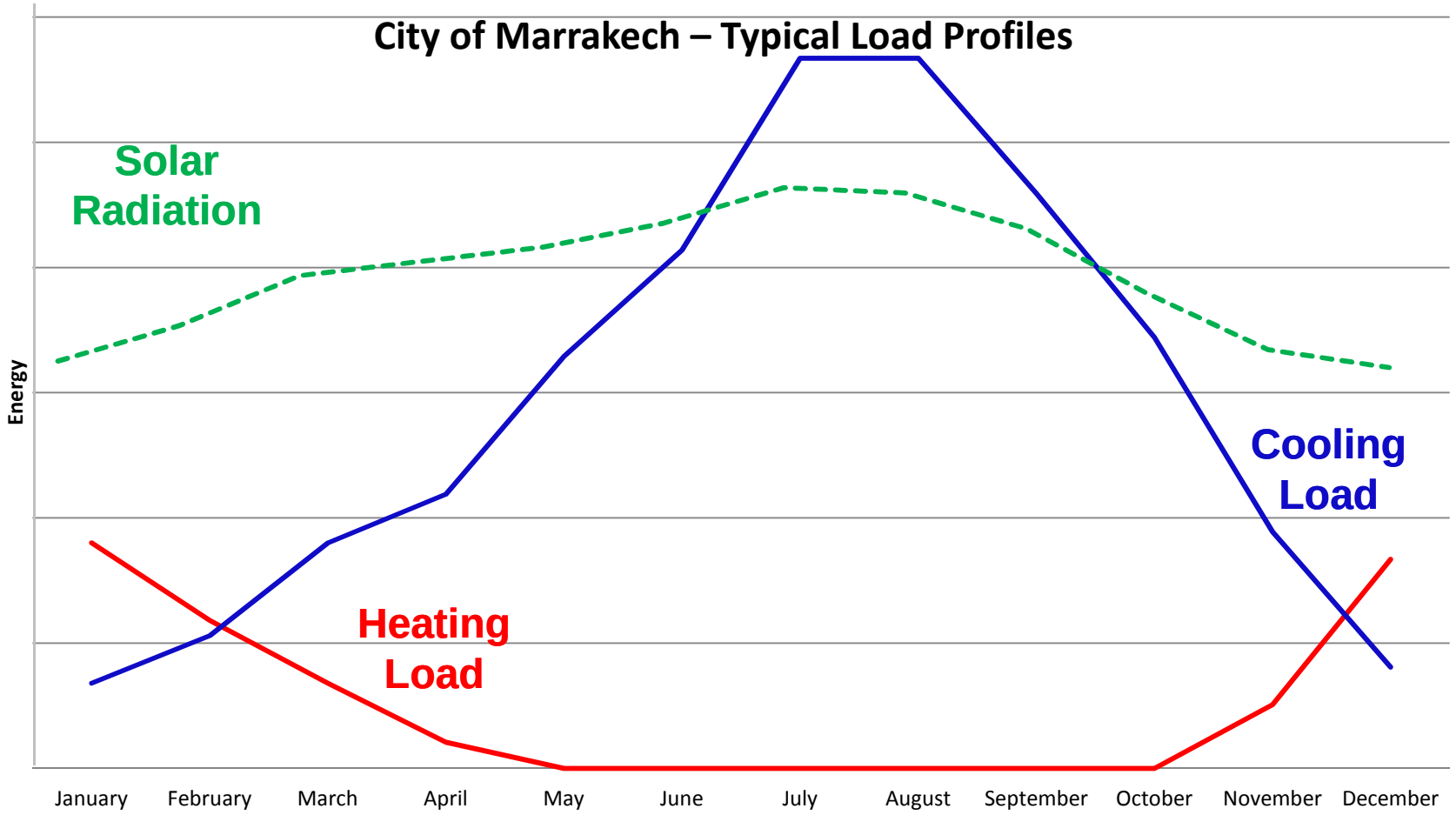
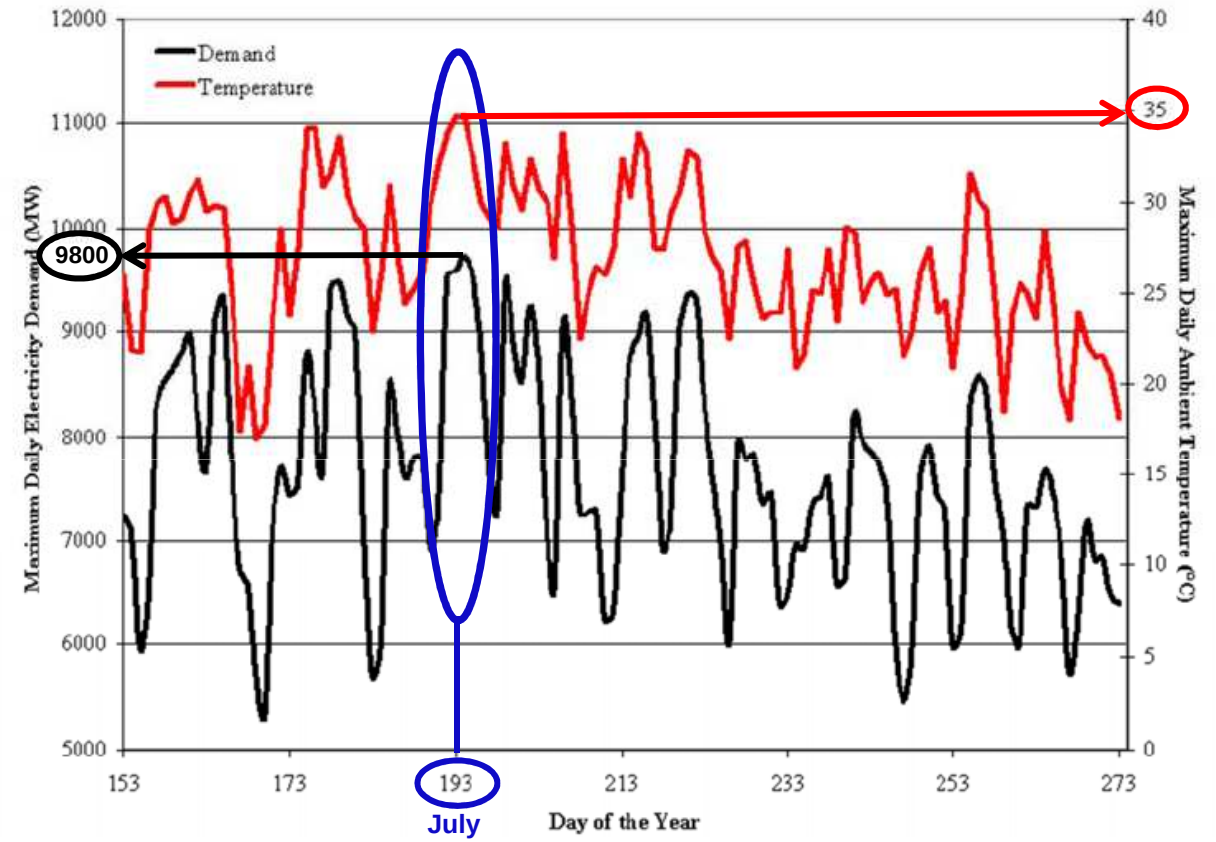
Why Solar Cooling Makes Sense!



Source : Energy Management Consulting Group

Why Solar Cooling Makes Sense! (Cont…)



Source : Thermosol Consulting

- Look at the correlation between Hi. Temp. & Hi. demand. The higher the temperature the higher the demand

Execution Plan

1. Perform TRNSYS simulations
2. Select appropriate system configuration and size equipment
3. Prepare construction documents for a small pilot system
4. Install complete system
5. Commission installed system
6. Start monitoring the system
    a. The data collected should be analyzed and conclusions drawn

Note: Significant effort would be undertaken to source all available components and equipment from local suppliers provided they meet the international quality standards.

Main Deliverables/Milestones

Deliverable/Milestone	Project Month
Public workshop – Solar Cooling State-of-the-art	1
Feasibility and Market Analysis, with focus on the tourism and fruit processing industry	9
Pilot Project Installation/Commissioning	11/12
Interim Report on Installation and Initial Costs and Technical Issues	17
Final Report on System Operation and Feasibility Analysis Validation	23
Final Workshop – Project Results and Future Opportunities	24

Be Creative and Use the Power of the Sun!

Thank you for your attention

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