

# Experiences of West Mediterranean Countries

(Algeria, France, Morocco, Portugal, Tunisia)





# ALGERIA

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- Number of households: 6.000.000 of which 800.000 are over 50 years old
- Constantly increased construction rhythm: from 135.000 new constructions/year between 1994 and 2004 to 200.000 today
- The typical building is constructed using as main material béton armé
- The most of building are warmed by using natural gas.
- Domestic sector consumes 35% of total final energy consumption (37% natural gas, 30% LPG, 14% electricity and 19% petrol)
- Tertiary sector consumes 6% of total final energy consumption (50% electricity, 35% natural gas, 9% petrol)



## Overview of policy concerning energy performance of buildings EE and RES in Algeria

- No obligations for energy performance of building in order to issue the construction permission
- The legislation on energy efficiency defines measures mainly giving priority to the natural gas in thermal uses and electricity in specific uses
- For building sector since 2000 there is thermal regulation for new building
- National Program for Energy Efficiency for 2006-2010 finances projects of use of RES mainly in buildings (Solar Thermal for hot water in domestic and tertiary sector)
- Algeria is engaged of covering 5% of total electricity needs by RES mainly through solar technologies.



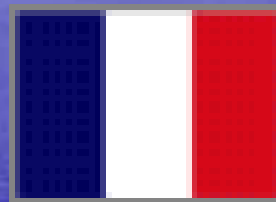
## Main barriers for the use of solar technologies in buildings

- High prices of IMPORTED equipment
- Absence of local industry
- Long pay back period due to low prices of natural gas



## Existing solar applications

- Electrification of 20 isolated villages or 1.100 houses through photovoltaics (Société National d' Électricité et du Gaz – SONELGAZ)
- Electrification of approx. 1.000 houses in steppe (Haut Commissariat au Développement de la Steppe – HCDS)



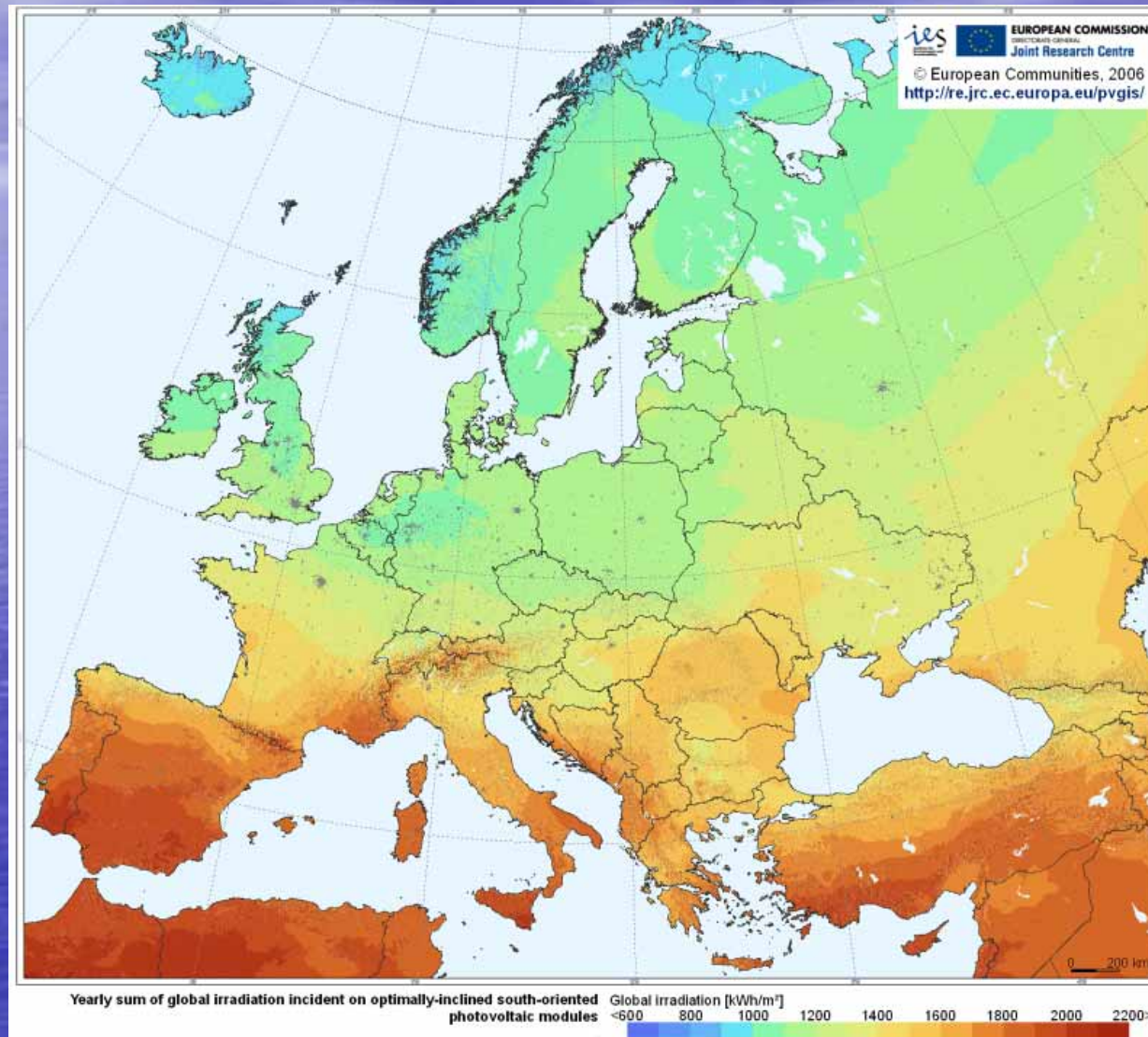
FRANCE

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# Sun radiation map



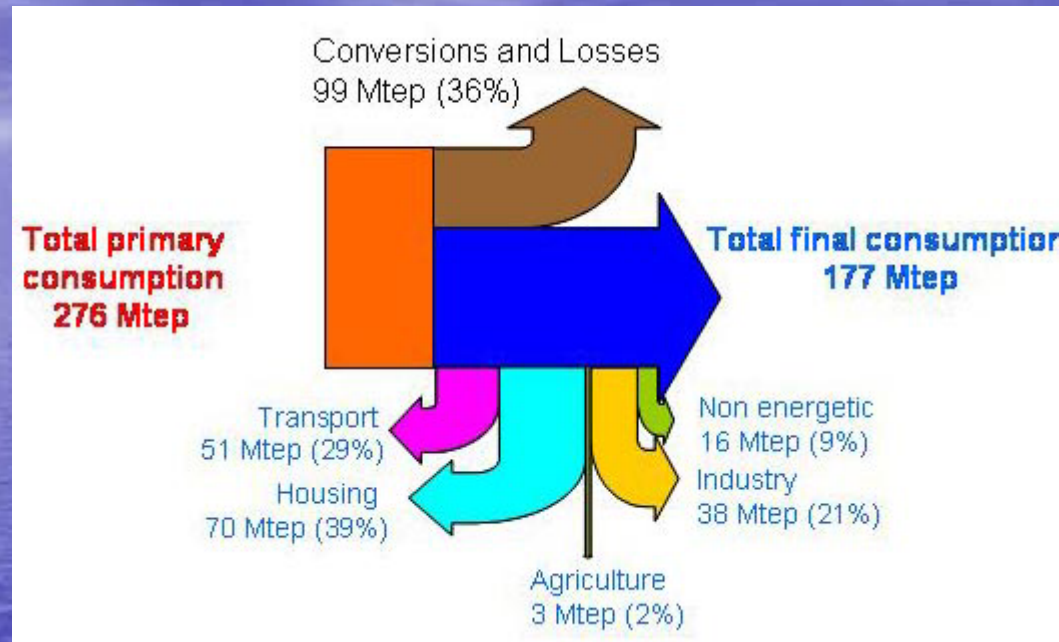
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# Energy consumption



source: MINEFI, 2002

At 2006, building sector consumes 46 % of the energy consumption of the country and produces approx. 20% of CO2 emissions.  
During last 30 years energy consumed increased by 30%



## Policies linked to the construction in relation to energy

- The construction permission in France, modified since 1st October 2007, has not objectives in terms of energy performance
- Obligations for thermal studies exist for operations of important size (RT-Réglementation Thermique- 2005, towards RT2010)
- 70 % of new constructions is realised without application of legislation (mainly construction of individual houses)



Labeling policies are introduced in order to motivate the constructors to show better results than those previewed by legislation

- Label HPE ( high energy performance) RT 2005 -10%
- Label THPE (very high energy performance) RT 2005 – 20%
- Label HPE ENR : HPE + wood or heating network\*
- Label THPE ENR : RT2005 - 30% + (solar hot water and wood or heating network) or (solar hot water and heat) or PV or Heating Pumps
- Label BBC 2005 (label Building Base Consumption): consumption of the class of 50 kWh/m<sup>2</sup>.yr (modified according climatic zone and altitude)



## Old buildings

- Concerning old buildings in order to be sold (from 1<sup>st</sup> November) or rent (from July 2007) there is obligation to realise energy audits through which there is
- Diagnosis concerning energy consumption and recommendations for improving energy behaviour



## Financial incentives

ADEME has permitted

- Subsidisation of pre-studies until 70% with upper limit 2300€
- Subsidisation of studies until 50% in which they could be added regional funds reaching 70%
- Finally the subsidisation of the works can reach 350 €/m<sup>2</sup> with limit 40% of total cost for privates, until 80% for local collectives)



# Other incentives like:

- **Tax credit** :
  - 40% for thermal insulation, appliances for regulating heating,
  - 50% for RES technologies and heat pumps contributing to decrease energy

etc....



# Apart legislation RT2005 other measures like:

- Regions propose to decrease local taxes
- Local urbanisation legislation permit to increase the constructed surface in case of use of RES

Etc....



# Solar thermal\_motivation

- 2000, Solar Plan
- Certification of solar equipment (CSTbat)
- QUALISOL: quality charts delivered to installators
- GSR: un Garantie Résultat Solaire





## Photovoltaic \_motivation

- 30 cts €/KWh for produced electricity that can reach 55 cts in case of panels integrated in buildings
- From 2006 à 2009, credit tax until of the investment
- Installer norm QualiPV



# Solar barriers

- Agreed payment time of subsidies
- Competition with other RES also subsidised
- Need for development of the market that will bring the industrialisation of the products
- Esthetical integration



# MOROCCO

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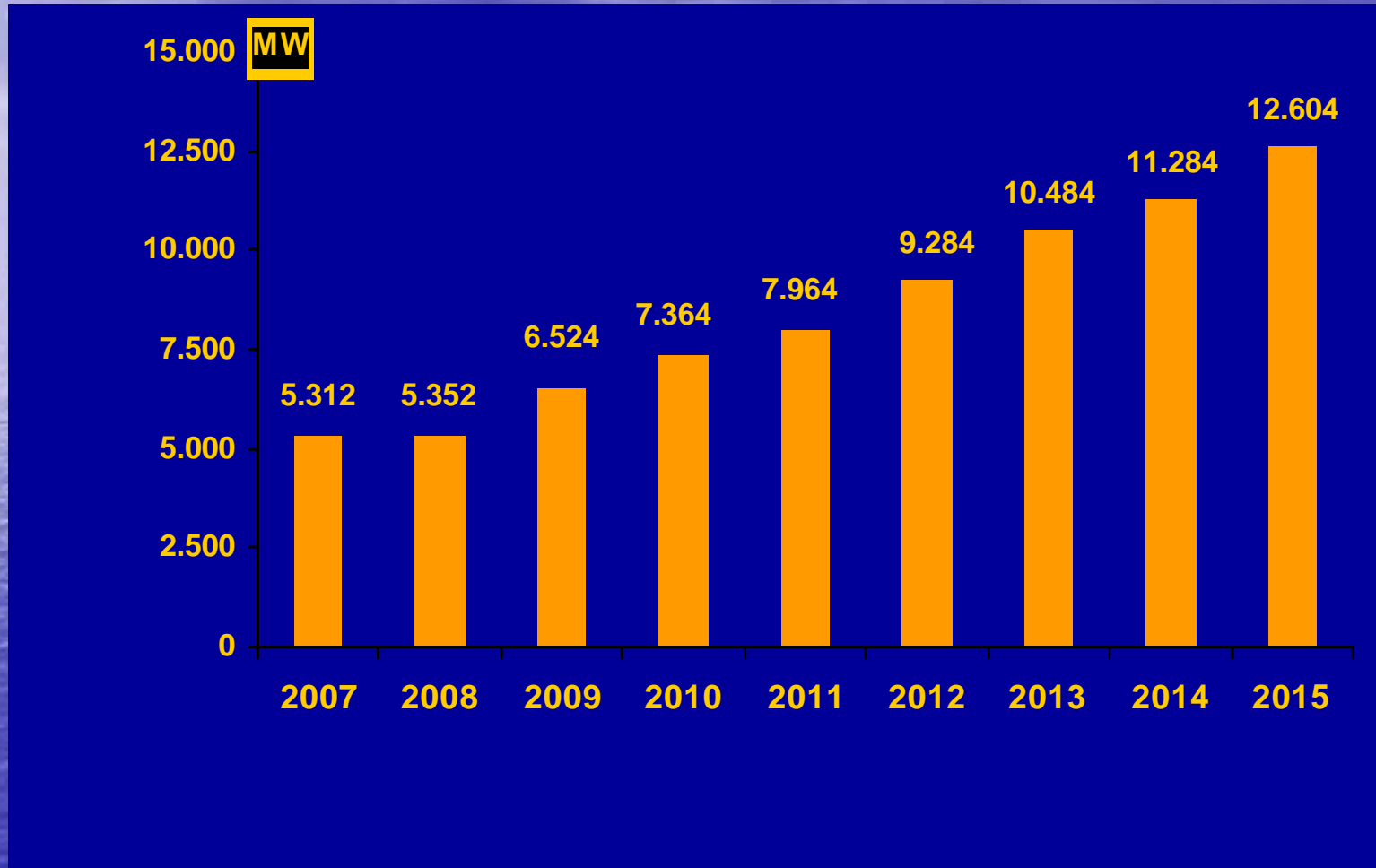
## Main programs of development related to the building sector

- Domestic (100 000 new house per year),
- Hotels (10 millions of tourists in 010),



Morocco

## Forecasting of installed electricity capacity



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RES and EE : mean for decoupling economic development and fossil fuels demand

- **Electricity generation** : Wind farms 124 MW and 140 MW under construction), Desalination of sea water, central thermal solar , auto-production
- **Rural energy** : Decentralised electrification of 150 000 households, biomass for heating and cooking, ...
- **Solar Thermal** : market development of SWH
- **Buildings** : Thermal regulation of building and energy efficiency actions in hospitals, households, hotels.



## PROMASOL : PROGRAM OF PROMOTION OF SOLAR WATER HEATING

- 100.000 m<sup>2</sup> in 4 years
- **Quality reinforcement:** certification, labelling, training
- **Partnership and promotion:** sectoral  
**Market promotion through:** Technical and financial aid in supply and direct support in leasing projects
- **Communication:** spot radio TV, press...



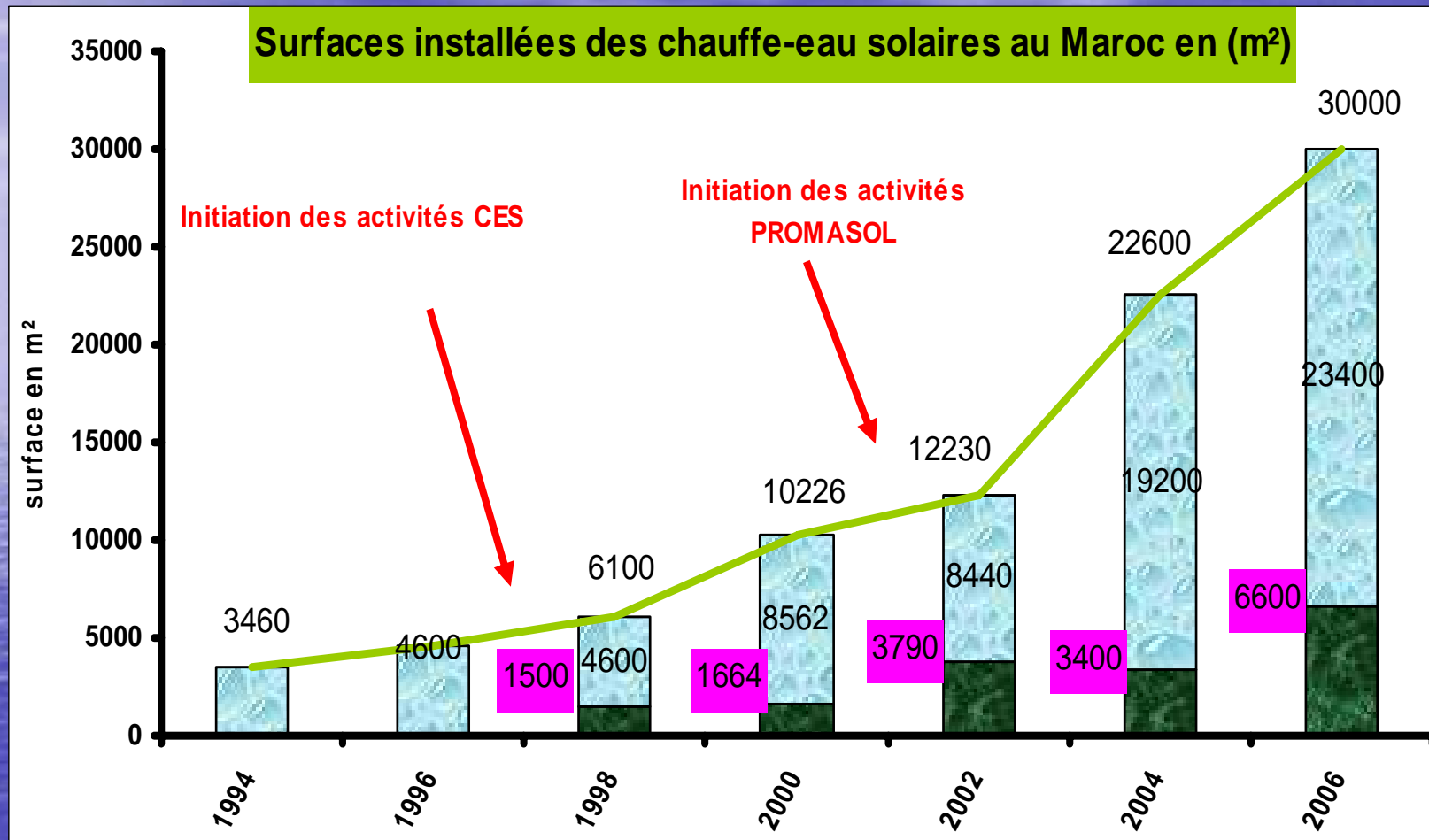
# Operation 1000 SWH

- Promotional price 5000 DH (460 €) for a SWH of 150 litres
- 90% of installation in individual households dans
  - 45% concern new constructions
  - 52 % substituted natural gas systems, 41% electricity
  - 95 % satisfied





# Evolution of ST market



Guarantee 8 years  
Life period 15-20years



*Morocco*

## ENERGY EFFICIENCY PROGRAM IN BUILDINGS

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## Main axis of the Program

- Building thermal regulation: norms and technical guidelines
  - Concept plans ( exploitation of bioclimatic potential)
  - Construction (improve insulation characteristics / use of the most appropriate materials)
  - Electromechanical systems for heating, ventilation acclimatisation
- Performance labelling of electrical appliances
- Implementation of 50 pilot projects ( 20 hospitals, 10 hotels, 5 collective buildings, 5 social buildings, 5 existing buildings, 5 national education buildings)
- Promotion activities



## Aims of National Program of RES and EE Development until 2012

- Diversification of energy supply sources
- Sustainable human development : general access to energy
- Decrease of energy service costs
- Optimisation of electricity load curve



## Aims of National Program of RES and EE Development until 2012

- Decrease of the increase rate of GHG emissions (avoid 24 millions Tonnes CO<sub>2</sub> until 2015 and preservation of natural resources: waters and forests)
- Economic Development : investment opportunities (More than 4 billion Euros until 2020) and 23000 new job positions,



## Legislation

- EE and RES legislation (17/05/07) previews among others:
  - Thermal regulation in buildings
  - Labelling of appliances
  - Fiscal and financial incentives
  - Financial Funds for supporting programmes for EE and RES



Support of electricity auto-producers: limit at 50 MW,  
access in networks, feed in tariff exceeds 60% of public  
tariff (50 cents DH/kWh)

Projet de Circulaire du Premier Ministre for Low  
Consumption Lamps and SWH in public buildings

Future launching of works of elaboration of Energy  
Efficiency Code in the Building Sector



## Other relevant legislation

Law relative to electricity market liberalisation

Law n° 28-00 relative to waste management (2006)

Law n° 54-05 relative to management of public services (2006)

Law for protection of the environment (2003)

Law relative to the fighting of air pollution (2003)

Law 10-95 concerning water (1995)





## Other tools for ST promotion

- Examples of public sector willingness (SWH etc)
- Quality of products and services through norms, certification and technical guidelines
- Financial and fiscal measures
- Energy tariffs policy (linkage with international markets)



## Barriers

- Not strong integration of RES in energy and development policies
- Not fair fiscal conditions,
- Limited quality approach
- Not enough information
- Not capitalisation of training
- Not sufficient R&D
- Inadequate configuration of usual financing
- Increased commercial tax credits
- Not adapted retail financing local tools
- External costs not taken into account

Policy

Technical

Fiscal



# PORTUGAL

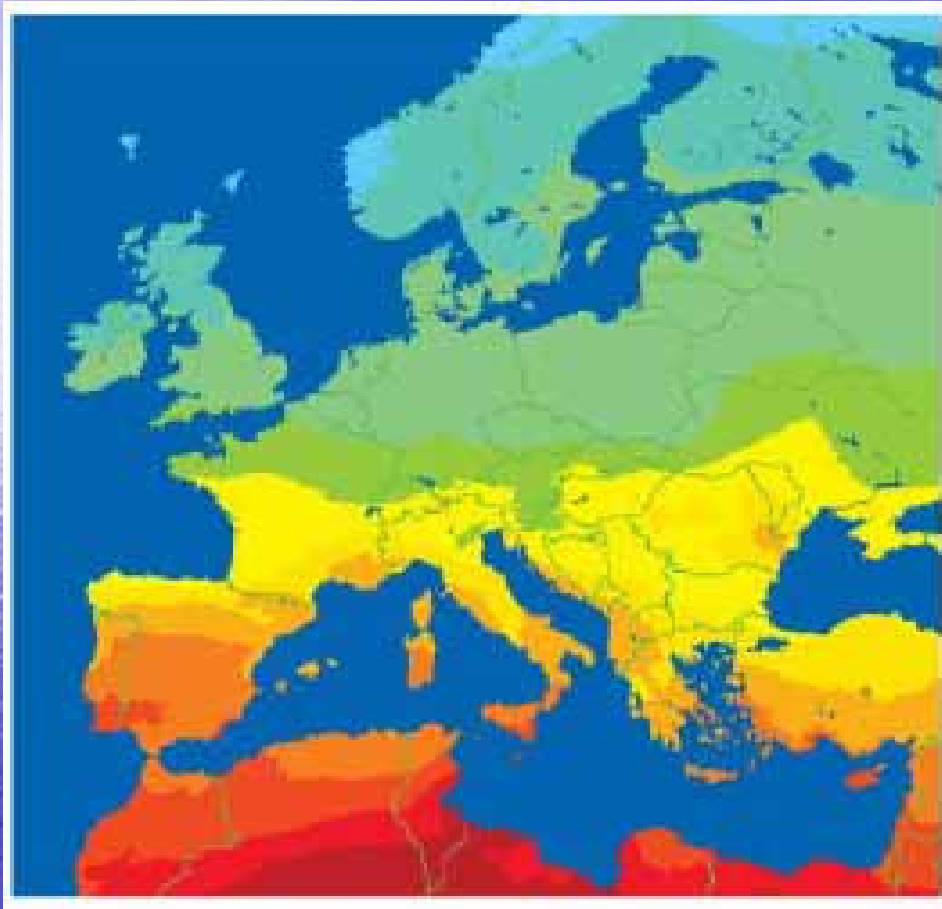
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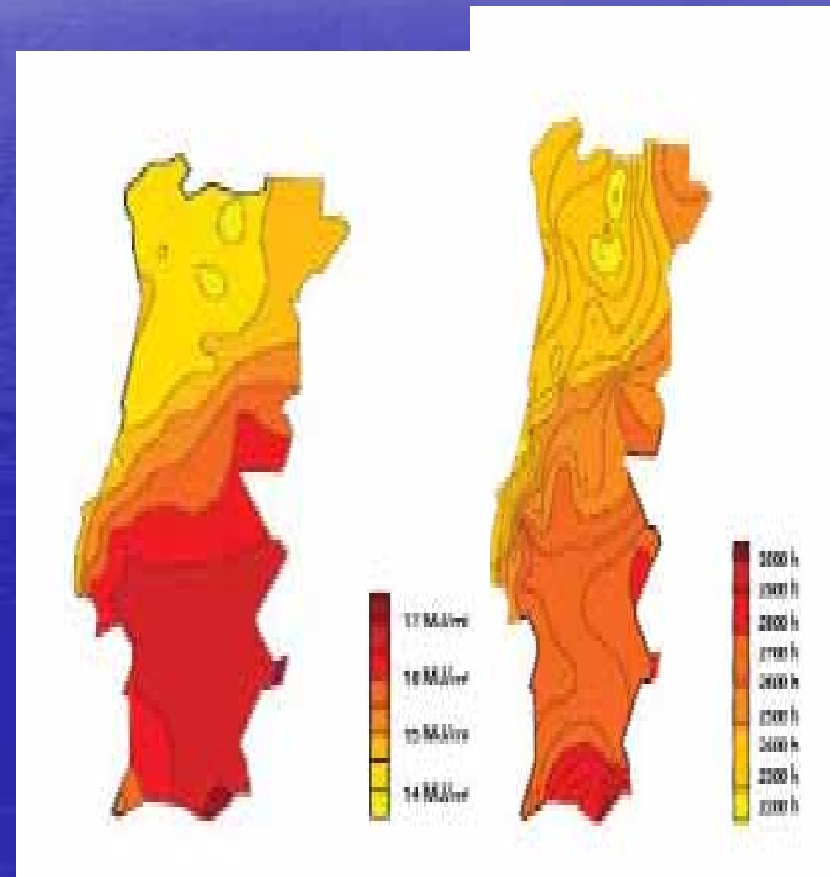
Portugal is the European country with higher sun radiation availability in % of the territory

*Portugal*



Sun radiation: 14 to 17 MJ/m<sup>2</sup>/day

2200 to 3000 hours of sun



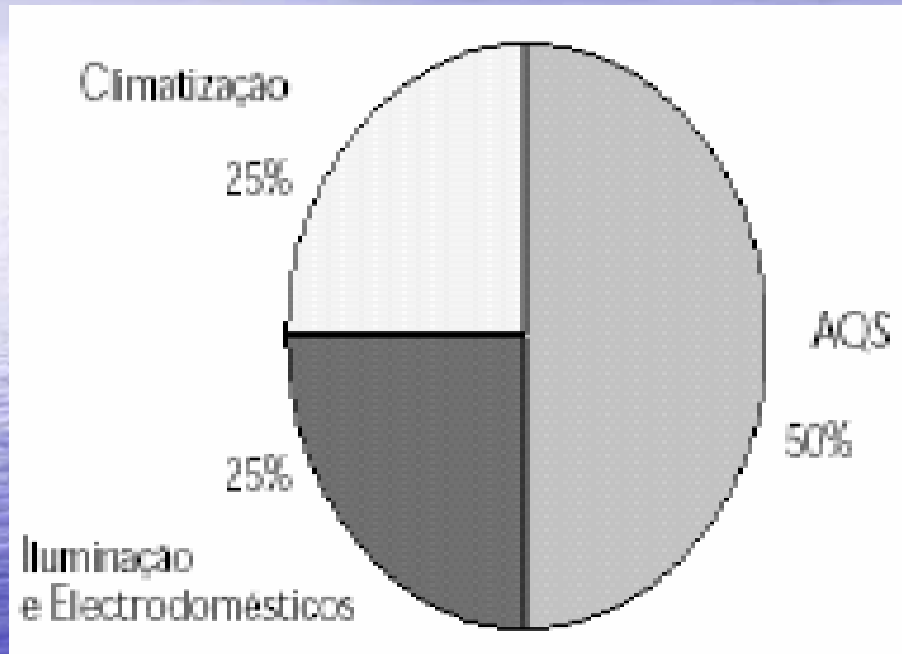
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Portugal

Buildings: 30% of total energy consumption and 62% of total electricity consumption, 2005 Data DGGE



Distribution of energetic costs associated with comfort, 1990

AQS –Heating sanitary water

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Portugal

## Directive 2002/91/CE on energy performance of buildings -revision of national thermal regulation

### RCCTE

- All household buildings
- Small service buildings without acclimatization systems or with an output less than 25 Kw

### RSECE

- Service buildings  
large (>1000 m<sup>2</sup> or 500 m<sup>2</sup>)  
Small with acclimatization (output greater than 25 kW)
- Household with acclimatization systems with an output greater than 25kW

**Type of buildings:**  
New building  
Great remodelling  
Increase area (only to new parts)



Portugal

# Energy Certification System in Portugal (DL 78/2006)

Code requirements supervision

Energy Classification and Certificate Emission

RCCTE  
DL 80/2006  
household



RSECE  
DL 79/2006  
Services



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**CERTIFICAÇÃO ENERGÉTICA E AR INTERIOR EDIFÍCIOS**  
Nº CCR 1234567/2007

**CERTIFICADO DE DESEMPENHO ENERGÉTICO E DA QUALIDADE DO AR INTERIOR**

TIPO DE EDIFÍCIO: EDIFÍCIO HABITAÇÃO UNIFAMILIAR / FRACÇÃO AUTÓNOMA DE EDIF. MULTIFAMILIAR  
Morada / Situação: \_\_\_\_\_

Localidade: \_\_\_\_\_ Freguesia: \_\_\_\_\_  
Cemitério: \_\_\_\_\_ Região: \_\_\_\_\_  
Data de emissão do certificado: \_\_\_\_\_ Validade do certificado: \_\_\_\_\_  
Norme do ponto qualif.: \_\_\_\_\_ Número do ponto qualif.: \_\_\_\_\_  
Imóvel descrito na \_\_\_\_\_ Conservatória de Registo Predial de \_\_\_\_\_  
sob o nº \_\_\_\_\_ Art. matricial nº \_\_\_\_\_ Fracção autón.: \_\_\_\_\_

Este certificado resulta de uma avaliação efectuada ao edifício ou fracção autónoma, por um perito devidamente qualificado para a efeito, em relação aos requisitos previstos no Regulamento das Características de Comportamento Térmico dos Edifícios (RCCTE), Decreto-Lei 102/2006 de 1 de Junho, alterado e revisto em vigor ao respectivo desenvolvimento. Para ser válido, este certificado precisa cumprir os requisitos de desenvolvimento aplicáveis à fracção autónoma ou edifício, para pontos e requisitos normativos energéticos e de qualidade do ar interior, que se vão reger pelo respectivo regulamento, que não pode ser superior ao estabelecido no presente.

**1. ETIQUETA DE DESEMPENHO ENERGÉTICO**

**INDICADORES DE DESEMPENHO**

Necessidades anuais globais estimadas de energia útil para climatização e águas quentes  kWh/m<sup>2</sup>.ano

Necessidades anuais globais estimadas de energia primária para climatização e águas quentes  kgpep/m<sup>2</sup>.ano

Valor limite máximo regulamentar para as necessidades anuais globais de energia primária para climatização e águas quentes  kgpep/m<sup>2</sup>.ano

Emissões anuais de gases de efeito de estufa associadas à energia primária para climatização e águas quentes  Toneladas de CO<sub>2</sub> equivalentes por ano

**CLASSE ENERGÉTICA**

A A+  
B+ B  
C  
D  
E  
F  
G

**2. DESAGREGAÇÃO DAS NECESSIDADES NOMINAIS DE ENERGIA ÚTIL**

Necessidades nominais de energia útil para:	Valor estimado para as condições de conforto térmico de referência	Valor limite regulamentar para as necessidades anuais
Aquecimento	kWh/m <sup>2</sup> .ano	kWh/m <sup>2</sup> .ano
Arrefecimento	kWh/m <sup>2</sup> .ano	kWh/m <sup>2</sup> .ano
Preparação das águas quentes sanitárias	kWh/m <sup>2</sup> .ano	kWh/m <sup>2</sup> .ano

**NOTAS EXPLICATIVAS**

As necessidades anuais globais estimadas de energia útil compreendem a soma prevista da quantidade de energia que terá de ser consumida para o efeito no regime normal de funcionamento do edifício ou fracção autónoma, para manter o edifício nos condições de conforto térmico de referência e para preparar as águas quentes sanitárias necessárias para o edifício. Os valores foram calculados para condições normais de utilização e sob condições normais de funcionamento do edifício ou fracção autónoma, sob condições normais de utilização e sob condições normais de funcionamento do edifício ou fracção autónoma.

As necessidades anuais globais de energia primária (incluindo o valor total resultante da conversão das necessidades nominais de energia útil em valores equivalentes de energia primária) são apresentadas em kgpep/m<sup>2</sup>.ano e em toneladas de CO<sub>2</sub> equivalentes por ano.

Os valores de CO<sub>2</sub> equivalentes incluem o contributo anual estimado de gases de efeito de estufa que podem ser libertados em resultado do consumo de energia primária (total de recursos ou necessidades anuais globais estimadas para o edifício, usando o factor de conversão de 0,256 toneladas equivalentes de CO<sub>2</sub> por kgpep).

A classe energética resulta de uma avaliação das necessidades anuais globais estimadas e do valor limite regulamentar para as necessidades anuais globais de energia primária para climatização e águas quentes sanitárias, para o edifício ou fracção autónoma. O método de avaliação normalizado é descrito no Regulamento das Características de Comportamento Térmico dos Edifícios (RCCTE), Decreto-Lei 102/2006 de 1 de Junho, alterado e revisto em vigor ao respectivo desenvolvimento. O método de avaliação normalizado é descrito no Regulamento das Características de Comportamento Térmico dos Edifícios (RCCTE), Decreto-Lei 102/2006 de 1 de Junho, alterado e revisto em vigor ao respectivo desenvolvimento. O método de avaliação normalizado é descrito no Regulamento das Características de Comportamento Térmico dos Edifícios (RCCTE), Decreto-Lei 102/2006 de 1 de Junho, alterado e revisto em vigor ao respectivo desenvolvimento.

Para mais informações sobre o desenvolvimento energético, visite o portal [www.dgdr.gov.pt](http://www.dgdr.gov.pt) ou o número de atendimento ao cliente 102 2006.

ELABORADO POR: **Divisão Geral de Ordenação e Gestão**

INSTITUTO DO AMBIENTE

ISSUE DATE: 102/2006





*Portugal*

## Energy Certification on Buildings - Calendar

**Large Buildings(>1000m<sup>2</sup>) 1<sup>st</sup> July 2007**  
**New**

**Small Buildings (<1000m<sup>2</sup>) 1<sup>st</sup> July 2008**  
**New**

**Existing Buildings**                      **1<sup>st</sup> January 2009**

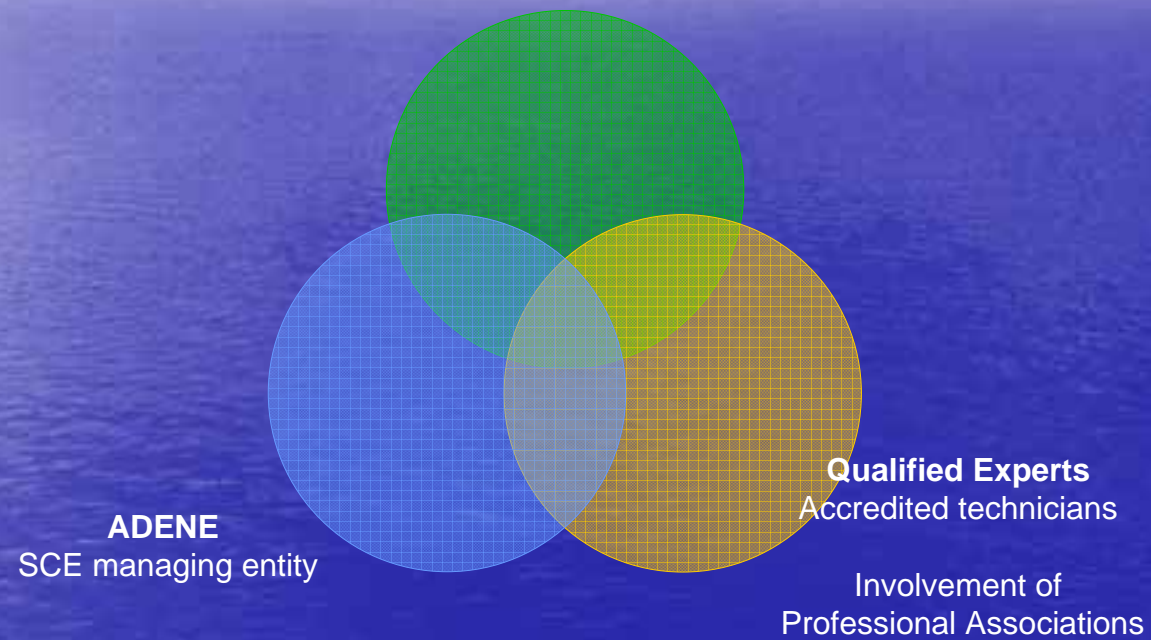




Portugal

## SCE main entities

DGGE and APA Supervision entities





Portugal

## Qualified experts –requirements

### Different areas

#### RCCTE

- Engineer degree or Bachelor in mechanics or civil
- Architect degree
- Specialists in acclimatization engineering

#### RSECE –Energy

- Engineer degree or Bachelor in mechanics or electromechanical
- Specialist in acclimatization engineering

#### RSECE –in Air Quality

- Engineer degree or Bachelor in mechanics, chemistry or environment
- Specialist in acclimatization Engineering

#### Other Requirements

- Specific training
- 5 years of professional experience
- Integration as member in the National Architect or Engineer Associations

#### Who Recognizes?

- Integration National Engineer Association Qualified

Portugal

## Passive systems

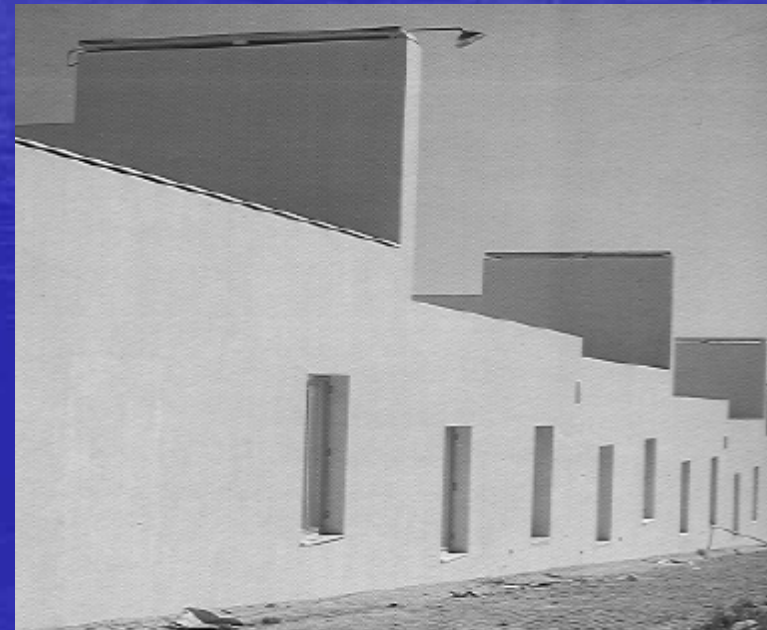
Modern contemporary architecture using based on vernacular references



Casa Beires (Póvoa de Varzim) –Siza Vieira



Bairro da Malagueira(Évora) –Siza Vieira



# Passive systems

## Contemporary External Shading devices



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## Active systems

### Photovoltaic integrated on facade



Solar XXI Building  
INETI Campus-Lisbon 96m<sup>2</sup> of  
panels on façade installed Power 12kWp  
Assures 30 to 50% of global electric energy  
Needs of the building (illumination and  
electronic equipment)

Arch: Pedro Cabrito  
Coordinator Eng: Helder Gonçalves



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## Active Systems

Integration of Thermal Solar Panels for water heating

New RCCTE

Compulsory use of Thermal Solar Panels for heating sanitary water

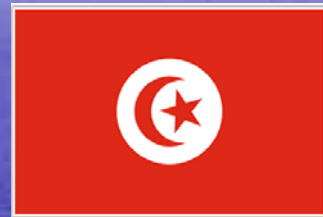




*Portugal*

# Barriers

- Construction industry too much conservative
- Disperse and contradictory legislation
- Some disinterest among architects

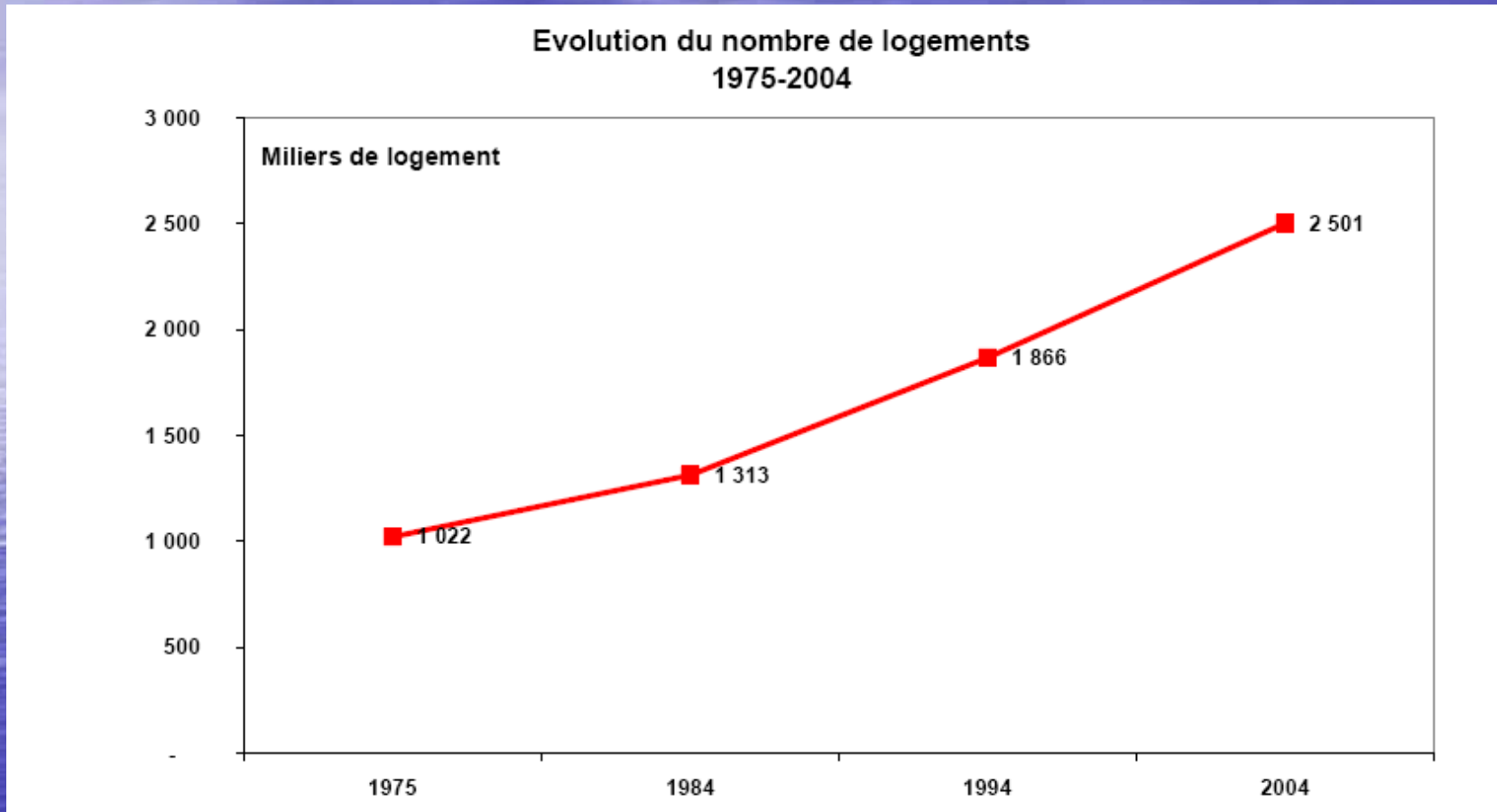


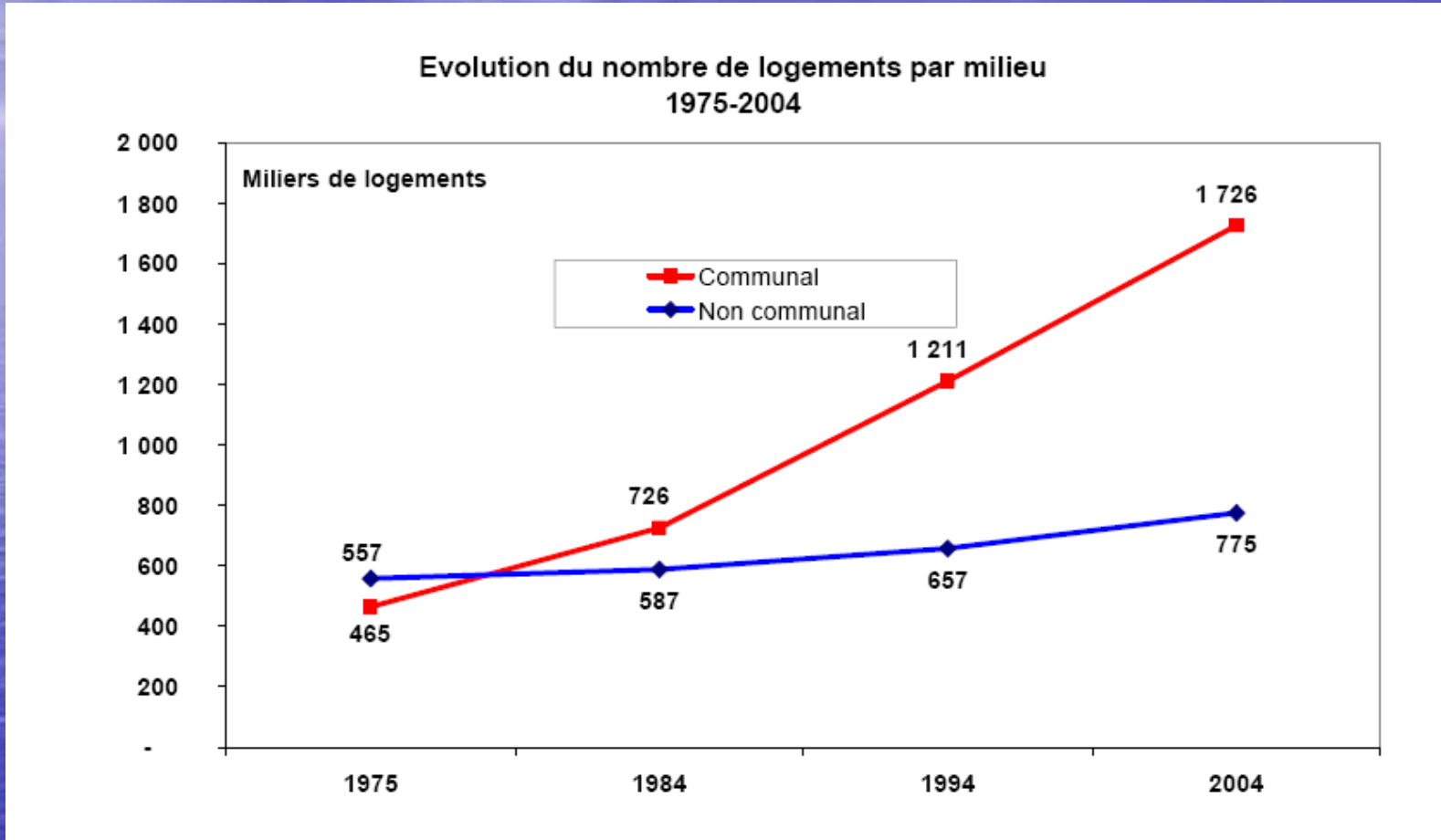
TUNISIA

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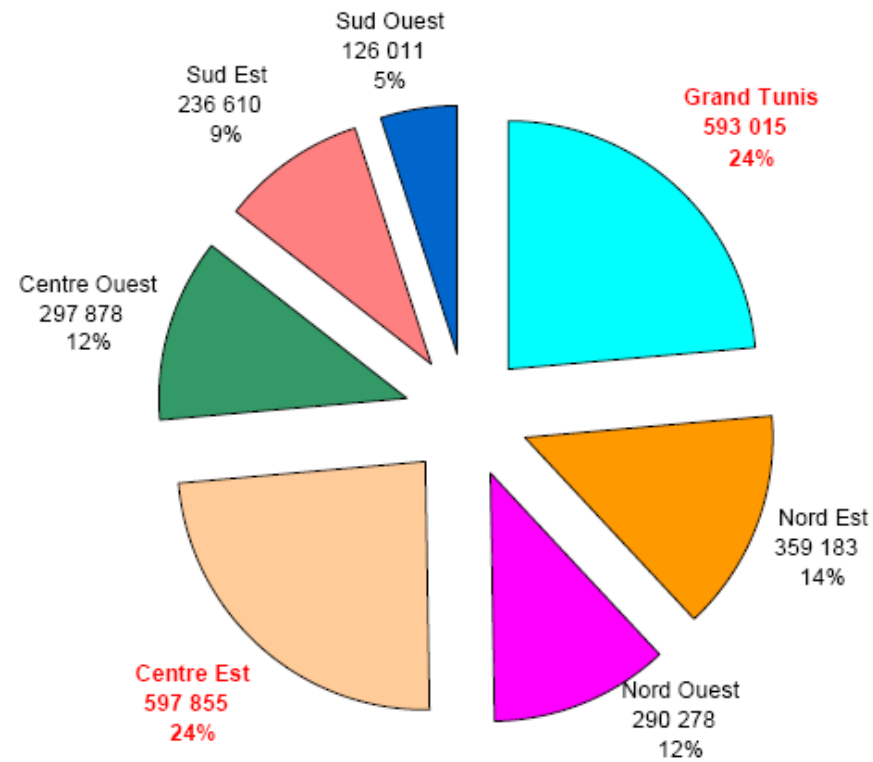


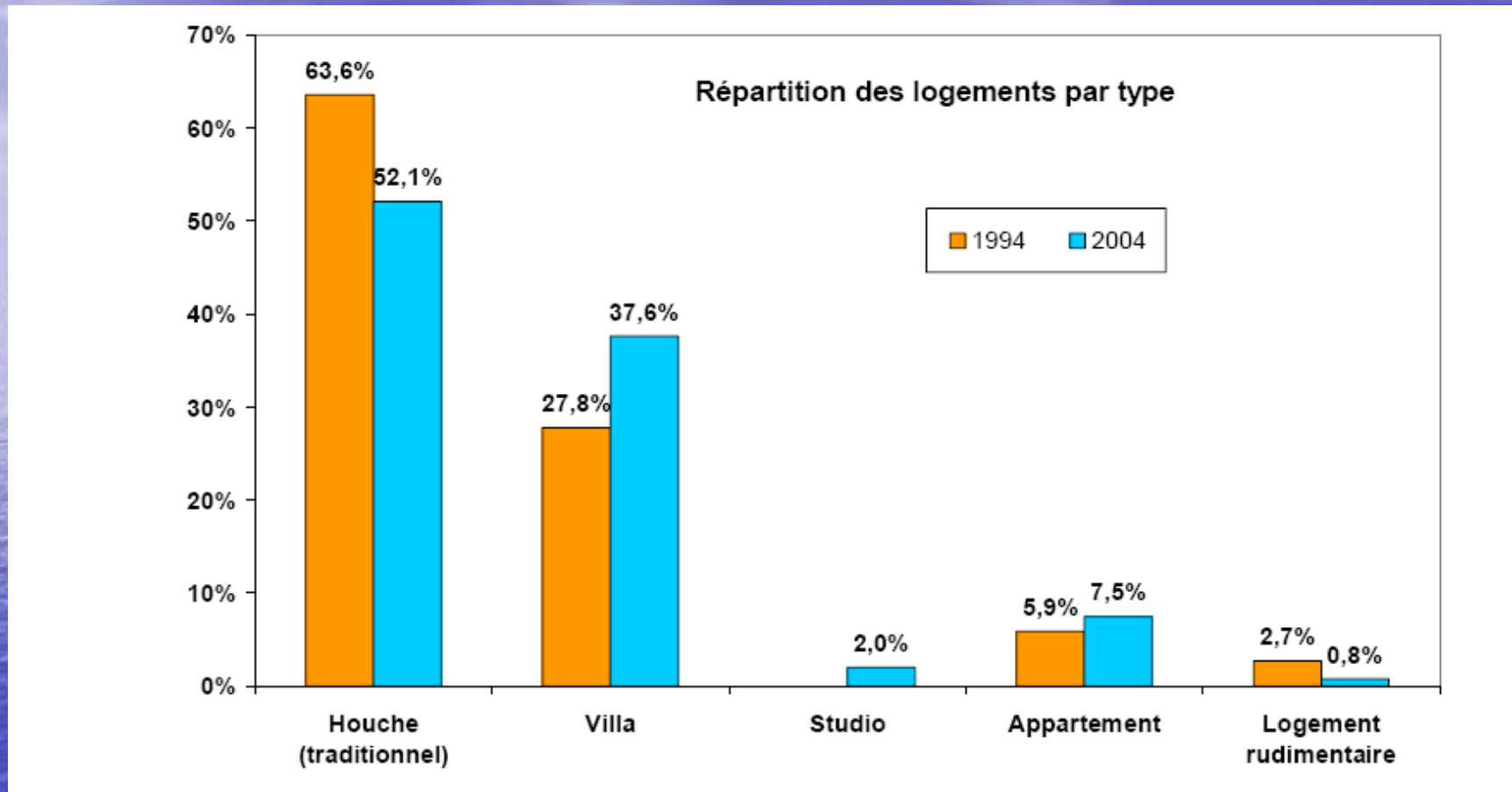






### Répartition des logements par Région

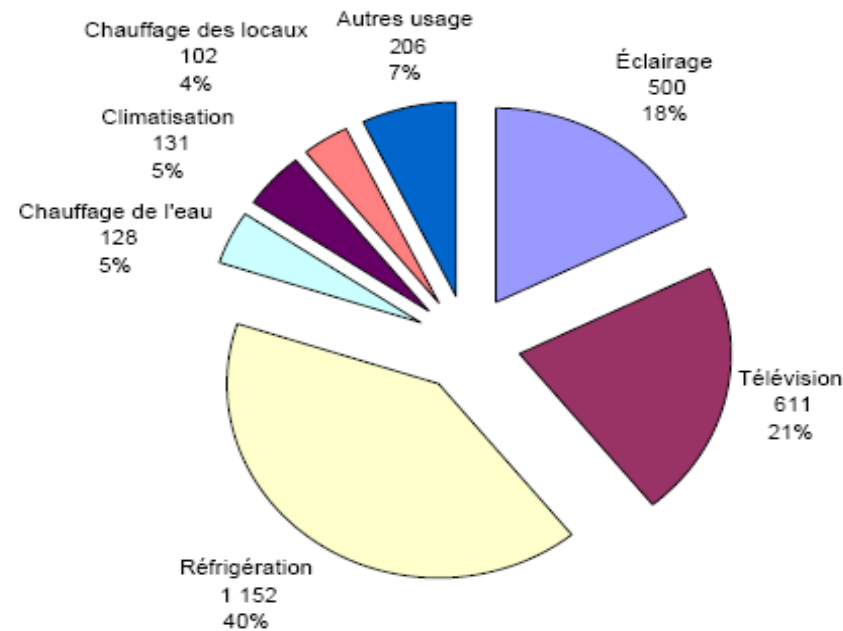






Consumption in households reached at 2004, approx 940 ktoe (16% of total final energy consumption or 0,5 toe per household)

### Structure de la consommation électrique des ménages



Source: Enquête STEG, 2004



## Policy overview concerning energy performance in buildings

- In the energy efficiency law of 2 August 2004 there is no specification for the improvement of thermal performance of buildings
- Code of construction and thermal regulation in buildings is under development in the framework of GEF/PNUD project
- For the existing buildings there are not legislative obligations for the energy performance of buildings
- The works of thermal renovation of buildings are not eligible for the 20% subsidisation, previewed in the National Fund for Energy Efficiency (FNME). The materials of thermal insulation are eligible for fiscal advantages described in the law for energy efficiency (VAT exemption....) but the procedures are very long



## Solar Thermal

- Favorable solar radiation conditions → solar energy is solution for the satisfaction of base energy needs
- Solar Water Heaters is today technically and commercially mature technology and suitable for tunisian applications, individual and collectives (hospitals, hotels, universities etc)
- In the past the Solar Thermal market was not developed because taking into account the prices of alternative energy forms (gas and electricity) the pay back period was big (even with 20% subsidisation pay back period reached 13 years, if the substituted system was LPG, 15 years for substitution of natural gas systems, 5 to 6 years for substitution of electricity)
- For the consumers acceptable pay back period is 4 – 5 years (households)

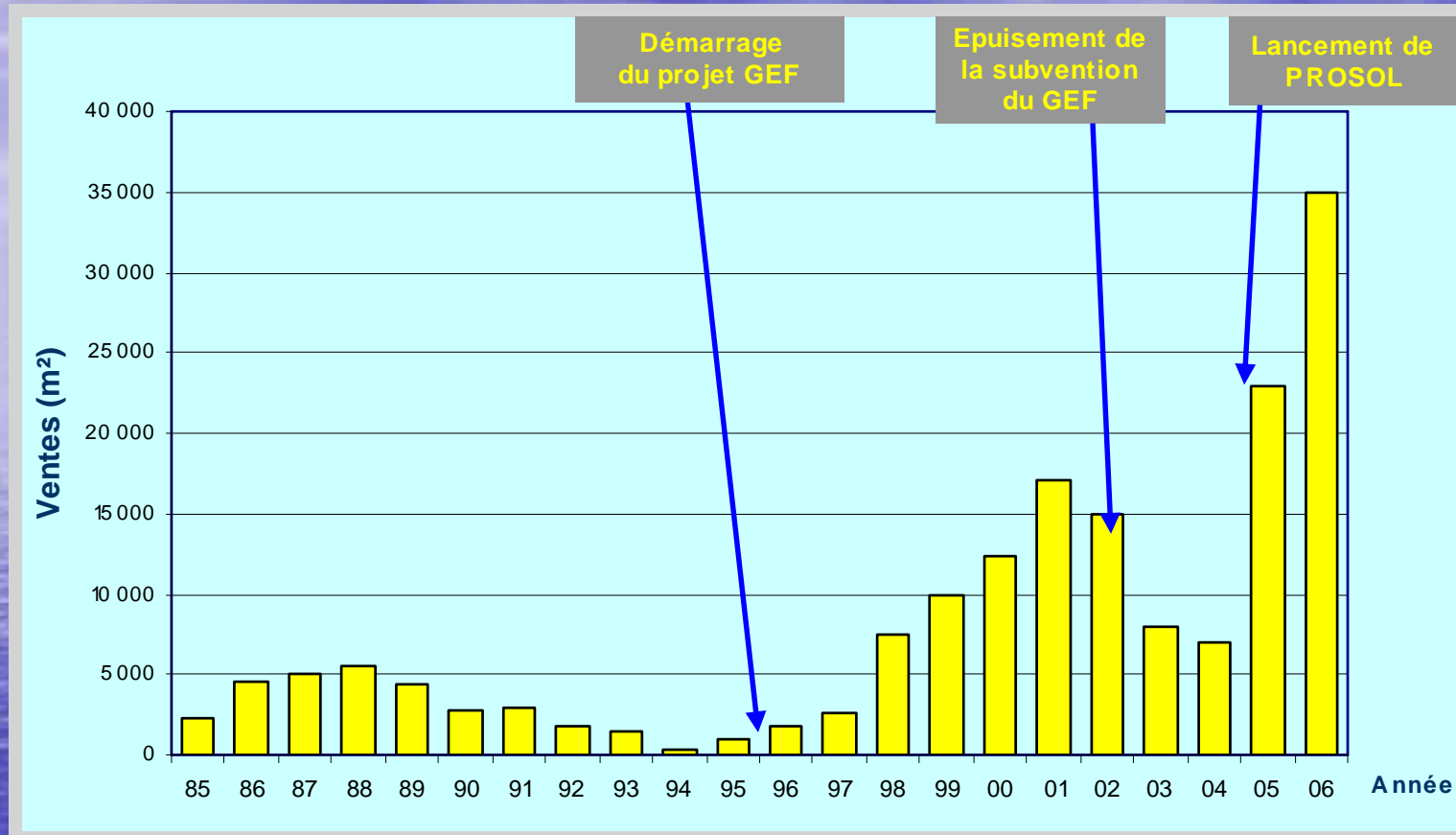


- For tertiary sector the acceptable pay back period is 2 – 3 years. The most promising sector is hotels but even there the investment on ST technologies have payback period 7-8 years (for substitution of gasoil or LPG systems), 6 years (for electricity) and 15 years for substitution of natural gas systems.
- In the collective national level the use of ST for water heating purposes is an obvious energy and economic option, taking into consideration the explosion of energy world markets, giving IRR of 15 – 20% for domestic uses and 20% for tertiary uses





## Evolution of SWH in Tunisia



PROSOL (Ministry of Industry, Energy and SMEs+ ANME + Programme MEDREP) previewed additional several credits and subsidies

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## Potential of ST for Water Heating according the Strategic Scenario for RES development

Horizon	2010	2020	2030
Number of households (1000)	2 420	2 900	3 420
Number of householdswith hot water (1000)	900	1 400	2 100
Realistic market potential (millions of m <sup>2</sup> )	0,255	0,9	2,2
Residential	0,214	0,715	1,750
Tertiary	0,04 1	0,185	0,450
<i>Percentage of SWH in households WITH hot water</i>	10%	23%	35%
<i>Percentage of SWH in households WITH hot water</i>	3,7%	11,2%	21%



## Incentives for ST technologies

- According to the legislation for Energy Efficiency ST for hot water in households and enterprises are eligible for subsidies (20% until 100 DT per m<sup>2</sup>) .
- Investment code: for imported ST systems for water heating, preview minimum duties (10%) and VAT exemption (if there are not same produced locally) and exemption of VAT for systems produced locally.



## Photovoltaics

Quite significant during 1970-1980 but with the increase of electrification through the network the situation changed.

PV benefit similar with other RES incentives previewed by the general frame for investments on electricity production from RES

The potential according to different studies vary from 1,5 MW at 2020 (pessimistic scenario) to 5 MW at 2020 and 20 MW at 2030 (optimistic)