STEG Renewable Energy

Economic Forum Japan - World arab

Tunisian Solar Plan

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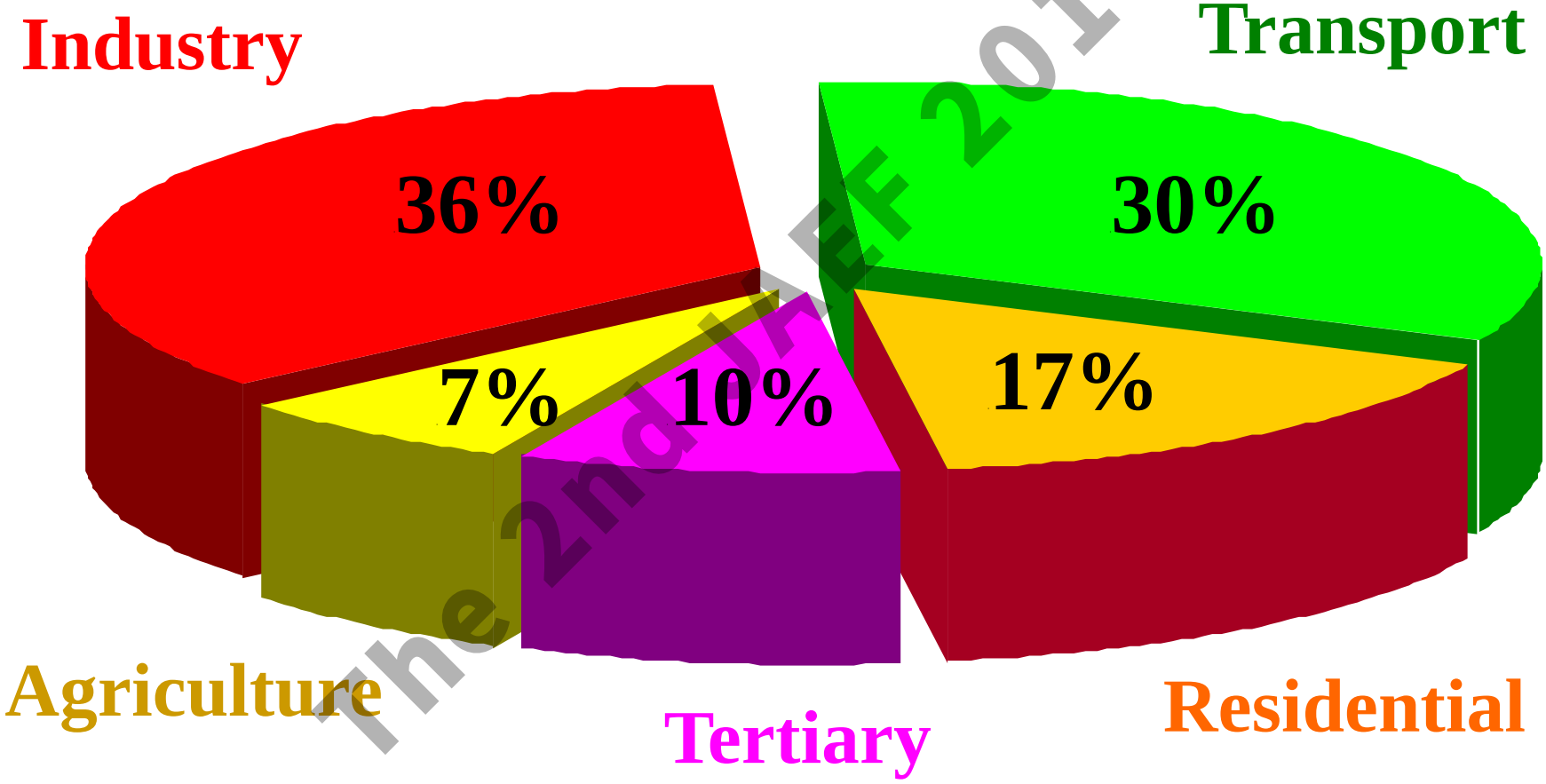
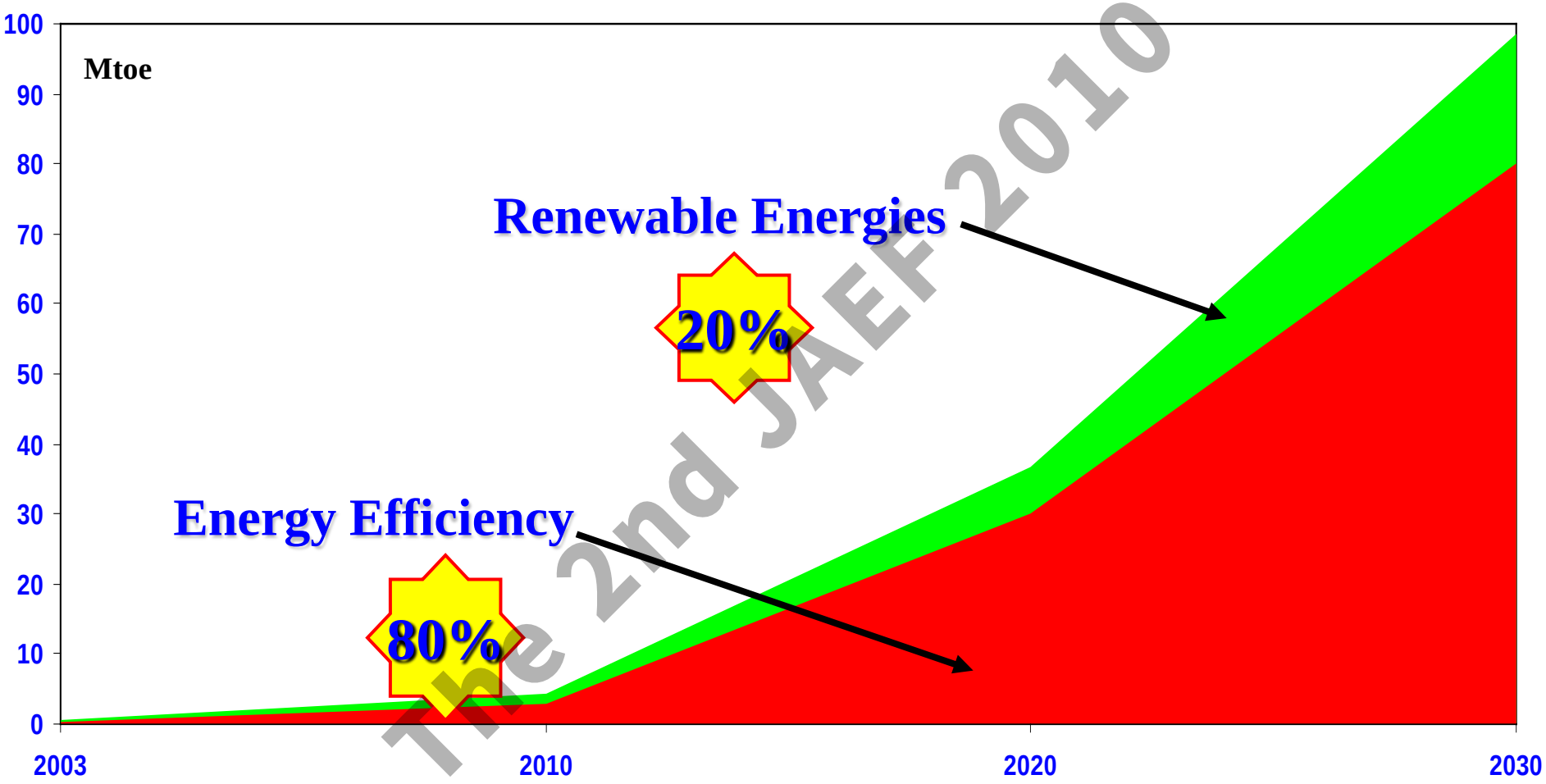
Energy Conservation Data in Tunisia

Sectorial distribution of final consumption



Energy Saving Potential by 2030



The implementation of energy conservation policy in Tunisia

- setting up the institutional framework :

The creation of ANME in 1985

- setting up the legal framework :

Law of August 2nd 2004 amended by the Law of February 9th 2009

- setting up financial initiatives:

The Creation of National Fund for Energy Conservation in December 2005

-Setting action programs

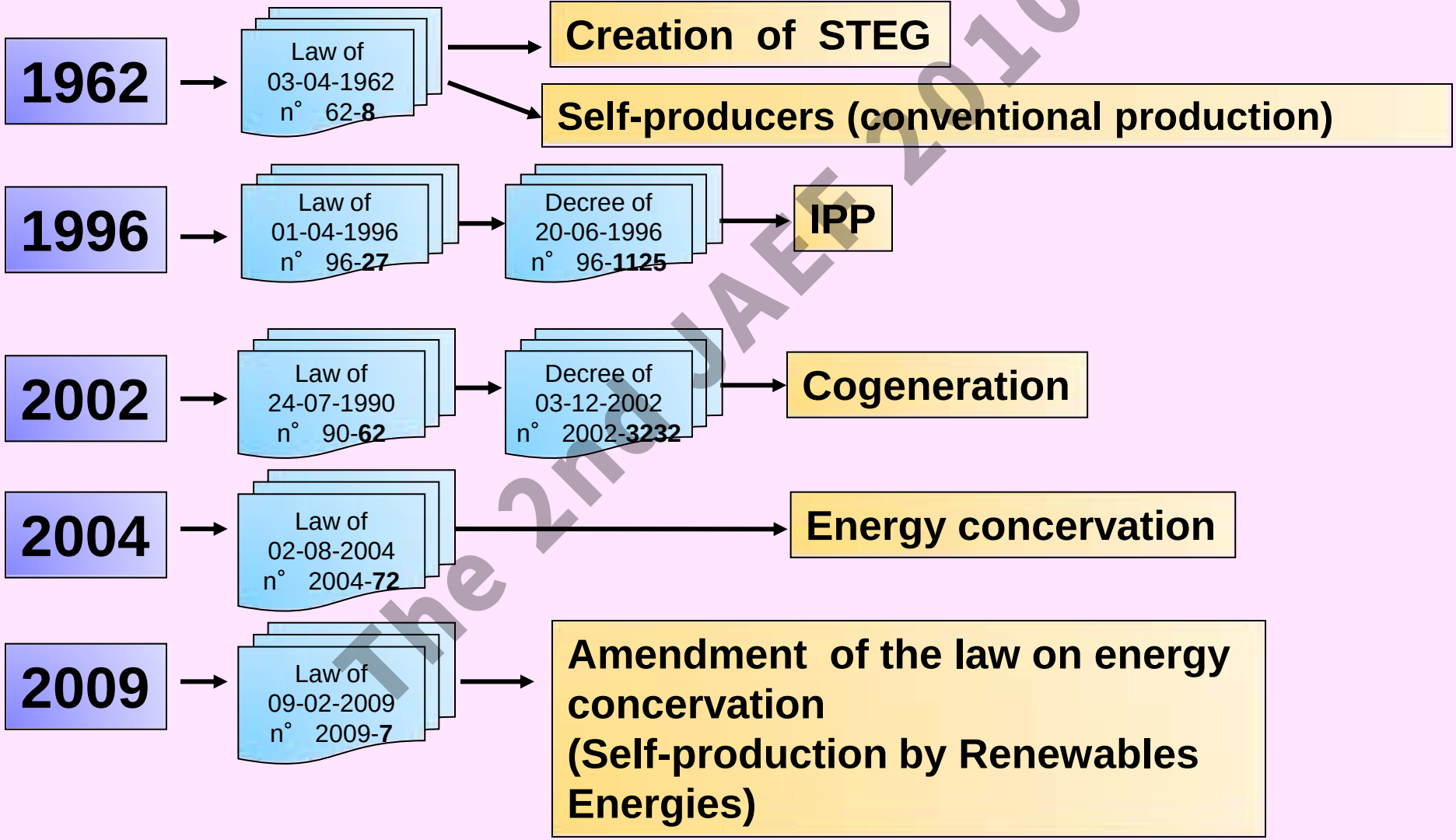
-1st programme 2005-2008

-2nd programme 2008-2011

-3rd programme: Presidential Programme 2009-2014

- 4rd programme: Tunisian Solar Plan 2009-2016

Evolution of the legal framework for electricity production in Tunisia



Evolution of the legal framework for electricity production in Tunisia

Electricity producers in Tunisia:

- **STEG:** Société Tunisienne de l'Electricité et du Gaz - Production, Transmission and Distribution

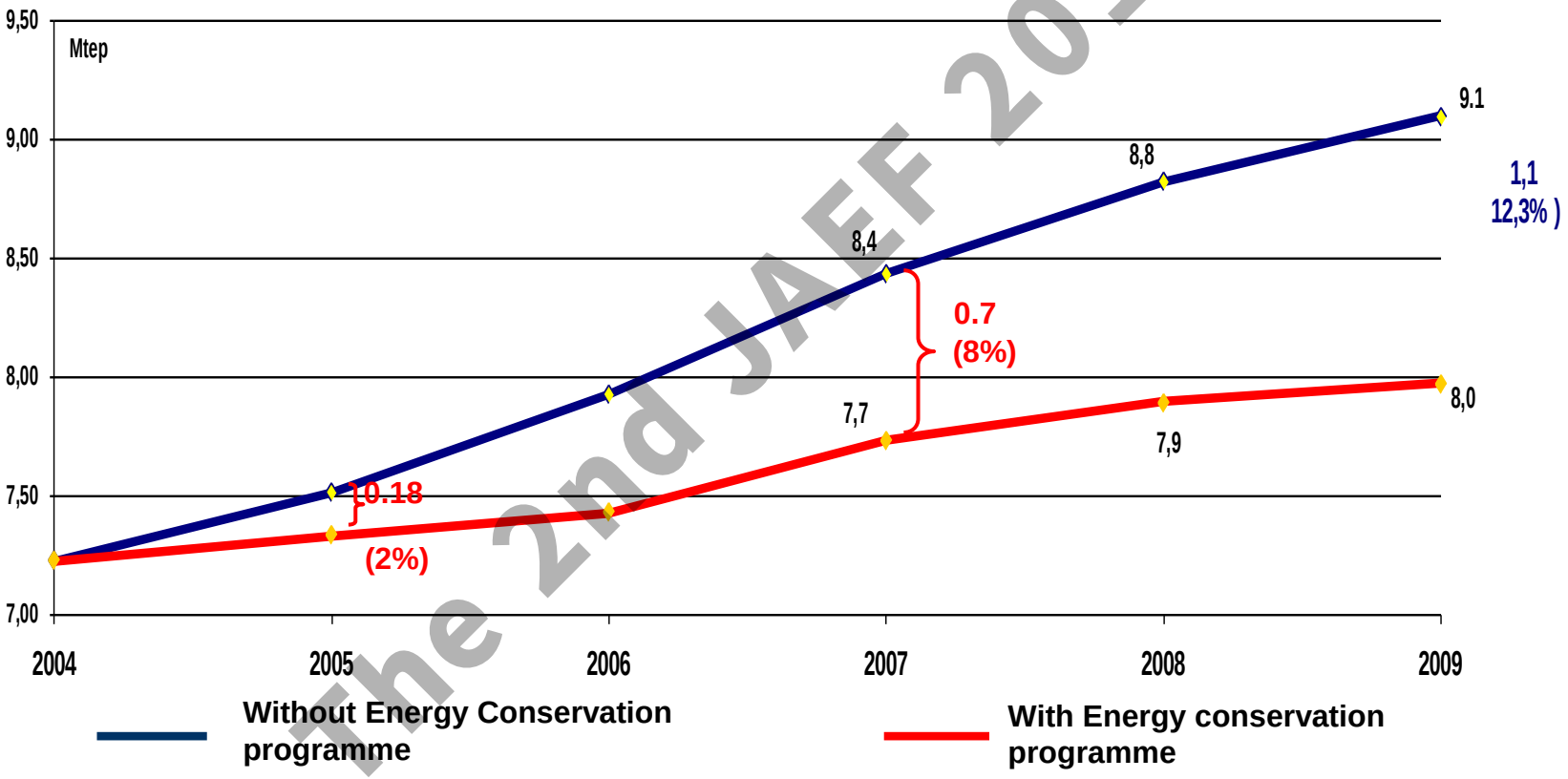
- **Cogenerator:** In accordance with the decree of 3 febr 2002 and law of of 9 feb 2009.

- **IPP:** Granted by governmental AO (Sell only for STEG)

- **Self-producers:** Big Power Consuming Facilities (BPCF) can produce – from RE- their own requirements in Energy and sell to STEG up to 30% of their production (Law of 9 Feb. 2009)

- **Export:** Energy production in Tunisia intended for export (law In progress)

Programme results (2005-2008)



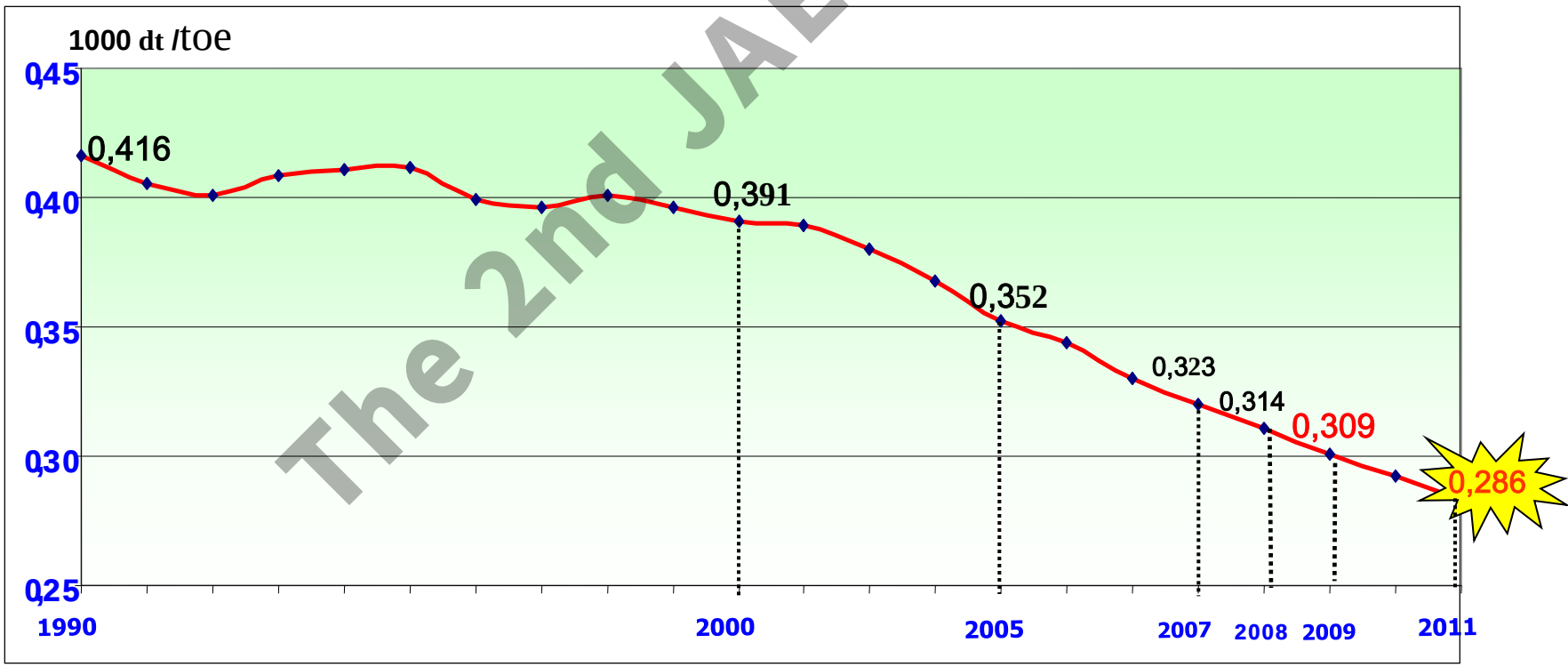
Energy intensity evolution

Evolution of energy intensity

1990-2005 : Annual reduction for energy intensity : 1%

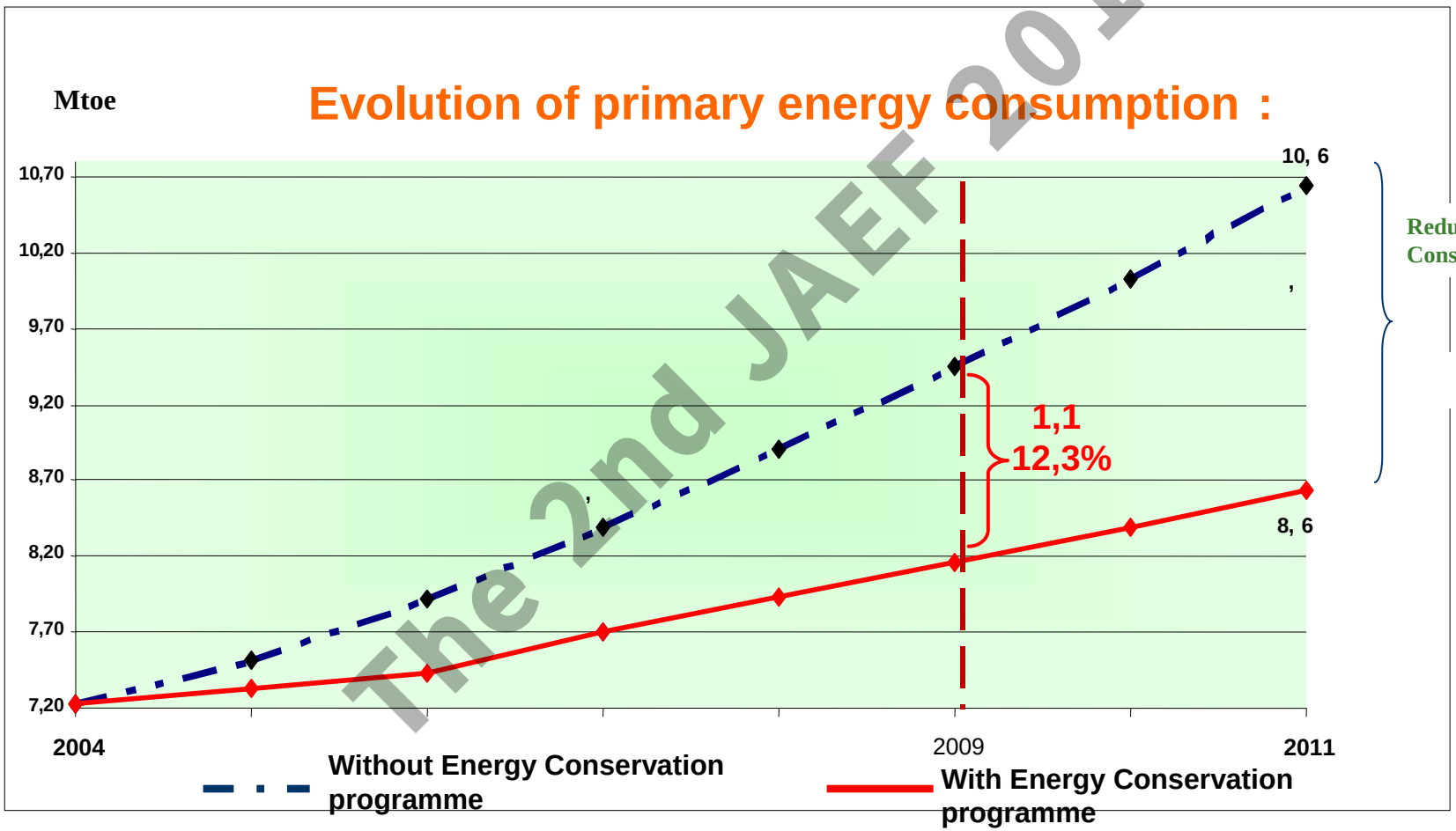
2005-2007 : Annual reduction for energy intensity : 2.8%

2008-2011 : Annual reduction for energy intensity : 3%



Programme targets (2008-2011)

Reduction of primary energy consumption by 20% in 2011



The Presidential Programme 2009-2014

From paragraph 11 of the Presidential Program 2009-2014

Towards environment-friendly, energy-saving and innovative economy with high technological content.

- **Improving energy efficiency indicator to reach 275 kg oil equivalent per 1000 dinars of GDP at constant prices, in 2014, compared to 305 kg currently.**

- **Increasing five-fold the percentage of renewable energies use in the total energy consumption, from 0,8% currently to 4,3% in 2014, and producing 550 megawatts of this type of energy (including cogeneration).**

Tunisian solar plan

Tunisian Solar Plan

- **The Tunisian Solar Plan (TSP) aims at implementing the 2009-2014 presidential programme and the will of the Tunisian State to promote concrete actions in the fields of energy efficiency and renewable energies. Besides, it confirms Tunisia's ambition to become an international platform for production and industrial and energy export including the solar energy.**

TUNISIAN SOLAR PLAN

PLAN CONSISTENCY AND TOTAL COST

OVERALL PRESENTATION : The Tunisian Solar Plan in divided into 5 chapters, related to specific fields of energy activities, and encompasses 40 projects.

IMPLEMENTATION PERIOD : 2010- 2016.

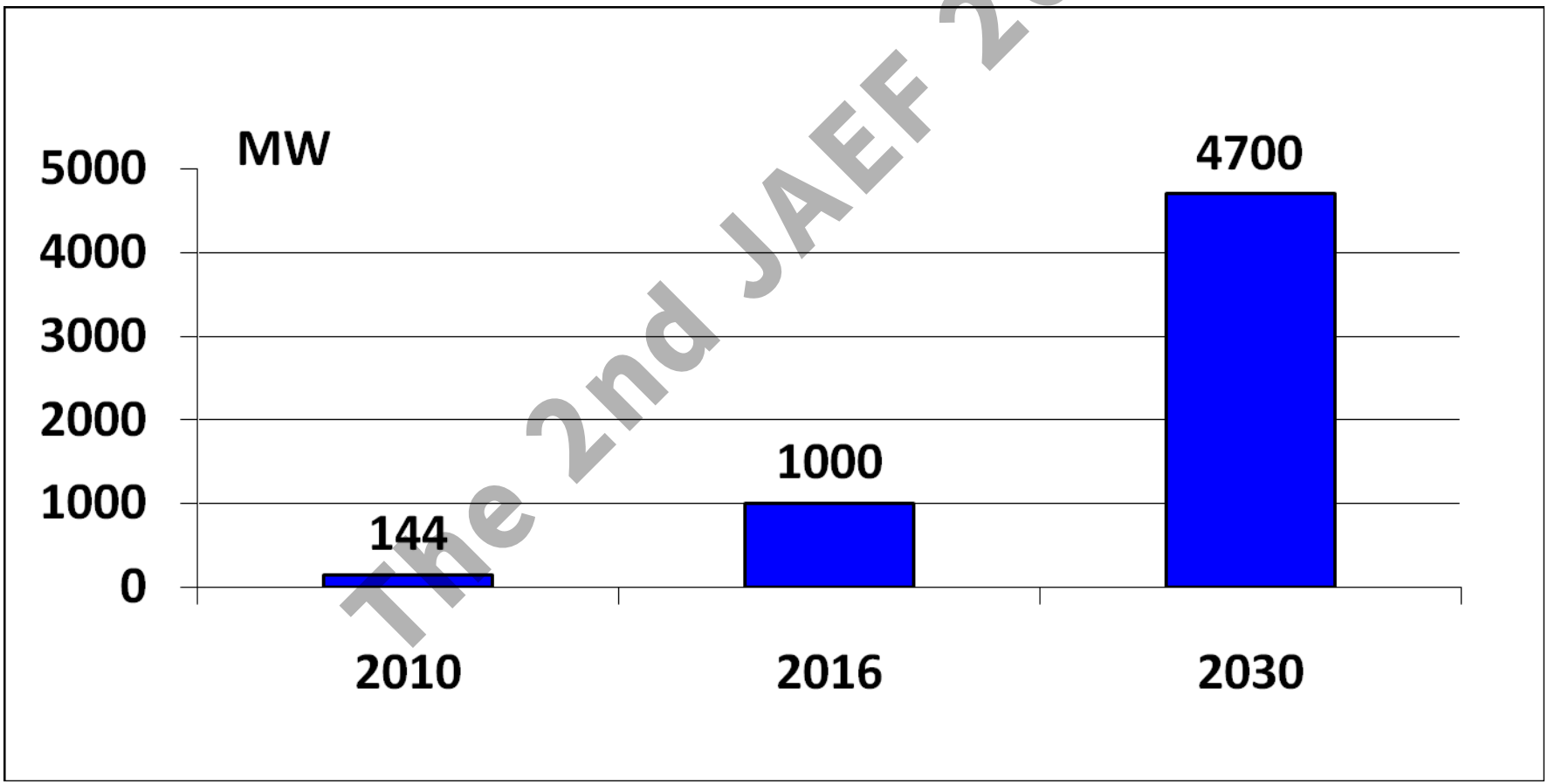
PROGRAMME TOTAL COST: The estimated total cost of the TSP is about 4100 MTND which is the equivalent of 2300 M€. The funding is detailed as follow:

- **260 MTND, (145 M€) : by the National Fund for Energy Conservation (FNME)**
- **1000 MTND, (560 M€) : by the public sector (925 MTND by STEG)**
- **2750 MTND, (1530 M€) : by private funds**
- **115 MTND, (65 M€) by international cooperation.**

TUNISIAN SOLAR PLAN

Targets

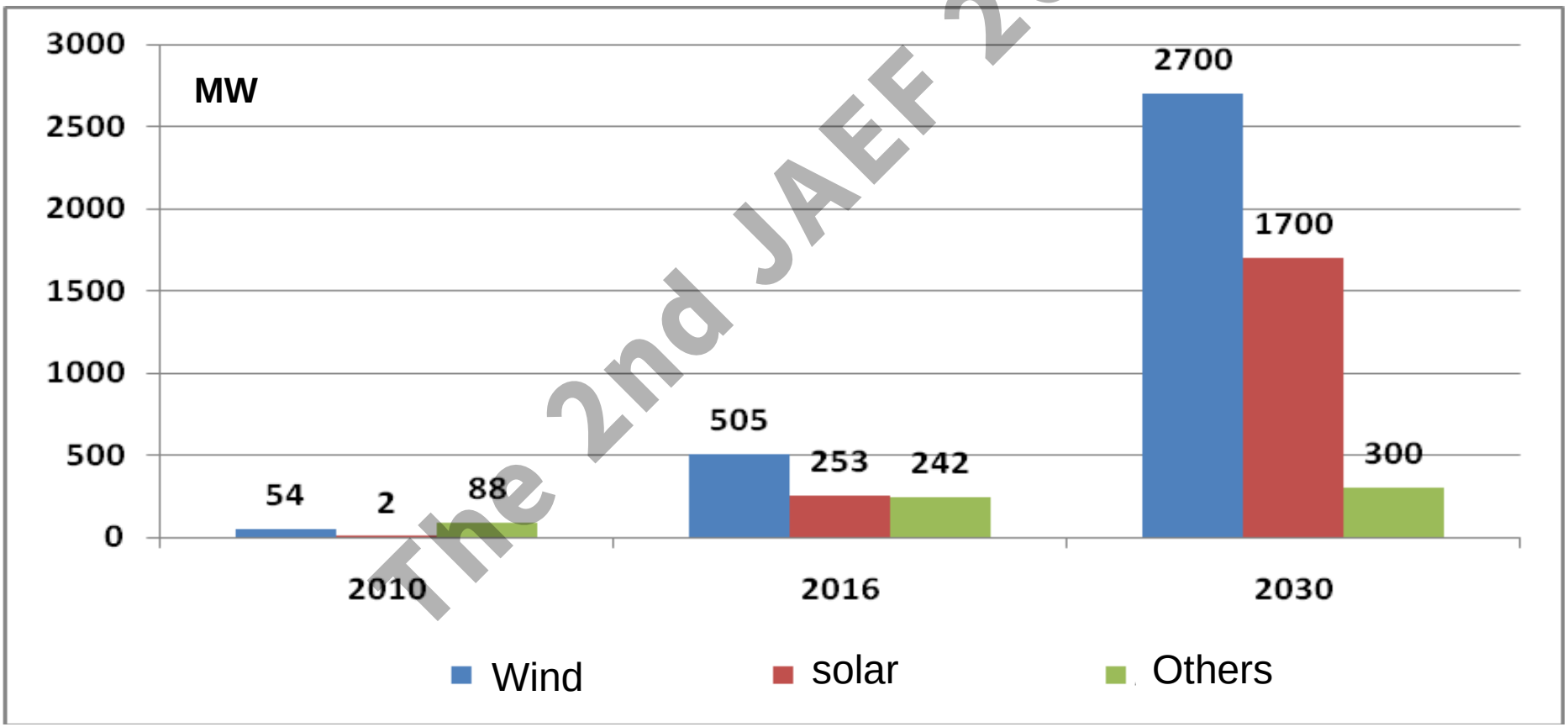
Renewable Installed Power:



TUNISIAN SOLAR PLAN

Targets

Distribution by type of Renewables Energies :



TUNISIAN SOLAR PLAN

IMPACT

ENERGY IMPACT : Fall in demand about 24% in 2016

ENVIRONNEMENTAL IMPACT : The estimated amount of avoided CO2 is about 2 000 000 tons per year, thus generating CDM (Clean Development Mechanism) revenues of around 400 MD (200 M€) over 10 years (based on 10 € per ton).

TUNISIAN SOLAR PLAN

THE OPERATORS

THE OPERATORS : The proponents of the 40 projects are as follows :

- **Public sector : 5 projects, of which 3 STEG projects ;**
- **private sector : 29 projects ;**
- **5 projects related to the studies and the plan implementation : financed by international cooperation ;**
- **Establishment of « STEG Renewable Energies ».**

TUNISIAN SOLAR PLAN PROJECTS

I. Solar Energy Projects

II. Wind Energy Projects

III. Energy Efficiency Projects

IV. Other Projects

V. Study and Implementation of the Plan

TUNISIAN SOLAR PLAN PROJECTS

I. SOLAR

I.1. THERMAL PROSOL

Solar water heating by solar thermal energy:

Project n°1 : Residential and individual Household PROSOL

Project n°2 : Residential Collective PROSOL.

Project n°3 : Tertiary (services) and industrial PROSOL.

Project n°4 : Solar powering of municipal indoors swimming pools.

I. SOLAR

I.1. THERMAL PROSOL [continued]

Solar cooling :

Project n°5 : Execution of 10 pilot projects of application of solar cooling technologies in agro-food industry (conditioning , storage….).

Solar drying :

Project n°6 : Execution of 1 pilot project of application of solar drying technologies in the agro-food industry.

I. SOLAR

I.2. POWER PROSOL

Decentralised production :

Project n°7 : Installation of 15 MW of solar panels (6000 individuals households and 1000 public and private buildings).

Project n°8 : Equipment of 200 agriculture farms with water pumping photovoltaic systems for irrigation purposes.

Project n°9 : Electrification of 1 000 households and of 100 farms and small-scale rural projects by solar and wind energies.

Project n°10 : Installation of photovoltaic systems for street lighting of a total power of 0.5 MW.

Project n°11 : Installation of 100 photovoltaic systems connected to the network in petrol stations.

TUNISIAN SOLAR PLAN PROJECTS

I. SOLAR

I.2. POWER PROSOL

Centralised production :

Project n°12 : Construction of a Concentrated Solar Power (CSP) plant of 25 MW capacity, integrated to Combine Cycle of 150 MW capacity (by STEG).

Project n°13 : Construction of a CSP plants of 75 MW capacity whose production is totally or partly intended for exportation.

Project n°14 : Construction of a Solar/Gas combine CSP plant in El Borma (by SITEP).

Project n°15 : Photovoltaic plants of 10 MW capacity (by STEG).

Project n°16 : Photovoltaic plants of 10 MW capacity (by private sector).

Manufacture of photovoltaic panels

Project n°17 : Construction of a plant for the manufacture of photovoltaic panels of a 14 MW minimum production capacity.

II. WIND ENERGY

Wind Energy :

Project n°18 : Electricity self-production (60 MW) based on wind energy for the supply of Big Power Consuming Facilities (EGCE).

Project n°19 : Electricity production (120 MW+69 MW) based on wind energy (by STEG).

Project n°20 :

Electricity production (100 MW) based on wind energy, whose production is totally or partly intended for exportation (by the private sector).

III. ENERGY EFFICIENCY

Energy Efficiency :

Project n°21 : Replacement of 400 000 over 10-year old refrigerators by energy efficient refrigerators of Classes 1 and 2.

Project n°22 : Construction of positive energy buildings.

Project n°23 : Thermal insulation of housing terraces.

Project n°24 : Dissemination of low consumption lamps (LCL) in households.

Project n°25 : Energy efficiency in the industrial sector.

Project n°26 : Training in economical energy consumption behaviour.

Project n°27 : Setting up corporate car fleet monitoring systems of public enterprises.

TUNISIAN PLAN SOLAR PROJECTS

IV. OTHER PROJECTS

Biomass :

Project n°28 : Electricity production (14,5 MW) based on optimisation of poultry waste.

Project n°29: Electricity production (10 MW) based on optimisation of landfill gases.

Project n°30 : Electricity self-production (1 MW) based on optimisation of organic wastes.

Electrical interconnection :

Project n°31 : ELMED project, Electrical interconnection between Tunisia and Italy via a 400 kV direct current submarine cable.

Other projects :

Project n°32 : "soleil de Nefta" / "Nefta sun project": Renewable Energies for the oasis of, Nefta.

Project n°33 :"Zarzis-Jerba Eco village" project.

Project n°34 : Energy optimisation of the reclamation project of the Train Station of Sousse.

V. STUDY AND IMPLEMENTAION OF THE PLAN

Studies and implementation of the Plan :

Project n°35 : Centre International Centre International de Formation supérieure des Énergies Renouvelables et efficacité énergétique et laboratoire International des Technologies de l'Énergie Solaire (International Centre for Advanced Training in Renewable Energies and Energy Efficiency & International Laboratory of Solar Energy technologies).

Project n°36 : Pilot photovoltaic plant in Borj-Cedria.

Project n°37 : Establishment of "STEG Renewable Energies".

Project n°38 : Strategic Study of the Energy Mix for power production in Tunisia for the time frame 2030.

Project n°39 : Strategic study on production of electricity based on solar and wind energy.

Project n°40 : Setting up a Management Unit of the Tunisian Solar Plan (PST).

TUNISIAN SOLAR PLAN

ISCC POWER PLANT PROJECT IN EL BORMA : PROJECT 14

It is what the site of El Borma?

- It is an isolated site, situated in Sahara in the southwest of the country and far from the national network.

- It is the site which contains diverse oil well exploited by the Italo-Tunisian Company of Oil Operation (SITEP).

- needs of electricity for oil and gas installations of the (SITEP) are satisfied by **3** gas turbine of **14 MW** unit power of which became antiquated and energy intensive; from where the decision of the SITEP to renew it.

TUNISIAN SOLAR PLAN

ISCC POWER PLANT PROJECT IN EL BORMA : PROJECT 14

Objectives and Project components

On the occasion of the renewal of the power plant, the SITEP aims at various objectives which are the following:

- **Optimize the consumption of natural gas for electricity production by the installation of equipments with high performance where from the choice of the construction of a power plant with 40 MW combined cycle CC (1st constituent of the project).**
  - **Evolution of the performance : from 20 % to 35 %.**
  - **Cost of this constituent : 140 Million Tunisian Dinras.**
  - **Starting date : in December, 2013.**
- **Join within the framework of the PST which plans the integration of a power plant CSP to the power plant CC, where from the ISCC project.**

TUNISIAN SOLAR PLAN

ISCC POWER PLANT PROJECT IN EL BORMA : PROJECT 14

Supply of the CSP by Japan

- A letter of intention carrying supply by the NEDO (New Energy and Industrial Development Organization) to the MIT (Ministry of Industry and the Technology) of a thermo-solar power plant was signed on 23/07/2010 by the Tunisian part represented by the MIT and STEG ER and the Japanese part represented by the NIDO; fulfilling so agreements of cooperation Tuniso - Japanese.

- This power plant will be integrated into the CC power plant of El Borma

TUNISIAN SOLAR PLAN

ISCC POWER PLANT PROJECT IN EL BORMA : PROJECT 14

The thermo-solar power station

- It is about the building of a tower thermo-solar generator steam. This steam generator will be integrated into the power station combined cycle and will give him with the steam to produce 5 MW electrical.

- Cost of this constituent : 25-30 Million Tunisian Dinars
  Starting date : December, 2013

Example of a tower CSP Plant

TUNISIAN SOLAR PLAN

Second phase of cooperation Tuniso- Japanese

After the success of the project of El Borma, Japan will finance the construction of a tower Concentrated Solar Power (CSP) plant of 25MW capacity integrated to a combined cycle plant of 150MW capacity in the south of Tunisia.

Thanks for your attention

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