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## 葡萄牙和巴西太阳能再生能源市场

### 一、简介：国际推动力和葡萄牙的策略

随着国际社会对气候变化的关注持续增加，以及共同努力寻求可持续发展并尽力避免自然资源的过度消耗——以京都议定书为主要推动力——不断取得成效，再生能源得以在全球范围内广泛应用。各国政府在充分考虑各自地理和自然优势的基础上，制定各种经济和法律优惠政策吸引投资建设再生能源设施。

巴西依靠水力发电满足国内的基本负载需求，而葡萄牙的能源主要依靠进口电力以及火力发电厂，这对环境影响非常大。两国都在可持续的再生能源方面展开努力。去年，葡萄牙政府通过了新的国家能源战略（葡萄牙语为Estratégia Nacional para a Energia或简称为“ENE 2020”）。该战略的目标是在2020年时，葡萄牙将大幅度的提升再生能源的生产和占国内能源消费的比例。

下面我们将着重分析葡萄牙的太阳能能源市场，文章最后会对巴西太阳能市场的发展进行介绍。

### 二、葡萄牙

#### 1、可再生能源情况概要

葡萄牙能源战略（ENE2020）的主要是实现欧盟关于能源、气候变化和能效的方面的指导方针的目标。现在，葡萄牙对水电、热能、风能、固体和生物能的利用非常好，其再生能源的发展在欧洲各国中是佼佼者。根据2009年8月的数据显示，再生能源中有47%来自水力发电，39.3%来自风力、生物能以及城市固体垃圾，13%来自沼气发电，而太阳能发电仅占0.8%。葡萄牙对再生能源发电采取优惠政策。再生能源发电优惠税公式按再生能源的不同来源，适用特别税率。该再生能源税在计算三种额外成本的基础上得出：（1）固定成本——包括首次投资运营再生能源发电机组省下的成本；（2）变动成本——包括与传统发电方式对比而节省的化石燃料的买卖和运输成本，以及运营再生能源发电机组节省的运营成本；（3）环境成本（二氧化碳排放）因使用再生能源发电而节省下。

#### 2、葡萄牙太阳能的发展

根据能源与地质总理事会（葡萄牙语或简称“DGEG”）——能源业监管单位——2010年的最新数据显示，太阳能发电占再生能源发电总量的0.8%，远低于风力发电（占总量32%）和水力发电（占总量57.6%）的比例。而葡萄牙在太阳能资源方面，是国际社会公认的最具潜力的欧洲国家之一。在拥有充足的自然资源的基础上，葡萄牙能源战略规划（ENE2020）设立的目标是在2020年将太阳能装机容量达到1500百万瓦。该目标将是现在装机容量的十倍。而150百万瓦的太阳能发电项目以两百万瓦为单位通过公开招标，仍在不断建设中。在第一波投资水力发电和第二波投资风力发电后，葡萄牙政策开始转向第三波太阳能发电投资，目标是在2020年，再生能源占全国能源消耗的60%。与该能源战略规划目的配套的是E4支持规划（葡萄牙语是），该支持规划目标是在2010年时拥有100万平方米的太阳能集热器。此外，从2002年至2010年间最高增长率达到74.6%这一数据（来自DGGE官方网站<http://www.dgge.pt/>）表明，太阳能投资在持续增加，必将成为再生能源的未来。

能源得以在全球范围内广泛应用。各国政府在充分考虑各自地理和自然优势的基础上，制定各种经济和法律优惠政策吸引投资建设再生能源设施。

#### 3、许可证制度概述

依据现行法律规定，供电厂有两种方式获取公共电网连接点（以向公共电网销售电能）——公开招标或直接申请（葡萄牙语或简称“PIP”）。后者需要在每季度的第一至十五天内向DGEG递交申请。递交申请一般是根据DGEG总理事长在一个月前发出的批示，批示内容包括申请人将获准接入公共电网的电量以及其他必要指数（大部分是技术指数）。而通过公开招标获取公共电网连接点的，招标书中需向投标人披露单位面积内或单位变电站内公共电网的可用性。

## 葡萄牙和巴西太阳能再生能源市场

通过申请获得公共电网连接点的，当申请获批后，太阳能发电厂（简称PV Plant）的项目发起人将在12个月内获准修建太阳能发电厂设施的许可。如果有关法律要求进行环境影响评估，那么该获准期限将在评估期间内保留，自评估结束后，再延长120天。项目发起人将规划项目和其他项目文件按照太阳能发电厂审批程序递交DGEG处理，最后由国家经济部部长和创新发展部部长批准。建设工程要在获准修建太阳能发电厂的许可后的18个月内开始。工程结束后，DGEG或该区域的经济理事会将检测建成电厂的装机容量是否达到10百万瓦，当发电厂达标后，才发放入网许可证，并在6个月内开始发电。

## 4、太阳能项目和主要参与方

现在，葡萄牙拥有全世界规模第三大的太阳能发电厂。该电厂于2008年十二月开始运营，总装机容量达46.41百万瓦，占地250公顷，位于葡萄牙南部阿伦特茹（Alentejo）地区的Amareleja市。该地区因降雨稀少而阳光充足最适宜收集太阳能。该项目为来自西班牙的Acciona Energia集团拥有并运营，发电量93千兆瓦时。葡萄牙境内另外还有其他9个太阳能设施，其中阿伦特茹（Alentejo）地区占据了绝大部分。

太阳能发电厂太阳能发电厂			
发电厂	装机容量 (百万瓦)	所有人	地点
FERREIRA DO ALENTEJO (GENERG)	12	FRENCH GDF DE SUEZ持股的 GENERG GROUP	FERREIRA DO ALENTEJO (ALENTEJO – SOUTH OF MAINLAND PORTUGAL)
FERREIRA DO ALENTEJO	1.8	NET PLAN	FERREIRA DO ALENTEJO (ALENTEJO)
FERREIRA DO ALENTEJO (TECNEIRA)	10	TECNEIRA (PROCME GROUP)	FERREIRA DO ALENTEJO (ALENTEJO)
BEJA (GE ENERGIA)	11	GE ENERGIA, GENERAL ELECTRICS GROUP 和 POWERLIGHT	BEJA (ALENTEJO)
CORTE PÃO E ÁGUA (CAVALUM)	0.76	CAVALUM RENEWABLE ENERGIES GROUP	MÉRTOLA (ALENTEJO)
OLVA (CAVALUM)	2.4	CAVALUM RENEWABLE ENERGIES GROUP	MÉRTOLA (ALENTEJO)
SANCTUARY OF FATIMA	0.10	SANCTUARY OF FATIMA	FATIMA (OURÉM - CENTRAL-NORTH REGION OF MAINLAND PORTUGAL)
ALMODÔVAR (WPD)	2.15	WPD (GERMAN GROUP)	ALMODÔVAR (ALENTEJO)
LAMELAS	0.10	CAVALUM RENEWABLE ENERGIES GROUP	LAMELAS (FREIXO DE ESPADA À CINTA, BRAGANÇA, NORTH WEST OF MAINLAND PORTUGAL)
总装机容量: 其他9个发电厂总装机容量 (40.31 MW)			

葡萄牙Cavalum集团正计划在Bragança市开发另一个太阳能发电厂，装机容量达两百万瓦。另外还有两个太阳能项目已经规划完毕，等待实行，其中一个位于里斯本地区市场内，装机容量达六百万瓦，由Forminvest 集团和Efacec and Caixa Capital开发。另一个就是位于阿伦特茹（Alentejo）地区的Luz On Project（项目），这将是首个特级太阳能发电厂，总装机容量达2000百万瓦（是Moura太阳能发电厂的45倍，中国和Intersolar也声称将建造同样装机容量的太阳能发电厂）。该项目发起者是Efacec集团，EIP (Eléctrico Industrial Português), Fundação Calouste Gulbenkian和Mário Baptista Coelho先生（Amareleja太阳能发电厂项目发起人，Amper股东之一）。其他一些中小项目已通过许可或正在申请许可过程中。

## 三、巴西——太阳能发电和市场概述

巴西日照辐射量为22 MJ/m<sup>2</sup>（兆焦每平方米），其东北部也是国际公认的太阳能资源最丰富的地区之一。但巴西的太阳能发电利用率却很低，先仅有5个项目在运作，总装机容量为0.087百万瓦，大部分都是科研项目。这比葡萄牙的太阳能发电装机容量要低太多，虽然两国在面积上不具备可比性。

巴西能源市场分为三类：（1）管制市场（ACR），通过管制价格将电力拍卖给电力分销公司，太阳能发电厂参与电力拍卖需经过政府同意；（2）当地电网，如果太阳能电厂运营者就是电网运营者，则在参考法定电价的情况下，太阳能发电厂可以该价格直接将电力卖于当地电网公司；（3）自由交易市场，与其他市场参与者交易（例如其他发电厂，贸易商，消费者等等）。

巴西通过实行各种能源政策和优惠，力图使其能源供给多样化，也表明该国巨大的潜能足以保持其在能源市场上的竞争力。

下图是太阳能产业的参与方

太阳能发电厂			
发电厂	装机容量 (KW)	所有人	地点
ARARAS - RO	20.48	FUNDAÇÃO DE AMPARO À PESQUISA E EXTENSÃO UNIVERSITÁRIA	NOVA MAMORÉ - RO
UFV IEE	12.26	INSTITUTO DE ELETROTÉCNICA E ENERGIA	SÃO PAULO - SP
UFV IEE	3	INSTITUTO DE ELETROTÉCNICA E ENERGIA	SÃO PAULO - SP
ITALIAN EMBASSY	50	ITALIAN EMBASSY IN BRASÍLIA	BRASÍLIA - DF
PV BETA TEST SITE	1.7	DUPONT DO BRASIL S.A	BARUERI - SP
总量: 5个发电厂 (87.44 KW = 0.874 MW)			

信息来源: NATIONAL ELECTRICITY AGENCY (ANEEL)/2011



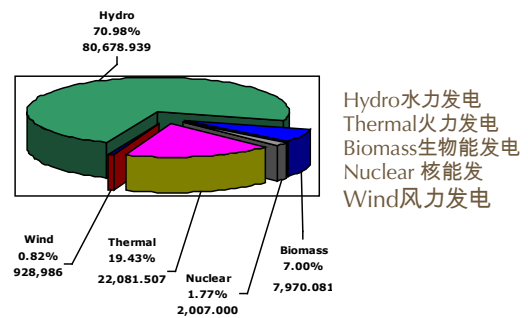
该图展示的是10年内，平均可利用的太阳能。

其中，北部可利用太阳能最多，其次是中部和东南部。

但北部受气候影响，其数

信息来源: Brazilian Atlas of Solar Energy - 2006

总功率 (2011): 113 671 600 KW



信息来源: Brazilian Atlas of Solar Energy - 2006

与世界其他国家的政策一样，巴西也鼓励发展太阳能发电，优惠政策有 (1) 将发电厂连入电网的税费降低50%；(2) 税收优惠，例如 REIDI (5年内停止收缴适用于该项目所需的商品和服务购买和进口方面的税收)，和免除与太阳能项目相关的设备部件的ICMS (商品和服务流转税)。

### SOLAR RENEWABLE ENERGY MARKETS: PORTUGAL AND BRAZIL 2011

#### I – INTRODUCTION: INTERNATIONAL DRIVERS AND PORTUGAL'S STRATEGY

With the increase in international awareness of climate change and the regional application of worldwide policies - for which the Kyoto Protocol was the basic driver - striving for the same goals in the search for sustainability and an attempt to avoid depletion of natural resources, renewable energy policies are evolving and being implemented across the globe. Everywhere governments are providing legal and financial incentives for the installation of renewable energies<sup>1</sup>, always taking into account the territorial and natural advantages of each country.

While Brazil has a history of relying on hydropower generation for baseload demand, Portugal has been relying on imported electricity and coal-fired power plants which are environmentally unfriendly. Sustainable power generation has been evolving in both these countries. Within the last year, the Portuguese government approved a new National Energy Strategy (Estratégia Nacional para a Energia or "ENE 2020"), establishing more ambitious goals for renewable energy production and its representation in domestic consumption, with targets to be achieved by 2020.

Below we will set out a specific analysis of the Portuguese solar market and finally provide an insight into the developing Brazilian solar market.

#### II. PORTUGAL

##### A – Outline of Renewables

ENE 2020 generally implements EU energy, climate change and efficiency policies with ambitious targets to comply with these EU guidelines.

Hydro, thermal, wind, solids and biomass are already well established sources of energy in Portugal. Portugal is now the leading country in Europe in terms of renewable energy generation development.

With reference to data available from August 2009, the share of total renewable energy generated, per source, is as follows: 47% from hydro, 39.3% from wind, biomass jointly with urban solid waste and biogas representing 13% of the overall production and, finally, photovoltaic generation representing 0.8%.

Renewable energy generation in Portugal is being incentivised and the formula for the regulated tariff for repayment of generation to renewable energy generators contains a specific coefficient evaluated per source of generation of renewable energy. This tariff for sale of renewable energy is based on the addition of the following 3 layers: (i) fixed costs - including costs saved with the first investment in the operation of the electrical unit; (ii) variable costs - including costs of acquisition and transportation of fuel, as well as operation and handling cost saved by the operation of the electrical unit, and (iii) environmental costs (CO<sub>2</sub> emissions) saved by the use of renewable endogenous sources used by the electrical unit.

##### B – Development of Solar Energy in Portugal

Accordant to the latest 2010 data released by the General Directorate for Energy and Geology (Direcção Geral de Energia e Geologia or "DGEG"), the supervisory body for the energy sector, the contribution of solar energy generation to the renewable energy sector was only 0.8% which is far below that of wind energy or of hydropower generation each with respectively 32% and 57.6% representative contribution.

Portugal is internationally recognised as one of the European Countries with the greatest solar energy potential.

In light of the favourable natural conditions, ENE 2020 sets a goal to reach 1500 MW of installed solar capacity by the end of 2020. This goal represents ten times the current installed capacity the projects for which are still in the implementation phase as this 150 MW capacity was granted by public tender to several bidding entities in 2 MW packages. After the first wave of investment in hydropower energy and the second wave in wind energy generation, Portuguese policies now plan to dramatically increase the production of renewable energy turning to solar energy in a third wave. The implementation of this third wave policy will greatly assist in achieving the goal of 60% of all national energy consumption from renewable energies in 2020.

The aims set forth also lead to the introduction of an efficiency support programme named E4 - Água Quente Solar para Portugal or "Support Programme E4", which was intended to achieve the installation of 1 000 000 m<sup>2</sup> of solar collectors in 2010.

Moreover, the growth in investment in solar energy, showing the clear focus on this source as the future energy among all other sources of renewable energy, is also confirmed by the highest Average Annual Growth Rate of 74.6% in solar installed capacity<sup>2</sup> between 2002 and 2010.

<sup>1</sup> Protocol to the United Nations Framework Convention, adopted at the third Conference of the Convention of Parties, in Kyoto, on 11 December 1997.

<sup>2</sup> Data from DGEG, in <http://www.dgge.pt/>

### C – BRIEF DESCRIPTION OF THE LICENSING PROCESS

Under the applicable legislation there are two ways to obtain the necessary connection point to inject capacity to the public distribution grid – through a public tender or through an application for a connection point (Pedido de Informação Prévia or “PIP”). The latter application needs to be submitted to the DGEG between day 1 and 15 of each quarter. Submissions must be preceded by an order issued by the General Director of the DGEG, in the previous month, with definition of the potential capacity to be granted to applicants jointly with all other inherent and related specifications (mostly of a technical nature). If a public tender is launched for the purposes of granting capacity injection rights, this information - grid availabilities per area/connection substation - will be provided to bidders in the tender documents.

As to the attribution of the PIP, if the request is approved, the promoter of the Photovoltaic Power Plant (“PV Plant”) will then be granted Authorisation for PV Plant Installation (Autorização de Instalação) within a 12 month period. This period will be extended if an Environmental Impact Assessment is necessary, as defined under several pieces of legislation. The attribution of the said point is deemed to be a “reservation” of the same and will expire after 120 days. The PV Plant installation authorisation procedure will be handled by the DGEG, upon submission of the planned project and other project documents by the Promoter, with final approval required from the Minister of Economy, Innovation and Development.

Construction must then start within 18 months from the PV Plant Installation Authorisation. Following the end of the construction works, the DGEG or the Regional Directorate of the Economy, depending on whether the capacity is above or below 10 MW, will supervise the construction works and when they are in compliance, an Exploration Licence will be issued and energy generation started within a maximum of 6 months<sup>3</sup>.

### D – SOLAR PROJECTS AND MAJOR PLAYERS

For the moment Portugal has the third largest PV Plant in the world in terms of size. This plant, which became operational in December 2008 has a total installed capacity of 46.41 MW and occupies a total of 250 hectares. It is located in the city of Amareleja in the region of the Alentejo in

Nine other photovoltaic installations are presently located in Portugal, the Alentejo region having most of the installed capacity when compared to the rest of Portugal:

SOLAR PLANTS			
PLANT	CAPACITY (MW)	OWNER	LOCATION
FERREIRA DO ALENTEJO (GENERG)	12	GENERG GROUP HELD BY THE FRENCH GDF DE SUEZ	FERREIRA DO ALENTEJO (ALENTEJO – SOUTH OF MAINLAND PORTUGAL)
FERREIRA DO ALENTEJO	1.8	NET PLAN	FERREIRA DO ALENTEJO (ALENTEJO)
FERREIRA DO ALENTEJO (TECNEIRA)	10	TECNEIRA (PROCME GROUP)	FERREIRA DO ALENTEJO (ALENTEJO)
BEJA (GE ENERGIA)	11	GE ENERGIA, GENERAL ELECTRICS GROUP POWERLIGHT	BEJA (ALENTEJO)
CORTE PÃO E ÁGUA (CAVALUM)	0.76	CAVALUM RENEWABLE ENERGIES GROUP	MÉRTOLA (ALENTEJO)
OLVA (CAVALUM)	2.4	CAVALUM RENEWABLE ENERGIES GROUP	MÉRTOLA (ALENTEJO)
SANCTUARY OF FATIMA	0.10	SANCTUARY OF FATIMA	FATIMA (OURÉM - CENTRAL-NORTH REGION OF MAINLAND PORTUGAL)
ALMODÔVAR (WPD)	2.15	WPD (GERMAN GROUP)	ALMODÔVAR (ALENTEJO)
LAMELAS	0.10	CAVALUM RENEWABLE ENERGIES GROUP	LAMELAS (FREIXO DE ESPADA À CINTA, BRAGANÇA, NORTH WEST OF MAINLAND PORTUGAL)
TOTAL: 9 OTHER PLANTS (40.31 MW)			

<sup>3</sup> Please note that some other municipal licences may be required for full compliance with the applicable Portuguese Legal Framework.



# SOLAR RENEWABLE ENERGY MARKETS: PORTUGAL AND BRAZIL

## 葡萄牙和巴西太阳能再生能源市场

### III – BRAZIL – SOLAR ENERGY GENERATION AND MARKET OUTLINE

Brazil has a solar radiation of 22 MJ/m<sup>2</sup> during the day and its north east region is also internationally recognised as having one of the world's best solar radiation levels.

Despite this potential, the contribution of solar generated power still has a very small ratio. Brazil currently has 5 solar projects in operation, with a total installed capacity of 0.087 MW, mostly related to research institutes. This is much lower than the Portuguese installed capacity to date whereas the sizes two countries are very different in size.

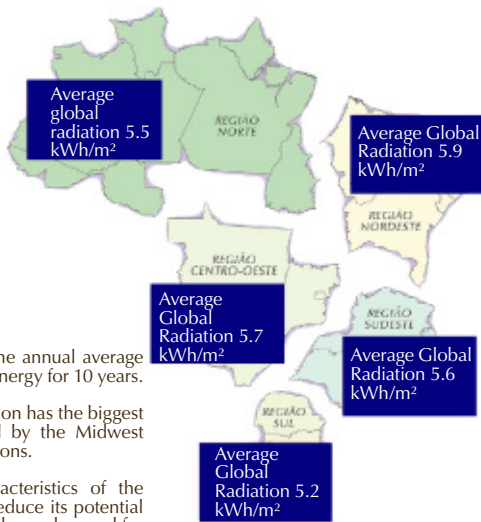
Brazil's power market is divided into (i) the Regulated Market (ACR), where the sale to distributors is made through auctions with regulated prices and the participation of PV Plants in such auction is subject to governmental approval, (ii) the Local Distributor's grid if the PV Plant is directly connected to the distributor, holder of the concession, where the sale of power generated is made directly to this local distributor with a legally limited price calculated having as reference the value of the sale to the power system (in general), and (iii) the Free Market (ACL), where the sale is made to other market agents (e.g., generators, traders, consumers, etc.).

Brazil has invested a lot in the diversification of its energy system through the implementation of policies and incentives and these policies demonstrate that the country has enormous potential which is to be developed so as to compete with other energy sources.

The chart below shows the players acting in solar energy generation:

SOLAR PLANTS			
PLANT	CAPACITY (KW)	OWNER	LOCATION
ARARAS - RO	20.48	FUNDAÇÃO DE AMPARO À PESQUISA E EXTENSÃO UNIVERSITÁRIA	NOVA MAMORÉ – RO
UFV IEE	12.26	INSTITUTO DE ELETROTÉCNICA E ENERGIA	SÃO PAULO - SP
UFV IEE	3	INSTITUTO DE ELETROTÉCNICA E ENERGIA	SÃO PAULO - SP
ITALIAN EMBASSY	50	ITALIAN EMBASSY IN BRASÍLIA	BRASÍLIA - DF
PV BETA TEST SITE	1.7	DUPONT DO BRASIL S.A	BARUERI - SP
TOTAL: 5 PLANTS (87.44 KW = 0.874 MW)			

Source: National Electricity Agency (ANEEL)/2011



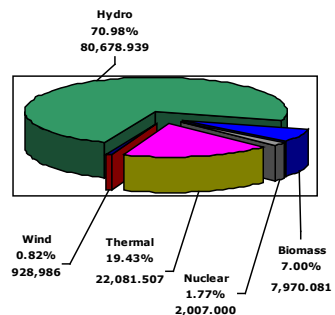
This map shows the annual average potential of solar energy for 10 years.

The Northeast region has the biggest potential followed by the Midwest and Southeast regions.

The climate characteristics of the Northern region reduce its potential to values close to those observed for the Southern region.

Source: Brazilian Atlas of Solar Energy - 2006

### GENERATION CAPACITY (2011): 113 671 600 KW



Source: Banco de Informações de Geração 2011

Solar energy in Brazil currently represents less than 0.01% of the national energy supply

**PLMJ**  
INTERNATIONAL  
LEGAL NETWORK  
MEMBER OFFICES  
ANGOLA • BRAZIL • CAPE VERDE • CHINA  
MACAO • MOZAMBIQUE • PORTUGAL

**PLMJ**   
SOCIEDADE DE ADVOGADOS, RL  
A. M. PEREIRA, SÁRAGGA LEAL, OLIVEIRA MARTINS, JÚDICE  
E ASSOCIADOS

 DACHENG  
LAW  
OFFICES  
大成律师事务所

Brazilian policies, similarly to other renewables policies in the world, incentivise this type of power generation, by (i) offering a reduction of at least 50% in the tariffs paid by generators to have access and use the grid, (ii) tax incentives such as the REIDI (suspending taxes applicable to the acquisition and import of goods and services related to the respective project for 5 years) and an exemption from ICMS (Tax on the Circulation of Goods and Services) applicable to the equipment and components related to solar projects.

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