

# CSP FIT GUIDE

## CSP TODAY SEVILLA 2011

### 5th International Concentrated Solar Thermal Power Summit

November 29-30, Sevilla, Spain

**CSP is Evolving - Increase competitiveness and exploit new opportunities to develop a profitable & commercially successful business**

**CSP TODAY SEVILLA** is the number one networking and knowledge centre for the industry and the most influential CSP-focused event in the world. In association with the launch of this event, we are pleased to present you with the CSP Feed-in tariffs Guide.

For more information, visit: [www.csptoday.com/csp/fit](http://www.csptoday.com/csp/fit)



The International Energy Agency already envisages that with the right support, **CSP could provide 11.3% of global electricity by 2050.**

As part of this year's **CSP TODAY SEVILLA 2011** event, we have compiled a useful CSP feed-in tariffs and incentives guide to help you spot the best opportunities. This document contains vital information on the schemes available to the concentrated solar thermal industry around the world and will keep on being updated.

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## Available solar incentives at a glance

Authority/Regulator	Type of Incentive/Mechanism	Currency/ kWh	Tariff
<b>USA</b>			
State Government/US Treasury Department	Tax credits		Vary from state to state
US Department of Energy	DoE Loan Guarantee Program		\$10 bn of the total sums available under the programme are targeted to renewable and/or energy efficient systems and manufacturing
Federal Government	Tax credit bonds		N/A
	MTC for creation of expansion of manufacturing facilities		N/A
<b>South Africa</b>			
National Energy Regulator of South Africa (NERSA)	REFIT 2011 for CSP trough $\geq$ 1 MW with storage	Rand/kWh	R 1.836 - Not accepted yet; tariffs are proposed for revision through a discussion paper submitted by the energy regulator
National Energy Regulator of South Africa (NERSA)	REFIT 2011 for CSP trough $\geq$ 1 MW without storage	Rand/kWh	R 1.938
<b>India</b>			
Central Electricity Regulatory Commission (CERC)	Solar Tariff (FY 2010-11)	Rupees/ kWh	Rs. 15.31 - Tariffs also vary at a State level in: Gujarat, Rajasthan, Maharashtra, Jharkhand and Madhya Pradesh
Central Electricity Regulatory Commission (CERC)	Solar Tariff (FY 2010-11)	Rupees/ kWh	Rs. 15.04
<b>Morocco</b>			
Moroccan Agency for Solar Energy (MASEN)	Tender offer framework		Masen has currently set two tariffs, one for peak and a lower one for offpeak for the CSP Ouarzazate plant which might be a base for future projects
<b>Spain</b>			
Ministry of Energy and Mines	Royal Decree 661/2007- Fixed regime: fixed a tariff for the first 25 years	Euros/kWh	€ 0.27
Ministry of Energy and Mines	Royal Decree 661/2007- Fixed regime: after 25 years	Euros/kWh	€ 0.22
Ministry of Energy and Mines	Royal Decree 661/2007- Variable regime	Euros/kWh	Market price + premium with lower limit and cap of: floor of €0.2712/kWh and a cap of €0.3673/kWh
Ministry of Energy and Mines	Royal Decree 661/2009 - Updated Feed-in-tariff with two options	Euros/kWh	1.Regulated tariff : €0.28 first 25 years; €0.23 from then on. 2. Organized electricity market: €0.27first 25 years; €0.21 from then on (top cap €0.36; lower cap €0.26)
<b>Italy</b>			
Ministry of Economic Development / Ministry of Environment and Territory / Gestore dei Servizi Energetici	Decrees No. 387/2003; DM 11/04/2008: Feed-in tariff for CSP	Euros/kWh	0-15% €0.28; 15-50% €0.25; 50% and greater €0.22. The tariff depends on the net production that (not attributable to solar) - See annex 6 for more details
<b>Portugal</b>			
Portuguese Government/Directorate General for Energy and Geology (DGEG) / Portuguese energy agency Adene	Decrees No. 312/2001; No. 189/88; No. 225/2007 :Special Production Regime based on formula	Euros/kWh	Average indicative tariff for CSP installations $\leq$ 10MW: €26.3 - €27.3 (valid for 15 years)
Portuguese Government/Directorate General for Energy and Geology (DGEG) / Portuguese energy agency Adene	Direct subsidy payments (PRIME-Programme) and tax incentives		N/A
<b>Greece</b>			
Regulatory Authority for Energy	Decree L3468/2006	Euros/MWh	As from June 2010: Solar thermal energy €264.85; Solar thermal with storage system (at least 2h at nominal load) €284.85

## Summary of the various incentive mechanisms in the USA

Type of mechanism	Description	Example of Use
ITC	Tax credit on a percentage of the total capital investment in a renewable energy project.	30% of CSP use projects constructed before 2017.
PTC	Tax credit for electricity generated by qualified energy resources and sold by the taxpayer to an unrelated person during the taxable year.	Can now be exchanged for a grant from the US Treasury Department.
Accelerated	Depreciation Enables greater tax write-offs at early stages of project to help cover initial start-up costs.	Five years for solar property.
Loan Guarantee	Government guarantees the full repayment of a loan, which helps projects attract debt financing at lower rates.	Provided by US DoE.
CREBs	Tax credit bonds on which the companies do not pay full interest. The federal government provides the bondholder with a tax credit that covers 70% of the interest earned.	Increased funding of \$1.6 bn under ARRA.
MTC	Incentive for the creation or expansion of manufacturing facilities producing clean energy components and systems.	Provides a 30% credit for investments in advanced energy manufacturing projects.
Sales or Property Tax Reduction/Waiver	Governmental or bank financing at terms below commercial rates.	Arizona has a sales tax exemption for CSP components.
R&D Support	Helps drive more rapid technological improvement.	DoE-funded R&D partnerships.

# Spain

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## The Spanish STE Regulatory Framework

Incentives and government support The main government support for CSP is the FIT. These are payments made by grid operators or utilities to renewable energy generators for the energy they supply to the grid. Grid operators are legally obligated to enter into long-term contracts (25 years) under which they will pay a fixed amount for each unit of renewable energy produced, which is above the average wholesale energy price. Spain was the first country to introduce a FIT for CSP. The original FIT offered a rate of €0.12/kWh for electricity produced at CSP plants with up to 50MW of capacity.

The FIT was increased to €0.18/kWh in Royal Decree 436 in 2004 and then to €0.27/kWh in 2007. The Royal Decree (RD) 661 in 2007 fixed a tariff of €0.269375/kWh for the first 25 years, and then drops to €0.215498/kWh. Under RD 661/2007, CSP producers could claim the FIT in two different ways. One of them is the fixed regime, in which they receive the amounts given above. Alternatively, they could claim the FIT under the variable regime. This means that they received the market price of electricity plus a premium.

Under the variable regime there is a floor of €0.2712/kWh and a cap of €0.3673/ kWh. This is the tariff that has been granted to all the current projects in the planning and construction stages in Spain. It separates the tariff from the market reference price, which is linked to oil prices.

### R.D. 661/2007 (May)

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- ▶ It established a FIT of 27 c€/kWh (or pool price + 25,4
- ▶ c€/kWh) for plants <50 MW

### R.D.L 6/2009 (May)

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- ▶ It made a selection of the eligible plants for the former FIT
- ▶ Criteria : Permits, financing, component acquisition,
- ▶ 4500 MW applied and 2400 MW registered
- ▶ Limitation in connection dates:  
Phases I, II, III, IV (2011-13)
- ▶ 36 months for completion. Dec-2012 for ph. I, II and III and Dec-2013 for ph. IV

### R.D. 1614/2010 (Dec.)

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- ▶ It maintained the FIT for all the plants registered under the
- ▶ R.D.L. 6/2009 process
- ▶ It limited the operating hours of these plants according to their respective designs to prevent for future capacity enlargements

### New R.D. still to be negotiated

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- ▶ It will cover the period 2014 - 2020.
- ▶ Goal: approximately 5.000 MW in operation by 2020
- ▶ Criteria and technology breakdown still to be defined

# South Africa

## 2009 REFIT and 2011 Revised REFIT with projected CPI adjustments for years 2012-2013

YEAR	REFIT 2009	REFIT 2011	REFIT 2012	REFIT 2013	PERCENTAGE CHANGE 2011/2009
TECHNOLOGY	R/kWh	R/kWh	R/kWh	R/kWh	
Wind ≥ 1 MW	1.25	0.938	0.945	0.952	-24.9%
Landfill Gas ≥ 1 MW	0.90	0.539	0.550	0.562	-40.1%
Small Hydro ≥ 1 MW	0.94	0.671	0.675	0.680	-28.6%
CSP trough ≥ 1 MW with 6 storage	2.10	1.836	1.845	1.854	-12.6%
CSP trough ≥ 1 MW without storage	3.14	1.938	1.953	1.967	-38.3%
CSP central receiver (tower) ≥ 1 MW with TES 6 hrs	2.31	1.399	1.408	1.417	-39.4%
Photovoltaic ≥ 1 MW ground mounted	3.94	2.311	2.325	2.338	-41.3%
Biomass solid ≥ 1 MW (direct combustion)	1.18	1.060	1.084	1.108	-10.1%
Biogas ≥ 1 MW	0.96	0.837	0.862	0.887	-12.9%

### TARIFF INDEXATION

South African CPI as published by South African BER annually, will be used to adjust the REFIT in the PPA for annual economic fluctuations. The adjustment will only be applied to the 'operation and maintenance' and fuel portions of the previous calendar year REFIT. The Capex portion will remain constant for the duration of the PPA.

The formula for annual REFIT CPI adjustment in the PPA will take the following form:  $REFIT_{j+1} = Capex_{2011} + (FOM_j + VOM_j + FUEL_j) \times (1 + RSA\_CPI_j/100)$  (1)

Where:

j - calendar year ≥ 2011

REFIT<sub>j</sub> - PPA tariff in year j

CAPEX<sub>2011</sub> - Capex, R/kWh

FOM - Fixed Operation and Maintenance in year j, R/kWh

VOM - Variable Operation and Maintenance in year j, R/kWh

RSA\_CPI<sub>j</sub> - Actual South African CPI for year j

Forestry trees must be replanted into order to complete the carbon cycle in the Atmosphere

All forestry trees and residues to be used for electricity generation will be collected from fields where there is plantation, not from industrial plants

### **REFIT POWER PURCHASE AGREEMENT**

- ▶ The Regulator will facilitate the conclusion of the REFIT PPA and the associated commercial agreements necessary for buying and selling power between a REFIT IPP and the Buyer.
- ▶ REFIT agreements will be approved by the Regulator in the licensing process of the preferred bidders
- ▶ The term of the PPA is 20 years as agreed in REFIT Phases 1 and 2.

### **STAKEHOLDERS INPUTS REQUESTED**

- ▶ Stakeholders are requested to provide comments on the following:
  - (a) Financial assumptions used for the calculation of the REFIT.
  - (b) REFITs and qualifying principles.
  - (c) Any other comments or proposals to the Regulator related to this Review of Renewable Energy Feed-In Tariffs Consultation Paper.

### **REFIT REVIEW**

The revised tariffs will apply to new REFIT IPP projects to be commissioned after the promulgation of the revised tariffs.

# India

## Regulatory Initiative: CERC-RE Tariff Regulations

### Comprehensive RE tariff regulations by CERC

#### Tariff Support

- ▶ Tariff design ensures assured return with full cost recovery during debt repayment period
- ▶ Fixed Levelized tariff for useful life: 25 years

#### Tariff Visibility

- ▶ Solar PV: Tariff for FY10-11 shall also be applicable for FY11-12, PPA to be signed on or before 31.03.11
- ▶ Solar Thermal: Tariff for FY10-11 shall also be applicable for FY11-12 and FY12-13, PPA to be signed on or before 31.03.11

### Regulatory Initiative: Solar Tariff (FY 2010-11)

Norm	Solar PV	Solar Thermal
Capital Cost	Rs. 16.90 Cr/MW	Rs.15.30 Cr./MW
CUF	19%	23%
Tariff	Rs. 17.91 /kWh	Rs. 15.31 /kWh

**Reverse bidding experience of NVVN:** Invited bid discount from CERC determined rate for FY10-11 Rs.15.31/kWh (34 ct/kWh) for solar thermal, has yielded prices in the range of Rs. 10.49 to 12.24/kWh (23 to 27 ct/kWh)

### Regulatory Initiative: Solar Tariff (FY 2011-12)

Norm	Solar PV	Solar Thermal
Capital Cost	Rs. 14.42 Cr/MW	Rs.15.00 Cr./MW
CUF	19%	23%
Tariff	Rs. 15.39/kWh	Rs. 15.04/kWh



## Solar PV and Thermal Tariff of SERCs

Norm	Solar PV	Solar Thermal
Gujarat	Rs. 12.54 / kWh Or Rs. 15 for first 12 years, Rs.5 from 13th to 25th year	Rs.9.29 / kWh Or Rs. 11 for first 12 years, Rs.4 from 13th to 25th year
Rajasthan	Rs. 12.58 / kWh	Rs. 15.32 / kWh
Maharashtra	Rs. 15.61 / kWh	Rs. 15.24 / kWh
Jharkhand	Rs. 17.96 / kWh	Rs. 13.12 / kWh
Madhya Pradesh	Rs. 15.35 / kWh	Rs. 11.26 / kWh

# Morocco

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Morocco has a high energy demand, which is increasing and is forecast to continue growing steadily. The country has developed a strategy to address energy security in light of the fact that the country's energy

balance is dominated by imported fossil fuels. With no fossil-fuel production capacity, Morocco has to import all its fuel requirements and wishes to achieve sovereign security of fuel. Key elements of this strategy include: diversifying and optimising the energy mix around reliable and competitive energy technologies, in order to reduce the share of oil to 40% by 2030; making energy efficiency improvements a national priority; and integrating into the regional energy market, through enhanced cooperation and trade with the other countries of North Africa and the EU. On 2 November 2009, the government unveiled a Moroccan Solar Plan aimed at achieving a 42% renewable energy target by 2020. It has a 2,000MW long-term target for solar power, including CSP, by 2020, intended to meet 14% of the country's energy needs.

Together with Jordan, Morocco is one of the two most deregulated markets in the region for electricity. It has established a single authority, the Moroccan Agency for Solar Energy (MASEN), to run tenders. Our primary sources confirmed that Morocco is a positive example of the tender offer framework or market. It is competitive, and not the preferred option for investors, but it is functioning. The framework is a result of government policy not to introduce feed-in tariffs because it could put threaten public finances, which did happen in Spain, as described above. In addition, the country has the regulatory framework in place to allow energy products from solar power to be exported, thereby making it of interest to both developers and investors.

MASEN has established two tariffs, one for peak and a lower one for offpeak or base load, for the CSP Ouarzazate plant.

# Implementation Potential

Public policies and the institutional set-up in Morocco are very supportive for this project (Ouarzazate plant). The Government has in recent years undertaken a substantial effort to promote renewable energy, establish an adequate legal framework, set up a dedicated agency for energy efficiency and renewable energy development, and set up an institution specifically dedicated to implementing the Solar Plan (MASEN).

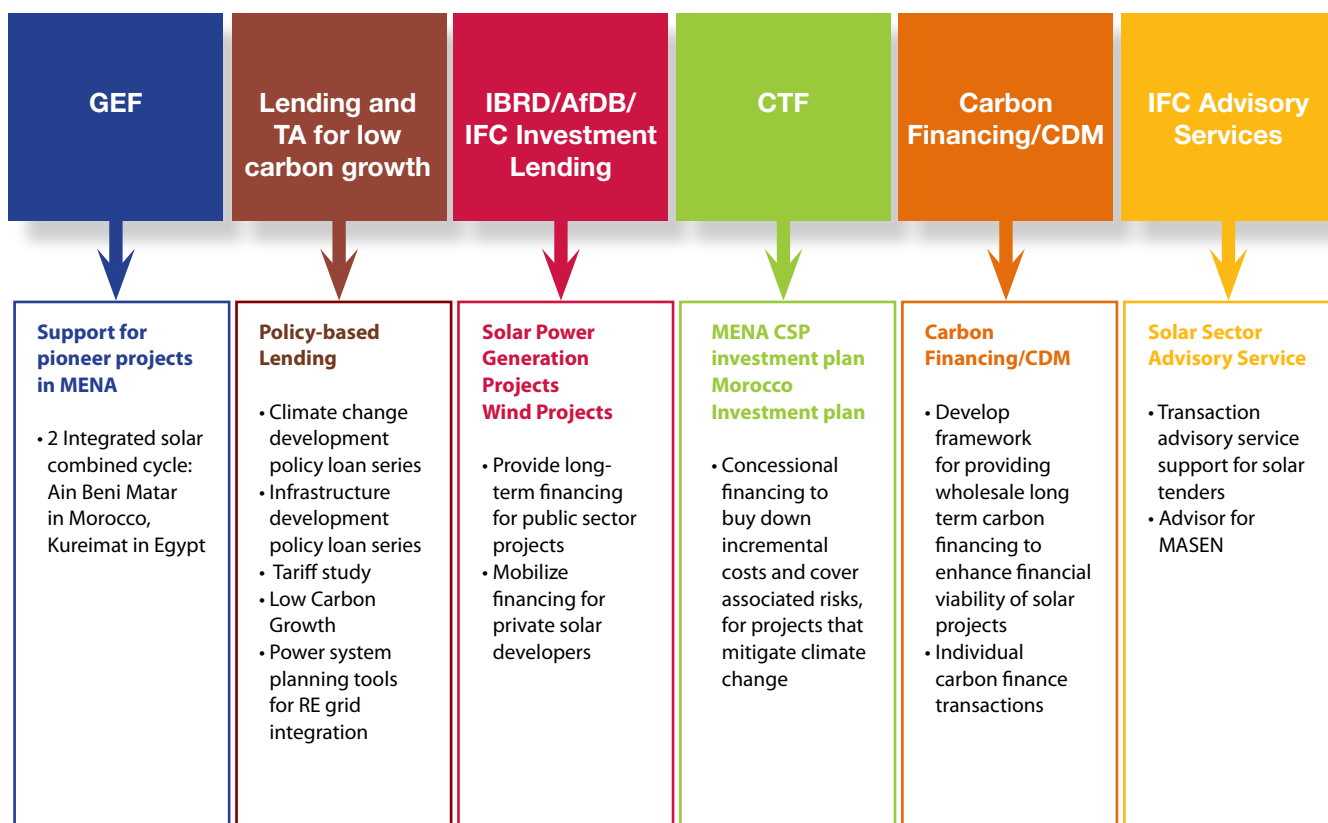
A renewable law 13-09 was approved in 2010. It provides a legal framework for the creation and operation of facilities producing electricity from renewable energy sources. It allows public and private corporations to compete with ONE, the publicly owned utility, in the production of electricity from renewable energy and have access to the electricity transmission system operated by ONE.

The Government is also undertaking extensive efforts to implement cost-reflective energy pricing and is launching energy conservation programs that will ease the transition to cost-reflective pricing by keeping consumer electricity steady.

# Sustainability of Transformation

In addition, the World Bank and the African Development Bank are engaged with the Government to enhance the overall sector policy framework and advance reforms aimed at improving the sector's commercial environment and financial sustainability. The Government recognizes that ONE operates under tight financial constraints and has demonstrated its willingness to gradually increase tariffs toward covering costs, and provide budget and other support in the meantime. A study aimed at proposing a cost-reflective structure for electricity tariffs has been launched. In parallel, a study was also launched to define the missions of a new regulatory authority to be created.

As illustrated below, the World Bank and the AfDB are leveraging a set of actions aimed at building capacity within Morocco and providing the adequate incentives for policy reforms enabling a higher penetration for renewable energy.



### Utilizing Different Instruments Together to Make a Transformational Impact

IFI (International Financial Institution) and Donor Coordination: Given the importance of solar energy in Morocco’s development agenda and its significance to mitigating climate change, a number of IFIs and donors are assisting the Government of Morocco implement its national solar plan. There is already considerable coordination as well as collaboration of these efforts. This is exemplified by the various sources of financing expected for the Ourazazate I.

Leverage: The CTF (Clean Technology Fund) co-financing will directly lead to the development of up to 160MW of CSP capacity that is estimated to cost about \$1 billion in investments. The \$197 million allocation from the CTF will be leveraged about 7 times.

# Portugal

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## **RES POLICY**

The Portuguese Government promotes RES principally via guaranteed feed-in tariffs for renewable electricity, direct subsidy payments (PRIME-Programme) and tax incentives. Beginning in 2005, a tendering/concession process has also been established. Subsidy payments and tax incentives have been largely, though not entirely, used for smaller-scale renewable energy applications. Feed-in tariffs and tendering schemes, used principally for larger-scale renewable applications.

## **RES TARGETS**

Mandatory targets set by the Directive on the Promotion of the use of energy from renewable sources

- ▶ 31% share of RES on the final consumption of energy in 2020.
- ▶ At least 10% share of renewable energy in final consumption of energy in transport by 2020 .

## **RES POLICY INSTRUMENTS**

## Support for Electricity

### **Feed in tariff**

The Decree-law 33\_A of 16th February 2005 modified the system of feed-in tariffs, establishing a new calculation system. The formula for calculation of the feed in tariffs takes in account the technology, the environmental aspects and the inflation rate through the index of prices to the consumer. There are also some minimum and maximum tariffs, according to the variations of load on the grid.

Resource	Technology	Support level [€cents/kWh]	Feed-in tariff or premium?	Duration [up to years that an investor is entitled to support]
hydro	small	7.5	feed-in tariff	20 years
wind	onshore	7.4	feed-in tariff	15 years
wind	offshore	7.4	feed in tariff	15 years
biomass	solid	11	feed in	15 years
biomass	gasification (biogas)	10.2	feed-in tariff	15 years
PV		31-45	feed in	15 years
CSP	Up to 10 MW	26.3-27.3	feed-in tariff	15 years
Wave		26 -7.6	feed-in tariff	15 years

The Decree-law 225/2007 introduced new tariffs for emerging technologies, such as wave energy and Concentrated Solar Power providing the legal basis for government use of public maritime areas for producing electricity from sea-wave power.

The present Portuguese feed-in law also describes a specific procedure that aims at minimizing local opposition towards new wind projects. In consideration of the crucial role of wind power within Portugal's energy strategy and the immense increases in installed capacity required to meet Portugal's wind energy targets. Under this procedure, municipalities in which a wind farm is located will automatically benefit from the remuneration the operator of the wind project receives. Altogether, the municipality receives a share of 2.5 percent of the monthly remuneration paid to the wind project operator. As expected, municipalities have responded with support for wind power projects in their territory. Local resistance against new installations has consequently remained negligible. A comparable procedure for other renewable technologies does not exist under the Portuguese regulation, and most other countries with feed-in tariffs have not experimented with this approach to minimizing local opposition to new renewable energy projects.

**Tendering procedures**

- ▶ Were used in 2005 and 2006 in connection to wind and biomass installations.
- ▶ In 2006, a call for tenders was launched for CSP power plants using forest biomass.

# Europe

## Regulatory Incentives for Solar Thermal Energy

Country	Decree	Value
Greece	L3468/2006	Original: For solar energy from units other than photovoltaic smaller than 5MW (250€/MWh Mainland; 270€/MWh Non-interconnected islands); larger than 5MW (230€/MWh Mainland; 250€/MWh Non-interconnected islands) Valid for 2009: For solar energy from units other than photovoltaic smaller than 5MW (264,84€/MWh Mainland; 284,84€/MWh Non-interconnected islands); larger than 5MW (244,84€/MWh Mainland; 264,84€/MWh Non-interconnected islands) As from June 2010: Solar thermal energy 264,85€/MWh; Solar thermal with storage system (at least 2h at nominal load) 284,85€/MWh
Cyprus		Financial incentives. Subsidies of capital cost and license aquisition cost. Support in cost of ancillary services. Use of system tariffs and losses. 0,26€/Wh for the first 20 years the system is in operation.
France	No. 2000-108	STE ha no specific support. More emphasis placed on biomass, wind and PV.
Malta		No specific reglatory support mechanisms for STE. (Appropriate for unshore wind and some on biogas and PV).
Portugal	No. 312/2001 No. 189/88 No. 225/2007	Special Production Regime based on formula. Average indicative tariff for STE installations <= 10MW: 267-273 €/MWh (valid for 15 years)
Italy	No. 387/2003 DM 11/04/2008	Feed-in-tariff for STE is dependent on the net production that is not attributable to solar: [0-15% 0,28€/kWh; 15-50% 0,25€/kWh; 50% and greater 22€/kWh].
Spain	RD 661/2007 RD ley 6/2009	Feed-in-tariff with two options: Regulated tariff [28,4983 c€/kWh first 25 years; 22,7984 c€/kWh from then on]; Organized electricity market [Reference bonus 26,8717 c€/kWh first 25 years 21,4973 from then on; top cap 36,3906 c€/kWhM lower cap 26,8757 c€/kWh]