THE NEW LAW FOR RENEWABLE ENERGY SOURCES IN GREECE AND MEASURES FOR THE DEVELOPMENT OF PHOTOVOLTAIC APPLICATIONS IN THE COUNTRY

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ABSTRACT: An overview of the New Law 3468 for RES and HE–CHP which is now in effect in Greece is presented in this paper. The Law includes all RES and the essential new legislative and regulatory framework is explained, with details on PV applications. Compensation for energy producers is based on a FiT model, with generous pricing for PV systems in the range €(0.4–0.5)/kWh. The procedures to issue the necessary licences and permits are presented, together with the timetable of activities. Specific measures for energy guarantees of origin, installations' register, coordination and promotion mechanisms and reporting of activities on the National level are presented. The signs of a considerable PV market expansion are already noticed in Greece, especially for medium and large scale systems.

Keywords: National Programme – 1; Legislation – 2; Strategy – 3

1 INTRODUCTION

On 22 June 2006, the Hellenic Parliament approved Law 3468 referring to, *"Production of Electricity from Renewable Energy Sources, High Efficiency Cogeneration of Heat and Power and Other Devices"*. Law 3468 was published in the Official Gazette of the Hellenic Republic, see [1], and is in effect since then.

2 SCOPES AND AIMS

A main scope of the New Law 3468 is to establish an adequate legislative and regulatory framework in order to support investments in the RES and High Efficiency CHP energy sectors and eventually increase the penetration of these resources in the energy mix of the country. Aiming at conveying to the Hellenic legislation Directive 2001/77/EC of the European Parliament and of the Council of 27 September 2001 on the *"Promotion of Electricity Produced from RES in the Internal Electricity Market"*, the National target is set to a 20.1% RES contribution on the total electricity production by 2010. For 2020 the target is 29%. In the internal electricity market, the production of electricity from RES and High Efficiency Cogeneration of Heat and Power (HE–CHP) are promoted in priority over other means of power production with specific regulations and principles.

High Efficiency CHP is meant a cogeneration process that ensures primary energy saving of at least 10% compared to the heat and electricity produced within the framework of separate processes as well as, the production from Small (up to 1MWe) and Very Small (up to 50kWe) scale cogeneration units that ensure primary energy saving irrespective the percentage. The calculation of the primary energy savings is done using the European Directive 2004/8/EC.

The utilisation of the vast renewable energy resource of the country, mainly the wind and solar potential, together with complying with the environmental targets of the Kyoto protocol are promoted as well. The attraction of large scale energy investments is also envisaged, in parallel with simplification measures for the necessary licensing procedures.

3 BACKGROUND, EXPERIENCES ENCOUNTRERED

Act 2244 of 1994 *"Regulation of issues related with the production of electrical power from RES and conventional fuel and other provisions"*, established the legislative environment for the development of RES in Greece, providing access to the grid for individual energy producers.

A specific regulatory framework for RES was introduced by Act 2773 of 1999, establishing the Regulatory Authority for Energy (RAE) and initiating the deregulation of the electrical energy market. The so-called, *"Code for the Management of the System and Transactions of Electrical Energy"*, regulates the framework of the energy sector in Greece. The code is valid for grid-connected RE applications coupled to MV or HV lines of the utility. Before the New Law 3468, RAE determined the Feed-in Tariffs from RE power stations, in correlation with the development of electricity price levels.

Concerning support schemes, the Operational Programme for Competitiveness (OPC) has been the major financial tool for developing RE investments, PV plants included. In its last phases, OPC was open for the period 2000 to 2006 and in the latest call, subsidies for PV varied between 40% and 50%, depending on the geographical location of the application.

Act 2244 established the legislative environment for the development of RE resources but proved to be insufficient and a number of modifications and amendments were introduced aiming to resolve important technical and processing issues. In the last decade, some 13 laws, common ministerial decisions, circular decisions, etc. were put in place. Practically, the

regulatory and legislation environment was extremely confusing and bureaucratic, restraining the sustainable development of RES in the country. For solar electrification in particular, PVs were treated on a common basis with other RES and the purposeless processes for licensing, the irrational environmental conditions required, the lack of a reasonable FiT and the problems encountered for grid-connection were some of the constraining factors limiting PV applications in Greece to a relatively low capacity.

4 ENERGY PRODUCTION LICENCE

The so-called Energy Production Licence is required for power production from RES or HE–CHP. The licence is granted by the MoD after a positive consultation from RAE. The assessment is done based on the following criteria:

a) National security.
b) Protection of public health and safety.
c) Overall safety of the System and the Grid as well as the relevant hardware equipment.
d) Energy validity of the project under evaluation.
e) Maturity of the suggested project development procedure, based on the studies that are presented, the opinion of involved authorities etc.
f) Adequate access rights to the land to be used for the project installation.
g) The potential of the investor to materialise the project, based on financial and technical adequacy.
h) Ensuring delivery of public benefit services and protection of the clients.
i) Protection of the environment according to the existing legislation.

RAE receives the applications for issuing the Energy Production License by the interested bodies. In the assessment process, RAE may collaborate with the system Operator in cases that technical details on grid connection issues must be elaborated. If required by the legislation, RAE must forward to the responsible authority the so-called Preliminary Environmental Impact study (PEI) which accompanies the application. Within ~60 days, the responsible authority will have to respond back its opinion to RAE on the so-called Preliminary Environmental Assessment and Evaluation (PEAE).

RAE is obliged to submit an opinion report on an application for an EPL to MoD within 4 months after receiving the response on PEAE. The final decision is then issued by the minister of MoD within a period of 15 days. The Energy Production License has a validity of 25 years and is renewable for an equal time period thereafter. An EPL for electricity production from RES or HE–CHP includes the following:

- Owner, physical or legal entity.
- Location of the power plant.
- Installed power capacity and the maximum production power.
- Utilised technology.
- Period of validity.
- Team in charge for the financing and realisation of the project.

A valid EPL does not need to be modified in case that the installed power or the maximum production power of the plant changes only once to a percentage of up to 10%, provided that this change shall not result in an increase of the land space required for the extra installation.

4.1 Exemptions from an EPL

Exemptions from the requirement of issuing an Energy Production Licence are given in the following cases:

a) Geothermal power plants of installed power ≤ 0.5MWe.
b) Biomass or bio-fuel plants of installed power ≤ 100kWe.
c) PV stations of nominal capacity ≤ 150kWp.
d) Wind power parks of installed power: ≤ 20kWe for plants in isolated microgrids; ≤ 40kWe for plants on the remaining non-interconnected islands; ≤ 50kWe for plants in the interconnected system.
e) Power plants of installed power ≤ 5kWe operated by educational or research institutions of the public or private sector exclusively for RTD purposes.
f) Power plants installed by CRES for as long as these plants operate in order to carry out certification work or measurements.
g) Other RES power plants of installed power ≤ 50kWe.

Except point f) above, the exemptions are valid provided that no grid congestion occurs. The case of exemption from receiving an Energy Production License is certified by RAE within 10 working days after submission of a relevant application including all the necessary documents. Additionally, autonomous power plants of installed power ≤ 5MWe are exempted from the issuing of an EPL. An exemption decision by RAE is not required for grid-connected RES or HE–CHP plants of installed power ≤ 20kWe unless grid congestion on non-interconnected islands occurs, or autonomous plants of power ≤ 50kWe. Practically, this means that small grid-connected PV systems of power below 20kWp are excluded from the procedure to submit to RAE even an application for exemption, simplifying in this way the licensing procedures for installers in the household sector.

5 ENVIRONMENTAL APPROVALS

Specific environmental concern is taken in Law 3468 for the installation of power plants based on RES. The requirements have been published in the Official Gazette of the Hellenic Republic, see [2], and a summary of the most essential points for PV installations above 20kWp nominal power are presented in this section. Photovoltaic systems below this power threshold are exempted from the environmental terms procedure.

5.1 PEI (Preliminary Environmental Impact study) and PEAE (Preliminary Environmental Assessment and Evaluation)

In order PEAE to be initiated, an investor submits to RAE a relevant application which is then forwarded for assessment to the Direction of Environment and Land Planning (DELP) of the district of the intended project installation.

This application is accompanied by a Preliminary Environmental study (PEI), which includes the following:

a) Location and capacity of the power plant.
b) Identification of the RES or other technology to be used and a general technical description of the project.
c) Conditions in the area of application with main focus on physical and human parameters.
d) Usage of natural resources.
e) Affiliations and synergies with other projects or activities.
f) Production of wastes.
g) Pollution and causes of annoyance.
h) Measures for prevention of accidents due to the usage of materials or technological installations.
i) Preliminary summary of measures envisaged that would prevent or restrict or make up considerable environmental impact.
j) Summary of the main alternative to the intended project solutions and identification of the main selection criteria of the final project, bearing in mind the environmental impact.

In case that the PEI study is not complete or certain documentation is needed, the responsible Direction of Environment and Land Planning requests additional information from the investor within 10 days after delivery of the file from RAE. On delivery of a complete PEI file, DELP sends within 10 days the whole documentation to the following authorities for opinion:

- General Forces of National Defence.
- Department of Civil Aviation.
- Regional Forests Department.
- Regional Tourism Department.
- Departments of Prehistoric and Classical Archaeology, Byzantine Archaeology and Contemporary Monuments.
- Town Planning and Environmental Protection authorities.
- Regional office of the Ministry of Transport and Communications for telecommunication projects.
- Coastal Authority of the Ministry of Commercial Navigation for RES applications in the sea or at the coast line.

The above mentioned authorities shall officially reply to DELP on their assessment within 20 days after delivery of the documentation. Then, the general director of the DELP of the district of the intended application comments on the Preliminary Environmental Assessment and Evaluation within a total 15 days period. On a positive assessment, the validity of PEAE is 3 years.

5.2 EIS (Environmental Impact Study) and ETA (Environmental Terms Approval)

In order ETA to be initiated, the investor submits to the Direction of Planning and Development (DPD) of the district of the intended project installation an application which is then forwarded for assessment to the Direction of Environment and Land Planning (DELP) who actually carried out PEAE as described above.

This application is accompanied by an approved PEAE and an Environmental Impact Study (EIS), which includes the following:

a) Detailed description of the project and accompanying works, such as civil works, connection to the grid etc.
b) Description of the existing environmental conditions, including documentation for the assessment of the main environmental impacts on humans, fauna, flora, soil, water, air, climate, landscape, materials, cultural heritage as well as, the interaction of these parameters.
c) Assessment and evaluation of the direct and indirect affiliations and synergies concerning impact to humans and the physical environment.
d) Summary of measures envisaged that would prevent or restrict or make up considerable environmental impact.
e) Summary of the main alternative to the intended project solutions and identification of the main selection criteria of the final project, bearing in mind the environmental impact.

In case that EIS is not complete or certain documentation is needed, the responsible Direction of Environment and Land Planning requests additional information from the investor within 10 days after delivery of the file. On delivery of a complete EIS file, DELP sends within 10 days the whole documentation to those authorities from section 5.1 above that explicitly and justifiably requested so during the PEAE assessment that was carried out at an earlier stage. Additionally, EIS is sent to the following authorities for assessment:

- Prefecture Council of the district of the installation.
- Institutions for the Management of Protected Areas.

The above mentioned authorities shall officially reply to DELP on their assessment within 40 days after delivery of the documentation. Within 15 days, DELP of the district of the intended application should comment on the Environmental Impact Study. The final decision for issuing the Environmental Terms Approval is taken by the General Secretary of the Prefecture within 10 days. On a positive assessment, the validity of ETA is 10 years and can be renewed for an equal time period.

6 INSTALLATION AND OPERATION PERMITS

An Installation permit is required for the setting or expansion of a RES or HE–CHP power plant. The Installation permit is issued by decision of the Prefecture General Secretary in the boundaries of which the plant shall be installed and within 15 days after the relevant application and all supporting documentation of the investor. In the case that the responsible Prefecture General Secretary does not issue the Installation permit within this strict time frame, responsible for its issuing is the minister of MoD to whom the interested body should submit a new application including the decision of the Environmental Terms Approval (ETA). Thereafter, the minister must issue the Installation permit within 30 days. In this case, CRES provides secretarial, technical and scientific support to MoD.

The validity of the Installation permit is 2 years and can be extended for another 2 years in the cases that at least 50% of the investment has been realised or in the case that the project has not yet began for reasons provably

irrelevant to the willing of the permit owner, all the necessary contracts for the procurement of hardware equipment have been signed with the suppliers.

Additionally, an Operation permit is required for the operation of RES or HE–CHP plants. This permit is granted by decision of the body that is responsible for issuing the Installation permit as described above, after the submission of a relevant application by the investor. The responsible authorities are responsible to certify the fulfilment of the technical terms of installation during the delivery phase and CRES to control on the operational and technical features of the plant equipment. Should these controls are positive, the Operation permit is issued within 15 days time frame and has a validity of 20 years, renewable for an equal period thereafter.

Issuing the Installation and Operation permits is not necessary in cases of exemption of the Energy Production Licence, see section 4.1 above. In any case, all power plants require an environmental permit according to the existing legislation. In the following Table 1, a summary of the licensing procedure is presented, together with the time frame indicated in Law 3468 and in [2].

Table 1 Licences and permits required and timetable

Description of Activity	Days Required	Total Days
1. Issuing of PEAE	55	55
2. Issuing of ETA	85	140
3. Consultation of RAE to the minister of MoD on the EPL	~90	230
4. Decision of the minister of MoD on the EPL	15	245
5. Issue of the Installation permit from the Prefecture General Secretary	15	260
6. Issue of the Installation permit from the minister of MoD (if failure in 5. above)	30	290
7. Issue of the Operation permit from the authority that granted the Installation permit	15	**305**

The days indicated in Table 1 are working days. Thus, 305 working days correspond to approximately 14 months total period.

7 ACCESS TO THE GRID AND FiT

During dispatching and provided that the safety of the System or the Grid is not endangered, the New Law 3468 obliges the Operator to give priority to RES power plants irrespective their installed capacity, except hydro plants of more that 15MWe. This applies in both the interconnected system and the non-interconnected islands.

In order RES or HE–CHP plants to be integrated into the System or the Grid, including the non-interconnected islands Grid, the system Operator is obliged to sign an Electricity Sale Contract with the Energy Production Licence owner. This contract is valid for 10 years and may be extended for another 10 more years after a written declaration of the energy producer. Remuneration of the energy producers is based on a Feed-in Tariff (FiT) model, which is presented in Table 2 for the different technologies.

Table 2 FiT in Law 3468 for RES and HE–CHP

Power Supply Source	Feed-in Tariff, [Euro/MWh]	
	Interconnected System	Non-interconnected Islands
Wind	73.0	84.6
Wind, off-shore	90.0	90.0
Small Hydro <15MWp	73.0	84.6
PV Solar <100kWp	**450.0**	**500.0**
PV Solar ≥100kWp	**400.0**	**450.0**
Other Solar <5MWe	250.0	270.0
Other Solar ≥5MWe	230.0	250.0
Geothermal, Biomass	73.0	84.6
Other RES	73.0	84.6
HE–CHP	73.0	84.6

Pricing of the electricity produced is done on a monthly basis, except the case of power stations connected to the LV grid where pricing takes place every 4 months. For "self-producers", tariffs presented in Table 2 are valid for a maximum power capacity of 35MW for the surplus energy fed into the grid with upper limit a 20% of the total energy produced by the plant on an annual basis.

For hybrid power plants installed on non-interconnected islands, pricing is based on the MW power installed and is done monthly.

7.1 FiT Resources

Effective from April 2003 and based on Act 2773 of 1999 for market deregulation, PPC charges its customers an amount of €60c/MWh as a fee for the promotion of RES. The money sum is rendered to the Hellenic Transmission System Operator (HTSO), and they are then used to compensate RES energy producers owning contracts.

7.2 Photovoltaic Stations

As seen in Table 2 above, pricing of the energy produced by PV is adequate for a sustainable market development in the country. The New Law 3468 is intended to promote the electricity production from PV and, apart from tariffs, this will also be implemented through the so-called Photovoltaic Plant Development Programme. The PV Programme will be drawn up by RAE with the approval of the minister of MoD and will last till 2020.

The main targets of the PV Programme refer to the development of plants of total power at least **500MWp** grid-connected stations and at least **200MWp** stations integrated to the non-interconnected islands grid. It should be mentioned that prices indicated in Table 2 may be modified in the course of the PV Programme, depending on its planning and scopes.

8 OTHER PROVISIONS

8.1 Guarantees of Origin

The origin of the electricity produced by RES power plants is testified by the producers with the so-called Guarantees of Origin. These guarantees specify the source from which electricity is produced and determine the time and place of the production. The main institution that supervises the Guarantees of Origin system in Greece and cooperates with Authorities in other EU Member States or third countries is RAE.

The following institutions are responsible for issuing Guarantees of Origin in Greece:

- The system Operator, for the electricity that supplies the grid.
- The non-interconnected islands Operator, for the electricity that supplies the non-interconnected islands grid.
- CRES, for the electricity produced from stand-alone plants. In this case, CRES installs the appropriate measuring devices on the expense of the owner.

For issuing a Guarantee of Origin, the energy producer submits a relevant application to the corresponding issuing institutions as above. The Guarantees are based on sufficient information and accurate details provided by the producer for the certification of the electricity origin, e.g. certified measuring data of the system Operator etc.

8.2 Register

RAE keeps a special register of Energy Production Licenses issued for power production from RES and HE–CHP. The EPL Register includes all relevant information as described above in section 4. The contents of the EPL Register are notified by RAE to the operators and to the minister of MoD on a bi-monthly basis.

MoD keeps the register for the Installation and Operation permits that are issued to RES or HE–CHP power plants. In this register are also the cases of exemption from the requirement of receiving these licenses. Should the production license be modified or conveyed, the register is updated accordingly.

Every institution responsible for issuing Guarantees of Origin, see section 8.1 above, keeps a specific register listing all specific information including any relevant modifications, suspensions etc. Free access to this register is provided to all interested bodies.

8.3 Coordination and Promotion Mechanisms

Committee for the Promotion of RES and HE–CHP Large-scale Investments

MoD shall establish a committee for the promotion of RES and HE–CHP large-scale investments in the country. The Committee's main task is to promote investments regarding electricity production of RES or HE–CHP plants of installed power more than 30MWe or total budget more than 30M Euros and to resolve efficiently any matters arising during the licensing and Installation and Operation permissions' procedure.

Committee for RES and HE–CHP

MoD shall establish a committee for the promotion of RES and HE–CHP investments. This Committee's main task is to coordinate the responsible authorities and provide support in the procedure of issuing Installation and Operation permits for plants of installed power less than 30MWe or an equivalent investment budget less than 30M Euros.

8.4 Reporting

By February each year, the Committee for RES and HE–CHP submits to the minister of MoD a report relevant with the most important barriers experienced in the process of relevant investments, appropriately documented and including proposals for their solution.

By October each year, the minister of MoD shall approve a National Report on the Promotion of RES, submitted by CRES. This report shall include:

- Detailed overview of the development of RES and HE–CHP power units in the energy balance of the country and the investment progress made in these sectors, especially correlated to achieving the national and EC objectives.
- Identification of barriers that restrict electricity production from RES.
- Information on the promotion mechanisms for the development of RES in Greece, in comparison with measures taken in other EU countries.

By October every 2nd year, the minister of MoD shall approve a detailed Report focused on the achievements of the National objectives, submitted by RAE. This report shall include:

- Information on climatic factors that may affect the realisation of the National objectives. Specific reference to the measures that have been taken against climate change and assessment on the effectiveness of these measures is done in this report.
- Reference to measures taken for the restriction of legislative, regulatory, administrative and any other barriers affecting the promotion of RES applications.
- Proposals on energy policy and towards an effective realisation of the National objectives.

By October every 5th year, the minister of MoD shall approve a detailed Report focused on the achievements of the National objectives, submitted by RAE. This report shall include:

- Definition of the National objectives regarding the contribution of electricity produced by RES in the electricity consumption of the country in the next decade.
- Description of the measures that have been taken or are examined on a national level for the achievement of the National objectives.

8.5 Specific Charge

After a RES plant is commercialised, electricity producers who hold an Energy Production Licence are obliged to pay a Specific Charge of 3% of the electricity sales to the system Operator before VAT. Electricity producers from PV power plants are exempted from this Specific Charge.

The amounts that correspond to the Specific Charge are initially retained by the Operator and then distributed by 80% to the Local Governmental Administrative Organisations (LGAO) in the boundaries of which the power plant is located, and by 20% to the LGAO in the territorial boundaries of which passes through the connection line from the plant to the grid.

8.6 Existing RES Plants

Electricity sales contracts from RES or HE–CHP plants that are valid at the moment of publication of the new Law and have not been renewed, may be extended for another 10 years with FiT prices as indicated in Table 2.

9 PRESENT MARKET REACTIONS AND COMMENTS

From April 2006 so far, 17 applications for PV grid-connected power plants have been submitted to RAE to obtain an Energy Production License, [3]. The total installed power is calculated 40.6MWp, with the largest project being 9MWp and the smallest 410kWp. This instantaneous reaction to the new measures for the promotion of PV technology and applications in the country indicates the large market potential for solar electrification in Greece.

Additionally, industrial activity in PV technology is taking up in the country, with a new factory for the production of crystalline PV cells and modules now being under construction. The project has been approved and co-funded by the Development Law. First production is expected in the market in mid 2007 and the predicted annual capacity will be in the order of 30MW.

As far as the household sector is concerned, i.e. PV systems of capacity below 20kWp, a market reaction has not been yet recorded. As explained in previous sections of this paper, the New Law exempts such systems from the obligation to obtain an Energy Production License as well as, the whole procedure for the Environmental Terms Approval. On the other hand, owners of small PV systems are obliged to inform RAE and MoD on the PV installations in order such systems to be registered. It seems that the determining factor for an adequate household PV market development in the country will be the practical payment of the fixed FiT prices of Table 2. If an EPL is issued to a so-called "independent" energy producer, i.e. all energy is fed into the grid, then tariffs are adequate and the market is expected to develop sufficiently. However, in the case that an EPL is granted to a "self-producer" that is, produced energy primarily supplies own loads and any excess is fed into the grid, then tariffs are valid for the surplus of energy only. In this case, only few amounts of solar energy will be sold to the system Operator and PV system economics do not seem to be favourable for the end user. Thus, in the household sector, an energy producer better be considered as "independent", which in turn obliges the system owner to establish a small business, keeping books, being taxed etc.

10 CONCLUSIONS

This paper summarises the main issues of the New Law 3468 for RES and HE–CHP, which is effective since 22 June 2006. These power supply resources are intended to be promoted in order the country to cope with the targets of the EC and the Kyoto protocol on energy production from RES and emissions respectively.

For PV applications, a generous FiT varying between €(0.4–0.5)/kWh depending on the system capacity and location has been introduced. A considerable market expansion is already noticed, especially medium and large scale PV plants. Remarkable industrial activity is also under way for the production of crystalline solar cells and modules. Specific targets for PV applications have been set in the PV Plant Development Programme, with minimum capacities 500MWp grid-connected and 200MWp on non-interconnected islands to be installed by 2020. So far, an upper total capacity limit for PV system applications has not yet been introduced.

LIST OF ABBREVIATIONS

CRES:	Centre for Renewable Energy Sources
DELP:	Direction of Environment and Land Planning
DPD:	Direction of Planning and Development
EIS:	Environmental Impact Study
EPL:	Energy Production License
ETA:	Environmental Terms Approval
FiT:	Feed-in Tariff
HE–CHP:	High-efficiency Cogeneration of Heat and Power
HTSO:	Hellenic Transmission System Operator
HV:	High Voltage
LV:	Low Voltage
MoD:	Ministry of Development
MV:	Medium Voltage
OPC:	Operational Programme for Competitiveness
PEAE:	Preliminary Environmental Assessment & Evaluation
PEI:	Preliminary Environmental Impact study
PPC:	Public Power Corporation
PV:	Photovoltaic
RAE:	Regulatory Authority for Energy
RES:	Renewable Energy Sources

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