

**UNIVERSITY OF PIRAEUS
DEPARTMENT OF INTERNATIONAL AND EUROPEAN
STUDIES**



**MASTER PROGRAM IN ENERGY:
STRATEGY, LAW AND ECONOMICS**

**Non-Interconnected Islands:
the EU and national Institutional Framework**

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Master Thesis submitted to the Department of International and European Studies of the University of Piraeus in partial fulfillment of the requirements for the degree of Master of Science in Energy: Strategy, Law and Economics

Piraeus, September 2021

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Abstract

The electrification of Greek islands has always been a challenge due to various technical and financial constraints. The complexity of the issue is accentuated from the islands' large number, their sparseness and the significant seasonal variability of electricity demand, due to them being popular tourist destinations. This issue was addressed in the main Ionian Islands through interconnections to the mainland Greek grid between 1960 and 1980. In April 2018 the first phase of the interconnection project of the Cyclades, an island group of the Aegean Sea, to the main grid was completed. Despite the ongoing interconnection projects, the majority of the Aegean Sea islands will continue to produce electricity in a business-as-usual manner. In the short- and medium-term it is not expected that interconnection to the main grid will be a universal solution for all islands.

The scope of this master thesis is to present the legislative and regulatory framework for the operation of the market of Non-Interconnected Islands, the way in which energy companies operate and been compensated in this market, and the issues that have arisen in recent years due to the liberalization of the energy market. Finally, a brief reference is made to the very recent interconnection of Crete with the Peloponnese.

Acknowledgements

Upon completion of my postgraduate thesis, I would wish to acknowledge the contribution made by all who helped to its preparation.

Firstly, I would like to thank my supervisor Professor Petros Liakouras for his scientific guidance and his helpful suggestions. I would also like to thank my supervisor in the Legal Support to Corporate Operations Department of PPC S.A., Mr. Harris Simodinos and Professors Katerina Iliadou and Panagiotis Glavinis, as without them I would not have had the opportunity to deepen into the topic of my thesis. Last but not least, I would like to thank Ms. Evangelia Gotzou, Director of Regulatory Affairs of PPC S.A., for her valuable advice on the technical part of the work.

Finally, I would like to express my gratitude to my family and friends for all their support and understanding throughout my postgraduate studies.

Table of Contents

Introduction.	1
Chapter 1 - Legislation and Regulatory Framework for the Electricity Supply activity in NII.....	3
1.1 Law 4001/2011 (GG A' 179/22.8.2011).....	3
1.2 The “Non-interconnected island power systems (NIIS) Management Code (NIIS Code)”.....	4
1.2.1 Introduction.	4
1.2.2 Main purposes of NIIS Code.	5
1.2.3 Basic definitions (article 2).	8
1.2.4 Operation of NII - General Responsibilities and Obligations of the Operator (HEDNO S.A.) (Article 10).....	8
1.2.5 Participants General Obligations (article 11).....	11
1.2.6 Participation in the NIIS Market Agreements between the Operator of the NIIS (HEDNO S.A.) and the Participants (article 47).....	12
1.2.7 NIIS Market Settlements.	13
Monthly Settlement Procedure (article 183).	13
Annual Final Settlement Procedure (article 184).....	14
Chapter 2 - Compensation Mechanism for the Injected Electricity to the Non-Interconnected Islands - Public Services Obligation (PSO)	15
2.1 Introduction	15
2.2 Legislation and Regulatory Framework.....	16
2.2.1 Legislative and regulatory framework PSO before Law 4001/2011 enter into force.	16
2.2.2 Legislative and regulatory framework PSO after Law 4001/2011 enter into force.....	19
2.2.3 The Decision 469/2012 of the Council of State.	20
2.2.4 Article 36 of Law 4067/2012.....	21
2.2.5 Decision RAE 14/20.1.2014 "Methodology for calculating the	

compensation for covering the costs of utility services for non-interconnected islands" (GG B' 270/07.02.2014).....	24
General Information.	24
Calculation method of PSO compensation.....	28
Chapter 3 - Crete as a Small Interconnected Island.....	30
3.1 Introduction	30
3.2 Proposal for a hybrid model for the operation of the «market» in Crete (Phase I to Phase II)	31
3.3 Proposal for amendment of NIIS Code	35
3.3.1 Participants General Obligations.....	36
3.3.2 Derogations from NIIS Code	37
3.3.3 PSO Compensation regarding Crete.....	37
Conclusions.....	37
Bibliography	40

Introduction.

Most Greek islands, mainly in the Aegean, are not interconnected by the mainland electricity system. The reasons why these islands have not yet been interconnected are not only technical or technological but mainly economic, as an impending interconnection requires large sums of money. These islands referred as “Non-Interconnected Islands” (NII) and are powered by autonomous local thermal power plants, which operate with fuel oil -heavy (mazut) or light (diesel) and renewable stations (mainly wind and photovoltaic). In other words, NII are considered those Greek islands whose electricity Distribution Network is not connected to the electricity Transmission System or the Distribution Network of the mainland.

The operation of the electrical systems of NII, which includes the operation of the production, the functioning of the market and of the systems of these islands, is the responsibility of HEDNO S.A. (the Greek Distribution System Operator)³. It is conducted in accordance with the “Non-interconnected island power systems (NIIS) Management Code”, issued pursuant to article 130 of Law 4001/2011. With regard to the implementation of the “Non-interconnected island power systems (NIIS) Management Code”, RAE has approved the “HEDNO S.A. Infrastructure Implementation Action Plan in accordance with Decision 2014/536/EC/14.08.2014 of the European Commission”. In addition, the regulatory framework is also governed by other texts issued by the Regulatory Authority for Energy concerning the average variable cost of conventional production units in the NII, Utilities in the NII, Prices of hybrid power stations in the NII, etc., which are not going to be analyzed in this thesis.

After the completion of Phase A of the Cyclades Interconnection (Syros, Mykonos, Paros and Naxos) to the mainland system in March 2018, the electrification of NII substantially altered compared to the situation in the beginning of the previous decade. With the completion of Phases B and C of Cyclades interconnection, their systems’ reliability and stability are now further secured. Things have changed, also, after the completion of Phase I of Crete’s interconnection with Peloponnese. However, a significant number of NII continue to be electrified by the local production units of Public Power Corporation S.A. (PPC S.A.), which are fueled with oil, either heavy (fuel oil) and/or light (diesel). The contribution of RES is also important, especially the wind and photovoltaic stations,

³ HEDNO S.A. established when Law 4001/2011 issued and incorporated the provisions of Directive 2009/72/EC of the European Parliament and of the Council of 13 July 2009 into Greek legislation “*On common rules for the internal market in electricity and repealing Directive 2003/45/EC and Directive 2009/73/EC of the European Parliament and of the Council of 13 July 2009*”. Pursuant to the above law, two distinct competencies are conferred to HEDNO SA: the competency relating to the management of the Hellenic Electricity Distribution Network (HEDN), and the competency concerning the management of the markets of non-interconnected islands.

which operate on these islands.

Today, the NII market consists of twenty-eight (28) autonomous systems. Some of them consist of several islands (island clusters). The size of these twenty-eight (28) autonomous island electrical systems varies:

- Nineteen (19) “small” autonomous systems with a peak demand up to 10 MW.
- Eight (8) “medium-size” autonomous systems with a peak demand from 10 to 100 MW.
- One (1) “large” autonomous system with a peak demand of more than 100 MW (Rhodes), after the completion of Phase I of the interconnection of Crete with Peloponnese.

The annual demand for electricity in the NII varies in size, from a few hundred MWh on the smaller islands (e.g. Antikythira, Agathonisi, etc.), to some TWh in the larger Systems.⁴

List of electricity systems in the non-interconnected islands		
July 2021		
No.	Island Electrical System	Island
1	Agios Efstratios	Agios Efstratios
2	Agathonisi	Agathonisi
3	Amorgos	Amorgos
4	Anafi	Anafi
5	Antikythira	Antikythira
6	Arkioi	Arkioi
		Marathi
7	Astipalaia	Astipalaia
8	Gavdos	Gavdos
9	Donousa	Donousa
10	Erikousa	Erikousa
11	Thira	Thira
		Thirasia
12	Ikaria	Ikaria
13	Karpathos	Karpathos
		Kasos
14	Kithnos	Kithnos
15	Kos-Kalymnos	Kos
		Pserimos
		Gyali

⁴ <https://www.rae.gr/non-interconnected-islands/?lang=en>

		Kalymnos
		Leros
		Lipsoi
		Telendos
		Nisiros
		Tilos
16	Lesvos	Lesvos
		Megalonisi
17	Limnos	Limnos
18	Megisti	Megisti
19	Milos	Milos
		Kimolos
20	Othonoi	Othonoi
21	Patmos	Patmos
22	Rhodes	Rhodes
		Halki
23	Samos	Samos
		Fournoi
		Thimaina
24	Serifos	Serifos
25	Sifnos	Sifnos
26	Skiros	Skiros
27	Simi	Simi
28	Chios	Chios
		Inousses
		Psara

Chapter 1 - Legislation and Regulatory Framework for the Electricity Supply activity in NII.

1.1 Law 4001/2011 (GG A' 179/22.8.2011).

The definition of "Non-interconnected islands" was introduced for the first time in the national legal framework with Law 4001/2011 *on the Operation of Electricity and Gas Energy Markets, for Exploration, Production and Transmission Networks of Hydrocarbons and other provisions*. In article 2 par. 3 in. (kb) of this article, "Non-Interconnected Islands" are defined as *the islands of the Greek territory whose electricity distribution network is not connected to the Transmission System and Distribution Network of the mainland*. At the same paragraph [in. (kc)] a definition of "Small Isolated System" is given as *the electricity system of any Non-Interconnected Island which in the year 1996 had a total annual energy consumption of less than 3000 GWh and where less than 5% of the annual consumption is derived from interconnection with other systems*. At the same law provided in article 129 that the management of the electricity

systems of NII, which includes the management of generation, market operation and systems of these islands, is carried out by HEDNO S.A (“Network Operator of the Non-Interconnected Islands”).

1.2 The “Non-interconnected island power systems (NIIS) Management Code (NIIS Code)”.

1.2.1 Introduction.

According to par. 1 of article 130 of Law 4001/2011, the “Non-interconnected island power systems (NIIS) Management Code (NIIS Code)” must be prepared by RAE and submitted to RAE. The issue of the NIIS Code was necessary. A series of problems that concern mainly the production of electricity as well as the adequate and safe electrification of NII, created due to the unique geographical situation of Greek islands, with its many isolated and small electrical systems. Thus, a Code would ensure the smooth, uninterrupted, secure, and efficient operation of the Network of these islands.

In 2014, RAE issued Decision 39/2014 (GG B’ 304/11.2.2014), by which the first version of NIIS Code was published. The preparation of such a Code was an original project, as there was no equivalent or similar in the world, due to the geographical peculiarity of the Greek island network. However, beyond that, the drafting of NIIS Code was a rather difficult task that had to formulate and incorporate many rules. It is the culmination of the long and arduous effort of RAE, with the assistance of the Distribution System Operator and the contribution of the country's University Institutions, and especially the National Technical University of Athens (NTUA), for the preparation and establishment of rules for the operation of the energy market on NII, taking into account the following, critical needs:

- The need to ensure the energy supply of these islands and the optimal development of their generation systems, by providing incentives and establishing procedures for a gradual increase in the flexibility of power systems, especially conventional units.
- The numerous features of NII, and in particular the wide range of size of their systems (maximum demand per island, ranging from a few hundred KW to several hundred MW), compared to interconnected systems.
- The need to promote the penetration of energy from RES and HECHP in the energy balances of NII, with the participation of a wide range of RES and hybrid technologies, based on the relevant requirements and provisions of the legislative framework, in order to achieve penetration levels above 50-60%.
- The need to maintain the cost of electricity generation in NII, especially

conventional units.

- The need for documentation, transparency and verifiability of the production costs and the calculation of the costs for the provision of Public Service Obligations (PSOs) in NII, as required by the Directive 2009/72/EC.
- The urgency to provide equal access to the NII market for stakeholders.
- The need, and mostly the urgency, consumers of these islands to enjoy electricity and the related services at equal prices and quality levels compared to those of the consumers of the Interconnected System.

In any case, NIIS Code has largely completed the secondary legislation that regulates the operation and the transactions at the NII electrical systems, as provided by Law 4001/2011. It is the cornerstone for the establishment of fair and transparent rules and procedures in this market, with the ultimate goal of protecting the Greek electricity consumer in the most effective way.

To date, NIIS Code has been amended twice. The second version of NIIS Code was published in April 2018 (RAE Decision 330/17.9.2015 [GG B' 2221/15.10.2015], RAE Decision 238/15.7.2016 [GG B' 3286/13.10.2016], RAE Decision 215/7.3.2018 [GG B' 1148/29.3.2018]). This first amendment concerned the response to emergency needs, as it was found by RAE that for the proper and effective implementation of the procedures, as well as for the effective control and supervision by Regulatory Authority, certain stages of the procedure described in the Code need to be specified. These improvements identified in particular in the times during which there were obligations both on the part of the producer and on the part of HEDNO for the submission of the relevant applications and reports to RAE, but also in the procedures for the assessment of emergencies, which are directly related to the supervisory responsibilities of RAE. The third version of the Code was published in July 2020 (RAE Decision 429/4.3.2020 [GG B' 2004/25.5.2020]). The second amendment concerned the introduction of Annex B in NIIS Code, which defines a specific framework operation and management of the research – demonstrative hybrid power station and the electrical system of the island of Agios Efstratios, by derogation from NIIS Code in accordance with the provisions of article 152 of Law 4495/2017.

1.2.2 Main purposes of NIIS Code⁵.

⁵ Source: "Network Development Plan 2021-2025"
<https://www.deddie.gr/media/7847/%CF%83%CF%87%CE%AD%CE%B4%CE%B9%CE%BF-%CE%B1%CE%BD%CE%AC%CF%80%CF%84%CF%85%CE%BE%CE%B7%CF%82->

The provisions of NIIS Code specify in particular:

(a) The criteria applied by HEDNO for the allocation of energy load to the available power facilities. In determining the criteria, account shall be taken, inter alia, of:

(i) The planning of injections and absorptions of electricity into the Grid of NII for a given period of time. The scheduling shall be prepared by HEDNO, as a result of the economic prioritization of the availability declarations for electricity injection from the power units, based on the variable costs of these units.

(ii) The technical characteristics of the available production facilities.

(iii) The technical limitations of the electricity system of NII.

(b) The manner, extent, terms and conditions according to which, HEDNO, in the allocation of energy load to the available generation facilities, gives priority to generation facilities using RES, as well as to combined heat and power installations in accordance with article 9 of Law 3468/2006.

(c) The manner, procedure and conditions for the settlement of payments for the scheduled injections of electricity into the NII Distribution Network, as well as payments for the availability of generation facilities. For the above payments, the production price offered shall not be taken into account:

(i) From installations which are given priority by the provisions of NII Code.

(ii) From installations which are included in the Distribution Network of NII for the sole purpose of meeting its needs.

(d) The method of calculation and the way of measurement of the Production-Demand Deviations in each period by HEDNO. The manner, procedure and conditions for the settlement of Production - Demand Discrepancies between production and supply licensees. The above arrangement is made in such a way as to promote the availability of production facilities, to allocate costs to those causing the deviations, to be based the price on cost elements of the operation of the production facilities and to minimize overall costs.

(e) The period taken as a basis by HEDNO for the allocation of energy load, the calculation and the settlement of production-demand deviations.

(f) The conditions and the procedure for the imposition of penalties and the provision of incentives by HEDNO for the maintenance of secure margins of power offers, the availability of sufficient power generation capacity and the proper operation of injection planning and load sharing.

(g) The conditions and the procedure to be followed by HEDNO for the conclusion of contracts, in accordance with paragraph 2g of article 129 and the terms of the respective contracts.

(h) The methodology for calculating the remuneration of the production units. By decision of RAE, numerical values of the parameters of this methodology may be established.

(i) The procedure and the terms of settlement by HEDNO of suppliers' and customers' charges for the absorption of electricity from the Distribution Network of NII.

(j) The type, amount and manner of provision of guarantees or other security and payment of contributions by the Users of the Distribution Network of NII in proportion to the energy they absorb from it, in such a way as to ensure the coverage of the costs of HEDNO, in case of any inability of the Users to fulfil their financial obligations in the context of the operation of the electricity market in NII.

(k) The manner and procedure for the publication of the information necessary for participation in the electricity market of NII and for its proper and non-discriminatory operation.

(l) The procedures for the resolution of disputes arising between market Participants and HEDNO

(m) The obligations to provide guarantees of availability of sufficient capacity to be fulfilled for the absorption of electricity from the Distribution Network of NII and the manner in which these obligations are to be fulfilled, in particular through contracts.

(n) The type and minimum content of the contracts connecting power stations to the Distribution Network of NII and any other relevant matter.

(o) The technical specifications for the design and operation of the equipment of the installations of the power plants connected to the Distribution Network of NIIS.

(p) The procedures for issuing invoices and keeping accounts by HEDNO, as well as the procedures for the settlement of accounts.

(q) The procedure for dealing with emergencies related to the operation of the Electricity Systems of NII.

(r) Any other detail necessary to regulate the management of the Electricity Systems of NII.

Regulations, calculations and special approvals required for the implementation of NIIS Code are determined by a decision of RAE, after an opinion of HEDNO. The details of the implementation of NIIS Code shall be determined by a decision of RAE, following a recommendation of HEDNO.

1.2.3 Basic definitions (article 2).

The following definitions are set out in article 2 of NIIS Code:

The Non-Interconnected Islands Market: *the set of processes, activities and transactions that take place in each Non-Interconnected Island System and concern the planning of the development and its operation, monitoring and control of the actual operation, the settlement of payments with a view to the safe, smooth and in the most cost-effective way to electrify its consumers.*

Non-Interconnected Island System: *the Autonomous Electricity System of a Non-Interconnected Island, such as this is defined in Law 3468/2006, as in force.*

Rolling Day-Ahead Scheduling (RDAS): *The production scheduling of all the production Units for meeting the demand for the 24 hours of the next day (Dispatch Day), which is compiled and run in two 12-hour sub-periods of the Dispatch Day (1st and 2nd RDAS Period).*

Participants: *The Producers and the Load Representatives participating in the Non-Interconnected Islands Market.*

Self-suppling Costumers: *Costumers who choose to supply energy from the Non-Interconnected Island System for own use.*

Grid Users: *a) The Producers whose generation Unit Facilities are interconnected to the Grid, b) the Load Representatives and c) the “Customers”, whose facilities are connected to the Grid in order to absorb electricity.*

Producers: *The owners of power Stations or production Units interconnected to the NIIS Grid, who have been granted production license or have been exempt from such an obligation, based on the current legislation, including the self-producers.*

Load Representatives: *The entities submitting Demand Bids to the RDAS such as the electricity Suppliers who have a respective electricity Supply license in force, the Self-Supplying Customers, and the Producers for any absorption of electricity from the NIIS Grid for meeting their own power Station demand, such as particularly the Hybrid Power Stations.*

Settlement/pricing Period: *the period of each calendar month.*

1.2.4 Operation of NII - General Responsibilities and Obligations of the Operator (HEDNO S.A.) (Article 10).

The operation of the electricity systems in NII, which includes the management of production, the operation of the market and the systems of these islands, is carried out

by HEDNO, taking the necessary measures to ensure the impartial and non-discriminatory behavior of HEDNO towards its Producers and Suppliers. The energy production in NII is managed in accordance with the provisions of NIIS Code.

HEDNO S.A., as the Operator of NII, monitors and ensures the reliable, cost-effective and safe operation of the production units of NII, while taking appropriate measures to limit the impact on the environment, ensures the development, technical excellence and economic efficiency of production in NII to meet demand and prepares by 31st of March of each year production development plans for the Small Isolated Systems, approved by RAE and a documented account.

HEDNO shall conclude contracts with the licensees for the injection and absorption of energy and the provision of ancillary services in the distribution network of NII and the remuneration of the Producers of such energy and shall keep the necessary accounts for the remuneration of such Producers, the charging of customers and Suppliers for the absorption of energy, as well as for the other debits and credits of the special accounts, as defined in the legislation in force Law 4001/2011, in accordance with the specific provisions of the NIIS Code.

Settlement is implemented in NII with invoicing to all Participants (Producers and Suppliers) in accordance with the institutional framework. NII operate under a liberalized market regime and Participants are cleared in accordance with the institutional framework on an equal and non-discriminatory basis. In addition, Procedures have been established by HEDNO for the licensing process of RES Producers' applications and the management of applications of Market Participants, as well as for the Technical and Economic Data Declarations by the Producers, as well as for the Duration of the Participation Contract of Load Representative in NII and the Representation Meters of Load Representatives in NII. The organization of the Load Representatives Registry for NII takes place through access to the "Thales" application of HEDNO. The Registers within the information system maintain and manage all the necessary information of Conventional Power Units, RES Producers, Load Representatives and Meters.

Since the entry into force of NIIS Code, the NII market is cleared on a monthly and annual basis by HEDNO with RES Producers (including Hybrid Plants), Conventional Units and Load Representatives in NII, with the implementation of controls and appropriate Procedures. The Operator shall publish monthly on its website energy and cost data per Electricity System, as provided for in Article 188 of the NIIS Code. HEDNO prepares a simplified Day-Ahead Scheduling for almost all the Electrical Systems of NII.

HEDNO publishes on its website the data of Day-Ahead Scheduling, in accordance with

the provisions of article 231 of NIIS Code. Specifically, data are disclosed daily, concerning both the Day-Ahead Scheduling and the actual operation of the NII Electricity Systems, for each hour of the previous day's allocation⁶.

Thus, according to article 10 of NII Code, HEDNO is obliged to:

- a) Monitor and ensure the reliable, financially efficient and secure operation of the generation Units of NII, at the same time taking the necessary measures for the mitigation of the environmental impact;
- b) Ensure the planning, the technical soundness and the economy of the generation on NII, to meet the demand;
- c) Refrain from any discrimination among the Producers of NII and especially from discrimination favoring the enterprises linked to the Operator of NII;
- d) Compile and submit for approval the NII Power System Planning Studies and make every possible effort to comply with the approved Planning Studies based on this Section;
- e) Compile the RDAS and Dispatch Schedules and ensure their implementation;
- f) Ensure that the necessary premises for the installation of new production capacity, for the extension of the existing capacity for the reinforcement and expansion of HEDN in NII are reassured;
- g) enter into agreements with the owners of production licenses for the electricity injection and absorption and the Ancillary Services provision in the distribution network of NII, the Producers remuneration, as well as the charges to the Load Representatives;
- h) maintain and operate the NIIS Market Settlement System and Account Monitoring; hold and manage the Participants Accounts, as well as the Special Accounts; issue the requested instructions for the Settlement of the transaction and may request from the Customers payment of any debt in the event of non-fulfillment of monetary obligations from their Supplier part, in case they are owed by the Customer;
- i) Enter into Power Purchase Agreements with RES/CHP and Hybrid Power Station facilities interconnected to NII's Grid and make the payments foreseen in these Agreements;
- j) monitor, on a continuous basis, the operation of the generation Units, with frequent

⁶ Source: "Network Development Plan 2021-2025"
https://www.deddie.gr/media/7847/%CF%83%CF%87%CE%AD%CE%B4%CE%B9%CE%BF-%CE%B1%CE%BD%CE%AC%CF%80%CF%84%CF%85%CE%BE%CE%B7%CF%82-%CE%B4%CE%B9%CE%BA%CF%84%CF%8D%CE%BF%CF%85-2021_2025-network-development-plan-2021-2025.pdf

verification of the ex post operation data, particularly related with the proper application of the related provisions declared Techno-economic Characteristics of the 19 Units;

k) Ensure the reliable, secure and seamless operation of the NIIS adopting all the necessary measures as more specifically foreseen in the Grid Management Code.

HEDNO undertake the responsibility for the proper application of the provisions of NIIS Code related to him. Within this framework, the Operator ensures the adoption of all the necessary measures for planning, development, reinforcement, maintenance and every day operation of the facilities and the necessary equipment for the technically sound and as much as possible efficient management and operation of the Market and the NIIS, based on the provisions of NIIS Code. Moreover, HEDNO ensures that all the necessary measures are taken and all the necessary resources are provided for maintaining high quality of service to the Participants and Users of the NIIS and the NII Grid and at least at the level described in NIIS Code.

1.2.5 Participants General Obligations (article 11).

Each Participant in the NIIS Market is obliged to abide by the provisions of NIIS Code, to undertake any necessary action for their proper application and restrain from any action against them. Thus, within the framework of his general obligations for the application of the provisions of NIIS Code, each Participant is particularly obliged to:

a) install, maintain and ensure the troubleshooting of his own necessary equipment for the application of the provisions of NIIS Code, on his expenses, as well as pay any additional expense foreseen in the Interconnection and Power Purchase Agreements;

b) Hold all the necessary Accounts and timely pay the liabilities to the Operator of NIIS;

c) Take care for the good and smooth operation of his facilities, so that the risks for the secure and seamless operation of the Power Systems and the NIIS Market etc. are minimized;

d) Do his utmost to assist in the more effective and appropriate operation of the NIIS Market and the NII Power Systems. Within this context every Participant contributes via the submission of proposals incorporating improvement measures for the application of NIIS Code and via his Participation in the public consultations related to the application issues of the Code;

e) Ensure that the disputes that may arise in the framework of the application of the provisions of NIIS Code are settled mainly via amicable settlement as specifically foreseen in NIIS Code.

The active Suppliers in the NIIS Market have to provide uniform tariffs per Customer category on the entire territory of the country, as- based on the current legislation- they shall be compensated for the provision of Public Service Obligations (PSO) in the NIIS for this reason. The Suppliers, based on the market rules, shall freely set the tariffs.

1.2.6 Participation in the NIIS Market Agreements between the Operator of the NIIS (HEDNO S.A.) and the Participants (article 47).

For the participation of Producer or Load Representative in the NIIS Market Participation Agreement in the NIIS Market, abiding by the type and the Contents of the Template Agreement annexed in this Code must be formerly signed with the Operator of the NIIS. More specifically, these Template Agreements are foreseen:

a) Producer's Participation to the NIIS Market Agreement. With this Agreement, among others, the parameters taken into account for the calculation methodologies for the remuneration of the Power Station or the Units, according to the provisions of this Code shall be determined. Furthermore, specific calculation issues are defined, such as the offsetting of the internal electricity consumption of a Unit with its production, as well as Guarantees issues and sanctions in case of interruption of the operation of the Power Station, which does not comply with the provisions of this Code. For RES/CHP Units or Hybrid Power Stations, for which a conclusion of a Power Purchase Agreement is foreseen in the current legislation, such as particularly Law 3468/2006, a conclusion of a Producer's Participation in the NIIS Market Agreement, which is substituted by the Power Purchase Agreement, is not required.

b) Producer's Participation in the NIIS Market Agreement for Ancillary Services provision. With this Agreement is determined, among others, the kind of the Ancillary Services provided by each Unit of the Power Station, any possible particularities for their provision, as well as Guarantees issues and sanctions in case of interruption of their provision. Similarly, the Ancillary Services provided by the Absorption Unit the Power Station may include (e.g. in case of Hybrid Power Stations) are also defined with this Agreement.

c) Load Representative Participation in the NIIS Market Agreement. With this Agreement are defined, among others, the parameters taken into account for the calculation of corresponding charges to the Load Representative, according to the provisions of this Code.

The Participation in the NIIS Market Agreements tackles with the performed transactions within the framework of the NIIS Market Operation, according to the provisions of NIIS Code, and entitle the Load Representatives and the Producers to participate in the NIIS Market, receiving the payments and paying off their corresponding charges.

1.2.7 NIIS Market Settlements.

Monthly Settlement Procedure (article 183).

HEDNO carries out the Market Settlement at the end of each calendar month, for that month and per NII System. This Settlement includes the following individual settlements: Electricity Transactions, Ancillary Services, Capacity Assurance Mechanism, Special Accounts RES NIIS and PSO NIIS, Emergency Situation Coverage Cost, Operational Expenditure and Assets Management Coverage of the Operator of the NIIS, Collections in Favour of Third Parties/CGU, as well as Sanctions.

By the fifteenth (15th) day after the last day of each Settlement Period, the Operator of the NIIS shall enter the sums that have been calculated, based on the provisions of this Code, for payment or collection for each one of the Participants in the NIIS Market. Moreover, HEDNO shall issue the Monthly Settlement List, which is notified to the Participants including the part related to each one of them.

Should a Participant doubt the Contents of the Monthly Settlement List, lodges justified objections to the Operator of the NIIS in writing and within five (5) calendar days since the notification of this List, explicitly stating the reasons of the objections, the sum about which a doubt exists, the Dispatch Day, as well as any related data and evidence supporting his objections.

The Operator of the NIIS within fifteen (15) calendar days since the submission of the Participant objections, shall issue a justified decision on these objections and differences that may arise are incorporated in the Monthly Settlement List of the next Settlement Period, provided this is feasible according to the fiscal legislation, otherwise they are settled in the Annual Final Settlement the latest. Any difference between the parties, which still exists after the aforementioned procedure, is resolved utilizing the procedure described in Chapter 2 of NIIS Code.

In any case, the Load Representative is obliged to pay off the charges and receive the credits refereed in the Monthly Settlement List within five (5) days since the date of receipt of the invoices. The aforementioned obligation is independent from any objections of the Load Representative.

Following the realization of the banking transactions the Operator of the NIIS shall send to each Participant separately, who legally paid off his debts, payoff invoices with the following data: a) the sums of the charges and payments related to the Participant, which have been settled. b) Any further data defined in the NIIS Market Operation Manual.

Annual Final Settlement Procedure (article 184).

After the end of each calendar year, the Operator of NIIS proceeds in Annual Final Settlement for that year, per NII System, within the context of which he:

- a) Takes into account any differences between the Metering Data and the rest utilized data for the calculation of charges and credits in the Monthly Settlement Lists with the final ex post data of the year.
- b) Identifies any errors to the initial calculations of charges and credits of the Monthly Settlement Lists.
- c) Verifies any estimation made in case of Emergency Situations Settlements based on updated data, pursuant to Article 187 of the NIIS Code.
- d) Defines the ex post Emergency Situation Coverage Cost based on the provisions of Article 155.
- e) Defines the ex post Operational Expenditure and Assets Coverage Cost, based on the provisions of Article 180.
- f) Takes into consideration the outcome of any Dispute Settlement Procedure.

The NIIS Market Annual Final Settlement takes place per NII System and includes the individual Final Settlements: Electricity Transactions, Ancillary Services, Capacity Assurance Mechanism, Special Accounts RES and PSO for NIIS, Emergency Situation Coverage Cost, Operational Expenditure and Assets Management Coverage of the Operator of the NIIS, Collections in Favor of Third Parties/CGU, as well as Sanctions.

By the fifteenth (15th) of February of every subsequent year from the Settlement year, the Operator of NIIS submits for checking to the RAE the ex post cost and electricity data for each NII System. By the fifteenth (15th) of March of every next year from the Settlement year, the final cost data shall be approved on a RAE's decision regarding whether the data on the level and the kind of the individual expenditure of the production activity, utilized by the Operator of the NIIS for the calculation of the compensation for the Public Service Obligations of paragraph 1 of Article 1 of the number. ПΔ5/ΗΛ/Β/Φ1Β/12924/13.06.2007 (GG B' 1040/25.6.2007) Ministerial Decision, as amended and in force, for every NIIS, according to the provisions of the current legislation is reasonable or not.

By the twenty-sixth (26th) of March of the next year after the Settlement year the Operator of NIIS shall send to each Participant the Annual Settlement List, related to that year. Charges and credits are entered into the Annual Settlement List as a result of the Annual Final Settlement.

Should a Participant doubt the Contents of the Annual Settlement List lodges justified objections to the Operator of NIIS in writing and within ten (10) calendar days since the notification of this List, explicitly stating the reasons of the objections, the sum about which a doubt exists, the Dispatch Day, as well as any related data and evidence for the basis of his objections. The Operator of NIIS within ten (10) calendar days since the notification of the objections, shall issue a justified decision on these objections and any differences that may arise shall be included in the Settlement List of the next Settlement procedure provided that this is feasible, in accordance also with the fiscal legislation. Any difference between the contracting parties, which still exists after the aforementioned procedure, shall be resolved pursuant to Chapter 2.

The Operator of NIIS calculates per NIIS System and publishes monthly on his web page, just after the compilation of the Monthly Settlement Lists, the following data:

- a) the Average Variable Production Cost of Article 190 for each Dispatch Period for all the Dispatch Days of the month the settlement refers to,
- b) the Maximum Variable Production Cost of Article 191 for each Dispatch Period for all the Dispatch Days of the month the settlement refers to,
- c) the average provision cost of each Ancillary Service, which is calculated as the quotient of the resulted total cost per Ancillary Service pursuant to Article 196 to the total produced electricity in the NII System for the Settlement month,
- d) the average Capacity Assurance Mechanism cost, which is calculated as the ratio of the total cost of this Mechanism pursuant to Chapter 41, including the budgeted Emergency Situation Cost Coverage of Article 181, to the total produced electricity in the NII System for the Settlement month.

Chapter 2 - Compensation Mechanism for the Injected Electricity to the Non-Interconnected Islands - Public Services Obligation (PSO)

2.1 Introduction

For decades, the State, as part of its social and regional policy, has imposed a uniform electricity tariff for all consumers in the country, irrespective of their geographical location and the cost of electricity production. The beneficiaries of this policy are the residents of those areas of the Greek islands that are not connected to the mainland network, i.e. the residents of NII. As mentioned above, these islands are generated locally by power plants, the cost of setting up and operating is, in comparison, much higher than the

corresponding cost of the higher capacity units operating in mainland Greece. In other words, electricity is produced in NII at a higher cost per unit of electricity produced (€/MWh) than the corresponding cost of electricity produced in the rest of Greece.

In order to implement this policy, the electricity Suppliers, operating in NII⁷, are required by law to charge the same unit rates per MWh for the electricity they supply to consumers in the rest of the country. Similarly, for reasons related to the protection of the family institution, large families have already benefited from preferential tariffs.

These services, which electricity Suppliers are obliged to provide to specific categories of beneficiary residents are called Public Services Obligation (PSO).

2.2 Legislation and Regulatory Framework

2.2.1 Legislative and regulatory framework PSO before Law 4001/2011 enter into force.

The possibility of imposing the obligation on electricity Suppliers to provide PSO is provided for in both European and national law.

The relevant provisions are contained in article 3 of Directive 2003/54/EC of 26.6.2003 concerning *common rules for the internal market in electricity (I 176/37)*, as amended by the more recent Directive 2009/72/EC of 13.7.2009 (I 211/55). According to article 3 par. 2 of this Directive:

“Member States may impose on undertakings operating in the electricity sector, in the general economic interest, public service obligations”

In national law, PSO was initially regulated by article 29 of Law 2773/1999 *on the liberalization of the electricity market (GG A' 286)*, which stipulated the following:

“By decision of the Minister of Development, following the opinion of RAE, licensees, in the context of their general obligation to provide public utility services, may be obliged to differentiate their tariffs for groups of Consumers, provided that it is ensured the possibility of covering the total costs for each licensee. The costs of cases f and g of paragraph 2 of this article shall be allocated uniformly for the entire Greek territory, to each category of Customers, including self-producers, according to a methodology which shall be determined by a joint decision of the Ministers of Economy and Finance and Development, issued after the opinion of RAE and which shall take into account the electricity consumed by each Customer and factors that differentiate the allocation by category Customers, so that a charge results that balances the financial consequences between the categories of Customers. The numerical values of the coefficients of the

⁷ Mainly Public Power Corporation S.A., as the sole electricity Supplier in NII until 2018.

above methodology are determined each year by a decision of the Minister of Development, following an opinion of the RAE, published in the Government Gazette.”

Later, due to the transposition of the provisions of Directive 2003/54/EC into national law, PSO was regulated by article 28 of Law 3426/2005 *on the acceleration of the procedure for the liberalization of the electricity market* (GG A' 309), which stipulated the following:

“By decision of the Minister of Development, which shall be issued within six (6) months of the publication of this Law, published in the Government Gazette and notified to the European Commission, the services of general interest and the holders of a license granted under the provisions of Law 2773/1999, who are obliged to provide these services, shall be determined.

A decision of the Minister of Development, issued after an opinion of RAE published in the Government Gazette and notified to the European Commission, within three (3) months of the adoption of the decision provided for in paragraph 1, shall determine the methodology for calculating the compensation due for the fulfilment of obligations of licensees providing public utility services. The amount of the compensation due for the provision of public utility services is approved each year, after the consent of RAE, by a decision of the Minister of Development, which is published in the Government Gazette. The above consideration shall be paid, subject to compliance with paragraph 4.

The System Operator shall keep a special account for utility services. This account shall be debited with the consideration provided to the utility service providers and credited with the revenue from charges imposed on the holders of electricity supply licenses. Electricity supply license holders are entitled to recover the cost of such charges from their customers, in accordance with the applicable legislation and the decision issued pursuant to paragraph 4 of Article 29 of Law 2773/1999, as in force.”

Based on the above provisions, it was clearly stated that compensation must be given to undertakings, which were burdened to provide PSO, so as not to create a competitive disadvantage for them, due to their specific obligations arising from the provision of PSO.

In application of par. 1 of article 28 of Law 3426/2005, Decision D5/HL/B/F1B/12924 of the Minister of Development (GG B' 1040/25.6.2007) define PSO as follows:

- The supply of electricity to consumers of NII and Small Isolated Systems, with same tariffs, per consumer category, to those of the Interconnected System.
- The supply of electricity at a special tariff to large consumers, as defined under the provisions of the law.

Later, under the ministerial decision AP:D5/HL/B/F.29/oik.19046 (GG B' 1614/6.10.2010), vulnerable consumers, as they are identified under the ministerial decision D5-HL/B/F.29/16027/6.8.2010 "Implementation of Social Household Tariff", were added to PSO with the issue of "Social Residential Tariff".

The Decision No. D5-HL/B/F.1/F.1/oik.27547 of the Minister of Environment, Energy and Climate Change, on "*Definition of Public Services Obligation (PSO)*" (GG B' 2783/2.12.2011), established that the PSO, as defined in No. D5/HL/B'/F1B/12924/13.6.2007 (GG B' 1040 25.6.2007) and D5/HL/B'/F.29/F.19046/24.9.2010 (GG 1614 B' 6.10.2010) aforementioned Ministerial Decisions, are provided by all the undertakings carrying out the relevant activity, i.e. by all electricity suppliers.

In application of par. 2 of article 28 of Law 3426/2005, Minister of Development issued No. D5/HL/B/F1B/2467/23859/30.11.2007 Decision on "*Methodology for calculating the remuneration for the provision of Public Services Obligation (PSO)*" (GG B' 2353/11.12.2007). This Decision was the first establishing the methodology for calculating the compensation due for the provision of PSO. Further to No.451/2008 Opinion of RAE, this abovementioned decision was amended by the decision no.D5/HL/B/F1B/3018/oik. 7504 of the Minister of Development on "*Modification of the methodology for calculating the annual compensation for the coverage of the provision of Public Services Obligation*" (GG B' 664/9.4.2009). According to this methodology, the compensation for the fulfilment of PSO is calculated for the reference year (Λ) and paid in the following year ($\Lambda+1$), taking into account any over/under-recognitions arising from the settlement of the compensation of the previous reference year ($\Lambda-1$). For example, the compensation of 2010, calculated at the end of 2010 after taking into account what was recovered in 2009, was retrieved in 2011.

In application of par. 3 of article 28 of Law 3426/2005, in conjunction with par. 4 of article 29 of Law 2773/1999 added by par. 19 of article 23 of Law 3175/2003 (GG A' 207), No. D5/HL/B/F1.13/2037/oik.9691 Joint Decision of the Ministers of Economy & Finance and Development on "*Methodology for the allocation of the Annual compensation to cover the costs of the provision of PSO*" (GG B' 932/18.5.2009) was issued. This decision established a method of financing the PSO compensation, through the allocation of this compensation to various categories of electricity consumers and the determination of the unit charges per category of electricity consumers (customers). That in order to recover the annual compensation of the Suppliers providing PSO in the following calendar year from which the PSO compensation arose.

Thus, the institutional framework was completed. This framework provided what PSO

were, who had to provide them, the calculation of the compensation, which Suppliers are entitled, and finally how this compensation would be recovered from them, i.e. how the coverage of this compensation would be financed.

2.2.2 Legislative and regulatory framework PSO after Law 4001/2011 enter into force.

When Law 4001/2011 enter into force, the purpose was to adopt national legislation to the provisions of Directive 2009/72/EC and Directive 2009/73/EC and to create a single, clear and harmonized legislative framework for the organization and supervision of the electricity and gas markets. The legislative framework for PSO has changed substantially, without, however, changing its basic philosophy.

In particular, article 55 of Law 4001/2011 defines the Supplier of Last Resort and the universal service (as defined in Articles 57 and 58) as PSO and it is provided that other PSO are defined by Presidential Decree. This presidential decree may stipulate that the expenses for the provision of PSO are shared throughout the Greek territory, to each category of customers, including self-producers, in the case of electricity producers, in accordance with a methodology, which is determined by decision of PAE, and which is published in the Government Gazette and is notified to the European Commission. This methodology shares the costs based on coefficients, which are differentiated per category of customers, so as to result in a charge per unit consumption, which balances the economic consequences between customer categories and at the same time promotes energy saving and its efficient use.

Further, par. 3 of the same article 55 provides that, a Ministerial Decision define the provider of PSO, which may be:

- (a) undertakings carrying out the relevant activity, or
- (b) undertakings selected following a call for expressions of interest, carried out following a decision of the Ministerial Decision and after an opinion of RAE, on the basis of the possibility of providing the services concerned at the lowest cost to society as a whole.

Authorized by the abovementioned provision, Decision No. D5-EL/B7Φ.1/ok.27547 on *Definition of Public Services Obligation (PSO)* (GG B' 2783/2.12.....) was issued, which stipulates that PSO are provided by all electricity Suppliers.

The methodology for calculating the costs and the compensation due for the fulfilment of the obligations to provide PSO, in accordance with par. 2 of article 56 of Law 4001/2011, is determined by a decision of RAE, based on specific criteria, as referred to in Directive 72/2009/EC and the framework for Services of General Economic Interest

(SGEI). In particular, it is provided that services, referred to in articles 55, 56 and 57, are provided by all the undertakings carrying out the activity concerned, a decision of RAE published in the Official Gazette and notified to the European Commission shall determine the methodology for calculating the costs and the compensation due for the fulfilment of the public service obligations.

The Presidential decree provided for in par. 1 of article 55 of Law 4001/2011, as well as the Impact Report of par. 2 of the same article, have not yet been issued. The operation of PSO is based on the transitional provision of par. 14 of article 196 of Law 4001/2011, which expressly states that *"Decisions, codes, regulations and manuals, issued under enabling provisions by the bodies competent for this purpose, which are repealed, amended, supplemented or replaced by the provisions of this Act, shall remain in force until they are repealed, amended, supplemented or replaced in accordance with their respective provisions"*. Thus, to date, based on this article, Decision no. D5/HL/B7Φ1B/12924/13-6- 2007 (GG B' 1040/25.6.2007) by which the Public Utility Services are defined, as amended and supplemented successively by the Decision No. D5-HL/B/F29/19046 and D5-HL/B7Φ. 1/oik.27547 continue to apply.

2.2.3 The Decision 469/2012 of the Council of State.

A crucial and decisive factor for the evolution of the legislation on PSO was the decision of the Council of State 469/2012. Specifically, it was held that, since the NIIS Code had not been issued, no other electricity Supplier could operate in NII other than the PPC. Since the European Commission had granted no derogation at the time of the said court decision, the maintenance of the contested monopoly regime was contrary to the provisions of Directive 2003/54/EC. According to the same decision, the provision of financial compensation to PPC for the cost of fulfilling its obligation to supply the consumers in NII, and the charging of that compensation to all undertakings supplying electricity to consumers in the rest of the country, is contrary to article 3 of the above Directive. Based on this legal reasoning, the Court ruled that the Decisions by which the compensation of PSO for years 2008 and 2009 and the coefficients of its distribution per category of consumers had been determined were unlawful and annulled. However, in the same decision it was held that the regulation defining the PSO is not contrary to article 3 of Directive 2003/54/EC, nor is it in conformity with Article 106(1)(b) of Directive 2003/54/EC. 1 of the Constitution (special concern of the State for the economy of mountainous, island and peripheral regions) and is within the limits of the authorization granted by Laws 2773/1999 (article 28(3)(a)) and 3426/2005 (Article 28(1)). Nor does the regulation providing for the payment of a financial reward to the providers of PSO and the charging of such a reward to the electricity Suppliers, contravene article 3 of

Directive 2003/54/EC.

2.2.4 Article 36 of Law 4067/2012.

In compliance with the above decision of the Council of State, the State, by article 36 of Law 4067/2012 defined the electricity consumer as the direct payer of the PSO compensation. In addition, it defined the unit charges for PSO, per customer category, for the years 2009, 2010 and 2011, which share the relevant costs corresponding to the cost of fulfilling the PSO obligations for 2008 - 2011.

Below, part of article 36 concerning PSO charges is reproduced, as it is in force:

“1. Pending the completion of the procedures for the award of Public Services Obligation (PSO) in accordance with the provisions of articles 55 et seq. of Law 4001/2011 (A’ 179) and the adoption of the “Non-interconnected island power systems (NIIS) Management Code (NIIS Code)” in accordance with article 130 of the same law, for the uninterrupted and uninterrupted provision of PSO which has imposed on undertakings in the electricity sector, from 1.1.2012 PSO compensation is due, which, subject to par. 7 of article 55 of Law 4001/2011, is calculated as follows:

Consumer Category	Unit charge in €/MWh
<i>High Voltage</i>	<i>4,14</i>
<i>Medium Voltage Industrial use</i>	<i>6,91</i>
<i>Medium Voltage Agricultural use</i>	<i>5,46</i>
<i>Medium Voltage General use</i>	<i>17,9</i>
<i>Low Voltage Night Consumption</i>	<i>8,89</i>
<i>Low Voltage Agricultural use</i>	<i>7,07</i>
<i>Street and Square Lighting</i>	<i>13,71</i>
<i>Low Voltage General use</i>	<i>18,24</i>
<i>Low Voltage Industrial use</i>	<i>18,24</i>

Low Voltage Household (Daily Consumption)	
<i>0 - 1600 kWh/quarterly</i>	<i>6,99</i>
<i>1601 - 2000 kWh/quarterly</i>	<i>15,7</i>

2001 - 3000 kWh/quarterly	39,87
3001 - up kWh/quarterly	44,88

1a. From 1.1.2018, pending the completion of the procedures for the award of Public Services Obligation (PSO) in accordance with the provisions of articles 55 et seq. of Law 4001/2011 (A' 179), for the uninterrupted and uninterrupted provision of PSO, which has imposed on undertakings in the electricity sector, PSO compensation is due, which, subject to par. 7 of article 55 of Law 4001/2011, is calculated as follows:

Consumer Category	Unit charge in €/MWh
High Voltage	4,14
Medium Voltage Industrial use > 13GWh	4,14
Medium Voltage Industrial use	6,91
Medium Voltage Agricultural use	5,46
Medium Voltage General use	17,90
Low Voltage Agricultural use	7,07
Street and Square Lighting	13,71
Low Voltage General use	18,24
Low Voltage Industrial use	18,24

Low Voltage Household (Daily Consumption)	
0 - 1600 kWh/quarterly	6,90
1601 - 2000 kWh/quarterly	50,00
2001 - up kWh/quarterly	85,00

Low Voltage Household (Night Consumption)	
0 - 1600 kWh/quarterly	6,90
1601 - 2000 kWh/quarterly	50,00

2001 - up kWh/quarterly	85,00
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If the quarterly energy consumption exceeds the consumption limits of a certain scale in Low Voltage Household categories, only the excess consumption shall be charged on the basis of the charges of the next scale in the order.⁸

2. The users of each electricity supply are liable for the payment of PSO, who shall co-opt it to the electricity Suppliers with a separate charge on their electricity consumption bills, such consumption being identified by the relevant Network Operator, as well as the self-supplying customers.

The consumption of each consumer is determined on the basis of the total consumption, irrespective of the origin of that energy, i.e. from the grid or from units of the consumer self-producer. The PSO compensation shall be attributed in accordance with the relevant Management Codes from Suppliers and self-supplying customers to the special account for PSO held by the competent Operator in accordance with par. 8 of article 55 of Law 4001/2011.

From the revenues of the special account, the relevant Operator shall pay in full compensation to electricity Suppliers for the supply of PSO.

In the event of a deficit or surplus in the annual financial outturn of the special account of PSO, the unit charges of PSO, referred to paragraph 1a, shall be adjusted in December of each year in the context of the monitoring of the specific account, following a recommendation of RAE, which is issued taking into account the recommendation of the competent Operator, any cumulative deficits, in accordance with par. 10 of article 55 of Law 4001/2011, the need to maintain a buffer stock and any coverage of the costs from the State Budget, in accordance with the last subparagraph. The revaluation shall be equal to zero of the projected deficit for the current year, incorporating any deficit of the previous year. The competent Operator shall send the relevant recommendation to RAE in September of each year with data and estimates of the annual financial outturn of the special account of PSO for the current and the following year. RAE sends the recommendation to the Minister of Environment and Energy in November of each year.⁹

By decision of the Minister of Finance, the cost of providing PSO may be covered by the State Budget, in full or in part, with a corresponding credit as an entry in the special account of PSO, which kept by the competent administrator in accordance with

⁸ Paragraph 1a was added by article 55 of Law 4508/2017, GG A' 200/22.12.2017.

⁹ The fifth subparagraph of paragraph 2 has been replaced by the above period with article 400 of Law 4512/2018, GG A' 5/17.1.2018.

paragraph 1. 8 of article 55 of Law 4001/2011.

In particular, for 2019 the appropriation referred to in the previous subparagraph shall amount to a maximum of fifty-nine million (59.000.000) euros and for 2020 to a maximum of sixty-eight million (68.000.000) euros. For 2018 no credit is granted.

3. The compensation corresponding to the cost of fulfilling obligations to provide PSO, such as this has been established for the electricity sector for the period from 2008 to 2011, shall be allocated to the respective electricity supply users instead of to the electricity Suppliers, as follows:

[...]"

2.2.5 Decision RAE 14/20.1.2014 "Methodology for calculating the compensation for covering the costs of utility services for non-interconnected islands" (GG B' 270/07.02.2014).

General Information.

Based on the abovementioned authorizing provision, RAE issued Decision 14/2014 on "*Methodology for calculating the compensation for covering the costs of utility services for non-interconnected islands*", which retained the basic philosophy of calculating the compensation for the provision of PSO. Specifically, RAE issued a methodology for calculating the yearly compensation per NII system and per Load Representative (according to customer's consumption), due to the fact that -as aforementioned- there is a uniform electricity supply tariff for consumers in the mainland of Greece and the residents of NII.

By this methodology, the compensation corresponds to the extra cost incurred by a retailer to provide electricity to a NII system, compared to the corresponding cost for providing electricity to consumers in the mainland, where there is availability of lignite and gas generator producers and thus the production cost is lower.

That yearly compensation per NII system is calculated preliminary by the relevant Operator for each Settlement Period, based on the cost data of the production activity by Conventional Stations and are finally validated and authorized on an annual basis by RAE.

PSO special account, created for these transactions, is debited with the compensation given to Suppliers for their public services and credited with revenues from charges imposed to consumers and collected by them. HEDNO has taken the role of managing that Special Account in order to be in balance.

ANNEX I Conventional Units Producer's Participation in the NIIS Market

Producer's Conventional Power Stations in the NIIS¹⁰

<i>NII SYSTEM....., POWER STATION</i>				
<i>Unit</i>	<i>Nominal Capacity (MW/kW)</i>	<i>Production License No.</i>	<i>Installation License No.</i>	<i>Operation License No.</i>
...
...
<i>NII SYSTEM....., POWER STATION</i>				
<i>Unit</i>	<i>Nominal Capacity (MW/kW)</i>	<i>Production License No.</i>	<i>Installation License No.</i>	<i>Operation License No.</i>
...
...

**ANNEX II of CONVENTIONAL UNITS PRODUCER PARTICIPATION AGREEMENT
IN THE NIIS MARKET ...»**

**ANALYSIS OF MONTHLY EXPENSES FOR PRODUCTION COST CALCULATION
OF THE NII SYSTEM-PUBLIC SERVICE OBLIGATIONS (PSO)¹¹**

QUANTITY	MEASURE MENT UNIT
General Month Data	
<i>Data Per Power Station (THERMAL PS/AUTONOMOUS PS/LOCAL PS)</i>	
<i>TOTAL INSTALLED POWER CAPACITY of the STATION</i>	<i>MW/kW</i>
<i>TOTAL MAXIMUM OUTPUT POWER of the STATION</i>	<i>MW/kW</i>
<i>ELECTRICITY INJECTED</i>	<i>MWh</i>
Month Cost Data	

¹⁰ Source: "Non-interconnected island power systems (NIIS) Management Code".

¹¹ Source: "Non-interconnected island power systems (NIIS) Management Code".

<i>Data Per Power Station (THERMAL PS/AUTONOMOUS PS/LOCAL PS)</i>	
QUANTITY of EMITTED CO2	tn CO2
AVERAGE COST of CO2 ALLOWANCES	€/tn
TOTAL COST OF CO2 ALLOWANCES	€
CONSUMED QUANTITY OF FUEL OIL	tn
TOTAL COST OF CONSUMED FUEL OIL	€
AVERAGE PURCHASE PRICE from REFINERY PLANT (a)	€/tn
TRANSPORTATION COST (b)	€/tn
AVERAGE FUEL OIL SUPPLY PRICE (in case elements a and b are not separately identifiable)	€/tn
EXCISE DUTY	€/tn
FEES	€
OTHER COSTS	€
CONSUMED DIESEL FUEL QUANTITY	klit
TOTAL COST OF DIESEL FUEL CONSUMED	€
AVERAGE PURCHASE PRICE from REFINERY PLANT (a)	€/klit
TRANSPORTATION COST (b)	€/klit
AVERAGE DIESEL FUEL SUPPLY PRICE (in case elements a and b are not separately identifiable)	€/klit
EXCISE DUTY	€/klit
FEES	€
OTHER COSTS	€
SALARY EXPENDITURE	€
PERSONNEL RENUMERATIONS (INCLUDING EMPLOYER'S SOCIAL CONTRIBUTION)	€
OTHER PERSONNEL BENEFITS	€
REPAIR AND MAINTENANCE COST (UNIT or STATION)	€
COST of REPLACEMENT PARTS AND OTHER MATERIALS (UNIT or STATION)	€
OTHER OPERATIONAL COSTS	€
THIRD PARTY RENUMERATIONS	€

<i>INSURANCE EXPENSES for UNITS/STATION</i>	€
<i>THIRD PARTY EXPENSES</i>	€
<i>TAXES AND FEES</i>	€
<i>OTHER OPERATIONAL EXPENSES</i>	€
<i>OTHER THIRD PARTY BENEFITS</i>	€
<i>ELECTRICITY CONSUMPTION</i>	€
ALLOCATED ADMINISTRATIVE COSTS	€
TOTAL COST FOR RENTING UNITS	€
<i>NUMBER OF RENTED UNITS</i>	#
<i>CAPACITY OF RENTED UNITS</i>	MW/kW
<i>Data Per Power Station (THERMAL PS/AUTONOMOUS PS/LOCAL PS)</i>	
DEPRECIATIONS	€
<i>UNIT DEPRECIATIONS</i>	€
<i>UNIT 1</i>	€
<i>UNIT...</i>	€
<i>ASSETS DEPRECIATIONS FOR POWER STATIONS (OTHER THAN UNITS)</i>	€

REGULATORY ASSET BASE DATA	
<i>Data Per Power Station (THERMAL PS/AUTONOMOUS PS/LOCAL PS)</i>	
QUANTITY	MEASUREMENT UNIT
UNDEPRECIATED ASSETS VALUE	€
<i>UNDEPRECIATED ASSET VALUE FOR UNITS</i>	€
<i>UNIT 1</i>	€
<i>UNIT...</i>	€
<i>UNDEPRECIATED ASSET VALUE of POWER STATIONS (OTHER THAN UNITS)</i>	€
WORKING CAPITAL (WC)	€
<i>WC DATA 1</i>	€
<i>...</i>	€

The following are some practical regulatory rules for data quality:

- The data of the production costs should be consistent with the audited published financial statements of the Producer.
- The actual capital cost of the conventional power stations must be accompanied by tables with the corresponding analysis of the working capital of the reporting year, excluding any investment grants and without taking into account any accounting adaptations.
- The difference between the net book value of assets on the basis of financial statements and this without the adjustments may be required to be accompanied by the report of an independent appraiser.
- The costs related to renting, transportation and installation of portable Gen-Sets (standby Generator) should concern only the approved / licensed by the Authority and should be accompanied by the relative invoice that the producer has paid at the relevant seller of the Gen-Set.

Calculation method of PSO compensation.

$$\text{PSO } i_{m,s} = (\text{FMEPC}_{i,m,s} - \text{System Marginal Price}_{\text{cu}} \text{ in } \text{€}/\text{MWh}) \times Q_{\text{CU},m,s} + (\text{VPC}_{m,s} - \text{System Marginal Price}_{\text{RES}i} \text{ in } \text{€}/\text{MWh}) \times \text{QB}_{(\text{RES})i} - \text{TNUoS}$$

The Operator of the NII, taking into account the final ex-post data of cost and energy, carries out an ex-post Final Settlement of any differences and submits to RAE the results of every month settlement with the necessary cost data, in order for RAE to calculate the yearly appropriate PSO compensation. Yearly PSO compensation is the sum of the twelve monthly above mentioned calculations.

For PSO compensation per NII system, the following main components are taken into account in the calculation:

- $\text{FMEPC}_{i,m,s}$: the price, in €/MWh, as a result of the Full monthly Electricity Production Cost by Conventional Units in each NII System i , per Settlement Period (*equation 2*).
- $\text{VPC}_{m,s}$: the value, in €/MWh, of the Conventional Units monthly Variable Electricity Production Cost, per Settlement Period (*equation 3*).
- $Q_{\text{CU},m,s}$: the electricity to be billed from Conventional Units to a Load Representative in the NII System i per Settlement Period
- $\text{QB}_{(\text{RES})i}$: the electricity to be billed from RES/CHP Units and Hybrid Power

Stations to a Load Representative in the NII System I, per Settlement Period.

- TNUoS : Transmission Network Use of System charges. The amount corresponding to the meters represented by the Load Representative (j), for the month (s) in €.

$$FMEPCi_{m,s} = \frac{RAV_{m,s} \cdot r + D_{m,s} + FC_{m,s} + CO2_{m,s} + O_{m,s} + CPG_{m,s} + AC_{m,s}}{Q_{CU,m,s}}$$

$O_{m,s}$: operating expenses of conventional units including:

- Payroll costs: the cost of the payroll for the permanent and temporary personnel
- Materials and consumables: the cost for materials and consumables, necessary for the plant to fulfill its operation
- Repair and maintenance cost
- Other operational expenses: the cost for expenses that do not fall into the above, such as (energy purchases, contracting costs [the cost from contracts the plant has entered into with contractors, in the context of its activities], third party costs: the cost for services provided by third parties [rent, storage fees, etc.], taxes-fees [the cost of taxes and fees borne by the undertaking for its activities])

$CPG_{m,s}$: costs for renting, transportation and installation of Portable Gen-Sets (standby generator for covering emergency needs)

$AC_{m,s}$: Allocative administrative cost

$Q_{CU,m,s}$: the Electricity to be billed from Conventional Units to a Load Representative in the NII System i per Settlement Period

$VPC_{m,s}$: the value, in €/MWh, of the Variable Electricity Production Cost of Conventional Units, per settlement period ($VPC_{m,s} = \text{Fuel Cost} + \text{CO}_2 + \text{other variable cost apart from fuel cost and CO}_2 \text{ cost}$)

$QB_{(RES)j}$: the electricity to be billed from RES/CHP Units and Hybrid Power Stations to a Load Representative in the NII System i per settlement period.

Example

		a	b	c	d	e	f	$a*(c-e)+(d-e)*b-f$
				Full Average Electricity Production Cost by Conventional Units	Conventional Units Average Variable Electricity Production Cost			
a/a	NII	the Electricity to be billed from Conventional Units to a Load Representative in the NII System i per Settlement Period (MWh)	the Electricity to be billed from RES/CHP Units and Hybrid Power Stations to a Load Representative in the NII System i per pricing period.	FAEPCi (€/MWh)	AVC(NII)I in (€/MWh)	SMP in (€/MWh)	TNUoS = Transmission Network Use of System charges (€)	PSO compensation (€)
		QB(CU)i:	QB(RES)i					
1	ΑΓ.ΕΥΣΤΡΑΤΙΟΣ	92,58	0,00	403,11	308,25	85,343	500,98	28.917,51

Chapter 3 - Crete as a Small Interconnected Island

3.1 Introduction

The interconnection of Crete with the Peloponnese constitutes the Phase I of the interconnection of Crete with the Hellenic Electricity Transmission System (HETS). The project consists of the construction of 150 kV AC 2x200 MVA interconnection between the island of Crete and peninsula Peloponnese. It includes two new submarine cables with the length of 135 km each, upgrades of the existing and construction of new transmission lines, underground cables and substations in the Peloponnese and Crete, static synchronous compensator on Crete. The landing points of the submarine cables are in the Kissamos Bay (Crete) and the Malea peninsula (Peloponnese).

The System of Crete is characterized by:

- Very high variable production cost due to the use of oil at the local production Stations, which is reflected as a steep charge for consumers in their utilities bills (more than €300 million a year).
- High annual increase rate for the Island's load. It should be noted that local Stations marginally manage to cover the load during the summer months.
- Great difficulty, or even inability, to find spaces and obtain the licensing for reinforcing local Stations or developing new ones.
- The constantly increasing interest in the utilisation of the rich local RES potential, penetration of which into the island's power production mix is limited due to technical constraints (mainly major stability issues which a high penetration of RES may cause in an autonomous electricity system such as Crete's).
- Low supply reliability level, particularly in cases of faults in the production system.

These characteristics render the interconnection of Crete with HETS a necessary project as regards the feasibility of its implementation. The benefits of this project are numerous:

- Reliable and stable operation of the Cretan grid, with significant benefits for tourism and the general economic activity.
- Reduction of environmental burden on Crete due to the gradual reduction of thermoelectrical power plant generation.
- Reduction of energy production cost.
- Reduction of utilities bills for all consumers.
- Development of wind, solar and other RES potential of Crete.
- Reduction of necessity for reserve units.
- Reduction of greenhouse gas emissions.
- Reduction of the country's dependency on oil.¹²

The implementation of the Phase II, the Interconnection of Crete with Attica is estimated to be completed in 2023.

3.2 Proposal for a hybrid model for the operation of the «market» in Crete (Phase I to Phase II)

The completion of the Phase I of the interconnection of the island shall *not ipso facto* render Crete as a fully integrated part of the System Grid. The interconnection line will only partially break-up the autonomous operation of the island's power system and market. Even the maximum use of the interconnection line (i.e. 150 MW * 8760 h = 1314 GWh) will only partially meet Crete's increased demand, i.e. about 35%.

Given the fact that:

(a) the transmission capacity of the interconnection with the completion of the Phase I does not meet Crete's annual electricity demand until the completion of Phase II of the interconnection;

(b) the creation of a single zone, where Producers and Suppliers of Crete could participate directly in the markets of the Interconnected System would lead to significant redistribution costs. Today, Producers and Suppliers do not submit any orders; there is no system marginal price but an estimated clearance price of energy. The estimation is done on a monthly basis, based on the variable and total costs of the conventional power units;

(c) the generation costs in the non-interconnected island of Crete are higher than the

¹² <https://www.admie.gr/en/erga/erga-diasyndeseis/diasyndesi-tis-kritis-me-tin-peloponniso>

costs of the Interconnected System and

(d) an upgrade of local metering infrastructure, including metering appropriate class of devices in the Substations of HV and MV and in the production units is a prerequisite for the operation of a balancing market, with the characteristics of that of the Interconnected System,

RAE proposed a “Hybrid Model” for the operation of the electricity market in Crete during the transitional period (Phase I to Phase II).

The Hellenic Republic, in order to safeguard System and Market optimal operation, in the sense of technical stability and economic efficiency, envisages the status of Crete as a *“small interconnected system”*, within the meaning of article 2 par.(43) of Directive 2019/944 *on common rules for the internal market for electricity and amending Directive 2012/27/EU*¹³. Thus, the implementation of the Hybrid Model depends on the approval by the European Commission of the submitted Request for Derogation from the provisions of articles 6, 7 par 1, 8 par. 1 & 4, 9-11 and 13 of the EU Regulation 943/2019 *on the internal market for electricity* and the EU Directive 944/2019 *on common rules for the internal market for electricity and amending Directive 2012/27/EU*, respectively.

On 25.5.2021, RAE put to public consultation two options for the implementation of the Hybrid Model concerning the operation and clearing of the electricity market in Crete. More specifically, it was suggested that the interconnection line is considered *-from the “small isolated system” perspective-* as a virtual Balance Responsible Entity (vBRE) (acting as a virtual power plant most of the time), given that the cable is expected to operate mostly at or near its maximum capacity to serve Crete’s demand. From the HETS perspective, the interconnection line could be understood, also, as a vBRE, acting as a virtual load unit. It is clarified that, under specific rare circumstances, the cable could inject power to the HETS. The vBRE of Crete will be connected to the HETS on the HV side of the Chania substation and thus, its withdrawn/injected energy to the HETS shall be recorded by the Registered Meters of the HV Chania substation. This two-way operation of the interconnection is driven by the need for the System’s secure operation as well as the fact that it is an AC cable. To this extent, two options for the Hybrid Model for market participation of the vBRE of Crete in the Electricity Markets operated on the mainland Interconnected System, i.e. the Day Ahead Market and the Intraday Market, will be evaluated during the public consultation of relevant regulatory documents.

¹³ According to which a “small connected system” is *any system that had consumption of less than 3.000 GWh in the year 1996, where more than 5% of annual consumption is obtained through interconnection with other systems*

Option 1: Priority Price Taking Buy/ Sell Orders corresponding explicitly for the vBRE energy quantities will be submitted:

- (i) by Hellenic Energy Exchange (HEEnEx) on behalf of Load Representatives supplying electricity to end-consumers in Crete, according to their supply percentage ratio calculated ex-ante on a monthly basis by HEDNO, for the case of forecasted imports in Crete by the IS, or
- (ii) by Renewable Energy Sources Operator & Guarantees of Origin (DAPEEP SA) for the rare case of forecasted exports from Crete to the IS.

Option 2: Priority Price Taking Buy/Sell Orders for the whole local load and generation of Crete will be submitted:

- (i) by HEEnEx on behalf of Load Representatives according to their supply percentage ratio calculated ex-ante on a monthly basis by HEDNO and on behalf of Thermal Producers reflecting the energy schedules determined by IPTO based on the results of a simplified dispatch schedule, and
- (ii) by DAPEEP for forecasted RES production.¹⁴

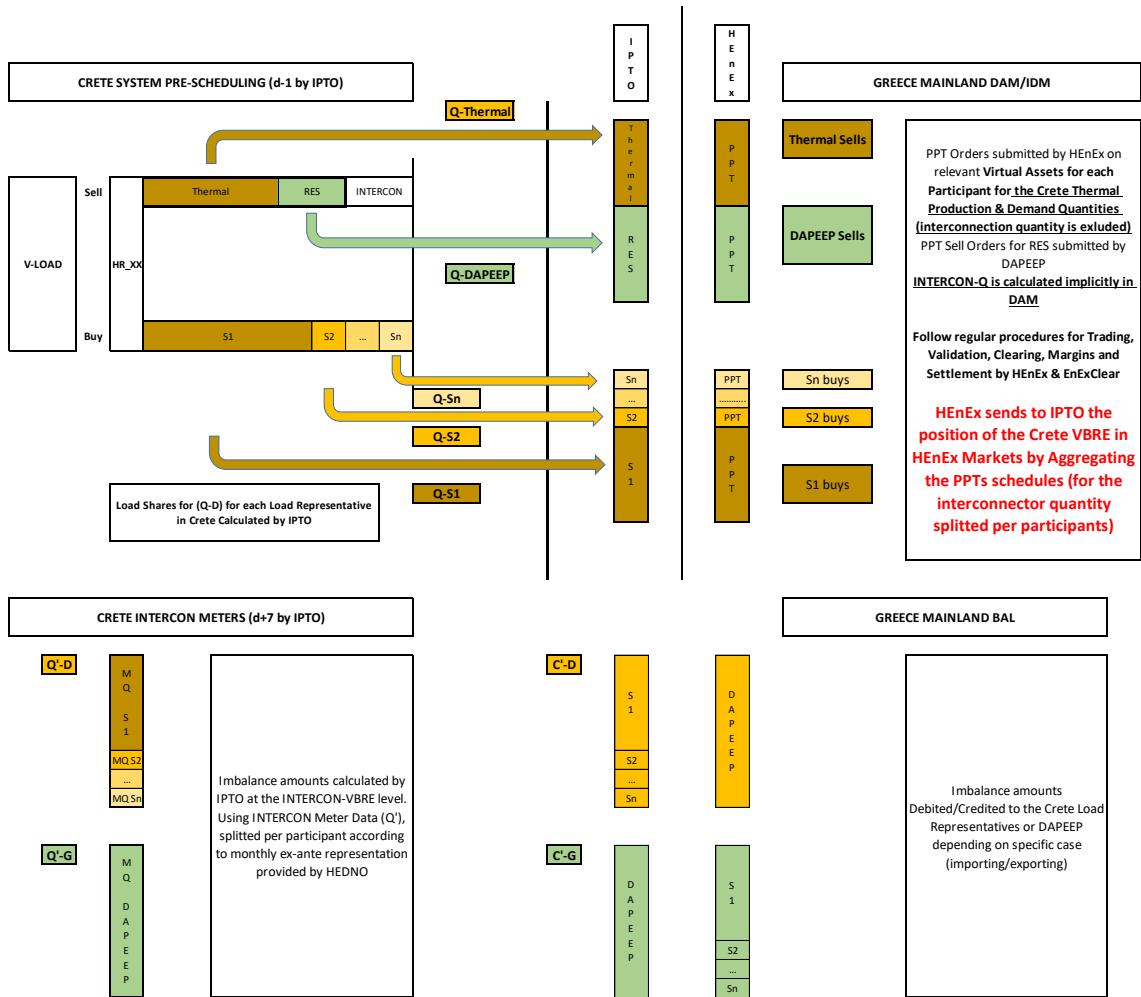
RAE, after the comments received in the context of the above mentioned (as published on the Authority's website), and additional information submitted by the parties concerned managers/operators with regard to the estimated impact of various scenarios, decided on 22.6.2021 to implement Option 2.

See below a Diagram Flow of energy in Option 2¹⁵ :

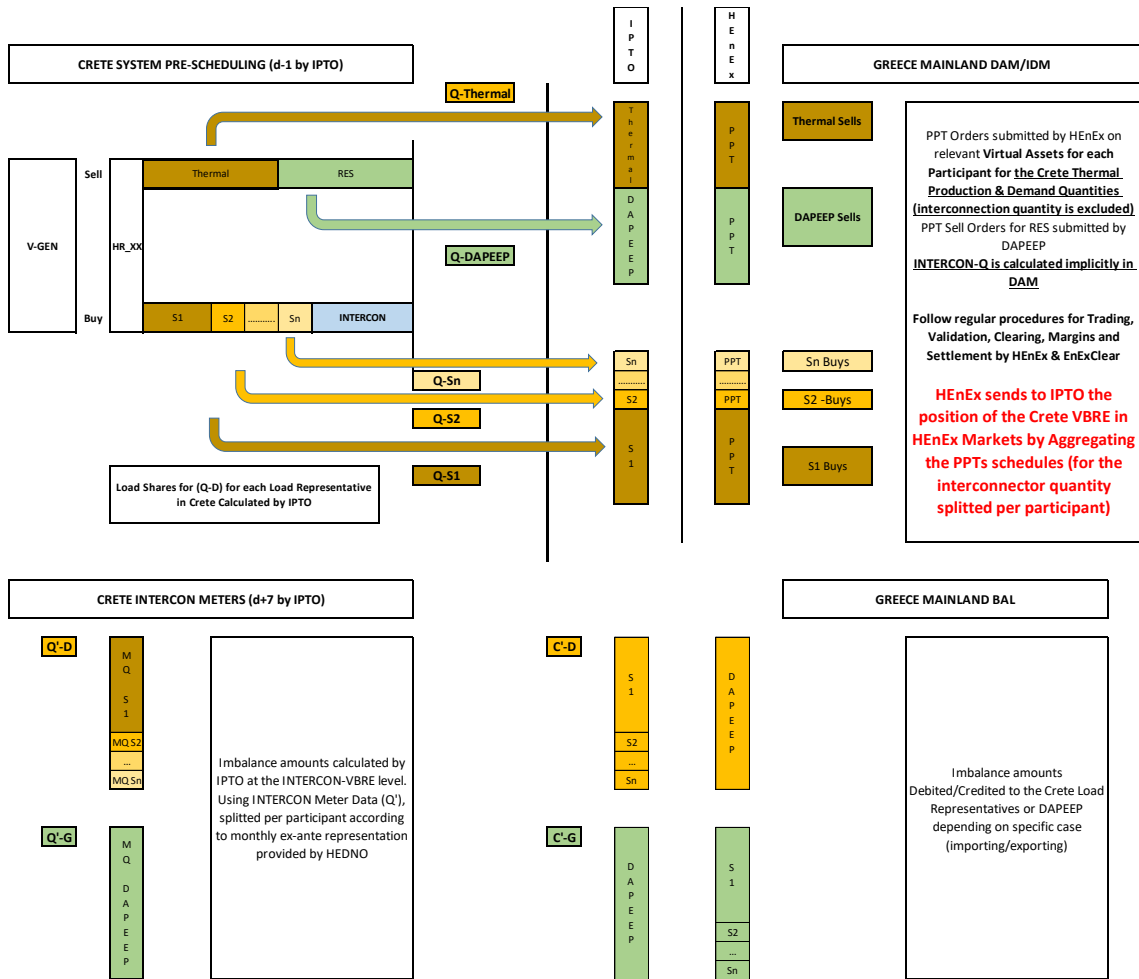
¹⁴ https://ec.europa.eu/energy/sites/ener/files/documents/2021_derogation_crete_notification_en.pdf

¹⁵ <https://www.rae.gr/2021/05/25>

Case 1 – Crete is importing



Case 2 – Crete is exporting



3.3 Proposal for amendment of NIIS Code

On 30.6.2021, RAE in cooperation with the institutional bodies (HEnEx, HEDNO, IPTO, DAPEEP) gave a detailed presentation of the key elements of the implementation of the Hybrid Model followed by a discussion with the representatives of the Participants in the energy markets. Following that Workshop, RAE put the proposals of the above institutional bodies on the regulatory model for public consultation of the framework of the hybrid model for the operation of the electricity market of Crete during the transition period 2021-2023. RAE, among the proposals of amendments on other regulatory frameworks (on provisions of the Balancing Market Rulebook, of the Spot Clearing Rulebook, of the Administrator of Renewable Energy Sources and Guarantees of Origin Rulebook) proposed the introduction of Annex C to the NIIS Code.

Specifically, Annex C defines the specific framework for the operation of a Small Interconnected System, notwithstanding the provisions of NIIS Code, from the day on

which a NII becomes a Small Interconnected System, as defined by a Decision of the Minister of Environment and Energy, until the Small Interconnected System is fully interconnected with the Interconnected System. The Small Interconnected System participates in Transmission Systems Electricity Markets, while the clearing of Conventional Units production is completed by HEDNO through supplementary procedures. Matters that are not regulated by this Annex, NIIS Code shall apply mutatis mutandis, provided that there is no conflict between the provision of NIIS Code with the provisions of this Annex. By decision of RAE, the scope of application of the provisions of NIIS Code may be clarified and specified with regard to the specific operating framework of this Annex.

In any case, it remains to be seen whether these proposals should apply on not and under which circumstances.

3.3.1 Participants General Obligations

HEDNO, as the Operator of NIIS shall:

(a) undertake the clearing of the Small Interconnected System Market, with additional procedures (monthly and annual) for the amounts related to the purchase and sale of energy produced by Contractual Units that has not been cleared in the wholesale market of the Interconnected System by EnExClear.

(b) enter into and execute the appropriately modified Participation Contracts with the Load Representatives and the Producers of the Conventional Units of the Small Interconnected System.

HEDNO shall exercise its responsibilities as the Operator of the PSO Special Account throughout the country, including the Small Interconnected System, and shall exercise its responsibilities as the Operator of HEDN in proportion to the responsibilities it exercises in the Interconnected System as the Operator of the Interconnected System.

IPTO shall be obliged to provide to HEDNO, on a monthly basis, the production energy of the Conventional Units in the Small Interconnected System, as well as the relevant forecasts required by HEDNO for the clearing of the Small Interconnected System Market (monthly and annual clearing), for the calculation of the Load Representatives guarantees and for the estimates of the Special PSO Account, in accordance with the applicable legislation.

EnExClear shall be obliged to provide to HEDNO, on a monthly basis, the amounts cleared in the HTS Markets related to Load Representatives charges/credits of Producers of Conventional Units for conventional energy in the Small Interconnected

System and on an annual basis, the accounting amounts, as well as the relevant forecasts required in procedures applied by HEDNO for the Small Interconnected System Market clearing (monthly and annual clearing), for the calculation of the Load Representatives guarantees and for the assessments of the PSO Special Account for the TSO, in accordance with the applicable legislation.

3.3.2 Derogations from NIIS Code

Producers of Conventional Units shall continue to participate in the Small Interconnected System Market according to NIIS Code. Thus, a Participation Agreement of a Conventional Unit Producer in the Small Interconnected System Market shall be concluded with HEDNO, in accordance with article 11 of Annex C. The Participation Agreement shall be applied on a transitional basis until the full interconnection of the Small Interconnected System with the Interconnected System. On the contrary, Producers of RES/ HECHP and Hybrid Stations in Medium and Low Voltage shall participate in the Small Interconnected System Market according to the HEDN Code applied in the Interconnected System.

Regarding the participation of Load Representatives in the Small Interconnected System, the provisions of the NIIS Code apply mutatis mutandis. Specifically, the requests of the Load Representatives for representation of Medium and Low Voltage supplies of the Small Interconnected System are submitted to HEDNO. A Participation Agreement shall be concluded, in accordance with article 12 of Annex C and on the basis of the procedures applicable in the transitional stage of the above mentioned Code, in which the Load Representatives shall declare to HEDNO the Customers they will represent for which they shall pay the required guarantees. The requests of the Load Representatives for the representation of the High Voltage supply shall be submitted to HEDNO and the metering data of the High Voltage shall be provided by IPTO to HEDNO.

3.3.3 PSO Compensation regarding Crete

RAE's 14/20.1.2014 on "Methodology for calculating the compensation for covering the costs of utility services for non-interconnected islands" does not apply to the Small Interconnected System. On the contrary, a methodology would be determined by RAE for the case of Small Interconnected Systems.

Conclusions

The present thesis reflects to a certain extent the very complex context in which the NIIS market operates and which the participants have to deal with. It is true that the unique situation of the Greek electricity system presents a great burden for the households as

it means an extra charge in their electricity bills. As mentioned above, for decades, the State, as part of its social and regional policy, has imposed a uniform electricity tariff for all consumers in the country, irrespective of their geographical location and the cost of electricity production. Thus, despite the fact that the production of electricity in NII costs more than the corresponding electricity produced in the rest of Greece, the State has demanded consumers on these islands not to pay more for the electricity. But, in order this policy to be implemented, the electricity Suppliers, operating in NII, are required by law to charge the same unit rates per MWh for the electricity they supply to consumers in the rest of the country (PSO). The mandatory provision of PSO by the Suppliers, operating in a highly competitive environment of a liberalized electricity market, has a cost, which they bear in principle themselves. In other words, Suppliers are obliged to provide electricity at prices that do not meet the cost they pay neither to obtain the electricity from Producers through the competent Administrator nor to generate it themselves, if they happen to be both Suppliers and Producers of electricity, such as PPC. This cost is the cost of implementing the above-described social and regional policy, which the State decided to pursue. Issues are arising in the context of the implementation of this policy. The established Methodology for calculating the compensation for covering the costs of PSO for NII does not reflect the real costs incurred by electricity Suppliers in providing PSO. The loss that these companies may suffer to supply electricity to NII's consumers at a price lower than what they pay to acquire or produce this electricity or at a price lower than what they are used to pricing to any of their other customers under normal conditions is not measurable. The cost of financing the PSO compensation, which is equivalent to the cost of pursuing this social and regional policy, bear the electricity Suppliers. However, these companies are public limited companies that address to the general investment community, operate according to the rules of the private economy, aim for profit and compete with each other in a liberalized electricity market. Therefore, the costs they bear should be covered in full by the one who decided to pursue the specific social policy, i.e. by the State. These problems have emerged in recent years with the introduction of the regulatory framework and due to the liberalization of the NII's market. On the one hand the historical electricity Supplier, PPC, which was the only one active in the NII market, filed appeals against RAE's decisions seeking compensation for previous years PSO, while on the other hand, to date, other electricity Suppliers are not active in the NII's market. Part of the problem solved by issue of article 400 of Law 4512/2018 (GG A '5/17.1.2018), which provides for the possibility of adjusting the unit charges of par. 1 of article 36 of Law 4067/2012, in order to zero the foreseen deficit of PSO compensation of the current and next year. RAE's obligation to send a report on the adjustment to the competent Minister in May

and November of each year intends to enable the Minister in question to assess the possibilities of the State's budget to cover partially the incurred costs of PSO compensation. There is no doubt, then, that the financing of PSO deficit is a matter of the State, which can either adjust the PSO unit charges to cover it through consumers, or pay part or all of the deficit from the State's budget, or both, with a mixture that the State will determine each time at its discretion. In particular, with its above interventions, the State has made it clear that this is the ultimate responsible for the proper operation of the PSO compensation and, consequently, it assumes the risk of its defective operation and, therefore, it has a duty to restore –with measures and regulations– possible malfunctions. Because, the formulation and exercise of this social and regional policy is his own business, regardless of whether, to implement it, it uses independent consultants such as RAE, Operators, IPTO and HEDNO, electricity Suppliers such as PPC, and finally the consumers of electricity throughout the country to finance the system. The ultimate risk for the proper functioning of the system that it instituted to implement his policy, bears the same. This, therefore, bears the ultimate responsibility to rectify any possible malfunction.

It is clear that the legislative and regulatory framework for the operation of the NII's market creates insecurity to the Participants. Because of this lack of security in this market, although today NII's market consider as liberalized, very few companies are active, choosing large islands (such as Rhodes) to reduce their business risk. The legislation and regulatory framework to date is still under development following the evolving needs and developments of the energy market. There is undoubtedly scope for legislative and regulatory intervention, particularly in relation to PSO that consumers are liable to pay. It remains to be seen, whether the interconnection of Crete to the HEDN are going to present the economic and financial results anticipated.

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