

## HYBRID MODEL - ISLAND OF CRETE

### TRANSITIONAL PERIOD 2021-2023

(Non Confidential version)

#### I. Introduction

The Greek island of Crete qualifies as “*a small isolated system*” within the meaning of EU Directives. It is an autonomous power system, currently operated without any wholesale electricity market. Producers and suppliers do not submit any orders; there is an estimated price of energy at which all volumes are settled. The units are dispatched mainly according to the minimum variable costs. The estimation is calculated on a monthly basis, based on the variable and total costs of the conventional power units, namely PPC’s units, since PPC is the only conventional power producer (using heavy oil or diesel as a fuel). In addition, there are several RES power producers with a fixed tariff pursuant to a power purchase agreement (Law no 3468/2006) or a Fixed Tariff operating Aid Agreement (Law no 4414/2016) depending on the date of the start of operation of each station.

It is clarified that the retail market is open to all suppliers. There are currently around twenty (20) suppliers active in Crete. Given the fact that the generation costs in the non-interconnected island of Crete are higher than the costs of the Interconnected System, the Hellenic Republic -for reasons of social cohesion- opted for the application by the suppliers of a single tariff for each category of customers, throughout the entire territory of Greece. The extra cost incurred is compensated by means of a Public Service Obligation tariff (please refer to EC Decision pertaining to the case SA 32060).

The interconnection of Crete to the continental National Transmission System is scheduled to be implemented in two Phases. Pursuant to the currently approved Ten-Year (2019 - 2028) Development Plan of IPTO (“IPTO S.A”) (RAE decision no. 1097/2019), implementation of Phase I of the island’s interconnection is expected to be concluded by July 2021. According to the up-to-date time schedule of the implementation of Phase II, the latter is expected to be concluded by 2023.

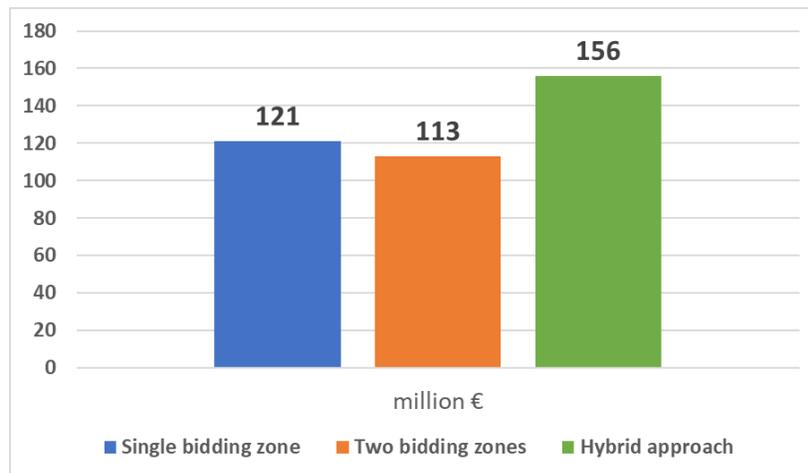
The Hellenic Republic has prioritized the island’s interconnection as a Project of Major Importance, in order to secure the safe and reliable electricity supply of Crete, having regard to the strict provisions of Directives 2010/75/EU (“IED”) and 2015/2193 (“MCPD”) over the existing thermal power plants and in view of the RES binding national targets towards 2030. More specifically, the interconnection of Crete, as approved by RAE by virtue of its Decisions (No. 280/2016, 256/2018 and 1097/2019) concerning the Ten-Year Network Development Plans, pertaining to the periods 2017-2026, 2018-2027 and 2019 - 2028 respectively, shall be implemented, as mentioned above, in two phases, as follows:

- **Phase I** concerns the interconnection of the western part of Crete (Chania Prefecture) to the Peloponnese peninsula by means of two circuits of HVAC 150kV. The two circuits will have a Nominal Transfer Capacity of approximately 2 X 200 MVA, which means that Phase I shall only cover part of the island's needs in electricity. It should be noted that the cables are anticipated to reach an underwater length of 132 km, thus being the longest in Europe as regards this specific technology. The project is scheduled to commence operation by May 2021 (trial operation period).
- **Phase II** refers to the interconnection of the central part of Crete (Heraklion Prefecture) to mainland Greece (Attica region) by means of two HVDC poles of +/-500kV. The two circuits will have a Nominal Transfer Capacity of approximately 2 X 500MW, as a result of which the electricity demand on the island shall be fully covered (710MW peak, 3TWh annual consumption, also taking into account networks' safety criteria) roughly for the next 25 years. It should be mentioned that the underwater length of the cables will reach a total length of 330km and a maximum depth of 1000m. According to the up-to-date information provided by the National Transmission System Operator ("IPTO S.A.") concerning the time schedule of the implementation of Phase II, the latter is expected to be operational by 2023. Its construction is currently in the first year of project implementation since the relevant contracts (for cables, converter stations, substations) were signed in June 2020.

In this context, it must be considered that **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.** Namely, it is expected that the interconnection line will only partially break-up the autonomous operation of the island's power system and market. Indeed, even the maximum use of the interconnection line (i.e. 150 MW \* 8760 h = 1314 GWh) will only partially meet Crete's increased demand since the projection of energy demand on Crete ranges from 3305 to 3371 GWh (under the basic forecast scenario) and from 3371 to 3439 (under the extreme forecast scenario), in years 2021-2023. Thus, in the interim period (i.e. after the commissioning of the Crete/Peloponnese line and before the completion of the Phase 2 - Crete/Attica line), the interconnector will roughly cover 35 % of the demand, as it is expected to reverse flow in few cases.

Furthermore, **in the case where the Cretan market is incorporated into the Greek wholesale electricity markets, its interim operational regime entails high redispatching costs.** Based on the information published on ENTSOE's website on the alternative configurations of the Bidding zone review region "South East Europe» which are to be considered in the bidding zone review process in accordance with article 14(5) of Regulation 2019/943 (<https://www.entsoe.eu/news/2020/02/18/bidding-zone-review-methodology-assumptions-and-configurations-resubmitted-to-nras/>) "IPTO S.A" estimates a daily redispatch volume that reflects the entire production of the old units that will operate in Crete (*see Section IV below*).

Moreover, based on an updated assessment of the costs for the operation of the market in Crete under three scenarios, which was developed by “IPTO S.A. “(attached hereto as *Annex 2*), the resulting benefit of the **hybrid approach amounts to an annual benefit of 156 mil. €**, while for the other two scenarios (i.e. operation of the Cretan market as incorporated into the current bidding zone “**single bidding zone approach**”, or operation of the Cretan market as a distinct bidding zone “**two bidding zones approach**”) the annual benefit amounts to 121 mil. €, and 113 mil. € respectively.



Therefore, to safeguard System and Market optimal operation, in the sense of technical stability and economic efficiency, **the Hellenic Republic envisages the status of Crete as a “small interconnected system”, within the meaning of article 2 para (43) of Directive 2019/944.**

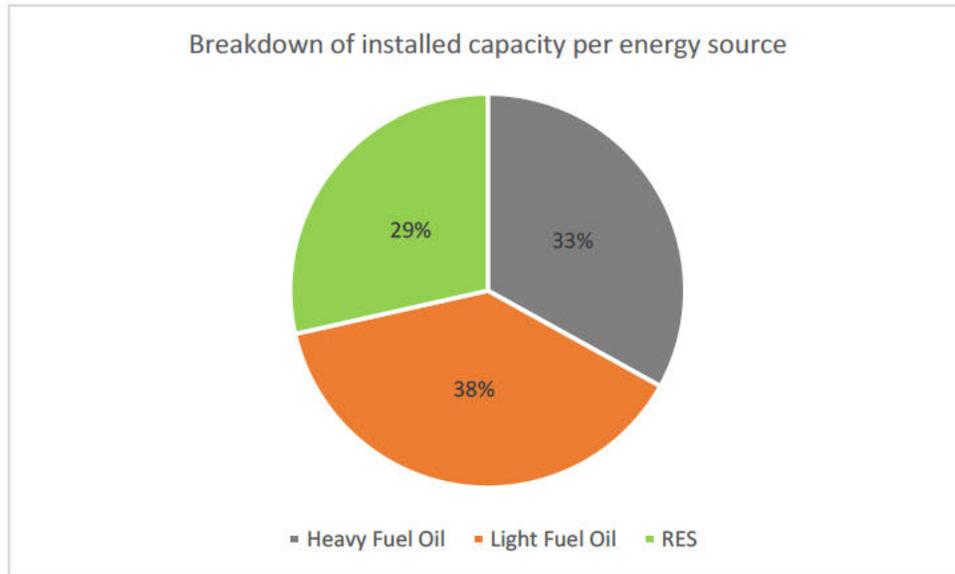
It is anticipated that the supply cost of electricity in Crete will continue to be higher than that in the interconnected system, given the fact that the conventional power units of PPC will still be needed to meet demand, albeit in significantly reduced timeframes. Thus, in order to avoid that consumers of Crete are adversely affected, a genuine need of a public service is recognized and hence the extra cost shall be recovered through the PSO charges. In this regard, supplying electricity in the small interconnected system of Crete should be set up as a service of general economic interest and approved by the Commission.

**The hybrid approach** described below **aims at providing a transitional solution** concerning the period **from the completion of Phase I until the completion of Phase II** where the island will constitute part of the Hellenic Electricity Transmission System (HETS) (the “**Transitional Period**”) to the benefit of the Greek consumers through the reduction of the Public Service Obligation (“PSO”) costs due to the expected displacement of more expensive thermal generation on the island of Crete.

## II. Current status of electricity system in Crete

### a. Current generation mix

Crete currently qualifies as a “small isolated system” by virtue of Art. 2 (42) of Directive 2019/944/EU (“SIS”). The existing conventional generation mix in its entirety comprises mainly steam, gas and one combined cycle unit, using heavy- or light-fuel oil (708 MW total installed capacity). Installed capacity of renewable generation is at 283 MW, most of which is wind power (203 MW) and photovoltaics (78 MW). The breakdown of existing generating capacity by energy source is presented in the following graph.



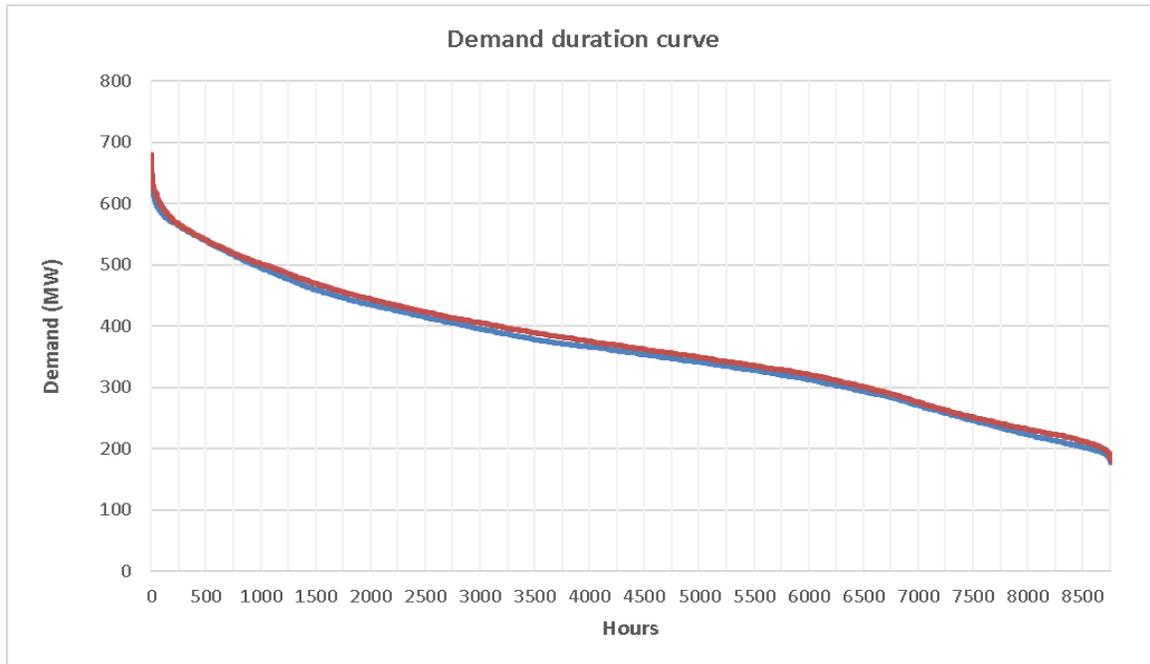
The following graph illustrates the Single Line diagram of the current and planned (until 2031) Electricity Network of Crete, as well as the location of the conventional generation plants.



### b. Current electricity demand and generation mix

The annual electricity demand over the past 5 years amounted to approximately 3TWh. The demand in 2020 (2.8TWh) was covered by 75% of conventional thermal generation and 25% of renewables' generation.

The annual load factor is in the order of 47%. A typical demand duration curve (for the last years - excluding 2020 due to the pandemic crisis) is presented in the following graph.



### III. Proposed operation of the electricity market in Crete during the Transitional Period

#### a. The proposal for the Hybrid Model

As the island of Crete is soon to be connected to the mainland (see section I above), the Hellenic Republic, following cooperation with RAE, the electricity market (HEnEx) and network (IPTO and HEDNO) operators and the RES Operator (DAPEEP), is submitting the following proposal regarding the operation of the market in Crete during the Transitional Period.

It is clarified that, since Crete has been qualified as a “*small isolated system*”, it can also be qualified as a «*small interconnected system*» following the commissioning of the interconnector. HEDNO will no longer operate the island’s HV network. Namely, “IPTO S.A.” will operate the HV system and HEDNO will operate the LV and MV networks.

With regards to the market operation model, and given that the Phase I cable is expected to be mainly congested, as its capacity is not enough to fully cover the demand on Crete, and energy will be imported to Crete from the mainland Interconnected System (IS) due to the lower IS costs, a hybrid approach is proposed in order to:

- Utilize the new cable as soon as possible and provide a benefit to Greek consumers through the reduction of the Public Service Obligation (PSO) costs due to the expected displacement of more expensive thermal generation on the island of Crete,
- minimize the total cost of electricity supplied in Crete and compensated by a PSO charge and simultaneously avoid an excessive redispatching cost of the Balancing Market operating in the interconnected system, and
- provide an interim solution which can easily be implemented in a short time period, requiring at the same time a minimum amount of changes to the current legal and regulatory framework.

Alternative solutions were considered, i.e. full participation of Crete market participants in the Electricity Markets operating on the mainland Interconnected System (IS) or the creation of a new bidding zone. Both options were rejected as non-feasible given infrastructure inadequacies (in particular, lack of the necessary metering systems), time constraints and higher resulting costs, as illustrated in TSO’s relevant study (*attached hereto as Annex 2*).

Based on an assessment of the costs for the operation of the market in Crete under the three scenarios developed by “IPTO S.A.” (Annex 2), the resulting benefit of the **hybrid approach amounts to an annual benefit of 156 mil. €**, while for the other two scenarios (i.e. operation as one bidding zone, or operation as two bidding zones) the annual benefit amounts to 121 mil. €, and 113 mil. € respectively. Therefore, the proposed hybrid model stands as the optimum approach for the period 2021-2023, namely among Phases I and II.

## b. The Hybrid Model –Operation during the Transitional Period

Following the successful completion of Phase I and the connection of Crete’s transmission system with the Hellenic Electricity Transmission System (HETS)<sup>1</sup>, which is scheduled to be operational by July 2021, it is 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.

- Option 1: Priority Price Taking Buy/ Sell Orders corresponding explicitly for the vBRE energy quantities will be submitted: (i) by HEnEx 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 DAPEEP for the rare case of forecasted exports from Crete to the IS. Option 1 as in public consultation by RAE is attached hereto as **Annex 3**.
- Option 2: Priority Price Taking Buy/Sell Orders for the whole local load and generation of Crete will be submitted: (i) by HEnEx 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. Option 2 as in public consultation by RAE is attached hereto as **Annex 4**.

It is envisaged that the Phase I cable will mostly be importing energy to Crete, therefore will be treated as a load point for the purposes of the IS Electricity Markets operation for most of the time. Given the amount of RES penetration in Crete and the need to also keep thermal plants running at their technical minimum limits, it is expected that at periods of low load and high RES output, the flow on the cable will reverse in order to avoid RES curtailment and allow the maximization of the utilization of RES units in Crete. In such rare cases when the cable will be exporting to the IS, all generation exported from Crete

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<sup>1</sup> Via the 2 X 200 MVA Crete-Peloponnese interconnection, which will be used for a power flow up to 150 MW, taking into account the relevant system safety rules.

to the mainland via the Phase I cable is considered to come from RES generation. All thermal generation in Crete should be considered to serve the local load, thus not injecting energy in the wholesale markets of IS.

*See Section IV(a) –Scope of Derogation*

c. Crete’s wholesale electricity market operation

“IPTO S.A.” will execute, on a daily basis, in cooperation with HEDNO for the initial period in order to achieve the transfer of know-how, a simplified Dispatch Schedule (DS) for each Physical Delivery Day D, having as input the reserve requirements, the forecasted load of the system in Crete, the forecasted output of the priority dispatched RES, the availability of thermal generating units and the availability of the interconnection. The output of the simplified DS will be the schedule of thermal units and the schedule of the interconnection. This DS will serve only as an indicative commitment schedule for thermal units in Crete and for the purpose of calculating the expected interconnector flow from the HETS to the island or vice versa.

Therefore, in this framework:

- By 09.00 EET D-1, IPTO shall prepare the following forecasts for each Market Time Unit (MTU) of Physical Delivery Day D:
  - a. Load Forecast for Crete,
  - b. RES Units in Crete forecasted output,
  - c. expected availability of thermal generating units, and
  - d. expected availability of the AC interconnector.

The above data and cost-based data for energy and reserves for the economic dispatch of conventional thermal units will be taken into account for solving the simplified DS.

- By 10.00 EET D-1, IPTO shall publish the results of the simplified DS, which will include the expected operating schedules of the generating units and the expected interconnector flow on an hourly basis.
- Based on the results of the simplified DS, IPTO shall determine the energy withdrawal/injection program of the vBRE of Crete to the HETS for each MTU of Physical Delivery Day.
- Based on the results of the simplified DS, the energy withdrawal schedule of the vBRE for each Load Representative in Crete for each MTU of Physical Delivery Day based on the ex-ante percentage representation calculated by HEDNO will be calculated and relevant Priority Price Taking Buy Orders (PPTBOs) will be prepared by HEnEX.

Furthermore, according to the Option 2 defined in article III b above, based on the results of the simplified DS, HEnEX will prepare, also, Priority Taking Sell Orders (PPTSOs) according to the calculations of the energy injection schedules of each Producer in Crete for each MTU of Physical Delivery Day.

- According to Option 1 defined in article III b above, in the rare cases of energy injections from Crete to IS, the injection program determined by the simplified DS

will be attributed to the Operator of Renewable Energy Sources & Guarantees of Origin (DAPEEP). For such cases, relevant Priority Price Taking Sell Orders (PPTSOs) will be prepared.

“IPTO S.A.” shall execute an updated Dispatch Schedule during D-1 or D whenever deemed necessary.

***See Section IV(a) – Scope of Derogation.***

#### **d. Participation in the IS Electricity Markets**

HEnEx shall submit PPTBOs to the Energy Trading Spot System (ETSS) for the Day-Ahead Market (DAM) and for each Market Time Unit of Physical Delivery Day D for the above-mentioned scheduled withdrawn energy quantities on behalf of the Load Representatives in Crete, according to the aforementioned simplified DS results and, in case of injection from Crete to the IS, DAPEEP shall submit PPTSOs for the above-mentioned scheduled injected energy quantities.

The simplified DS pre-scheduling of Crete may be updated by IPTO in D-1 or D, if deemed necessary. For such cases, following the same rules as stated above, relevant Hybrid Buy/Sell Orders (as the case may be) for the Intraday Day Auctions (LIDAs/CRIDAs), for the deviations from the scheduled withdrawn/injected energy quantities of the vBRE of Crete (option 1)/of each Market Participant (option 2), will be prepared. The price for such hybrid orders will be equal to the Day-Ahead Market Clearing Price for the corresponding MTUs. For such cases HEnEx shall submit the relevant hybrid sell/buy orders to the ETSS for the LIDAs/CRIDAs, on behalf of Load Representatives (option 1)/ thermal generators and Load Representatives (option 2) in Crete. According to Option 1, in case of further injection from Crete to IS, DAPEEP may submit hybrid sell orders for the deviation from the scheduled injected energy quantities of the vBRE of Crete while, according to Option 2, DAPEEP will submit the relevant Hybrid Sell/Buy Orders to the ETSS for RES generation.

Alternatively, according to Option 2 defined in article III b above, HEnEx shall submit PPTBOs and PPTSOs to the Energy Trading Spot System (ETSS) for the Day-Ahead Market (DAM) and for each Market Time Unit of Physical Delivery Day D on behalf of thermal generators and Load Representatives in Crete. It should be mentioned that PPTSOs for RES units of DAPEEP will be submitted by DAPEEP. In this option, the vBRE interconnector flow will be implicitly verified/calculated in the DAM as equal to the pre-scheduling IPTO results.

DAM and IDM transactions placed in HEnEx markets on-behalf-of Market Participants will be Cleared and Settled by EnExClear according to the existing standard procedures already applied for the IS.

With regards to the Balancing Market (BM):

- In case of importing vBRE (to Crete): IPTO calculates the imbalances and Uplift Charges<sup>2</sup> per Imbalance Settlement Period and Load Representative by comparing the Market Schedule (withdrawal) of the interconnector vBRE that corresponds to the Load Representative and final energy withdrawal metered at the HV side of the Chania substation allocated to the Load Representative. Final energy withdrawal metered at the HV side of the Chania substation is allocated to Load Representatives in Crete according to the ex-ante percentage representation calculated by HEDNO.
- In case of exporting vBRE (to the IS): IPTO calculates imbalances by comparing the Market Schedule (injection) of the vBRE and final energy injection metered at the HV side of the Chania substation. This is then allocated to DAPEEP as the representative of the RES energy injected to the IS.

The above calculations are sent to EnExClear following the weekly settlement process as described in the Balancing Market Rulebook for W+1. The same procedure is followed for the corrective settlement in week W+7, according to the Balancing Market Rulebook. Load Representatives or DAPEEP will not be charged with non-compliance charges for the vBRE.

Particularly in Option 2, for the Balancing Market to operate without taking into account market results/schedules of entities in the island, which cannot be treated as either BREs or BSEs, due to the fact that those entities are not part of the IS market, HEnEx will calculate and provide to IPTO the Market Schedule for the Interconnector, exporting or importing from/to the IS, as calculated implicitly according to market results. When the Interconnector is importing energy from the IS, this schedule will be attributed by HEnEx to each Load Representatives in Crete for each MTU of Physical Delivery Day based on the ex-ante percentage representation calculated by HEDNO, as in Option 1, whereas when the Interconnector is exporting energy to the IS the schedule will be attributed by HEnEx to DAPEEP.

The hybrid approach is broadly simple and easy to implement, without any significant changes in the existing market systems of IPTO, HEnEx and EnExClear. It allows familiarization of market participants in Crete with the IS market procedures and ensures daily cash flows between the Market of Crete and the IS Market between market participants without the involvement of the Operators.

Finally, it allows allocation of imbalances of the vBRE directly to Load Representatives in the island, and DAPEEP, accordingly, by taking into account actual metering data from the Chania substation, since frequency regulation in the island will be primarily performed by the AC interconnection, therefore imbalances calculated as the difference of the initial interconnection schedule calculated in the simplified DS to metered data will be caused primarily by the system of Crete.

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<sup>2</sup> According to provisions for Load Representatives in the Balancing Market Rulebook

To conclude, the hybrid approach allows for discrete operation of the IS market and the Cretan market, while fully benefiting from the operation of the interconnector during phase I.

#### e. Clearing and settlement of Crete's wholesale market

It is proposed that the clearing and settlement of transactions relating to Crete, including the flows on the Phase I cable, are conducted by EnExClear S.A., HEDNO and DAPEEP as follows:

EnExClear clears and settles the transactions of the interconnector (Option 1)/ the total Crete volume (Option 2) based on DAM, IDM and BM results through normal procedures applicable in the IS markets.

Thermal generation will follow the regular monthly settlement cycle performed by HEDNO to date (which also includes the settlement of regulated charges). Through this complementary settlement procedure, thermal producers will receive their revenue according to the rules already in place in Crete. In Option 2, HEDNO needs to take into account amounts already cleared by EnExClear.

Finally, regarding RES production on Crete, DAPEEP will settle and clear the related amounts by invoicing Load Representatives based on information provided by HEDNO (metered output). In Option 2, DAPEEP needs to take into account amounts already cleared by EnExClear.

#### f. Details on the clearing and settlement of DAM-IDM transactions and BM positions

EnExClear S.A. shall act as the Clearing House for the clearing and settlement of electricity transactions on DAM, IDM and of BM positions of the vBRE (option 1)/ Market Participants (option 2) of Crete.

The Clearing Members of Crete island's Market Participants and DAPEEP take the place of the Participants in the Electricity Markets and become liable to EnExClear S.A. as its' counterparties for the clearing of the relevant cash obligations arising from the relevant transactions (DAM/IDM) and positions (BM) of the vBRE for Crete.

Since all current Load Representatives of Crete are also Load Representatives in the IS, this process will be quite simple. The necessary collateral obligation for the Crete daily participation in the Electricity Markets will be covered by the Clearing Members of Crete island's Market Participants and DAPEEP, accordingly, as provided in the current Clearing Rulebooks. Market Participants will receive separate reports for debits and credits regarding the DAM, IDM and Balancing Market that correspond to their activity in Crete.

HEDNO shall continue calculating necessary guarantees to cover the additional amounts settled in the complementary settlement process according to existing rules, resulting in lower amounts to be paid by Load Representatives given the expected reduction of

thermal generation displaced by the interconnector imports, and in Option 2, amounts cleared by EnExClear.

g. RES contracts during the transitional period

All RES contracts are transferred to DAPEEP (by a Ministerial Decision). For the transitional period, all metering data for existing and new RES in Crete will be provided to DAPEEP by HEDNO.

h. Regulated charges

Transmission Use of System charges will be collected by IPTO according to the provisions in the HETS Grid Code.

ETMEAR will be charged by DAPEEP according to the provisions of its Code.

HEDNO will provide all the necessary metering data, including during the transitional period, High Voltage end-consumer data.

## IV. Application to the European Commission

### a. Scope of Derogation

1. According to article 66 para 1 of Directive (EU) 2019/944 of the European Parliament and of the Council of 5 June 2019 on common rules for the internal market for electricity and amending Directive 2012/27/EU (the “Electricity Directive”): *“Member States which can demonstrate that there are substantial problems for the operation of their small connected systems and small isolated systems, may apply to the Commission for derogations from the relevant provisions of Articles 7 and 8 and of Chapters IV, V and VI.”*

2. According to article 64 para 1 of Regulation (EU) 2019/943 of the European Parliament and of the Council of 5 June 2019 on the internal market for electricity (the “Electricity Regulation”): *“Member States may apply for derogations from the relevant provisions of Articles 3 and 6, Article 7(1), Article 8(1) and (4), Articles 9, 10 and 11, Articles 14 to 17, Articles 19 to 27, Articles 35 to 47 and Article 51 provided that: (a) the Member State can demonstrate that there are substantial problems for the operation of small isolated systems and small connected systems;.....*

*In the situation referred to in point (a) of the first subparagraph, the derogation shall be limited in time and shall subject to conditions aiming to increase competition and integration with the internal market for electricity”.*

3. Given the newly introduced features of the Hybrid Model for the island of Crete, for the Transitional Period as described in detail in Section III above, the Hellenic Republic submits a Derogation Request from the provisions of articles 6, 7 par 1, 8 paras 1 & 4, 9-11 and 13 of the Electricity Regulation and the provisions of article 40 paras 4-7 of the Electricity Directive, respectively. More specifically:

#### A. Derogation according to article 64 of the Electricity Regulation

The Hellenic Republic takes the view that the aforementioned hybrid nature of the Cretan market status still observes the General Principles governing the operation of the electricity markets, as provided by article 3. For this reason, the derogation request is not extended to include article 3.

##### i. Derogation from article 6

Considering that article 6 refers to the balancing market and given the above description and operation of the Hybrid Model which does not include a balancing market.

##### ii. Derogation from article 7 par. 1

Considering that article 7 par. 1 refers to day-ahead and intraday markets and given that the above description and operation of the Hybrid Model does not include day-ahead and intraday markets.

##### iii. Derogation from article 8, par. 1 and par. 4

Considering that article 8 refers to the trade on day-ahead and intraday markets and given that the above description and operation of the Hybrid Model does not include trades on day-ahead and intraday markets.

iv. Derogation from article 9

Considering that article 9 refers to forward markets and given that the above description and operation of the Hybrid Model does not include forward markets.

v. Derogation from article 10

Considering that article 10 refers to technical bidding limits and given that the above description and operation of the Hybrid Model does not include technical price limits until the island of Crete will be fully interconnected with HETS.

vi. Derogation from article 11

Taking into account the fact that the region of Crete will not be incorporated into the IS bidding zone but will be operated on the basis of a hybrid model, which resembles to a distinct “*quasi*” bidding zone, a single estimate of the value of lost load is not considered as reasonable. RAE shall have the discretion to determine the value of lost load in Crete in a nuanced way.

vii. Derogation from article 13

It is acknowledged that the non-operation of a Balancing Market in Crete entails the non-application of redispatching rules, as provided by article 13. Although article 64 of the Electricity Regulation does not foresee a derogation from article 13, such derogation is considered as a reasonable consequence of the other requested derogations.

Moreover, it should be mentioned that the main features of the Hybrid Model do not entail the operation of a balancing market. Although article 64(1) of the Electricity Regulation does not allow derogation from article 13 of the Electricity Regulation, however, in so far as a derogation from article 6 results in the non-application of balancing market rules, all references to re-dispatching in the Regulation are to be understood as non-applicable (*Commission Decision (EU) 2020/2123, section 3.2.*).

## **B. Derogation according to article 66 of the Electricity Directive**

i. As a general remark, the tasks to be performed by the “IPTO S.A.” as described above are not inconsistent with the TSO duties, as generally provided by the European framework. Thus, such tasks do not fall under the scope of article 40 paragraph 4-7 of the Electricity Directive and no derogation is deemed necessary. However, any alternative interpretation will be discussed with EC. As it derives from our proposal and as mentioned above, a local daily market with the participation and submission of offers by both producers and suppliers will be established. However, during this interim period, an ID and a Balancing Market cannot be put into place, thus the TSO will not procure

balancing services and non-frequency ancillary services according to the provisions of article 40 paras 4-7. In this regard the derogation from article 40 paras 4-7 should also be considered.

ii. It is also declared that it is not necessary to request derogations from articles 51 of EU Regulation 943/2019 and articles of the Chapter VI (Unbundling of Transmission System Operators) of EU Directive 944/2019, given that the assets of the System in Crete are going to be transferred to "IPTO S.A", within a short time-frame, before the beginning of the commercial operation period, thus fully observing the Ownership Unbundling regime requirements. It is also noted that an act will be passed by the end of 2021 including provisions regarding the transfer of the assets of the system of Crete from PPC (current owner) to ADMIE (TSO of the interconnected system). In any case, the Greek authorities seek to ensure that the transfer of ownership will be effective/ concluded on the day when the interconnection is put into commercial operation and, hence, Crete is declared as "small interconnected system.

#### **b. Notification according to article 5 of the Electricity Directive**

Article 5 para 3 of the Electricity Directive provides *"By way of derogation from paragraphs 1 and 2, Member States may apply public interventions in the price setting for the supply of electricity to energy poor or vulnerable household customers. Such public interventions shall be subject to the conditions set out in paragraphs 4 and 5."*

The Hellenic Republic requests a derogation from the fundamental principle of "market-based supply prices" and notifies the supply activity in Crete as a genuine service of general economic interest, as referred to in Article 106 and the 2012 SGEI framework. This notification is related to Public Service Obligation (PSO). More specifically:

Until the completion of Phase II (Crete-Attica), Crete will only cover part of its electricity demand through the operation of the small interconnection (Phase I) and the rest of the demand (about 2/3) shall be covered by the more expensive operation of the local generation units (Conventional and RES). The full production cost of local units, comprising of the variable cost of generation, the fixed cost of generation and the cost of capacity, must be compensated by the Suppliers of Crete.

Having regard to the above, in order for a supplier operating on a small interconnected system to be able to offer the same electricity retail tariffs as to customers on the IS, the NII\_PSO scheme will compensate the active suppliers specifically for the extra costs incurred, as explained in the previous paragraph, for the purchase of electricity in the wholesale electricity market of the SIS, namely Crete. In this case, however, the calculation of the compensation will be restricted to the volume of demand served by energy generated locally by conventional producers within the small interconnected system.

The basic principles include that HEDNO will continue to be responsible for the PSO account transactions, and suppliers will only be compensated for the extra cost entailed due to the higher prices paid for the volumes generated by power plants located on Crete

to serve local load. The PSO costs of Crete will be calculated separately from the PSO costs of the NII. Additionally, as Transmission Use of System charges currently collected through customer bills will be recovered by IPTO, following the completion of Phase I they will no longer offset PSO costs on the island as is currently foreseen in the NII PSO cost methodology.

The estimated compensation will be settled monthly for each Supplier in Crete by HEDNO, so that the supplier operating in Crete recovers the PSO compensation in a timely manner. RAE will check ex-post the costs and calculations submitted by HEDNO for reasonableness and appropriateness and will approve each year the total annual compensation to be settled for each supplier.

Further analysis is provided in Annex 1.

#### IV. Substantial problems for the operation of the system

Several data, assumptions and scenarios were considered in order to shape the proposal of the hybrid model, including the operation of the market in Crete as part of the Bidding Zone mainland interconnected system (IS) or as a separate bidding zone (two-zones approach). These issues address both technical and system security concerns and economic efficiency reasons.

First, in line with the bidding zone review process which has been initiated in 2019 on an EU level in accordance with article 14(5) of Regulation 2019/943 the Greek TSO, IPTO, at that time, incorporated two options for the operation of the market in Crete, that is Crete being part of the mainland Greece zone and constituting a second zone. **In January 2021, IPTO informed RAE that this process will take more than a year to complete, which is past the expected COD of Phase I of the interconnection (June 2021).** The TSO also provided evidence as to whether according to the provisions of article 33 of CACM the operation of Crete as a separate bidding zone until the operation of Phase II is not recommended.

It should be highlighted that, as a general prerequisite for the market in Crete to be incorporated in the mainland IS bidding zone, and therefore for the market participants in Crete to participate directly in the Day Ahead, Intra-day and Balancing markets which started operation on the 1<sup>st</sup> of November of 2020 on mainland Greece, all the necessary technical infrastructure should have been in place on the island, which is not the case.

Based on the information provided by IPTO the only valid measurement point in Crete is where the cable connects with the island (substation of Chania).

The installation of the necessary meters, with specifications in line with those of the interconnected system has not been completed for the three main conventional power units in Crete (Chania, Linoperamata and Atherinolakos), thereby restricting their direct participation to the wholesale market of mainland Greece. In addition, the measurement units of the RES installations currently have the specifications of those units installed in distribution networks. In addition, the measurements units connecting HV with MV network, on the 30 busbars of the island, do not have adequate measurement units to create a clear separation between the HV and MV network.

As a result, an upgrade of the metering infrastructure on the island is needed for imbalance settlement to be implemented past the point in Crete where the cable connects with the island. All the necessary meters should be installed with specifications in line with those of the interconnected system to allow for 15-minute measurements and telemetry, which constitute the necessary requirements for the inclusion of the market participants on the island in the Balancing Market. **Therefore, the lack of the necessary infrastructure cancels out the possibility for the electricity market in Crete to be incorporated in the Bidding Zone of mainland Greece.** The completion of the Phase 2 of Cretan Interconnection (i.e: Crete/Attica line), will allow the incorporation of the Cretan

market into the Greek wholesale electricity markets. Thus, within this timeframe, appropriate metering infrastructure shall be available.

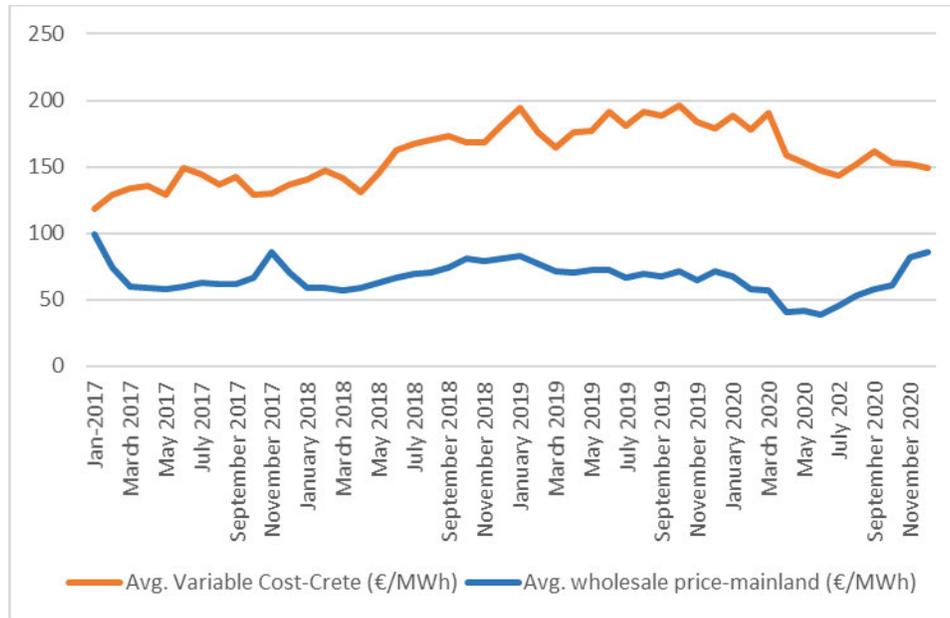
**The creation of a second bidding zone in Crete would have been necessary to provide the market signal for additional infrastructure investments to alleviate technical congestion. However, this decision has already been made and Phase II of the interconnection will be completed by 2023.**

In accordance with article 33 of CACM there are three criteria that need to be examined when deciding on a new zone: a) network security, b) overall market efficiency and c) stability and robustness of the bidding zones.

With regards to issues related to **network security** the proposed hybrid model does not make any practical difference compared to the operation of the market in Crete as part of the Bidding Zone mainland IS or as a separate bidding zone. The HV network and the MV/LV network in Crete will be operated by IPTO and HEDNO, respectively, according to all required standards in whichever model of operation of the market. However, all the necessary investments of upgrade of the network need to be completed both by IPTO and HEDNO, before the completion of Phase II to allow for the direct participation of market participants on the island of Crete to the wholesale market of the mainland.

Related to **market efficiency issues**, under the current regulatory framework, if there are two bidding zones, the price differentials between the two zones lead to different electricity supply costs for the participating suppliers in the Day-Ahead market and the Intra-Day market.

More specifically, the generation costs in the non-interconnected island of Crete are much higher than the costs of the Interconnected System. The average variable cost of Crete compared to the average wholesale price of the mainland is significantly higher, as presented in the following chart for the years 2017 to 2020.



The thermal Generation Units that are installed in Crete, refer to heavy-fuel and light-fuel oil, with Average Variable Cost (AVC) at 90€/MWh and 300€/MWh, respectively. Hence, even if the generation units would offer their bids at their AVC, in the DAM and IDM, the marginal clearing price of the second bidding zone (Crete) would be resulting at higher levels compared to the mainland IS.

However, it should be noted that in the Greek DAM there exist no PUN type purchase orders (such as in Italy), which ensure a single price of electricity supply for the participating suppliers within the whole country. Currently, this difference in supply costs is recovered through Public Service Obligation (PSO). In the case of two zones, the costs to be recovered considering the existence of two bidding zones and due to the marginal pricing of DAM and the IDM will always be higher than the total production cost in Crete. This will result in an additional burden on Greek consumers, which is not in line with the economic purpose of the Crete interconnection, i.e., the reduction of the energy costs for the end-consumers.

Also electricity market in Crete through a distinct bidding zone will not operate in an efficient way due to high PPC share in conventional generation and supply. In addition, there is insufficient energy differentiation and the level of interconnection with the mainland during Phase I will be low since the only producer with conventional generation units and the main supplier in the retail market is PPC. Although the implementation of the interconnection will allow the increase of the penetration of the RES production units on the island, as well as the restriction of operation of some of the existing local conventional generation units, the PPC market concentration is expected to remain high while the liquidity in the potential zone will be very limited.

Regarding the stability and robustness of the bidding zones between Phases I and Phase II of the interconnection, the congestion will be fully foreseen. The congestion remains

until the completion of the Attica-Crete interconnection (Phase II), as the remaining load of Crete (load – RES – local must-run thermal production) is generally maintained above 150MW, which will be the capacity limit of the Phase I interconnection. However, with the completion of the large interconnection (Phase II), the congestion is expected to cease completely and occur only exceptionally, mainly in cases of partial or total unavailability of the DC interconnection. Therefore, the bidding zone of Crete cannot be considered as sufficient and robust over time, since with the completion of Phase II the potential congestion cannot be considered as structural, i.e., clearly defined, predictable, geographically stable and over time often repeated under normal operation of the system.

At the end, if the market in Crete could operate as part of a single bidding zone and considering the given congestion at the interconnection, for the period between Phase I and II of the interconnection, a particularly high re-dispatching cost is expected (on the order of 240 mil. €/year<sup>3</sup> based on 2019 estimate), which is currently updated by a recent TSO study to about 70 mil. €/year<sup>4</sup>. More specifically, during the implementation of the first Phase of interconnection, and as the transfer capacity of the interconnection between Attica and Peloponnese is less than the difference between the load of Crete and the sum of the local production of RES and the must-run thermal generation units, congestion will occur in the interconnection for long periods of time and will require generation from the local thermal units in Crete.

In this context, the generation units of Crete and the IS, will be systematically re-dispatched during the Integrated Scheduling Procedure (ISP), considering the transfer capacity limitation of the interconnection and other technical constraints (i.e., regarding voltage regulation). The energy injected from the local generation in the context of the re-dispatching will present a significant additional cost to market participants in the Greek

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<sup>3</sup> Based on the information published on ENTSOE's website on the alternative configurations of the Bidding zone review region "South East Europe" which are to be considered in the bidding zone review process in accordance with article 14(5) of Regulation 2019/943 (<https://www.entsoe.eu/news/2020/02/18/bidding-zone-review-methodology-assumptions-and-configurations-resubmitted-to-nras/>) IPTO estimates a daily redispatch volume of 3.3 GWh with an estimated cost of 240 mil. €, namely about 200 €/MWh for each volume of MWh redispatched, which stands as a proxy equal to the difference among the total production costs of thermal units in the Crete system and the marginal price in the IS. This initial assumption and estimation was considered high, that led a re-assessment for the needs of this document.

<sup>4</sup> Study of TSO: "Comparison of different Models for Crete for the Transitional Period" (Annex 3). This estimation concerns remuneration for redispatch down volumes at the level of variable cost of natural gas units of the IS, therefore summing the redispatch up with redispatch down costs is 125m€-56m€, about 70 million €. However, in case of redispatch down bids are remunerated at lower to variable cost values, or even producers to be compensated due to negative bids, in case of scarcity pricing, redispatch costs might be considerably increased.

market, which can be eliminated should the hybrid model of operation of the market in Crete is put in place.

## V. No obstruction to the transition towards renewable energy, increased flexibility, energy storage, electromobility and demand response

### a. Renewables Integration

The entry into service of the Crete - Peloponnese interconnection relieves the technical limitations of the autonomous operation of the electricity system of Crete, during which the penetration of RES has been limited to percentages not exceeding 25% of the load, on the grounds of security and stability of the operation of the Cretan system and the technical limitations in operation related to the renewable generation volatility and the technical characteristics of the local conventional production plants.

#### i. Effects of the limitations on existing RES

As illustrated in the following table RES production, including both production from wind parks and photovoltaics, amounts to on average twenty two percent (22%) of the total electricity production in Crete in the period 2017-2020, which amounts to approximately 676.000 MWh/year. Wind parks account for seventy five percent (75%) of the total RES production, i.e., approximately 510.000 MWh/year.

Year	RES Production (MWh)	Conventional Units Production (MWh)	Total Production (MWh)	% of RES to total production
2017	680.828,85	2.372.736,78	3.053.565,62	22%
2018	677.651,55	2.404.160,02	3.081.811,57	22%
2019	670.576,16	2.438.384,33	3.108.960,49	22%
2020	676.909,82	2.134.452,99	2.811.362,81	24%

Based on information provided by HEDNO, approximately 10% more energy from wind parks could have been produced shouldn't there be the technical limitations of the system in Crete, which in the year 2020, due to lower consumption on the island amounted to approximately 12-15%. On average the energy not produced from wind parks amounts to approximately 56.000 MWh per year.

The entry into service of the Crete - Peloponnese interconnection will allow for this energy to flow in the interconnected system, in period of low load and high RES production, eliminating RES curtailment and maximizing utilization of RES units.

#### ii. Additional RES capacity

Regarding the additional renewables capacity that can be connected to the grid in the interim period between the first and second phase of the interconnection of Crete with the mainland Greece, IPTO and DSO conducted an analysis regarding the technically feasible limits of the grid to integrate additional capacity.

Considering all the operating restrictions, both of the interconnection line and of the local electricity system (transmission capacity limits, minimum number of conventional units in operation for stability reasons), the capacity to host additional power from RES units was determined by IPTO and DSO by geographical area (east, central, and west Crete), as presented in Table 1.

Region of Crete	Cumulative (East to West) margin for additional RES Capacity  (MW)
East	74
Central	147
West (interconnection node)	180

The additional RES capacity is regarded as cumulative (from east to west) due to the radial topology of the local transmission system from the interconnection node (Chania – west region) to the east; in this sense, following the order east-central-west, the non-covered margin in each region is added to the next level, up to a total capacity of 180 MW for the entire system.

It should be noted that these capacity margins of additional RES units are regardless of technology (wind power, photovoltaic, biomass etc.); However, as a prerequisite, the new stations should comply with the requirements of the respective regulations regarding the technical requirements for the connection of generators to the grid.

By virtue of Decision SA 44666, “New operating aid scheme for the production of electricity from RES and HECHP”, Hellenic Republic was granted approval by the Commission for the new support regime for RES stations. Moreover, SA 48143 decision described the tendering procedure for the production of electricity from renewable energy sources and highly efficient combined heat and power installations. Furthermore, a pre-notification of the Greek framework for the RES/HECHP auction scheme during the period 2021-2024 has been submitted to the E.C. (D.G.Com) by the Hellenic State (ΥΠΕΝ/ΓΡΓΓΕΟΠΥ 115769/5077/2.12.2020) which clarifies the willingness of the Hellenic Ministry of Environment and Energy to continue and enhance the approved provisions under SA.48143/17 decision regarding the technologies that are subject to and exempt from auctions, as well as to further improve on the type and format of auctions and establish their timeline for the upcoming period.

According to the above decisions, new photovoltaic installations with a capacity above 500 kW and new wind farms with a capacity above 3000 kW will only be granted aid on the basis of a competitive bidding process.

According to national Law 4414/2016, which implemented the above decisions of the

Commission, RES stations receive a Reference Price following participation in a competitive bidding process conducted by RAE.

According to the above EC Decisions site specific auction can be organized by RAE. The site specific auctions will be organized in order to take account of the specific conditions of the Greek power system. They will be conducted in case of

- (i) the islands that have just been interconnected or are just about to be connected with the main grid or
- (ii) system expansions.

The auctions would cover mainly non-mature projects at an earlier stage of the licensing process and therefore special conditions for the awarding and final granting of the operating aid will apply.

Therefore, the Reference Value of a project that has been granted after participating in a competitive process is not affected by the prices of the electricity market.

At present, no project has been implemented without receiving operating aid in the Greek power system and considering that Crete will become a part of the Interconnected System in 2 years from now, it is not reasonable to implement a RES project without operating aid with the hope that the market price in the zone of Crete would be higher than the MCP of the Mainland.

Considering also that the time required to license and activate a RES station ranges from 2 to 6 years, depending on the technology of the RES station, **no new RES station is expected to start operation in less than 2 years (until the complete interconnection of the island to the Mainland).**

#### **b. Electromobility and demand response**

Article 64 of the Electricity Regulation provides that the derogation does not obstruct the potential for flexibility or energy storage. Indeed, the hybrid model has no impact to the further development of electromobility and demand response resources.

### **VI. Limitation of the derogation in time and conditions aiming to increase competition and integration with the internal market for electricity**

#### **i. Derogation limited in time**

The derogation request is envisaged as limited in time based on the operation and connection of the island with mainland with the completion of Phase II of the interconnection.

#### **ii. The impact of the derogation for the suppliers of Crete as well as of those of the IS.**

Given that the total cost to the system from the application of the Hybrid Model (as opposed to the alternatives of a 2nd bidding zone or single bidding zone with significant redispatching costs, as discussed in section IV above) is expected to be lower, we see this as a benefit to suppliers across the board.

Other benefits stemming from the interconnection, regardless of which model is chosen (i.e. not directly related to the derogation), include lower costs for providing guarantees for participation given that settlement on the IS takes place more frequently than on the NII and the fact that the supplementary settlement carried out by HEDNO on Crete will be applied on a lower amount (in €) of transactions. On the other hand, interconnection is expected to put an upward pressure on market prices given the increased demand.

Interconnection will also impact the total market and consumers as follows:

- **Transmission Use of System Charges:** Given that the cost of the interconnector will be included in the IPTO S.A. allowed revenue, tariffs are expected to increase, although the participation of the demand in Crete in covering these costs will alleviate the increase.
- **Distribution Use of System Charges:** We do not expect a change in the level of charges but there will be a change in the procedure for the calculation and collection of these charges from the suppliers on Crete given that HEDNO follows different procedures on the IS and NII.
- **PSO charges:** These are expected to decrease (see analysis in Annex 1) reducing the charges to final consumers but also improving cashflow and reducing guarantee costs for suppliers across the board.
- **RES Levy:** RES account inflows for the energy produced in Crete will be reduced as RES production will be compensated at market prices of the IS and not on the Average Variable Cost of thermal generation on Crete.

Suppliers are relatively neutral to these changes as these charges are pass through, although it may have a small effect on cashflows and cost of guarantees.

With regards to the specific impact of the Hybrid Model on suppliers we expect that the model will be received positively given that it is simpler in its implementation and creates less additional market costs overall. During the finalization of the details in the relevant regulatory documents the comments received by market participants will be duly considered. One issue may be the application of “on behalf of trading” fees (OBOT fees) which could be significant according to the current levels applied (which are based on a different trading model and are only applied on an ad-hoc basis). Given that the application of the Hybrid Model is a special case where OBOT will be compulsory and on a continuous basis, we may need to introduce a special category of OBOT charges for the suppliers of Crete or exclude them completely.

## VII. Actions Required

1. Submission to the EC by the Hellenic State of an application for a derogation according to article 66 of the Electricity Directive and 64 of the Electricity Regulation in order for a Comfort Letter to be granted in order to proceed further with the realization of Crete Hybrid Model *[estimated time by the end of March 2021]*.
2. Pass of an act including provisions regarding the transfer of the assets of the system of Crete from PPC (current owner) to ADMIE (TSO of the interconnected system). *[estimated time mid-April 2021]*.
3. Enactment of Law including provisions on the description of the Hybrid Model, authorization of RAE to proceed with the amendment of relevant Codes and Regulations for the timely operation of the interconnection.
4. Public consultation on the amendments of Codes and Regulations regarding the operation for the Hybrid Model for Crete.
5. Issue of RAE decisions following public consultation and comfort letter by the EC.

### Other actions

The implementation of the Hybrid Model will further require:

- Contract amendments (particularly Crete market participants contracts)
- Conclusion of SLAs between IPTO and HEDNO.
- Secondment or transfer of local HEDNO staff to IPTO in order the smooth transition of competences and know-how to be secured, while maintaining system security on the island of Crete.
- As regards Transmission Use of System Charges, the ability of IPTO to collect same corresponding to consumption on Crete starting from completion of Phase I. This implies that these charges (already included in the customers' bills) will no longer be subtracted from the PSO compensation amount, as envisaged in the current NII PSO cost calculation methodology. To this end, HEDNO has to supply all necessary data to IPTO as per the rules currently applicable to the IS.

## VIII. Annexes

- Annex 1- Notification of a Service of General Economic Interest
- Annex 2 - Study of TSO: *“Comparison of different Models for Crete for the Transitional Period”*.
- Annex 3 - The Hybrid model description (Option 1)
- Annex 4 - The Hybrid model description (Option 2)

## ANNEX 1

### **Notification of a Service of General Economic Interest on the basis of the provisions of in Article 106 and the 2012 SGEI framework**

1. According to government social cohesion policy<sup>5</sup>, uniform retail tariffs apply across Greece with no geographical variation<sup>6</sup>. The implementation of this principle necessarily presupposes that suppliers face the same wholesale market costs. However, this is not the case in NII/Crete given that the generation cost in the NII is higher than that in the IS due to the increased operating cost of the NII generation units (small size power plants using diesel – heavy oil technology).

2. This service has been set as a Public Service Obligation (PSO) in Greece through a Ministerial Decision<sup>7</sup>. Furthermore, by virtue of supply licenses' general terms, suppliers are obliged to provide the “public service” consisting in offering uniform retail tariffs<sup>8</sup>. Thus, Suppliers, who are active in NII and provide the aforementioned public service, receive a special PSO compensation to cover the additional costs of operating on the NII, on the basis of a methodology established by RAE (RAE Decision 14/2014, Government Gazette 270/B/2014).

2. More specifically, according to the NII Code and related contracts, suppliers active on the NII pay for the energy absorbed/registered by the meters of the consumers they represent at a price that reflects the total cost of production (fixed and variable) for thermal plants and the average variable thermal generation costs (displacement cost) for RES production<sup>9</sup>. On the IS, suppliers face all wholesale market costs (previously DAS, imbalances, uplifts, currently DAM, ID, BM). The compensation to suppliers basically covers the difference of the two.

3. The PSO compensation is recovered through the PSO levy. It is highlighted that, although NII consumers do not benefit from the TSO services, they are however subject to the payment of Transmission Use of System Charges, due to the “uniform retail tariffs” policy<sup>10</sup>. So, the amount collected from NII consumers constitutes an additional revenue stream which helps reduce the amount covered by the PSO levy.

4. The PSO compensation calculation is based on estimates and takes place on a monthly basis for each island so as the supplier active in that island to recover NII PSO in a timely manner. RAE checks ex-post the costs and calculations submitted by DEDDIE for reasonableness and appropriateness and approves each year the total annual compensation to be settled for each supplier.

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<sup>5</sup> Article 106 para 1 of the Greek Constitution establishes the principle of equal living standards, irrespectively of the geographical area of residence.

<sup>6</sup> Former article 28 of the Law 3426/2001 and in force articles 55ss of the Energy Law 4001/2011.

<sup>7</sup> Ministerial Decision No. ΠΔ5/ΗΑ/Β/Φ1Β/129246 (Government Gazette 1040/B/2007).

<sup>8</sup> Ministerial Decision No. Δ5-ΗΑ/Β7Φ.1/ΟΙΚ.27547 (Government Gazette 2783/B/2011).

<sup>9</sup> It is clarified that the “generation cost” to be incurred by the Suppliers is calculated methodologically due to the fact that a wholesale market is not operating in NII.

<sup>10</sup> This policy encompasses the competitive (“Supplier’s cost”) and the regulated (PSO levy, Transmission System charge, Distribution System charge, RES levy) elements of the electricity bills.

5. The PSO methodology is based on the methodology of the net avoided cost (SGEI 2012 “μεθοδολογία καθαρού αποφευχθέντος κόστους”) meaning that the compensation does not exceed the difference of suppliers’ operation cost subject to PSO obligation and those not subject to.

6. The NII service and related PSO compensation cover exclusively the additional cost incurred by the Suppliers due to the higher generation cost in the NII and do not cover the company’s operational costs for the supply business. Suppliers are compensated for this additional cost and do not receive any extra fee or profit (on top of what is already incorporated in the tariffs they apply to their customers and they are free to formulate without ex-ante regulatory intervention) for supplying the service.

7. Finally, it is specified that RAE, based on the Methodology terms and conditions and the NII Code provisions, approved the PSO compensation for NII for the year 2017 as amounting to 532.701.813,53 Euros (RAE 1254/2019M Government Gazette 1049/B/27.3.2020). More specifically, Crete’s compensation amounts to 274.110.911,35 Euros, thus representing roughly over the half of the total annual PSO compensation.

8. It should be noted that the Ministry of Environment and Energy has already filed an application (ΥΠΕΝ/ΔΗΕ/103782/1290/27.10.2020) for the continuation of the financing of PSO for the supply of electricity to the non-interconnected islands which was forwarded to the European Commission DG Com by the State Aid Central Unit (prot.number 138199/3.12.2020)

## ANNEX 3

### The Hybrid Model- Operation of the electricity market in Crete during the Transitional Period

#### Option 1

Following the successful completion of Phase I and the connection of Crete's transmission system with the Hellenic Electricity Transmission System (HETS) , which is scheduled to be operational by July 2021, it is 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 constantly at, or near, its maximum capacity to serve Crete's demand at most times. 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 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.

Under the proposed Option 1 of the Hybrid Model, in the case the interconnection flow is from the mainland to Crete, HEnEx will submit Orders for the vBRE of Crete in the Electricity Markets operated on the mainland Interconnected System (IS), i.e., the Day Ahead Market (DAM) and the Intraday Market (IDM), 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 and according to the forecasted energy injection/withdrawal from the Crete interconnection prepared by IPTO.

It is envisaged that the Phase I cable will mostly be importing energy to Crete. Note that, given the amount of RES penetration in Crete and the need to also keep thermal plants running at their technical minimum limits, it is expected that at periods of low load and high RES output, the flow on the cable will reverse in order to avoid RES curtailment and allow the maximization of the utilization of RES units in Crete. In such rare cases when the cable is exporting to the IS, all generation exported from Crete to the mainland via the Phase I cable is considered as RES generation. Therefore, in the case the interconnection flow is from Crete to mainland, DAPEEP will submit Orders for the vBRE of Crete in the Electricity Markets operated on the mainland IS, i.e., the DAM and the IDM.

a. Crete's wholesale electricity market operation  
"IPTO S.A." will execute, on a daily basis, in cooperation with HEDNO for the initial period in order to achieve the transfer of know-how, a simplified Dispatch Schedule (DS) for each Physical Delivery Day D, having as input the reserve requirements, the forecasted load of the system in Crete, the forecasted output of

the priority dispatched RES, the availability of the interconnection and the availability of thermal generating units. The output of the simplified DS will be the schedule of thermal units and the schedule of the interconnection. This DS will serve only as an indicative commitment schedule for thermal units in Crete and for the purpose of calculating the expected interconnector flow from HETS to the island or vice versa.

Therefore, in this framework:

- By 09.00 EET D-1, IPTO shall prepare the following forecasts for each Market Time Unit (MTU) of Physical Delivery Day D:
  - a. Load Forecast for Crete,
  - b. RES Units in Crete forecasted output,
  - c. expected availability of thermal generating units, and
  - d. expected availability of the AC interconnector.

The above data and cost-based data for energy and reserves for the economic dispatch of conventional thermal units will be taken into account for solving the simplified DS.

- By 10.00 EET D-1, IPTO shall publish the results of the simplified DS, which will include the expected operating schedules of the generating units and the expected interconnector flow on an hourly basis.
- Based on the results of the simplified DS, IPTO shall determine the energy withdrawal/injection program of the vBRE of Crete to the HETS for each MTU of Physical Delivery Day.
- Based on the results of the simplified DS, the energy withdrawal schedule of the vBRE for each Load Representative in Crete for each MTU of Physical Delivery Day based on the ex-ante percentage representation calculated by HEDNO will be calculated and relevant Priority Price Taking Buy Orders (PPTBOs) will be prepared by HEnEX.
- In the rare cases of energy injections from Crete to IS, the injection program determined by the simplified DS will be attributed to the Operator of Renewable Energy Sources & Guarantees of Origin (DAPEEP). For such cases, relevant Priority Price Taking Sell Orders (PPTSOs) will be prepared.

IPTO shall execute an updated Dispatch Schedule during D-1 or D whenever, and if, deemed necessary.

b. Participation in the IS Electricity Markets

HEnEx shall submit Priority Price-Taking Buy Orders (PPTBOs) to the Energy Trading Spot System (ETSS) for the Day-Ahead Market (DAM) and for each Market Time Unit of Physical Delivery Day D for the above-mentioned scheduled withdrawn energy quantities on behalf of the Load Representatives in Crete, according to the aforementioned simplified DS results and, in case of injection from Crete to the IS, DAPEEP shall submit Priority Price-Taking Sell Orders PPTSOs for the above-mentioned scheduled injected energy quantities.

The simplified DS pre-scheduling of Crete may be updated by IPTO in D-1 or D, if-deemed necessary. For such cases, following the same rules as stated above, relevant Hybrid Buy/Sell Orders (as the case may be) for the Intraday Day

Auctions (LIDAs/CRIDAs), for the deviations from the scheduled withdrawn/injected energy quantities of the vBRE of Crete, will be prepared. The price for such hybrid orders will be equal to the Day-Ahead Market Clearing Price for the corresponding MTUs. For such cases HEnEx shall submit the relevant hybrid sell/buy orders to the ETSS for the LIDAs/CRIDAs, on behalf of Load Representatives in Crete. In case of further injection from Crete to IS, DAPEEP may submit hybrid sell orders for the deviation from the scheduled injected energy quantities of the vBRE of Crete.

DAM and IDM transactions placed in HEnEx markets on-behalf-of Market Participants will be Cleared and Settled by EnExClear according to the existing standard procedures already applied for the IS.

With regards to the Balancing Market (BM):

- In case of importing vBRE (to Crete) : IPTO calculates the imbalances and Uplift Charges per Imbalance Settlement Period and Load Representative by comparing the Market Schedule (withdrawal) of the interconnector vBRE that corresponds to the Load Representative and final energy withdrawal metered at the HV side of the Chania substation that corresponds to the Load Representative. Final energy withdrawal metered at the HV side of the Chania substation is allocated to Load Representatives in Crete according to the ex-ante percentage representation calculated by HEDNO.

- In case of exporting vBRE (to IS): IPTO calculates imbalances by comparing the Market Schedule (injection) of the vBRE and final energy injection metered at the HV side of the Chania substation. This is then allocated to DAPEEP as the representative of the RES energy injected to the IS. The above mentioned imbalances will be calculated the same way with RES Units without Market Participation Obligation and will be credited/debited to DAPEEP.

The above calculations are sent to EnExClear following the weekly settlement process as described in the Balancing Market Rulebook for W+1. The same procedure is followed for the corrective settlement in week W+7, according to the Balancing Market Rulebook. Load Representatives or DAPEEP will not be charged with non-compliance charges for the vBRE.

This approach allows familiarization of market participants in Crete with the IS market procedures and ensures daily cash flows between the Market of Crete and the IS Market between market participants without the involvement of any of the Operators.

Finally, it allows allocation of imbalances of the vBRE directly to Load Representatives in the island, and DAPEEP, accordingly, by taking into account actual metering data from the Chania substation, since frequency regulation in the island will be primarily performed by the AC interconnection, therefore imbalances calculated as the difference of the initial interconnection schedule calculated in the simplified DS to metered data will be caused primarily by the system of Crete.

To conclude, the hybrid approach allows for discrete operation of the IS market and the Cretan market, while fully benefiting from the operation of the interconnector during phase I.

c. Clearing and settlement of Crete's wholesale market

It is proposed that the clearing and settlement of transactions relating to Crete, including the flows on the Phase I cable, are conducted by EnExClear S.A., HEDNO and DAPEEP as follows:

EnExClear clears and settles the transactions of the interconnector through normal procedures applicable in the IS markets.

Thermal generation will follow the regular monthly settlement cycle performed by HEDNO to date (which also includes the settlement of regulated charges). Through this complementary settlement procedure, thermal producers will receive their revenue according to the rules already in place in Crete.

Finally, regarding RES production on Crete, DAPEEP will settle and clear the related amounts by invoicing Load Representatives based on information provided by HEDNO (metered output).

It is envisaged that the Phase I cable will mostly be importing energy to Crete, therefore will be treated as a load point for the purposes of the IS Electricity Markets operation for most of the time. Given the amount of RES penetration in Crete and the need to also keep thermal plants running at their technical minimum limits, it is expected that at periods of low load and high RES output, the flow on the cable will reverse in order to avoid RES curtailment. Given that, one of the goals of the use of the cable is to maximize utilization of RES units, and in order to simplify market clearing, it is proposed that all generation exported from Crete to the mainland via the Phase I cable is considered to come from RES generation and therefore associated revenues in the DAM and IDM markets (from the participation of the cable as a generating point) should be directed to the RES account managed by DAPEEP S.A. All thermal generation in Crete should be considered to serve the local load, thus not injecting energy in the wholesale markets of IS.

d. Details on the clearing and settlement of wholesale market transactions and BM positions

EnExClear S.A. shall act as the Clearing House for the clearing and settlement of electricity transactions on DAM, IDM and of BM positions of the vBRE of Crete.

The Clearing Members of Crete island's Load Representatives and DAPEEP take the place of the Participants in the Electricity Markets and become liable to EnExClear S.A. as its' counterparties for the clearing of the relevant cash obligations arising from the relevant transactions (DAM/IDM) and positions (BM) of the vBRE of Crete.

The necessary collateral obligation for the Crete daily participation in the Electricity Markets will be covered by the Clearing Members of Crete island's Load Representatives and DAPEEP, accordingly, as provided in the current Clearing Rulebooks. Market Participants will receive separate reports for debits and credits regarding the DAM, IDM and Balancing Market that correspond to their activity in Crete.

HEDNO shall continue calculating necessary guarantees to cover thermal generation on Crete according to the existing rules on this issue, resulting in lower amounts to be paid by Load Representatives given the reduction in thermal generation due to the load displacement by the interconnector.

e. RES contracts during the transitional period

All RES contracts are transferred to DAPEEP (by a Ministerial Decision). For the transitional period, all metering data for existing and new RES in Crete will be provided to DAPEEP by HEDNO.

f. Regulated charges

Transmission Use of System charges will be collected by IPTO according to the provisions in the HETS Grid Code.

ETMEAR will be charged by DAPEEP according to the provisions of its Code.

HEDNO will provide all the necessary metering data, including during the transitional period, High Voltage end-consumer data.

## ANNEX 4

### The Hybrid Model – Operation of the electricity market in Crete during the Transitional Period

#### Option 2

Following the successful completion of Phase I and the connection of Crete’s transmission system with the Hellenic Electricity Transmission System (HETS)<sup>11</sup>, which is scheduled to be operational by July 2021, it is 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 constantly at or near its maximum capacity to serve Crete’s demand at most times. From 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 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.

Under the proposed Option 2 of the Hybrid Model, HEnEx will submit Orders for the full local load and thermal generation of Crete (reflecting the energy schedules determined by IPTO based on the results of the simplified Dispatch Schedule as described in section a)) to the Day Ahead Market (DAM) and the Intraday Market (IDM), on behalf of all Load Representatives and thermal generators in Crete. DAPEEP will submit Orders for RES generation. Total demand (as forecasted by the Independent Power Transmission Operator (IPTO)) will be allocated to Load Representatives according to their supply percentage ratio calculated ex-ante on a monthly basis by the Hellenic Distribution Network Operator (HEDNO). In this way, the full load and generation of Crete will be “virtually” introduced in the DAM and IDM markets of the mainland interconnected system. The relevant vBRE schedule in the Interconnected System (IS) markets will be implicitly calculated by the results of the IS Markets.

It is envisaged that the Phase I cable will mostly be importing energy to Crete. Note that, given the amount of RES penetration in Crete and the need to also keep thermal plants running at their technical minimum limits, it is expected that at periods of low load and high-RES output, the flow on the cable will reverse in order to avoid RES curtailment and allow the maximization of the utilization of RES units in Crete. In such rare cases when the cable is exporting to the IS, all generation exported from Crete to the mainland via the

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<sup>11</sup> Via the 2 X 200 MVA Crete-Peloponnese interconnection, which will be used for a power flow up to 150 MW - taking into account the relevant system safety rules.

Phase I cable is considered to come from RES generation and therefore all thermal generation in Crete should be considered to serve the local load.

#### a. Crete's wholesale electricity market operation

"IPTO S.A." will execute, on a daily basis, in cooperation with HEDNO for the initial period in order to achieve the transfer of know-how, a simplified Dispatch Schedule (DS) for each Physical Delivery Day D, having as input the reserves requirements, the forecasted load of the system in Crete, the forecasted output of the priority dispatched RES, the availability of the interconnection and the availability of thermal generating units. The output of the simplified DS will be the schedule of thermal units and the schedule of the interconnection. This DS will serve only as an indicative commitment schedule for thermal units in Crete and for the purpose of calculating the expected interconnector flow from HETS to the island and vice versa.

Therefore, in this framework:

- By 09.00 EET D-1, IPTO shall prepare the following forecasts for each Market Time Unit (MTU) of Physical Delivery Day D:
  - e. Load Forecast for Crete,
  - f. RES Units in Crete forecasted output,
  - g. expected availability of thermal generating units, and
  - h. expected availability of the AC interconnector.

The above data and cost-based data for energy and reserves for the economic dispatch of conventional thermal units will be taken into account for solving the simplified DS.

- By 10.00 EET D-1, IPTO shall publish the results of the simplified DS, which will include the expected operating schedules of the generating units and the expected flow in the interconnector on an hourly basis.
- Based on the results of the simplified DS, IPTO shall determine the energy withdrawal/injection program of the vBRE of Crete to the HETS for each MTU of Physical Delivery Day.
- Based on the results of the simplified DS, the energy withdrawal and injection schedules of each Load Representative (based on the ex-ante percentage representation calculated by HEDNO) and Producer in Crete for each MTU of Physical Delivery Day, will be calculated and relevant Priority Price Taking Buy Orders (PPTBOs) and Priority Taking Sell Orders (PPTSOs) will be prepared by HEnEX.

IPTO shall execute an updated Dispatch Schedule during D-1 or D whenever deemed necessary.

#### b. Participation in the IS Electricity Markets

HEnEx shall submit PPTBOs and PPTSOs to the Energy Trading Spot System (ETSS) for the Day-Ahead Market (DAM) and for each Market Time Unit of Physical Delivery Day

D on behalf of thermal generators and Load Representatives in Crete. It should be mentioned that PPTSOs for RES units of DAPEEP will be submitted by DAPEEP.

Via these PPT Orders, the interconnection net transfer volume will also be implicitly scheduled as the net quantity between PPTBOs and PPTSOs. If the volume of the PPTBOs is greater than the volume of the PPTSOs, the resulting market schedule, corresponding to the vBRE of Crete is to buy the net quantity from the DAM (“importing vBRE”). If the volume of the PPTSOs is greater than the volume of the PPTBOs, the vBRE of Crete is scheduled to sell (“exporting vBRE”).

The simplified DS pre-scheduling of Crete may be updated by IPTO in D-1 or D, if deemed necessary. For such cases, following the same rules as stated above, relevant Hybrid Buy/Sell Orders (as the case may be) for the Intraday Day Auctions (LIDAs/CRIDAs), for the deviations from the scheduled withdrawn/injected energy quantities for each Market Participant will be prepared. The price for such hybrid orders will be equal to the Day-Ahead Market Clearing Price for the corresponding MTUs. For such cases HEnEx shall submit the relevant Hybrid Sell/Buy Orders to the ETSS for the LIDAs/CRIDAs, on behalf of thermal generators and Load Representatives of Crete. DAPEEP will submit the relevant Hybrid Sell Orders to the ETSS for RES generation.

DAM and IDM Transactions in HEnEx markets on-behalf-of Market Participants will be Cleared and Settled by EnExClear according to the existing standard procedures already applied for the IS.

For the Balancing Market to operate without taking into account market results/schedules of entities in the island, which cannot be treated as either BREs or BSEs, due to the fact that those entities are not part of the IS market, HEnEx will calculate and provide to IPTO the Market Schedule for the Interconnector, exporting or importing from/to the IS, as calculated implicitly according to market results. When the Interconnector is importing energy from the IS, this schedule will be attributed by HEnEx to each Load Representatives in Crete for each MTU of Physical Delivery Day based on the ex-ante percentage representation calculated by HEDNO, as in Option 1, whereas when the Interconnector is exporting energy to the IS the schedule will be attributed by HEnEx to DAPEEP.

With regards to the Balancing Market (BM):

- In case of importing vBRE (to Crete): IPTO calculates the imbalances and Uplift Charges<sup>12</sup> per Imbalance Settlement Period and Load Representative by comparing the Market Schedule (withdrawal) of the interconnector vBRE that corresponds to the Load Representative and final energy withdrawal metered at the HV side of the Chania substation allocated to the Load Representative. Final energy withdrawal metered at the HV side of the Chania substation is allocated to

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<sup>12</sup> According to provisions for Load Representatives in the Balancing Market Rulebook

Load Representatives in Crete according to the ex-ante percentage representation calculated by HEDNO.

- In case of exporting vBRE (to the IS): IPTO calculates imbalances by comparing the Market Schedule (injection) of the vBRE and final energy injection metered at the HV side of the Chania substation. This is then allocated to DAPEEP as the representative of the RES energy injected to the IS.

The above calculations are sent to EnExClear following the weekly settlement process as described in the Balancing Market Rulebook for W+1. The same procedure is followed for the corrective settlement in week W+7, according to the Balancing Market Rulebook. Load Representatives or DAPEEP will not to be charged with non-compliance charges for the vBRE.

This approach allows familiarization of market participants in Crete with the IS market procedures and ensures daily cash flows between market participants in Crete without the involvement of the Operators.

Finally, it allows allocation of imbalances of the vBRE directly to Load Representatives in the island, and DAPEEP, accordingly by considering actual metering data from the Chania substation, since frequency regulation in the island will be primarily performed by the AC interconnection, therefore imbalances calculated as the difference of the initial interconnection schedule calculated in the simplified DS to metered data will be caused primarily by the system of Crete.

To conclude, the hybrid approach allows for discrete operation of the IS market and the Cretan market, while fully benefiting from the operation of the interconnector during phase I.

### c. Clearing and settlement of Crete's wholesale market

It is proposed that the clearing and settlement of transactions relating to Crete are conducted by EnExClear S.A., HEDNO and DAPEEP as follows:

Following the publication of the Crete simplified DS, and the submission of PPT Orders on-behalf of generators and Load Representatives of Crete in the IS DAM and IDM, the resulting transactions (energy injected/absorbed) will be cleared for each MTU at the IS Market Clearing Prices following the standard Clearing and Settlement procedures already in place via the Day-Ahead and Intraday Markets Trading and Clearing Rulebooks.

EnExClear shall inform HEDNO and DAPEEP regarding the clearing results upon clearing of each relevant process (daily for DAM and IDM and weekly for BM).

Thermal generation will follow the regular monthly settlement cycle performed by HEDNO to date (which also includes the settlement of regulated charges). Through this complementary settlement procedure, thermal producers will receive their revenue according to the rules already in place in Crete, subtracting credits already cleared by EnExClear.

Finally, regarding RES production on Crete, DAPEEP will settle and clear the related amounts by invoicing Load Representatives based on information provided by HEDNO (metered output) for the residual value of the RES production not already covered through IS market transaction.

RES related transactions in the DAM and IDM will form a direct revenue stream for the RES special account managed by DAPEEP.

#### d. Details on the clearing and settlement of DAM-IDM transactions and BM positions

EnExClear S.A. shall act as the Clearing House for the clearing and settlement of electricity transactions on the DAM, IDM and of BM positions.

The Clearing Members of Crete island's Load Representatives, thermal producers and DAPEEP take the place of the Participants in the Electricity Markets and become liable to EnExClear S.A. as its' counterparties and provide the required collateral for clearing.

The necessary collateral obligation for the Crete daily participation in the Electricity Markets will be covered by the Clearing Members of Crete island's Load Representatives, DAPEEP, and thermal generators, accordingly, as provided in the current Clearing Rulebooks. Market Participants will receive separate reports for debits and credits regarding the DAM, IDM and Balancing Market that correspond to their activity in Crete.

HEDNO shall continue calculating necessary guarantees to cover thermal generation on Crete according to the existing rules on this issue, resulting in lower amounts to be paid by Load Representatives given the reduction in thermal generation due to the load displacement by the interconnector and the already cleared amounts through the IS markets.

#### e. RES contracts during the transitional period

All RES contracts are transferred to DAPEEP (by a Ministerial Decision). For the transitional period, all metering data for existing and new RES in Crete will be provided to DAPEEP by HEDNO.

#### f. Regulated charges

Transmission Use of System charges will be collected by IPTO according to the provisions in the HETS Grid Code.

ETMEAR will be charged by DAPEEP according to the provisions of its Code.

HEDNO will provide all the necessary metering data, including during the transitional period, High Voltage end-consumer data.

