

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)¹, 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 The vBRE of Crete will be connected to the HETS on the HV side of the Chania substation and thus, its withdrawn/injected energy to the HETS shall be recorded by the Registered Meters of the HV Chania substation.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 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

¹ 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.

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:
 - 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 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 Charges² 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 to be charged with non-compliance charges for the vBRE.

² According to provisions for Load Representatives in the Balancing Market Rulebook

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.