

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 The vBRE of Crete will be connected to the HETS on the HV side of the Chania substation and thus, its withdrawn/injected energy to the HETS shall be recorded by the Registered Meters of the HV Chania substation.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

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.

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 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 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.

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

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 ID 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.