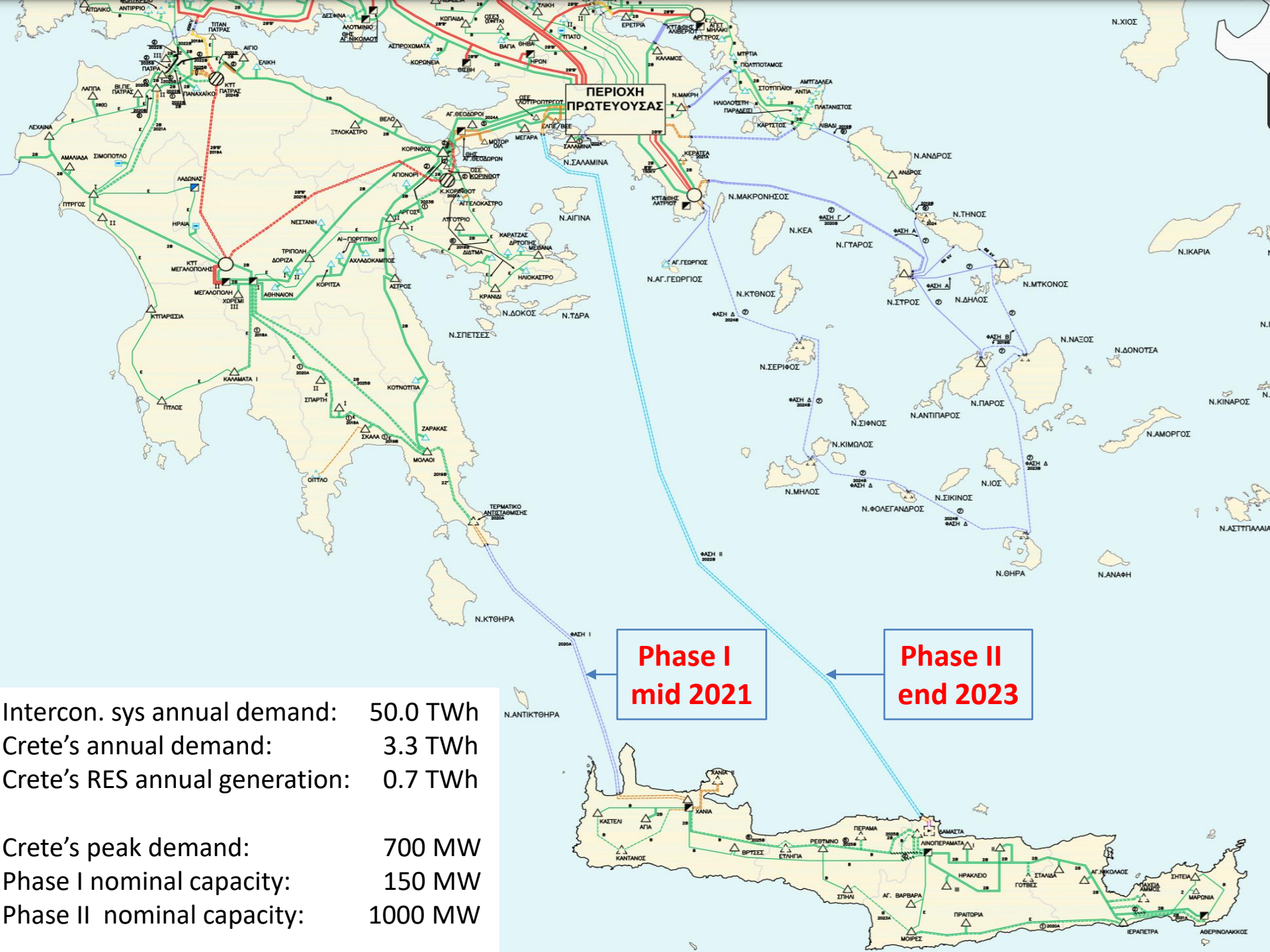


Proposal for a hybrid model for the operation of the «market» in Crete (Phase I to Phase II)

Athens, 25 May 2021

Info about the interconnection

- The interconnection of Crete to the continental National Transmission System is scheduled to be implemented in two Phases.
- Implementation of **Phase I** of the island's interconnection shall be concluded **by July 2021** and implementation of **Phase II by 2023**.
- The commercial operation of Phase I is expected **by July 2021**.
- The completion of the Phase I of the interconnection of the island shall not *ipso facto* render Crete as a fully integrated part of the System Grid.
- The interconnection line will only partially break-up the autonomous operation of the island's power system and market. Even the maximum use of the interconnection line (i.e. $150 \text{ MW} * 8760 \text{ h} = 1314 \text{ GWh}$) will only partially meet Crete's increased demand (about **35%**).



**Phase I
mid 2021**

**Phase II
end 2023**

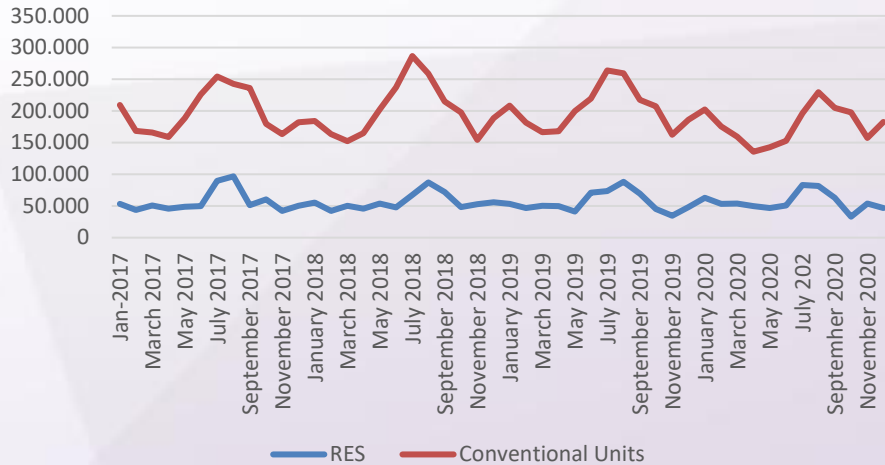
Intercon. sys annual demand: 50.0 TWh
 Crete's annual demand: 3.3 TWh
 Crete's RES annual generation: 0.7 TWh

Crete's peak demand: 700 MW
 Phase I nominal capacity: 150 MW
 Phase II nominal capacity: 1000 MW

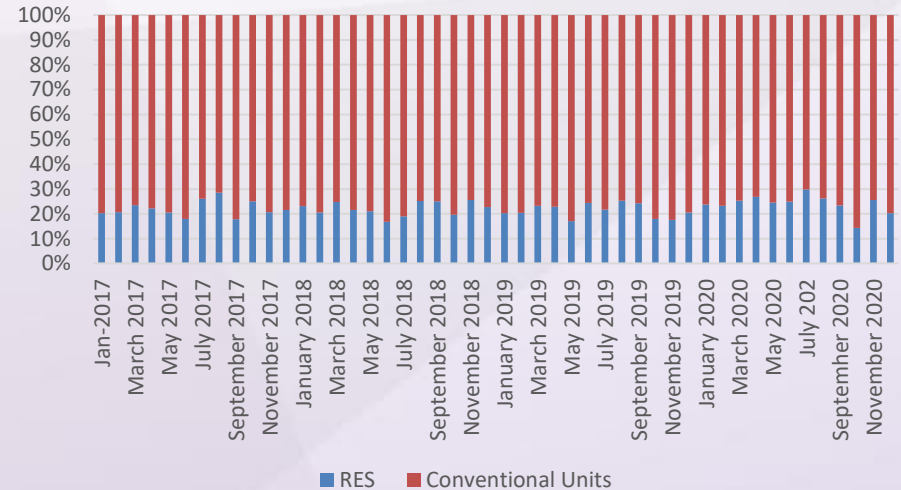


Production profile in Crete

Production by technology type (MWh)

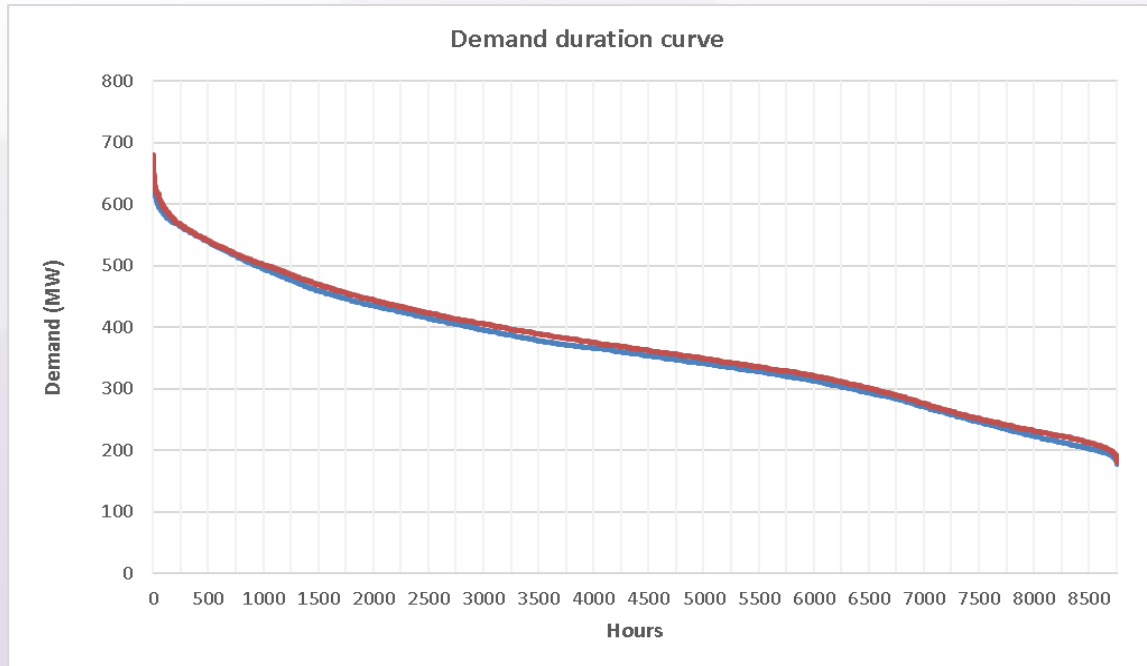


Production (%)



- The existing conventional generation mix in Crete amounts to approximately 700 MW.
- RES (~200 MW Wind and 80 MW Photovoltaics)
- 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.

Load profile in Crete

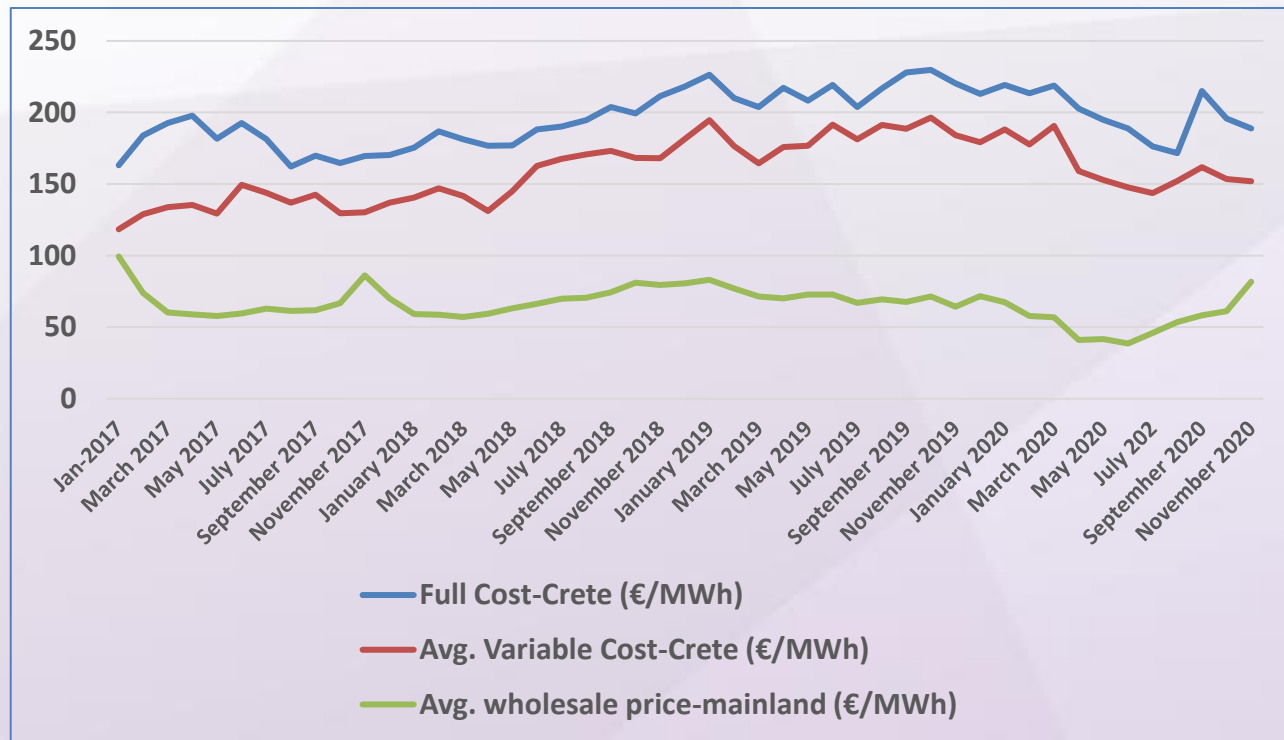


- The annual load factor is in the order of 47%.
- Approximately **twenty Load Representatives (retailers)** active on the island of Crete.

«Market» reality in Crete

- It is an autonomous power system, currently operated without any wholesale electricity market. The DSO, DEDDIE, is the operator of the market in Crete.
- **Producers and suppliers do not submit any orders; there is no system marginal price but an estimated clearance price of energy.** The estimation is done on a monthly basis, based on the variable and total costs of the conventional power units.
- The generation costs in the non-interconnected island of Crete are higher than the costs of the Interconnected System.
- **An upgrade of the metering infrastructure on the island is needed in order for imbalance settlement to be included in the imbalance settlement procedure of the balancing market in the mainland IS.** The only valid measurement point is where the cable connects with the island (substation of Chania).

«Market» Reality in Crete (2)



The generation costs in the non-interconnected island of Crete are much higher than the costs of the Interconnected System.

BZR Process SEE

- The TSO (IPTO) has examined two options for the introduction of Crete in the mainland interconnected system (**one zone, two zones**).
- It was at the end of January 2021 that the TSO informed RAE that the completion of **BZR Review Process will take approximately 15 months to complete**.
- The official investigation of alternative configurations of the Bidding zone review region “South East Europe» as part of 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/>) has target year of 2025, after the completion of Phase II of the interconnector, and it will provide first preliminary data by the end of 2021.
- For this reason, different market operation models for Crete were examined in the meantime by the TSO, and the analysis showed that a hybrid market model is the optimal approach for the transitional period between implementation of Phase I and Phase II of the interconnection.

Need to introduce a hybrid model

Given that the Phase I cable is expected to be constantly congested as it is not sufficient to fully cover the demand on Crete **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.**

Presentation of hybrid model

- The TSO will execute, on a daily basis, in cooperation with the DSO 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.
- **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.

Two options for the hybrid model

Following the publication of the simplified DS the TSO will determine the energy withdrawal/injection program of Crete to the HETS for each MTU of Physical Delivery Day.

Option 1 (Only for interconnection quantities). 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, i.e. the Day Ahead Market and the Intraday Market, on behalf of Load Representatives (according to their supply percentage ratio calculated ex-ante on a monthly basis by HEDNO) and according to forecasts prepared by IPTO. In the 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 this case 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.

Option 2 (For the full load and generation of Crete every day). HEnEx will submit Orders for the full load and thermal generation of Crete in the Day Ahead Market and the Intraday Markets on behalf of thermal generators and Load Representatives generating and supplying electricity in Crete. DAPEEP will submit Orders for RES generation.

Public consultation

- A detailed description of Option 1 and Option 2 of the hybrid model is included in the attached documents.
- All interested parties may submit their views on the two options of implementation of the hybrid model
by June 2, 2021 at elecodes-market@rae.gr

Proposed timeline

Public consultation of the two Options (High level design)	25 th of May – 2 nd of June
Submission of regulatory documents to RAE	7 th of June
Public consultation of regulatory documents	7 th of June – 14 th of June
Approval of regulatory documents	17 th of June(*)
Implementation of Hybrid model	1 st of July 2021 (*)

(*) Provided that the relevant authorizations have been established by Law for the implementation of the Hybrid Model for Crete and the associated necessary approvals by RAE