



November 2024

Remote Monitoring and Remote Control for Network Production Stations

Application of Articles 111 and 118 of Law 5106/2024 (GG 63/A/01.05.2024)¹

Questions - Answers

1. **What is remote monitoring and remote control?**

Remote monitoring is the remote real-time monitoring of key characteristics of a production station that are of interest to the relevant Network Operator and other market operators, such as Aggregators. Remote control is the remote intervention in the operation of a station in order to adjust its operation according to a target command. In the case of RES stations, the usual adjustment involves limiting the maximum active power output of the plant to a certain value ("active power setpoint").

2. **Who are the beneficiaries of remote monitoring and control?**

The obligation to install systems for remote monitoring and control applies in principle to stations of independent producers with electricity compensation and an installed capacity exceeding 400 kW, connected to the Interconnected Grid, irrespective of the production technology and irrespective of the date of activation. For self-consumer stations, remote monitoring and control will be carried out at a later stage.

3. **Is the installation of the equipment mandatory?**

The installation of equipment for remote monitoring and control in power stations with an installed capacity of more than 400 kW is mandatory by Law 5106/2024. Specifically, Articles 111 and 118 of the law describe the obligation, specify deadlines for the installation of the equipment and provide for penalties in case of non-compliance by the producer.

¹ As amended by article 86 of Law 5151/2024 (GG 173/A/04.11.2024)

4. What are the deadlines for installing the equipment?

Stations with an installed capacity exceeding 400 kW and up to 1000 kW are required to install the equipment within eight (8) months from the notification of the requirements of HEDNO, i.e. by 13/02/2025.

Power stations with an installed capacity exceeding 1000 kW are required to install the equipment within eight (8) months from the publication of Law 5106/2024, i.e. by 31/12/2024.

5. What are the penalties for not installing the equipment?

In the event of failure to install the equipment within the prescribed time limit, Article 111 provides for the deactivation of the connection of the station to the Network. In addition, for stations with a capacity exceeding 1 MW, Article 118 also provides for financial penalties.

After 31/12/2024 and after 13/02/2025, the Operator will decline connection to the grid of stations with capacity exceeding 1000 kW and stations in the 400-1000 kW power range respectively, in which the required equipment has not been installed.

6. How is compliance with the obligation to install the equipment demonstrated?

The producer must, within the time limit provided for in Law 5106/2024 to submit to the RES/CHP platform a signed Declaration of Compliance stating that they comply with the requirements for remote monitoring and remote control as specified in the latest version of the text "Equipment used in the reception and execution of remote monitoring/control commands for RES & CHP Stations" of HEDNO as part of the application of articles 111 and 118 of Law 5106/2024. The Declaration of Compliance may also be submitted by the Technical Manager of the station that has been designated by the producer. For its confirmation, the "Equipment - Station Control Protocol" and the "Equipment - SCADA/DMS Control Protocol" shall be attached in signed and fully completed form.

HEDNO will carry out the necessary tests and checks in order to verify compliance and in case of false or inaccurate Declaration, in addition to the deactivation of the connection of the station, the declarant will have the consequences provided by the Law.

7. Who bears the cost of the equipment?

The costs of installation, maintenance and operation of the equipment shall be borne by the producer.

The operation of the remote monitoring and remote control equipment requires the telecommunication connection with the command system of the Network Control Centers of HEDNO.

8. Is there any indicative equipment or list of eligible equipment to satisfy the needs?

HEDNO has published on its website the specifications of the equipment and the purpose it will serve. The equipment will be installed downstream of the HEDNO/producer's ownership limit, i.e. within the production station. The choice of the type of equipment is the responsibility of the producer. It is not the intention of HEDNO to recommend or confirm the suitability or otherwise of Equipment of a particular type or manufacturer. An exception is the choice of router, which is supplied by the Operator.

9. Why can't I install a router of my own choice?

The equipment installed for remote monitoring and remote control is the choice and responsibility of the producer. Specifically, the router is supplied by HEDNO in order to meet the increased cyber-security requirements that have been specified.

10. What is included in the technical specifications published on HEDNO's website?

The technical requirements published on HEDNO's website include:

- i) The commands to be received by the production station and the signals and measurements to be sent by the station to the SCADA/DMS of HEDNO.
- ii) The communication protocol between the station and the SCADA/DMS of HEDNO.
- iii) The programming requirements of the equipment.
- iv) The specifications of the telecommunications equipment, other than the router.

The requirements that have been published do not concern self-consumer stations and stations connected to Nonn-Interconnected Islands.

11. What are the commands that will be provided by HEDNO?

The commands that will be provided by HEDNO to the production station are:

- i) command for maximum allowable injection power ("active power setpoint") in specific value or in %,
- ii) command for a complete cut in power,
- iii) command to open the Automatic Disconnect Switch (in emergency situations only).

In the future, there is a provision to send commands for the regulation of reactive power/power factor/voltage and frequency support for those Stations that have the capacity and/or the obligation under EU Regulation 2016/631 ("RfG").

12. What are the statuses that will be monitored by HEDNO?

With the equipment that will be installed, the following statuses must be monitored:

- i) The status of the Automatic Disconnect Switch (closed or open) and its ability to be controlled remotely or locally (remote or local)
- ii) The status of the earthing (closed or open)
- iii) The control status of the equipment (remote or local), communication or loss of communication between the equipment and the production units and the health status of the relay and the equipment
- iv) Decoupling protection alarms
- v) Confirmation that the relevant command has been received from HEDNO or other operator.
- (vi) Relevant signals relating to reactive power/power/voltage factor determination and frequency support modes.

13. What are the measurements that will be sent to HEDNO?

The measurements sent to HEDNO relate to:

- i) The active and reactive output power for the whole station
- ii) The current and voltage per phase
- iii) The frequency and
- iv) The power factor

14. Does limiting active power mean loss of production and therefore loss of revenue?

Limitation of active power is in principle required for allocation purposes, in which case generating stations or their Aggregators may be required to limit their production capacity for certain hours, as the energy they are to produce

exceeds the demand of the Greek Interconnected System and the energy the country is allowed to export. A limitation of active capacity may, however, also be requested for reallocation purposes, i.e. when reasons of congestion in the System or the Grid require RES stations to further reduce their capacity.

Finally, power limitation may also constitute an offered service to IPTO, which operates the balancing market, when the stations will be requested to provide "downward frequency restoration reserve", i.e. a real-time power reduction, in order to contribute to the frequency regulation of the System.

Depending on the purpose of the limitation, the production station may or may not be compensated for the lost output, or may even be compensated for providing downward frequency restoration redundancy

15. Why is remote monitoring and control necessary? Is it a question of market participation or are there other reasons?

HEDNO has set the objective of modernizing its network through digitalization and active management.

Remote monitoring and control applies to all RES plants exceeding 400kW, irrespective of their participation in the market, and will cover the needs for system stability and better management of the Grid. With the stations exceeding 400 kW that are expected to be integrated into the control centers of HEDNO, the Operator will be able to remotely manage more than 70% of the RES capacity currently connected to the Grid (2024 figures). The possibility of installing the equipment, in addition to the Law, is mentioned in the generators' Connection Contracts and in the EDEO Code (Article 75).

16. My existing station is truncated by opening a switch on the Network. Why should I install the video and telecontrol system?

The disconnection of a station from the Network through the opening of remote or non-remote Network switches constitutes an emergency measure. In addition to the infrastructure for generating energy, the generating station has consumption infrastructure critical to its operation. Through the remote monitoring and control system, in addition to ensuring continuity in the operation of the critical loads of the plant (e.g. alarm, telecommunications and grid monitoring for automatic restoration), the plant is enabled to produce energy, even if only to a lesser extent, as opposed to the full curtailment that has been carried out so far.

The Operator, in exceptional situations, and when the station for any reason does not obey the order given to it, reserves the right to

given, to disconnect him from the Network by using the means of the Network.

17. My station is already monitored and receives orders from FOSE. Can I opt out of the obligation?

The remote monitoring and telecontrol that a generating station may have and has been required by a TSO for its participation in the market, covers only some of the operational requirements specified by the TSO. The TSO does not only prescribe requirements for monitoring the active power of a power plant or only orders to reduce it, but also sets additional requirements related to the operation of the network. Therefore, a generator, with the equipment it installs, will have to meet all the requirements set out in the specifications of the TSO. Most of the requirements will be exploited immediately, but others are foreseen to be exploited in the future. The Operator has specified equipment that will serve the current and future Grid, and generators will be able to participate in the current and future energy market.

18. My station is old and has no active power adjustment. How will it follow the commands given?

The Operator, or any other entity, issues an order to a station to adjust the injection power to a maximum value (in percentage or absolute value). The station shall comply with the order and adjust its power to a value less than or equal to the order given. Stations which do not have equipment with continuous regulation capability and which have more than one generating unit may disconnect their units in order to adjust their output level to a value less than or equal to the order given. For the installation and operation of the remote monitoring and remote control system there is no requirement for the replacement of the existing power generation equipment (power inverters or generators).

19. CHP plants are primarily installed to meet thermal needs. Are CHP producers obliged to install the equipment?

Law 5106/2024 does not exempt CHP stations with an electrical capacity exceeding 400 kW from the obligation to install remote monitoring and control equipment. Similarly, EU Regulation 2019/943 as well as Article 9, par. 1B of Law No. 3468/2006, which identifies the stations that do not have priority allocation (i.e. the stations that may be required to curtail), does not exclude CHP stations.

20. If there is a problem with the telecommunication connection and the station is not supervised and cannot accept commands,

will there be penalties?

The producer must maintain their telecommunications connection operational. After a command has been sent, the producer shall acknowledge receipt. Penalties in the event of non-execution of a command, as well as any acceptable tolerance limit on the magnitude and frequency of deviation for the network stations, will be defined and established in the next period of time.

21. How often will a station be cut?

The cuts are currently imposed primarily for market needs and system stability and secondarily for the needs of the Network. Market cuts are a matter of supply (production) and demand (load) and the decision to impose them is not the responsibility and competence of the Operator. For the needs of the Network, stations will be cut or limited for maintenance or damage to Network elements, with the same frequency as today, in order to maintain the proper operation of the Network.

22. When will the Automatic Disconnect Switch (ADS) of the station be opened by the Operator?

In general, the Operator shall open the Automatic Disconnection Switch (ADS) of the Station in exceptional cases associated with avoiding the phenomenon of islanding in the Network, ensuring the safety of people, the environment and technical equipment, as well as in cases of non-compliance with the commands received by the Operator.

In cases where the Switch is opened by the Operator, it will be closed by the Producer or the Technical Manager of the station, after consultation with the Operator. It is advisable that the Producer or their Technical Manager continuously monitor the status of the ADS so that, in the rare case that it is opened on the Operator's command, they are aware of it in time.

The Operator shall not be obliged to compensate the Producer for any loss of revenue due to the opening of the ADS in the above exceptional cases.

23. Law 3468/2006, as in force, gives priority to RES stations that were commissioned before 4.7.2019. I have an old station, why should I install the equipment?

The limitation of the capacity of a RES station may be imposed not only for allocation but also for reallocation purposes due to congestion in the System or the Grid, where no distinction is made between RES Stations with and without priority allocation. In addition, remote monitoring and control will enable the

Operator to monitor power flows in real time making better management of their network, which will also allow even greater penetration of RES. Law 5106/2024 describes the obligation to install remote monitoring and control systems, not the purpose for which they will be installed.

Article 9, para. 1B of Law 3468/2006 refers to the priority of allocation only. It does not refer to the priority to be given for reallocation purposes or to necessary cuts due to network management.

24. The PV station is already permanently restricted on a permanent basis, with a permanent 27% restriction applied. Will a new restriction be applied?

The restriction imposed by Article 10 of Law 4951/2022 and specified by a Ministerial Decision, is a limitation applied on a permanent basis in order to make better use of the existing RES margins in the Grid. Any market limitations that may be imposed, which depend on the total production and load in the country at any hour of the day, are additional to the permanent limitations. Any exceptional limitations due to congestion on the System or the Network shall also be additional.

25. Can the existing equipment installed on the MV side of the station be used to measure active and reactive power?

The protection relay featured in each station, from which the required measurements could be taken, is powered by the protection windings of the voltage and voltage transformers, which usually have a maximum error of 1% and 0.5% respectively at nominal values, so taking into account the error of the relay itself (of the order of 0.5% at nominal values), it follows that the measurement accuracy requirement of the technical description (<1.5% at nominal values) is met. Thus, based on the specifications set, the accuracy of measurement of active and reactive power for the purposes of remote sensing can be achieved with the normal installed equipment in the MV.

However, for some old-type relays, the error may be larger (in the order of 2%), so in order to achieve the required measurement accuracy <1.5%, an independent meter of appropriate specifications should theoretically be added (or the controller should be replaced with a more modern one). Nevertheless, it is recommended that measurements are taken from the existing protection relay in order to be able to verify the correct operation of the individual protections in future incidents. Therefore, and for the convenience of the producers, it is acceptable to take measurements from the existing relay, even if the required accuracy cannot be achieved with an old type of relay.

- 26. The power plant belongs to the network of Crete and is already being remote controlled by the Energy Control Centre of Crete. I am obliged to install the remote monitoring and control system according to Law 5106/2024;**

If the production station already has a system with which it is remote monitored/controlled by the Energy Control Centre of Crete, there is currently no obligation for the producer.

- 27. Are Stations with net metering or virtual net metering also obliged to install systems for remote monitoring and control?**

The announcement of HEDNO and the publication of the technical specifications for the remote monitoring/control systems concerns the owners of RES and CHP Stations of the Interconnected Network with electricity compensation and an installed capacity exceeding 400 kW.

Stations with net metering or virtual net metering are not compensated, as the injected energy is offset against the absorbed energy. At present, these stations are not required to install remote monitoring and control systems. Article 111 of Law 5106/2024 enables the Operator to issue specifications for remote monitoring/control systems for this category of stations as well. Therefore, the 8-month compliance deadline will apply to these stations when the relevant specifications are issued and published on the website of HEDNO.

- 28. How can equipment testing be carried out, including communication with the SCADA of HEDNO before the final connection stage?**

The control of the communication of the equipment with the SCADA of HEDNO will be carried out at the final stage of the connection of the station to the SCADA. Tests for the exchange of signals and commands can be performed using protocol Simulator IEC 60870-5-104.

- 29. After installing the Equipment and configuring its parameters, an ip - address and a station number must be set for communication with HEDNO at each station. When and by whom will this information be provided?**

On the day that the station is set to connect to the SCADA of HEDNO, HEDNO will determine the ip - address of the Equipment, the corresponding ip - address with which the Equipment will communicate to the SCADA and the unit number of the Equipment (station number).

The Equipment to be used for the reception and implementation of the remote monitoring/control commands of the RES & CHP stations is required to be able to use multiple subnet masks on its network interface (ethernet) in order to properly interface with the network of the

Operator. In practice, the internal networks to which the Equipment will be connected will be of size /29 and therefore mask 255.255.255.248.

30. How and when is the completion confirmation of a set-point command sent?

When the given command is executed, the command execution verification signal will be activated and sent to the SCADA via the IEC-60870-5-104 protocol and specifically with the existence of SSN and RSN in the package dispatched. The Equipment will understand that the SCADA has received the verification signal sent to it and will reset the status of this register as requested in §2.4.5 of the technical requirements for the Equipment.

31. Regarding the mechanism for the execution of the IEC 60870-5-104 protocol commands by the server, does HEDNO wish to configure the server with "Direct execute" or "Select before execute"?

The mechanism for sending commands should follow the "select before execute".

32. Is there a requirement for the equipment to have storage space for recording time-stamped events?

Based on the 2nd edition of the technical requirements for the equipment for receiving and applying monitoring/control commands, no storage space is required.

33. Can simultaneous transmission of analog set point type commands of active power output and reactive power output be performed?

Simultaneous dispatch can be performed, as the values of active and reactive power, although related, can be determined independently.

34. If two (2) commands are given for reactive power and power factor control, which one will be applied?

The command leading to the minimum absolute value of reactive power, in the case of reactive power control, or to the closest absolute value to one (1) for the power factor, in the case of power factor control, shall be applied.

35. The default value for the station mode setting command (command 60 of Table 4 of the Technical Specification

Specification "Equipment used in the reception and execution of remote monitoring/control commands for RES & CHP stations connected or to be connected to the HEDN with an installed capacity exceeding four hundred kilowatts") is "O"? Is "O" going to be used for the control of active power?

The default value for the command S/N: 60 of Table 4 of the Technical Specification is O (Status: Inactive). The active power control is independent of the value of command A/A: 60.

36. Can an existing internet connection be used for the telecommunication connection of the remote monitoring and control equipment with the command and control system of the Network Control Centers of HEDNO?

The 4G/5G interconnection with SIM card is provided by the router of HEDNO. If the producer has an existing telecommunication medium for Internet connection, then the producer is given the possibility, instead of using a SIM card and external antennas, to interconnect via ethernet the offered router with the existing Internet connection.

37. Is a solution recommended regarding the required antennas of the telecommunication equipment and the SIM card?

The supply of the required antennas is at the discretion of the producer, provided that the requirements regarding the characteristics and the connection of the antenna to the network equipment to be provided by HEDNO are met. As regards the SIM card, the choice of telecommunications provider is at the discretion of the producer. It is recommended to select the appropriate telecommunication provider depending on the signal strength and quality at the point of installation of the equipment and on the infrastructure of the RES producer.

The specific solution with the antennas will be used if the producer interconnects the network equipment via a SIM card. If the interconnection is made with another telecommunication medium (e.g. DSL) then the installation of antennas is not required.

38. What are the characteristics of the router?

- The router is powered via redundant dual input with 2 pins per terminal. It supports +12V to +125 V DC and -12 V to -125 V DC. DC power supply and cables are not included in the equipment package.
- The maximum consumption of the router is 20 W and the average consumption is 18.3 W.
- The maximum dimensions of the router are: height 15 cm, width 12 cm, length 13 cm.
- The router is DIN-rail mountable

39. What is the procedure for obtaining the router?

The steps are as follows:

1. Click on <https://ape.deddie.gr/apewebportal-ws/> and login with your taxis passwords.
2. Select "Manage Connection Requests".
3. From the list of applications that are displayed and by selecting anywhere in the line of each application except for the application's S/N, you move below to the section of the screen with the Producer / HEDNO Actions.
4. Select "Add Producer Energy" and from the list of options select "Obtain router for remote control" as the type of energy.
5. After selecting the action, a screen appears asking you to fill in the router's shipping information and your phone number.
6. Then select the RF generation button to generate the RF and finally type "Submit".

The cost for the acquisition of the router including VAT is 1736 €. Please note that after submitting the request for router supply, an email is sent to you, in which both the payment amount and the RF are indicated.

The supply and installation of the router at the station is a requirement for the submission of the Declaration of Compliance and the accompanying protocols.

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3. From the list of applications that are displayed and by selecting anywhere in the line of each application except the application's S/N, you move below to the section of the screen with the Producer/HEDNO Actions.
4. Select "Add Producer Energy" and from the list of options select as type of energy "Equipment Installation"

Remote monitoring/control".

5. On the screen that appears, you are asked to submit separately the Declaration of Compliance, the Station Equipment Control Protocol and the SCADA Equipment Control Protocol.
6. If the Station is represented by an Aggregator, then from the list of Aggregator options, please select the Aggregator that represents you or if there is no Aggregator in the options, enter the name of the Aggregator. In case there is no representation by an Aggregator, then select "I am not represented by an Aggregator".
7. Finally select "Submit"

A requirement for the submission of the Declaration of Compliance and the accompanying protocols is the receipt and installation of the router at the station. Otherwise, it is not possible to complete the "Installation of Remote Monitoring/Control Equipment" procedure.