METHODOLOGY

Baseline Load Calculation

July 2025
Version 5.0

Περιεχόμενα

1 Introduction

This methodology Baseline Load aims to define in detail the Baseline for Portfolios of Dispatchable Load and the Baseline for RES Units or RES Portfolios. The Baseline Load is necessary for the quantification of the variation in:

(a) the consumption of Dispatchable Load Portfolios during Demand Response Events,

(b) the injection of RES Units or RES Portfolios during RES Response Events.

2 Definitions

The definitions necessary for the purpose of calculating the Demand Response Baseline are given below:

1. **Public Holidays:** Public holidays are deemed to be the following 14 days each calendar year: New Year's Day, Epiphany, Clean Monday, Annunciation, Orthodox Good Friday, Orthodox Holy Saturday, Orthodox Easter Sunday, Orthodox Easter Monday, Labour Day, Orthodox Whit Monday, Assumption, Ochi Day, Christmas Day, Boxing Day.

2. **Initial Dispatchable Load Portfolio Baseline ("High X of Y" method):** An initial estimate of the electricity that would have been consumed by the consumer in the absence of a Demand Response Event prior to any adjustment.

3. **Corrected Dispatchable Load Portfolio Baseline ("High X of Y" method):** The constant quantity in MW that is added to or subtracted from the Initial Dispatchable Load Portfolio Baseline in order to calculate the Dispatchable Load Portfolio Baseline.

4. **Historical Look-Back Window ("High X of Y" method):** These are the days prior to the day of the Demand Response Event that are taken into account for the purpose of establishing the Dispatchable Load Portfolio Baseline Look-Back Window. The Look-Back Window is defined as the forty-five days preceding the day of the Demand Response Event.

5. **Controllable RES Generation Units**: Controllable RES and HECHP Generation Stations, as defined in Law 4414/2016, refer to electricity generation stations utilizing biomass or biogas, stations exploiting geothermal potential, solar thermal stations, as well as HECHP stations.

6. **Intermittent RES Generation Units**: RES Generation Stations of Non-Controllable Production within the meaning of Law. 4414/2016, i.e. RES power generating units that are not of controlled production , in particular wind, photovoltaic and small hydroelectric power plants.

7. **RES Response Event**: The issuance of one or more consecutive Dispatch Instructions by the competent Operator to RES Units or RES Portfolios, with the purpose of determining the injection level of the Unit or Portfolio.

8. **Demand Response Event**: An activation of the Demand Response, i.e. the Dispatchable Load Portfolio. A Demand Response Event shall have a duration equal to the consecutive Settlement Time Units (STUs) during which the HETS Operator issues relevant Dispatch Instructions for the activation of Demand Response and/or the Dispatchable Load Portfolio has a Market Schedule resulting from its participation in the Day-Ahead Market and the Intraday Market.

9. **Dispatchable Load Portfolio Baseline:** A load which corresponds to the electricity that would have been consumed by the Dispatchable Load Portfolio if it had not received a Dispatch Instruction for the activation of a Balancing Energy Offer

and/or did not have a Market Schedule resulting from its participation in the Day-Ahead Market and the Intraday Market.

10. **Dispatchable Load Portfolio Baseline for Uncontrolled RES Production Units:** The production corresponding to the electrical energy that would have been produced by the RES Unit or RES Portfolio in the event that it had not received a Dispatch Instruction determining the injection level.

11. **Cumulative RES Representation Body (RES Aggregator):** This has the meaning attributed to it under Article 2(case 22) of Law 4414/2016.

12. **Demand Response Aggregator**: This has the meaning attributed to it under Article 5(o) (para. 2) of Law 4425/2016.

13. **Dispatchable Load Portfolio:** A load portfolio, that includes one or more loads which are connected to a specific Bidding Zone and which, based on their technical capacity, offer Balancing Services to the HETS Operator. A Dispatchable Load Portfolio shall be represented by a Demand Response Aggregator. A Dispatchable Load Portfolio that contains only one load may be represented by a single Consumer. Each Pumped Storage Hydro Generating Unit shall be a distinct Dispatchable Load Portfolio and shall be represented by one Producer.

14. **Dispatchable RES Unit Portfolio:** The RES Units portfolio that includes one or more RES Units with Market Participation Obligation which are connected to a specific Bidding Zone and which, based on their technical capacity, offer Balancing Services to the HETS Operator. A Dispatchable RES Unit Portfolio shall be represented by one RES Producer or by one RES Aggregator.

15. **Dispatchable Load Portfolio Baseline Look-Back Window ("High X of Y" method and "Average X of Y" Method):** The days which are selected for the Look-Back Window, and which are used to calculate the Dispatchable Load Portfolio Baseline.

16. **Adjustment Window ("High X of Y" method):** The 15-minute intervals that are selected to calculate the fixed quantity for Adjustment of the Dispatchable Load Portfolio Baseline.

3 Dispatchable Load Portfolio Baseline

3.1 Dispatchable Load Portfolio Baseline mFRR

The participation of the Demand Response in the Balancing Market consists of an increase or decrease in consumption of the Dispatchable Load Portfolios following the respective issue of Dispatch Instructions. Accordingly, a reliable system for estimating the increase or decrease in consumption after a Demand Response Event is required. The estimated volume of electricity that would have been consumed from the Dispatchable Load Portfolio, in the event that the Demand Response Event had not occurred, constitutes the Dispatchable Load Portfolio Baseline.

An indicative Dispatchable Load Portfolio Baseline is presented in Figure 1Figure 1, where the actual load is the measured consumption occurring during a Demand Response Event.
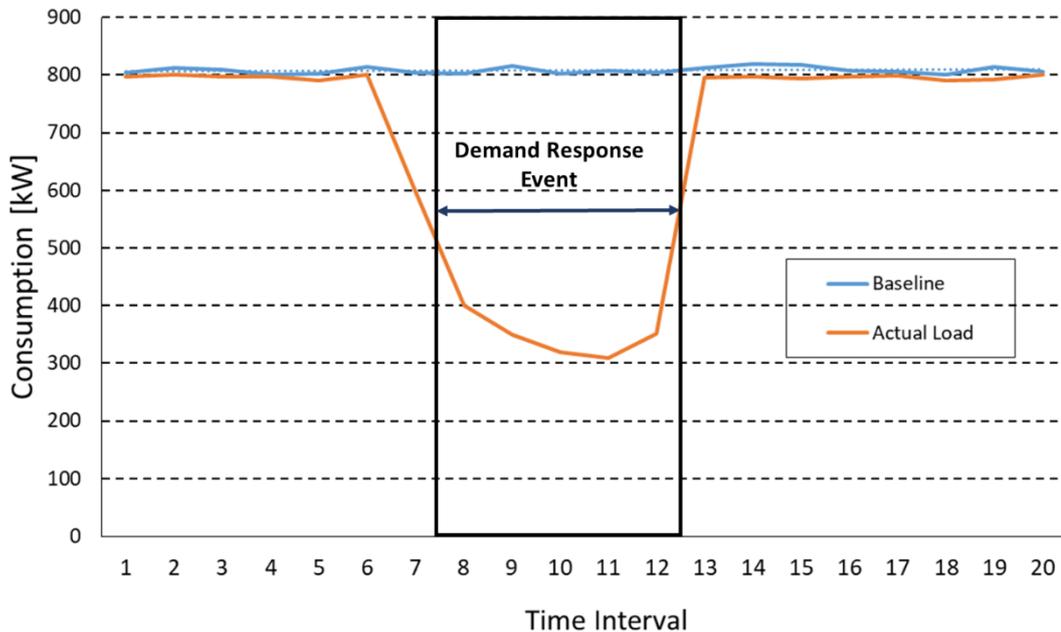
Figure 1 *Dispatchable Load Portfolio Baseline*

During a Demand Response Event, the Demand Response Aggregators will increase or decrease the consumption of the Dispatchable Load Portfolio they represent by responding to a Dispatch Order from the HETS Operator. Figure 2 shows the timeline of a Demand Response Event:

- From the start time of the Dispatch Order (Occurrence of Demand Response Event), until
- The end of the Demand Response Event, which is specified in the Dispatch Order from the HETS Operator, after which the Dispatchable Load Portfolio is restored to normal operation.

Demand Response Event

Figure 2 *Demand Response Event Timeline*

3.1.1 Selection of mFRR Baseline Load Calculation Methodology

For a Dispatchable Load Portfolio to participate in the Balancing Market, the Demand Response Aggregator has the right to choose one of the available methods for calculating the Dispatchable Load Portfolio Baseline described in the Chapter 0~~1.1.1~~ hereof. The available methods for calculating Dispatchable Load Portfolio Baseline are the method internationally-known as the **'Meter before-Meter after'** and the **'High X of Y'** method.

Before registering a portfolio with the HETS Operator's Registry, the Demand Response Aggregator declares the method of its choice ('Meter Before-Meter After' or 'High X of Y') for the calculation of 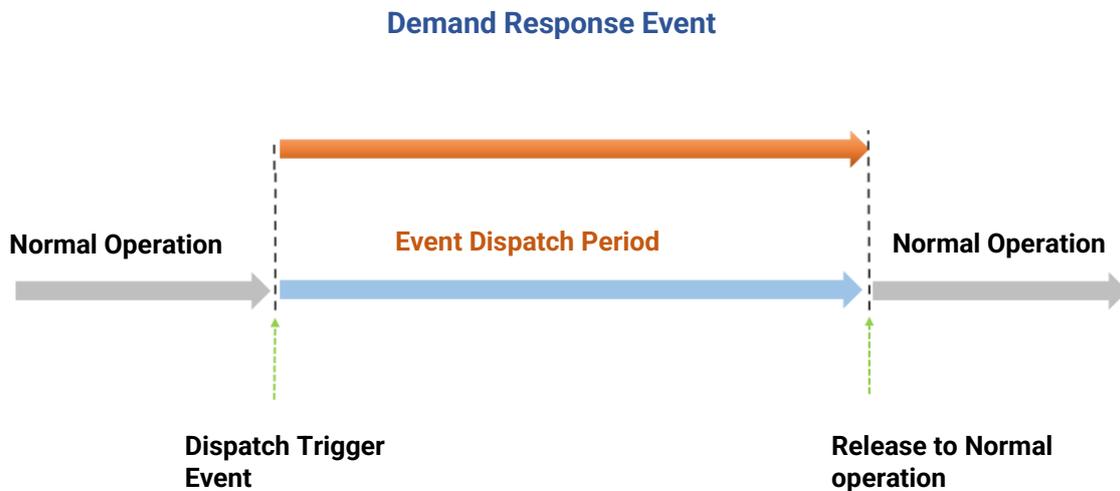the Dispatchable Load Portfolio Baseline to the HETS Operator for each Dispatchable Load Portfolio they represent. The selected method of calculating mFRR Baseline Load for month M can be changed, if the Demand Response Aggregator submits a respective application to change the baseline load calculation method. The relevant application must be submitted up to 15 working days before the end of the previous month, M-1. The new selected method is applied from the first day of month M.

It is noted that in the case of an initial registration or any modification of the composition of the Dispatchable Load Portfolio in the HETS Operator's Registry, the 'High X of Y' method for the calculation of the Baseline shall be applied, provided that historical data are available for the Portfolio for at least fifteen (15) calendar days from the date of commencement of the Portfolio's participation in the Market (in the case of initial registration) or from the successful completion of pre-selection tests (in the case of a modification to the composition of the Portfolio). Until the required period of fifteen (15) calendar days has elapsed, the Dispatchable Load Portfolio may participate in the Balancing Market, and the Baseline per Settlement Time Unit (STU) shall be mandatorily calculated using the 'Meter Before−Meter After' method.

3.1.2 Methods for the Calculation of the mFRR Baseline

3.1.2.1 'Meter Before-Meter After' Method

Under the baseline load calculation method 'Meter Before-Meter After', in the case of issue of a Dispatch Order for the provision of upward or downward mFRR Balancing Energy or energy for purposes other than balancing (reduction or increase of load respectively), the baseline load is equivalent to the sum of the certified reduced metered quantities absorbed at the Transmission System/Distribution Network Boundary, for the entire Dispatchable Load Portfolio during the Imbalance Settlement Period **prior to the Demand Response Event.**

Certified Metered Energy Consumption Data before activation = Baseline Load

Certified energy metering data prior to the Curtailment Instruction

Demand Response Event

Period during which a Curtailment Instruction has been issued
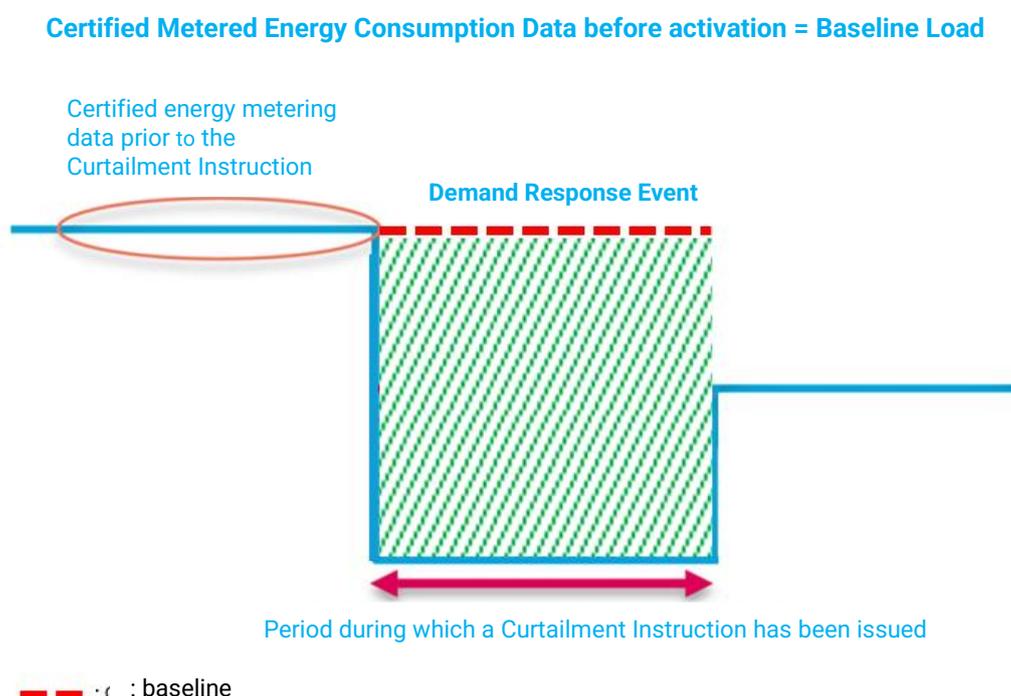
: baseline

Figure 3 *Meter Before-Meter After Method*

3.1.2.2 High X of Y Method

Under the baseline load calculation method "High X of Y", from the eligible days Y, X days with the highest consumption are selected and the Initial Dispatchable Load Portfolio Baseline is calculated on the basis of recent metered measurements of load consumption during those days. Furthermore, for the calculation of the highest consumption the *average method* is used, as shown below.

To calculate the Initial Dispatchable Load Portfolio Baseline on a weekday, the "High 5/10 method" is used, where the 5 (X) days with the highest average consumption in the hours corresponding to the duration of the Demand Response Event are chosen from the 10 (Y) most recent eligible weekdays.

To calculate the Initial Dispatchable Load Portfolio Baseline for Saturdays, Sundays or public holiday, the same method is used (High 2/3).

Where there is a Demand Response Event during the day, the Initial Dispatchable Load Portfolio Baseline is corrected based on the most recent consumption measurements preceding the Demand Response Event.

A. Determination of Look-Back Window

In order to determine the Dispatchable Load Portfolio Baseline Window, the Look-Back Window has to be identified first.

The Look-Back Window consists of the forty-five (45) most recent days preceding the day of a Demand Response Event. Then the Dispatchable Load Portfolio Baseline Window can be calculated separately for:

- Weekdays;
- Saturdays;
- Sundays and Public Holidays.

B. Determination of Dispatchable Load Portfolio Window for weekdays

The Dispatchable Load Portfolio Window is defined as the ten (10) most recent days within the Look-Back Window that are not excluded under the rules described below. The following days shall be excluded from the Baseline Window days for Demand Response Events that occur on a weekday:

- Days when Demand Response Events occur;
- Saturdays;
- Sundays and public holidays;
- Days when power outages or force majeure events occur.

In the event that, when identifying qualifying days within the Look-Back Window, the required number of ten (10) days cannot be established, but at least five (5) days or more have been identified, then the number of days actually identified (in excess of 5) shall be used instead of ten (10) days for the purpose of calculating the Initial Dispatchable Load Portfolio Baseline.

In the event that not even the necessary number of five days can be established, then the determination of the Initial Dispatchable Load Portfolio Baseline shall be made using days when Demand Response Events occurred in addition to qualifying days. In this case, days on which Demand Response Events with the highest average consumption occurred shall be selected until a total of five days has been identified.

Below is an example of Baseline Window calculation for weekdays. Table 1 shows the respective calendar and Table 2 shows the Dispatchable Load Portfolio Baseline Window of ten days for two calculation days – on 13/01 and 05/01 – as indicated in Table 1 in blue.

The calendar view illustrates the order of selection order of the ten days for the Baseline Window. As shown, the days that are rejected are the days with a Demand Response Event (grey), public holidays (green) and weekends (blue).

Table 1. Example of Look-back Window determination for weekdays

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
19-Dec	**20-Dec**	**21-Dec**	**22-Dec**	**23-Dec**	**24-Dec**	**25-Dec**
26-Dec	**27-Dec**	**28-Dec**	**29-Dec**	**30-Dec**	**01-Jan**	**02-Jan**
03-Jan	**04-Jan**	**05-Jan**	**06-Jan**	**07-Jan**	**08-Jan**	**09-Jan**
10-Jan	**11-Jan**	**12-Jan**	**13-Jan**			

Weekday	Demand Response Event (Calculation Day)	Weekend	Another day with a Demand Response Event	Public Holiday

Table 2. Example of determination of Dispatchable Load Portfolio Window for weekdays

Calculation Day	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10
13/01	11/01	10/01	07/01	03/01	30/12	29/12	28/12	27/12	23/12	22/12
5/01	03/01	30/12	29/12	28/12	27/12	23/12	22/12	21/12	20/12	19/12

C. **Determination of Dispatchable Load Portfolio Baseline Window for Saturdays, Sundays and public holidays**

When the calculation day is a Saturday, the Dispatchable Load Portfolio Baseline Window shall consist of the three most recent Saturdays. The following days shall be excluded from the Window:

- Days when Demand Response Events occur;
- Weekdays;
- Sundays and public holidays;
- Days when power outages or force majeure events occur.

When the calculation day is a Sunday or a public holiday, the Demand Response Baseline Window shall consist of the three most recent Sundays or public holidays. The following days shall be excluded from the Window:

- Days when Demand Response Events occur;
- Weekdays;
- Saturdays;
- Days when power outages or force majeure events occur.

In the event that during the check within the Look-back Window, three days cannot be established for calculation purposes, then two days will used to calculate the Initial Dispatchable Load Portfolio Baseline.

Below is an example of Initial Dispatchable Load Portfolio Baseline Look-Back Window calculation for Saturday 02/02 (light blue). Table 3 shows the respective calendar and Table 4 shows the Dispatchable Load Portfolio Baseline Window of three days.

Table 3. Example of Look-back Window determination for Saturdays

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
07-Jan	08-Jan	09-Jan	10-Jan	11-Jan	12-Jan	13-Jan
14-Jan	15-Jan	16-Jan	17-Jan	18-Jan	19-Jan	20-Jan
21-Jan	22-Jan	23-Jan	24-Jan	25-Jan	26-Jan	27-Jan
28-Jan	29-Jan	30-Jan	31-Jan	01-Feb	02-Feb	

Weekday	Demand Response Event (Calculation Day)	Weekend

Table 4. Example of determination of Dispatchable Load Portfolio Window for Saturdays

Demand Response Event (Calculation Day)	Day 1	Day 2	Day 3
02/02	26/01	19/01	12/01

D. Initial Dispatchable Load Portfolio Baseline Calculation

The Initial Dispatchable Load Portfolio Baseline is calculated for every 15-minute Imbalance Settlement Period on the day of the Demand Response Event. The Initial Dispatchable Load Portfolio Baseline may also be calculated for the day preceding the calculation day, if necessary in order to determine the Adjustment Window. To calculate the Initial Dispatchable Load Portfolio Baseline, the following procedure is followed:

1. For each of the days of the Demand Response Window (up to 10 days when the calculation day is for a weekday or up to 3 days when the calculation day is for Saturdays, Sundays or public holidays), the average consumption of the Dispatchable Load Portfolio belonging to the Demand Response Aggregator e, in Bidding Zone z, is calculated exclusively during the Imbalance Settlement Periods of the Demand Response Event.

2. In special cases where the Initial Dispatchable Load Portfolio Baseline must also be calculated for the day preceding that of the Demand Response Event (due to extension of the Adjustment Window), then Step 1 is performed by calculating

average consumption exclusively during Imbalance Settlement Periods for which the Adjustment Window extends to the previous day.

3. The days within the Initial Dispatchable Load Portfolio Baseline Window are ranked in descending order based on the aforementioned average measurements.

4. The five days with the highest averages are selected when the calculation day is a weekday or two days when the calculation day is a Saturday, Sunday or public holiday.

5. For each Imbalance Settlement Period t of the calculation day, the Initial Dispatchable Load Portfolio Baseline in MW is calculated as the average consumption of the respective Imbalance Settlement Period t in the days selected as per the previous step.

6. In the event of days with the same average consumption, those that are closer to the calculation day shall be selected.

Below is an illustrative example for a Demand Response Event that lasts 1 hour (15:00 - 16:00). Initially, the daily average of consumption for the ten days corresponding to the Baseline Window for weekdays is calculated, with regard to the time period over which the Demand Response Event lasted (15:00 – 16:00). Table 5 (sixth column) shows the average consumption in each of the ten days for the duration of the Demand Response Event. The days are ranked on the basis of their average consumption (Table 5, seventh column). Lastly, the five (5) days with the highest consumption are selected, as can be seen in Table 6.

The Initial Dispatchable Load Portfolio Baseline is calculated for each hour of the Demand Response Event day as the corresponding 5-minute interval average for the aforementioned 5 days, as indicated in Table 6. For example, the Initial Dispatchable Load Portfolio Baseline for 15:00 (corresponding to the Imbalance Settlement Period 15:00-15:15) is calculated as the average of the measurements at 15:00 on each of the five days selected.

Table 5. The 10 (Y) highest days from which the 5 (X) highest days are to be selected in order to calculate the Dispatchable Load Portfolio Baseline (weekdays)

Day	15:00 [MW]	15:15 [MW]	15:30 [MW]	15:45 [MW]	Average [MW]	Rank
Day 1	6.3	7.7	6.2	7.3	6.88	1
Day 2	6.2	7.3	7.5	6.1	6.78	2
Day 3	7.8	7.1	6.0	4.5	6.35	3
Day 4	4.9	6.9	6.6	5.8	6.05	4
Day 5	4.9	6.7	5.0	7.0	5.90	6
Day 6	5.8	7.8	5.0	4.2	5.70	7
Day 7	5.3	7.3	6.6	4.5	5.93	5
Day 8	5.0	4.4	6.3	6.7	5.60	8
Day 9	6.5	4.1	4.3	5.3	5.05	10
Day 10	4.3	6.5	5.9	4.8	5.38	9

Table 6. The 5 (Y) highest days for the calculation of the Dispatchable Load Portfolio Baseline (weekdays)

Day	15:00 [MW]	15:15 [MW]	15:30 [MW]	15:45 [MW]	Average [MW]	Rank
Day 1	6.3	7.7	6.2	7.3	6.88	1
Day 2	6.2	7.3	7.5	6.1	6.78	2
Day 3	7.8	7.1	6.0	4.5	6.35	3
Day 4	4.9	6.9	6.6	5.8	6.05	4
Day 7	5.3	7.3	6.6	4.5	5.93	5
Average	6.10	7.26	6.58	5.64	6.40	

E. Dispatchable Load Portfolio Baseline Adjustment

Because conditions on the day of the Demand Response Event can often be different from the conditions in the previous days used to calculate the Initial Dispatchable Load Portfolio Baseline, this value must be adjusted, on the basis of metering data in the mFRR period preceding the Demand Response Event. The method followed is that of the Additive Adjustment Method.

Specifically, the adjustment is made on the basis of the period preceding the Demand Response Event, referred to as the Adjustment Window. The Adjustment Window for the Initial Dispatchable Load Portfolio Baseline has a duration of 3 hours and ends at the time when the Dispatch Order from the Demand Response Aggregator commences, as shown in Figure 4 (box with green border). By default, the Adjustment Window may be extended to the day preceding the allocation from that of the Demand Response Event.

In the event that a Demand Response Event occurs during the aforementioned Adjustment Window, the most recent three hours prior to the Demand Response Event when consumption was recorded shall be taken as Adjustment Window.

The procedure to be followed is set out below:

1. The Adjustment Window shall be determined.
2. The average meter readings for each Imbalance Settlement Period falling within the Adjustment Window shall be calculated.
3. The average of the loads forming the Initial Dispatchable Load Portfolio Baseline for the Imbalance Settlement Periods in the Adjustment Window shall be calculated, as indicated in section 00.
4. The Baseline Adjustment shall be calculated as equal to the quantity calculated at point (2) less the quantity calculated at point (33). The quantity can be either positive or negative.
5. The Dispatchable Load Portfolio Baseline is calculated as the algebraic sum of the Initial Dispatchable Load Portfolio Baseline and the Adjusted Dispatchable Load Portfolio Baseline. The Dispatchable Load Portfolio Baseline calculated as above may not be less than zero.

Figure 4 *Example of adjustment to the Initial Dispatchable Load Portfolio Baseline*

F. **Calculation of the Dispatchable Load Portfolio Baseline**

The Dispatchable Load Portfolio Baseline is calculated only for mFRR time units with a Demand Response Event as the algebraic sum of the Initial Dispatchable Load Portfolio Baseline and the Adjusted Dispatchable Load Portfolio Baseline. The Dispatchable Load Portfolio Baseline calculated as above may not be less than zero.
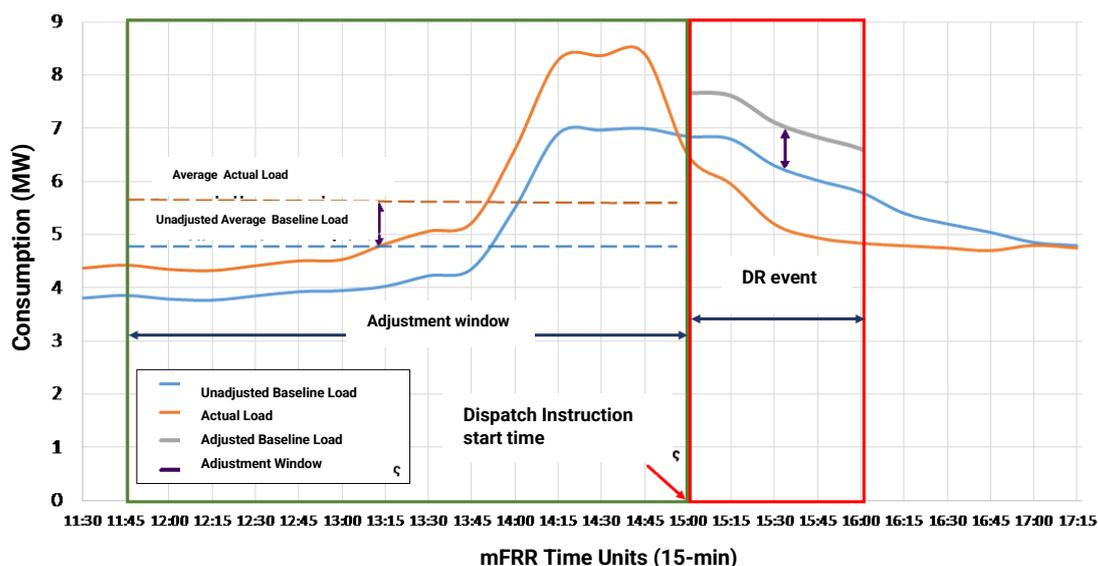
Calculation of the Adjusted Dispatchable Load Portfolio Baseline is described by the following mathematical relationships (1) − (3).

$e \in I$	Dispatchable Load Portfolio
$t \in T$	The Imbalance Settlement Period in one Dispatch Day.
$d_1 \in D_1$	The X number of days with the highest average consumption which have been selected for the calculation of the Initial Dispatchable Load Portfolio Baseline.
$d_2 \in D_2$	The day for which the Initial Dispatchable Load Portfolio Baseline is calculated.
N	The number of days (X) for calculation of the Dispatchable Load Portfolio Baseline.
K	The number of Imbalance Settlement Periods in the Adjustment Window.
$z \in Z$	The Bidding Zones to which the Demand Response Aggregators' Dispatch Load Portfolios belong.

$p_{z,e}^{t,d_1}$ The metered consumption in MW for the Dispatchable Load Portfolio of the Demand Response Aggregator e , during Imbalance Settlement Period t of Dispatch Day d_1, in Bidding Zone z.

$bl_{z,e,T^{str}(T_{adj}^{str})}^{t,d_2,init}$ The Initial Dispatchable Load Portfolio Baseline in MW calculated for the Dispatchable Load Portfolio of Demand Response Aggregator e, during Imbalance Settlement Period t of Dispatch Day d_2, in Bidding Zone z and its calculation is related to the Demand Response Event (Adjustment Window) with start time T^{str} (T_{adj}^{str}).

$adj_{z,e}^{T^{str},d_2}$ The Adjustment of the Dispatchable Load Portfolio Baseline in MW for the Dispatchable Load Portfolio of Demand Response Aggregator e, which relates to the Demand Response Event with start time T^{str}, on Dispatch Day d_2, in Bidding Zone z.

$bl_{z,e}^{t,d_2}$ The Dispatchable Load Portfolio Baseline in MW for the Dispatchable Load Portfolio of Demand Response Aggregator e, during the mFRR market time unit t of Dispatch Day d_2, in Bidding Zone z.

T^{str} The start time of a Demand Response Event.

T^{end} The end time of a Demand Response Event.

T_{adj}^{str} The start time of an Adjustment Window.

T_{adj}^{end} The end time of an Adjustment Window.

The Initial Dispatchable Load Portfolio Baseline, $bl_{z,e,T^{str}(T_{adj}^{str})}^{t,d_2,init}$, is calculated from ratio (1) as the average of the respective Imbalance Settlement Period, t, of X days (5 days with the highest average when the calculation day is a weekday, or 2 days when it is a Saturday, Sunday or public holiday).

$$bl_{z,e,T^{str}(T_{adj}^{str})}^{t,d_2,init} = \frac{\sum_{d_1 \in D_1}\left(p_{z,e}^{t,d_1}\right)}{N} \tag{1}$$
$$e \in I, \qquad z \in Z, t \in T, d_1 \in D_1, d_2 \in D_2$$

The Adjusted Dispatchable Load Portfolio Baseline is calculated from ratio (2) as the difference between the average value of the metered consumption and the average value of the Initial Dispatchable Load Portfolio Baseline during the Adjustment Window,

$$adj_{z,e}^{T^{str},d_2} = \frac{\sum_{t=T_{adj}^{str}}^{T_{adj}^{end}}\left(p_{z,e}^{t,d_2}\right)}{K} - \frac{\sum_{t=T_{adj}^{str}}^{T_{adj}^{end}}\left(bl_{z,e,T^{str}(T_{adj}^{str})}^{t,d_2,init}\right)}{K} \tag{2}$$
$$i \in I, \; z \in Z, d_2 \in D_2$$

while it is noted that the variable d_2 of ratio (2) may also refer to the day preceding dispatch day D_2 (in the case of extension of the Adjustment Window to the previous calendar day).

The Initial Dispatchable Load Portfolio Baseline is finally calculated using ratio (3):

$$bl_{z,e}^{t,d_2} = MAX \left\{ bl_{z,e,T^{str}}^{t,d_2,init} + adj_{z,e}^{T^{str},d_2}, 0 \right\} \qquad (3)$$

$$e \in I, z \in Z, t \in \left[T^{str}, T^{end} \right], d_2 \in D_2$$

3.2 Baseline of Dispatchable Load Portfolios for Participation in the Day-Ahead and Intraday Markets

3.2.1 Method for the Calculation of the Baseline of Dispatchable Load Portfolios for Participation in the Day-Ahead and Intraday Markets

The participation of Demand Response in the Day-Ahead Market and the Intraday Market consists of increasing or decreasing the consumption of the Dispatchable Load Portfolios in accordance with their Market Schedule.

For the participation of a Dispatchable Load Portfolio in the Day-Ahead Market and the Intraday Market, the Demand Response Aggregator is required to use the method for calculating the Baseline Load of the Dispatchable Load Portfolio called 'Average X of Y', as described in Chapter 3.2.2 of this document.

In the event that a Demand Response Event corresponds to a cycle of consecutive Settlement Time Units (mFRR) during which the Dispatchable Load Portfolio provides energy according to the Market Schedule and the relevant Dispatch Instructions (mFRR) issued by the HETS Operator, the Dispatchable Load Portfolio is required to use the 'Average X of Y' method for calculating its Baseline Load, and not the methods described in Chapter 3.1.2 of this document.

It is noted that in the case of an initial registration or any modification of the composition of the Dispatchable Load Portfolio in the HETS Operator's Registry, the 'Average X of Y' method for calculating the Baseline Load is applied, provided that historical data are available for the Portfolio for at least seven (7) calendar days from the date of the Portfolio's commencement of participation in the Market in the case of an initial registration, or from the successful completion of prequalification tests in the case of a modification of the Portfolio's composition.

If the Dispatchable Load Portfolio participates in the Day-Ahead Market and/or the Intraday Market before the required period of seven (7) calendar days has elapsed from the date of its commencement of participation in the Market, the Baseline Load shall be calculated as equal to the certified measurement data of the Entity for each Imbalance Settlement Period during the Demand Response Event.

3.2.2 Average X of Y" Method

According to the 'Average X of Y' method for calculating the Baseline Load, X intermediate days are selected from the eligible Y days, and the Baseline Load of the Dispatchable Load Portfolio is calculated as the average consumption on those X days, for the time periods corresponding to the duration of the Demand Response Event.

For the calculation of the Baseline Load of the Dispatchable Load Portfolio on a weekday, the 'Average 2 of 10' method is used. The ten (Y) most recent eligible weekdays are ranked from highest to lowest based on their average consumption during the hours corresponding to the duration of the Demand Response Event. From the ranked list of the ten (Y) days, the two (X) intermediate days — specifically the 5th

and 6th in the ranking — are selected, and the Baseline Load of the Dispatchable Load Portfolio is calculated as the average consumption of these two (X) days.

For the calculation of the Baseline Load of the Dispatchable Load Portfolio for a Saturday, Sunday, or public holiday, the same 'Average 2 of 4' method is applied.

A. Determination of the Historical Assessment Window

In order to determine the Baseline Load Time Window for the Distributed Load Portfolio, the Historical Assessment Window is first defined.

The Historical Assessment Window consists of the 45 most recent days preceding the day for which the Baseline Load of the Dispatchable Load Portfolio is to be calculated. Subsequently, the Baseline Load Time Window of the Dispatchable Load Portfolio is determined separately for the following cases:

- Weekdays;
- Saturdays;
- Sundays and Public Holidays.

B. Determination of the Baseline Load Time Window of the Dispatchable Load Portfolio for Weekdays

The Baseline Load Time Window of the Dispatchable Load Portfolio is defined as the ten most recent days included in the Historical Assessment Window, which are not excluded based on the rules described below. From the days included in the Baseline Load Time Window, any days corresponding to a Demand Response Event that takes place on a weekday shall be excluded.

- Days with Demand Response Events;
- The day preceding the Demand Response Event under consideration;
- Saturdays;
- Sundays and public holidays;
- Days with operational outages or force majeure events

In the event that, during the audit within the Historical Assessment Window, the number of ten days cannot be fulfilled, but at least four days are identified, then these four days shall be ranked from highest to lowest based on their average consumption during the hours corresponding to the duration of the Demand Response Event. From the ranked list of the four days, the two intermediate days (i.e., the 2nd and 3rd in the ranking) shall be selected, and the Baseline Load of the Dispatchable Load Portfolio shall be calculated as the average consumption of these two days.

In the event that even the minimum required number of four days cannot be fulfilled, the Baseline Load of the Dispatchable Load Portfolio shall be determined using, in addition to the days that meet the eligibility criteria, all days on which Demand Response Events occurred. In this case, the most recent days with Demand Response Events shall be selected until a total of four days is reached.

Exclusively in the case of a first registration or a modification of the composition of the Distributed Load Portfolio, and provided that (a) historical data are available for the Portfolio for at least seven (7) calendar days from the date of its initial participation in the Market in the case of a first registration, or from the successful completion of the prequalification tests, and (b) it is not possible to identify at least four eligible days, the following shall be taken into account for the determination of the Baseline Load:

i. Both days shall be used if the total number of available eligible weekdays is two (2).
ii. The day with the highest average consumption shall be excluded, and the remaining two days shall be used, if the total number of available eligible weekdays is three (3).

An example of the calculation of the Baseline Load Time Window for weekdays is presented below. Table 7 displays the relevant calendar, while Table 8 presents the ten-day Baseline Load Time Window of the Dispatchable Load Portfolio for two calculation days — 23/08 and 28/08 — which are highlighted in grey in Table 7.

The calendar view illustrates the selection order of the ten days comprising the Baseline Load Time Window. As shown, the excluded days include: days with a Demand Response Event (grey color), public holidays (green color), the day preceding the Demand Response Event under consideration (orange color), and weekends (blue color).

Table 7. Example of Determining the Historical Evaluation Window for Weekdays

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
5-Aug	6-Aug	7-Aug	8-Aug	9-Aug	10-Aug	11-Aug
12-Aug	13-Aug	14-Aug	15-Aug	16-Aug	17-Aug	18-Aug
19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug
26-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug	1-Sept

Weekday	Demand Response Event (Calculation Day)	Weekend	Another day with a Demand Response Event	Public Holiday

Table 8. Example of Determining the Baseline Load Time Window for the Dispatchable Load Portfolio on Weekdays

Calculation	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9	Day 10

28/08	26/08	22/08	21/08	20/08	19/08	16/08	14/08	13/08	12/08	09/08
23/08	21/08	20/08	19/08	16/08	14/08	13/08	12/08	09/08	08/08	06/08

C. Determination of the Baseline Load Time Window for the Portfolio of Dispatchable Load on Saturdays, Sundays, and Public Holidays

The Baseline Load Time Window for the Portfolio of Dispatchable Load, when the calculation day is a Saturday, consists of the four most recent Saturdays. The following days are excluded from the Time Window:

- Days with Demand Response Events;
- The day preceding the Demand Response Event under consideration;
- Sundays and public holidays;
- Days with operational outages or force majeure events

The Baseline Load Time Window for a Demand Response Event, when the calculation day falls on a Sunday or a Public Holiday, consists of the four most recent Sundays or Public Holidays. The following days are excluded from the Time Window:

- Days with Demand Response Events
- Weekdays
- Saturdays
- Days with operational outages or force majeure events

In the event that the number of four days is not met during the check within the Historical Evaluation Window, two days shall be used for the calculation of the Baseline Load of the Dispatchable Load Portfolio.

Exclusively in the case of the initial registration or modification of the composition of the Dispatchable Load Portfolio, and provided that (a) historical data are available for the Portfolio for at least seven (7) calendar days from the date of its participation in the Market (in case of initial registration) or from the successful completion of the prequalification tests, and (b) it is not possible to meet the requirement for two days, one day shall be used for the calculation of the Baseline Load of the Dispatchable Load Portfolio.

Below is an example of the calculation of the Baseline Load Time Window for the Dispatchable Load Portfolio for Saturday, 14/09 (grey highlight), and one for Sunday, 22/09 (grey highlight). Table 9 presents the corresponding calendar, and Table 10 shows the four-day Baseline Load Time Window for the Dispatchable Load Portfolio.

Table 9. Example of Determining the Historical Evaluation Window for Saturdays and Sundays

Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
5-Aug	6-Aug	7-Aug	8-Aug	9-Aug	10-Aug	11-Aug
12-Aug	13-Aug	14-Aug	15-Aug	16-Aug	17-Aug	18-Aug
19-Aug	20-Aug	21-Aug	22-Aug	23-Aug	24-Aug	25-Aug
26-Aug	27-Aug	28-Aug	29-Aug	30-Aug	31-Aug	1-Sep
2-Sep	3-Sep	4-Sep	5-Sep	6-Sep	7-Sep	8-Sep
9-Sep	10-Sep	11-Sep	12-Sep	13-Sep	14-Sep	15-Sep
16-Sep	17-Sep	18-Sep	19-Sep	20-Sep	21-Sep	22-Sep

Weekday	Weekend	Day with Demand Response Event	Public Holiday

Table 10. Example of Determining the Baseline Load Time Window for the Dispatchable Load Portfolio on Saturdays and Sundays

Demand Response Event (Calculation Day)	Day 1	Day 2	Day 3	Day 4
14/09 (Saturday)	07/09	31/08	24/08	17/08
22/09 (Sunday)	15/09	08/09	01/09	18/08

D. Calculation of the Baseline Load of the Dispatchable Load Portfolio

The following procedure is applied for the calculation of the Baseline Load of the Dispatchable Load Portfolio:

1) For each of the days within the Demand Response Time Window (up to 10 days when the calculation day is a weekday, or up to 4 days when the calculation day is a weekend or a public holiday), the average consumption is calculated for the Dispatchable Load Portfolio of the Demand Response Aggregator e, in the Bidding Zone z, only during the Imbalance Settlement Periods of the Demand Response Event.

2) The days within the Baseline Load Time Window of the Dispatchable Load Portfolio are sorted in descending order based on the above-calculated average consumption.

3) The two intermediate days are selected: the 5th and 6th in the sorted list when the calculation day is a weekday, or the 2nd and 3rd in the sorted list when the calculation day is a weekend or a public holiday.

4) For each Imbalance Settlement Period t of the calculation day that corresponds to the duration of the Demand Response Event, the Baseline Load of the Dispatchable Load Portfolio, expressed in MW, is calculated as the average consumption of the corresponding Imbalance Settlement Period t of the days selected in the previous step.

An indicative example is presented below for a Demand Response Event lasting 1 hour (15:00−16:00). First, the average consumption is calculated for the 10 days comprising the Baseline Load Time Window for a weekday, taking into account the time period during which the Demand Response Event occurred (15:00−16:00). Table 11 presents (in the sixth column) the average consumption in MW for each of the 10 days during the time window of the Demand Response Event. The days are then sorted based on their average consumption (seventh column of Table 11). Finally, the two intermediate days (5th and 6th in the sorted list) are selected, as shown in Table 12.

Table 11. The 10 (Y) highest-consumption days for the selection of the 2 (X) intermediate days for the calculation of the Baseline Load of the Dispatchable Load Portfolio (weekdays).

Ημέρα	15:00 [MW]	15:15 [MW]	15:30 [MW]	15:45 [MW]	Average [MW]	Shorting
Day1	6,3	7,7	6,2	7,3	6,88	1
Day2	6,2	7,3	7,5	6,1	6,78	2
Day3	7,8	7,1	6,0	4,5	6,35	3
Day4	4,9	6,9	6,6	5,8	6,05	4
Day5	4,9	6,7	5,0	7,0	5,90	6
Day6	5,8	7,8	5,0	4,2	5,70	7
Day7	5,3	7,3	6,6	4,5	5,93	5
Day8	5,0	4,4	6,3	6,7	5,60	8
Day9	6,5	4,1	4,3	5,3	5,05	10
Day10	4,3	6,5	5,9	4,8	5,38	9

Table 12. The 2 (X) intermediate days (5th and 6th in the sorted list) selected for the calculation of the Baseline Load of the Dispatchable Load Portfolio (weekdays).

Day	Average [MW]	Shorting
Day 1	6,88	1
Day 2	6,78	2
Day 3	6,35	3
Day 4	6,05	4
Day 7	**5,93**	**5**
Day 5	**5,9**	**6**
Day 6	5,7	7
Day 8	5,6	8
Day 10	5,38	9
Day 9	5,05	10

The Baseline Load of the Dispatchable Load Portfolio is calculated for the Imbalance Settlement Periods of the Demand Response Event as the average of the corresponding Imbalance Settlement Periods of the two selected days. For example, the Baseline Load for the Imbalance Settlement Period 15:00–15:15 is calculated as the average of the measurements for the corresponding Imbalance Settlement Period from each of the two selected days, as shown in Table 13.

Table 13. Calculation of the Baseline Load of the Dispatchable Load Portfolio Based on the 2 (X) Selected Days for the Imbalance Settlement Periods of the Demand Response Event (Weekdays).

Day	15:00 [MW]	15:15 [MW]	15:30 [MW]	15:45 [MW]
Day 7	5,3	7,3	6,6	4,5
Day 5	4,9	6,7	5,0	7,0
Average	**5,10**	**7,00**	**5,80**	**5,75**

The calculation of the Baseline Load of the Dispatchable Load Portfolio is described by the following mathematical expression (4).

$e \in I$	The Dispatchable Load Portfolio
$d_1 \in D_1$	The X days that have been selected for the calculation of the Baseline Load of the Dispatchable Load Portfolio.
$d_2 \in D_2$	The day for which the Baseline Load of the Dispatchable Load Portfolio is calculated.
N	The number of X days used for the calculation of the Baseline Load of the Dispatchable Load Portfolio.
$z \in Z$	The Bidding Zones to which the Dispatchable Load Portfolios of the Demand Response Aggregators AZ belong.
T^{str}	The Imbalance Settlement Period corresponding to the start of a Demand Response Event on the Delivery Day d_2.
T^{end}	The Imbalance Settlement Period corresponding to the end of a Demand Response Event on the Delivery Day d_2.
$t \in [T^{str}, T^{end}]$	The Imbalance Settlement Periods corresponding to the duration of the Demand Response Event $[T^{str}, T^{end}]$ on the Delivery Day d_2.
$p_{z,e}^{t,d_1}$	The measured consumption in MW for the Dispatchable Load Portfolio of the Demand Response Aggregator AZ e, during the Imbalance Settlement Period t of Delivery Day d1, in Bidding Zone z.
$bl_{z,e}^{t,d_2}$	The Baseline Load in MW of the Dispatchable Load Portfolio of the Demand Response Aggregator AZ e, calculated for Imbalance Settlement Period t of Delivery Day d2, in Bidding Zone z.

The Baseline Load of the Dispatchable Load Portfolio, $bl_{z,e}^{t,d_2}$, is calculated using expression (4) as the average of the corresponding Imbalance Settlement Period t of the X selected days (i.e., the 5th and 6th days in the sorted list when the calculation day is a weekday, or the 2nd and 3rd days in the sorted list when the calculation day falls on a weekend or a public holiday).

$$bl_{z,e}^{t,d_2} = \frac{\sum_{d_1 \in D_1}\left(p_{z,e}^{t,d_1}\right)}{N} \tag{4}$$

$$e \in I, z \in Z, t \in [T^{str}, T^{end}], d_1 \in D_1, d_2 \in D_2$$

4 Baseline Load of RES Units

4.1 Introduction

The baseline calculation methodologies for RES Units presented in this section are equally applicable to:

- At the RES Unit level: each methodology is applied using the certified measurements and the technical characteristics of the respective RES Unit.

- At the group or portfolio level of RES Units: each methodology is applied using the sum of the certified measurements and the technical characteristics of all RES Units under consideration.

- At the level of a Private Network or Exclusive Network, as defined in Law 4951/2022: depending on the network's configuration, the corresponding methodology is applied using the certified network measurement, namely:

  o For networks that include only PV stations, the method "Production Curves with Correction Based on the Measurement Before" is used, in accordance with the provisions of Section 4.3.1.

  o For networks that include other or mixed technologies of RES Units with Non-Controllable Generation, the "Meter Before – Meter After" method is used, in accordance with the provisions of Section 4.4.1.

  o For networks that include RES Units with Controllable Generation, the "Meter Before – Meter After" method is used, in accordance with the provisions of Section 4.5.1.

Hereinafter, the term RES Unit as used in this document may refer to an individual RES Unit, a group of RES Units, a RES Units Portfolio, or a Private or Exclusive Network, depending on the specific application case.

The methodologies described below use the certified measurements of RES Units, normalized at the Transmission System–Distribution Network Interface Point. In cases where certified measurements are not available for Low Voltage (LV) RES Units, corresponding estimations are used.

4.2 RES Response Event

The response of RES Units consists in increasing or decreasing their generation level following the issuance of relevant Dispatch Instructions. The estimation of the amount of electricity that would have been generated by a RES Unit in the absence of such a Dispatch Instruction is referred to as the Baseline Load of the RES Unit.

An indicative Baseline Load of a RES Unit is presented in the following figure, where the measured generation of the Unit is shown with a solid orange line, and the estimated Baseline Load during the validity period of the corresponding Dispatch Instruction is shown with a dashed red line. In this case, the Dispatch Instruction refers to a downward activation (reduction of injection).
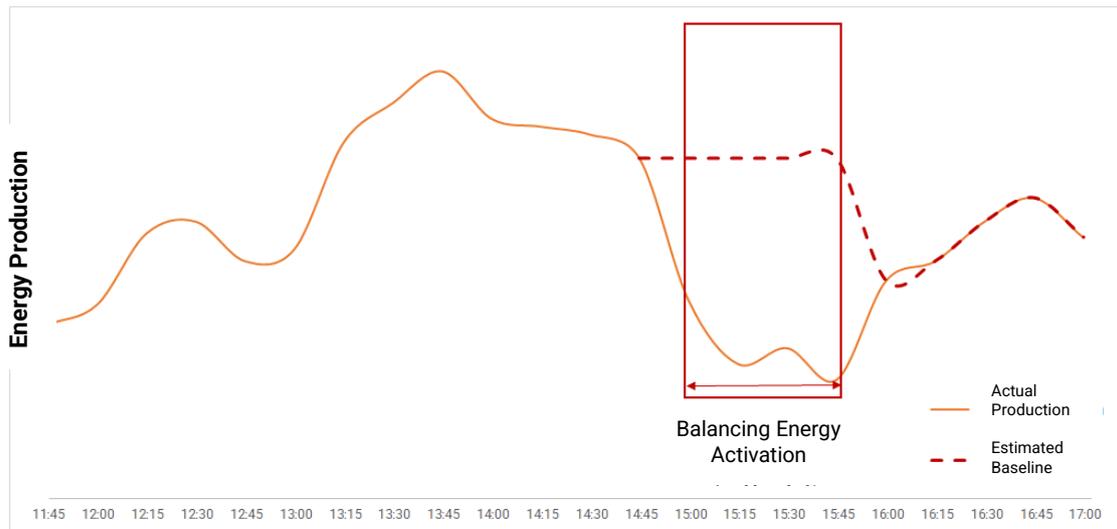
Figure 5 RES Unit Baseline Load in a RES Demand Response Event

In the case of multiple consecutive Events (consecutive Dispatch Orders for the same or different purposes), the Event Duration is considered to be the total duration of all the Events combined. The timeline of consecutive Events is illustrated in the figure below, and the corresponding quantities are defined as follows:

- An Event Occurrence is defined as the start of the Imbalance Settlement Period during which the Dispatch Order relating to the first in chronological order Event becomes effective.

- Event Duration is defined as the total duration of all Events, i.e., the Dispatch Period (DP).

- Normal Operation Resumption is defined as the start of the Imbalance Settlement Period during which the last chronological Event ceases to be effective.
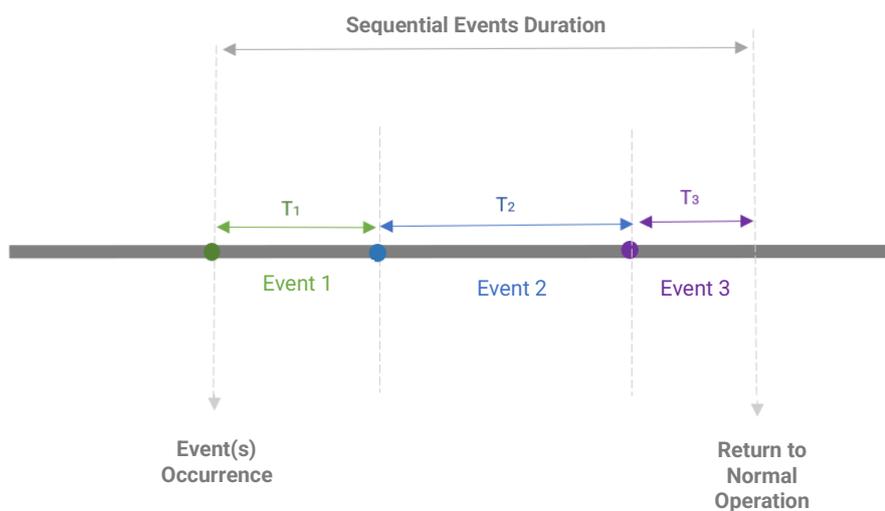

Figure 6 Occurrence of Sequential Events.

In the steps of the methodologies described for the various RES (Renewable Energy Sources) technologies, where reference is made to an Event, sequential Events are also implied. In the case of sequential Events, a single Baseline Load per RES Unit is calculated for the entire Event in accordance with the provisions set forth in this section, except for the Deviation Settlement Periods related to RES Response Events for the activation of aFRR, where the Baseline Load is calculated according to Chapter 5.

4.3 Baseline Load of Photovoltaic Stations

4.3.1 Method 'Production Curves Corrected Based on Prior Measurement'

The calculation method using Photovoltaic Production Curves is applied for determining the Baseline Load during RES Demand Response Events for Photovoltaic Stations.

The Baseline Load is calculated separately for each Photovoltaic Plant, based on typical daily 15-minute production curves for each month of the year, expressed as coefficients, as presented in Appendix I.

A. Initial Baseline Calculation for Photovoltaic Stations

The Initial Baseline Load of Photovoltaic Stations is calculated per Event for the following time periods:

- For each Imbalance Settlement Period during which the Event lasts.
- For the Imbalance Settlement Period preceding the Event Occurrence.

For each of the above Imbalance Settlement Periods, the Initial Baseline Load of a Photovoltaic Plant is equal to:

$$Initial\_BL_{t,u} = C_{t,M} \times P_{INS,u} \times D_t$$

where:

$Initial\_BL_{t,u}$ The Initial Baseline Load of Photovoltaic Station u, in MWh, for the Deviation Settlement Period t.

$C_{t,M}$ The coefficient for converting the installed capacity of Photovoltaic Stations to production level for the Deviation Settlement Period t of month M, based on the standard coefficients of Annex I.

$P_{INS,u}$ The installed capacity in MW of the Photovoltaic Plant *u*.

D_t The duration in hours *h* for the Deviation Settlement Period *t*.

B. Correction of the Initial Load of Photovoltaic Stations

In order to take into account the performance and geographical location of each Photovoltaic Station, as well as the specific weather conditions on the day of the Event, a correction of the Initial Baseline Load of Photovoltaic Stations is required based on injection measurements prior to the Event.

For the above correction, a correction factor is calculated for each Photovoltaic Station for the Deviation Settlement Period preceding the Event, according to the following formula:

$$adj_{T,u} = \frac{MQ_{BT,u}}{Initial\_BL_{BT,u}}$$

Where,

$adj_{T,u}$ the correction factor for the Initial Baseline Load of Photovoltaic Station u for the Event Duration *T*.

$MQ_{BT,u}$ the injection measurement of Photovoltaic Station u during the Imbalance Settlement Period preceding the Event *T*.

$Initial\_BL_{BT,u}$ the Initial Baseline Load of Photovoltaic Station *u*, in MWh, during the Imbalance Settlement Period preceding the Event *T*.

T   the set of consecutive Imbalance Settlement Periods t during which the Event lasts within the Dispatch Day for the Photovoltaic Station u.

Based on the above methodology, and specifically in cases where there is a significant difference in the geographical longitude of each station's location compared to the reference station used for deriving the standard curve, at the edges of the curve the correction factor $adj_{T,u}$ may become quite small (or quite large), posing the risk that this correction may not be representative for the rest of the curve.

Due to the above, the calculation of the correction factor is modified for Imbalance Settlement Periods with low production curve coefficients. More specifically, in the case where the Imbalance Settlement Period preceding the occurrence of the Event corresponds to a 15-minute period with a Photovoltaic production curve coefficient lower than 30% (0.3), no correction is applied and the correction factor $adj_{T,u}$ is set equal to 1.
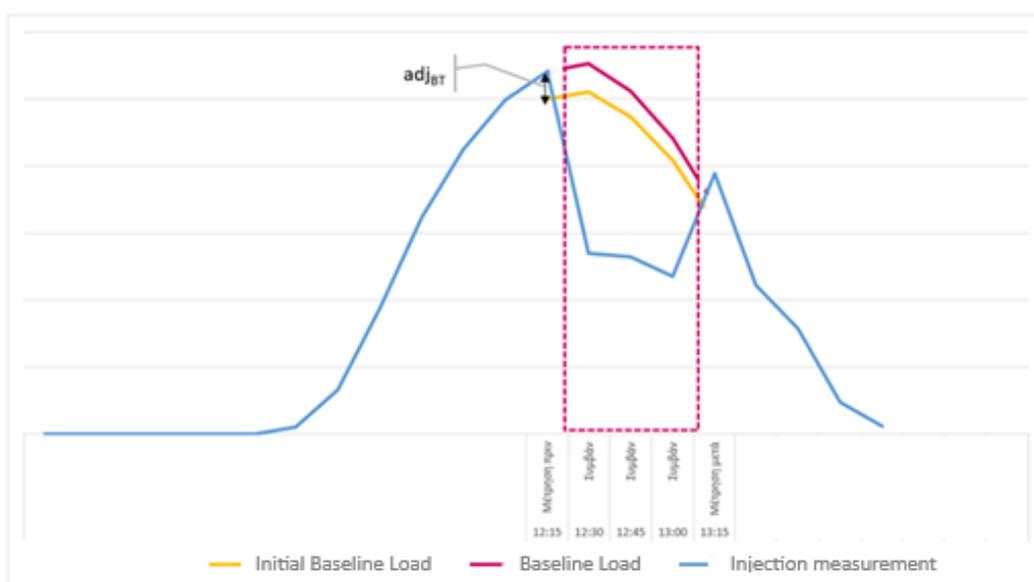

Figure 5̶7̶ Baseline *Load of a Photovoltaic Station using the "Production Curves" Method*

It should be noted that, since the standard coefficients in Appendix I for converting the installed capacity of photovoltaic stations to production levels have been calculated under conditions of maximum sunshine and are based on the simulation of a photovoltaic station with bifacial panels in a specific geographical area, it is considered necessary to allow some flexibility regarding the theoretical maximum production. This is intended to account for both the difference in solar noon at the extreme points of Greece and the potentially increased performance of photovoltaic stations equipped with a solar tracker system. In order to avoid large errors, and considering that the percentage corresponding to the average increase in the output of a photovoltaic park using a solar tracker is approximately 30%, an upper limit is set on the correction factor as follows:

$$adj_{BT,u} \leq 1,3$$

C. Calculation of the Baseline Load of a Photovoltaic Station

The Baseline Load of a Photovoltaic Station is calculated for each Imbalance Settlement Period during which the Event occurs as follows:

$$BL_{t,u} = min\{Initial\_BL_{t,u} \times adj_{T,u} \; ; C_{LIM,u,t} \times P_{INS,u} \times D_t\}$$

Where,

$BL_{t,u}$ the baseline Load of Photovoltaic Station u, in MWh, for each Imbalance Settlement Period t during which the Event occurs.

$Initial\_BL_{t,u}$ the Initial Baseline Load of Photovoltaic Station u for each Imbalance Settlement Period t during which the Event occurs.

$adj_{T,u}$ the correction factor for the Initial Baseline Load of the Photovoltaic Station u.

$C_{LIM,u,t}$ the coefficient limiting the maximum generation capacity of Photovoltaic Station u for the Imbalance Settlement Period t, corresponding either to the installed capacity or to the constraints specified in points (a) and (b) of paragraph 2 of Article 10 of Law 4951/2022.

$P_{INS,u}$ the installed capacity of Photovoltaic Station u, in MW.

D_t the duration, in hours, of the Imbalance Settlement Period t.

It is clarified that, for photovoltaic stations that do not fall under the restrictions of points (a) and (b) of paragraph 2 of Article 10 of Law 4951/2022, the coefficient $C_{LIM,u}$ is set equal to one. This restriction is necessary because, during an event, a single correction factor is applied $adj_{BT,u}$, which may lead to large positive errors (overestimation of production), particularly near the peak of the photovoltaic generation

curve. By applying the above limitation, it is ensured that the injection of Renewable Energy Sources (RES) units (even those not subject to injection restrictions under Law 4951/2022) will not exceed the installed capacity of the station.

4.4 Baseline Load of Other Intermittent RES

4.4.1 'Meter Before - Meter After' Method

The method for calculating the Baseline Load known as "Meter Before–Meter After" (MBMA) is widely used for determining the Baseline Load of other Intermittent RES (Renewable Energy Sources) Units during a RES Response Event.

To calculate the Baseline Load during an Event, the average injection measurement of the RES Unit is computed, as illustrated in the following figure:

$$MBMA_u = \frac{MQ_{BT,u} + MQ_{AT,u}}{2}$$

Όπου,

$MBMA_u$ the average injection measurement of the RES Unit, in MWh.

MQ_{BT} the injection measurement of the RES Unit, in MWh, during the Imbalance Settlement Period preceding the occurrence of the Event.

MQ_{AT} the injection measurement of the RES Unit, in MWh, during the nearest Imbalance Settlement Period following the Event.
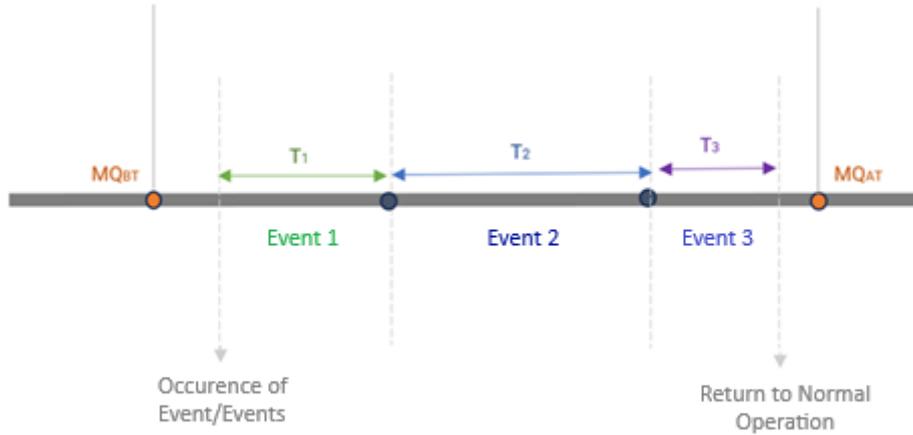

Figure 8: *Selection of Measurements Before and After Consecutive Events*

The Baseline Load of the RES Unit is calculated for each Imbalance Settlement Period during which the Event occurs as follows:

$$BL_{T,u} = min\{MBMA_u; C_{LIM,u,t} \times P_{INS,u} \times D_t\}$$

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Where,

$BL_{T,u}$ the Baseline Load of the Wind RES Unit *u*, in MWh, for the time period *T* during which the Event occurs.

$MBMA_u$ the average injection measurement of the RES Unit *u*, in MWh.

$C_{LIM,u,t}$ the coefficient limiting the maximum generation capacity of the RES Unit *u* for the Imbalance Settlement Period *t*, corresponding either to the installed capacity or to the constraints specified in points (a) and (b) of paragraph 2 of Article 10 of Law 4951/2022. $P_{INS,u}$ the installed capacity of the RES Unit *u*, in MW.

D_t the duration, in hours (*h*), of the Imbalance Settlement Period *t*.

It is clarified that, for RES Units that do not fall under the restrictions of points (a) and (b) of paragraph 2 of Article 10 of Law 4951/2022, the coefficient $C_{LIM,u}$ is set equal to one. This limitation is necessary because, during an event, a single correction factor $adj_{BT,u}$ is applied, which may lead to significant positive errors (overestimation of production). By applying the above limitation, it is ensured that the injection of RES Units (even those not subject to injection restrictions under Law 4951/2022) will not exceed the installed capacity of the Unit.

4.5   Baseline Load of Controllable Units

4.5.1 'Meter Before Meter After' Method

The "Meter Before" method for calculating the Baseline Load is used for Controllable RES Units in cases of RES Response Events, particularly when the corresponding Market Schedule cannot be applied. The Baseline Load of a RES Unit during a RES Response Event is calculated individually for each RES Unit as the measurement before the Event, as follows:

$$BL_{T,u} = MQ_{BT,u}$$

Where,

$BL_{T,u}$ the Baseline Load of Controllable RES Unit *u*, in MWh, for the time period *T* during which the Event occurs.

$MQ_{BT,u}$ the injection measurement of Controllable RES Unit *u*, in MWh, for the Imbalance Settlement Period preceding the occurrence of the Event.

5   aFRR Baseline Load

The method presented in this section is used to determine the activated aFRR Balancing Energy for the Dispatchable Load Portfolios and the Dispatchable Portfolio of Intermittent RES Generation Units. The aFRR Baseline Load of a Portfolio is defined as the electricity that would have been produced/consumed by the Portfolio in the event that it had not received a Dispatch Instruction for the activation of an aFRR Balancing Energy Offer from the HETS Operator.

5.1   Declaration Method

The aFRR Baseline Load is calculated by the Aggregator for each cycle of the aFRR process, i.e. every four (4) seconds, and is sent by the Aggregator to the HETS Operator via a remote terminal unit (RTU) one (1) minute before each cycle of the aFRR process. For example, at 14:00:00 (hh:mm:sd) the Aggregator sends the portfolio's production/consumption in MW for the period 14:01:00 − 14:01:04. Next, at 14:00:04 (hh:mm:sd) the Aggregator sends the portfolio's production/consumption in MW for the period 14:01:04 − 14:01:08 and so on.

The Aggregators that have successfully completed the prequalification tests for the aFRR procedure are always obliged to send the aFRR Baseline Load to the HETS Operator, in accordance with the above, regardless of whether they have submitted an Energy or Balancing Capacity Offer and regardless of whether they have been awarded aFRR Balancing Capacity for the specific period of time.

5.2   Initial aFRR Portfolio Baseline Check

In order for a Portfolio to acquire the right to participate in the aFRR process, the initial check of the aFRR Baseline Load, in accordance with the provisions of this section, must have been successfully completed in advance. The initial control check of the aFRR Baseline Load is carried out for all facilities making up the Portfolio, and lasts for 24 consecutive hours of Dispatch Day D.

During the 24-hour check, the Aggregator is obliged to send the aFRR Baseline Load data via a remote terminal unit (RTU) to the HETS Operator every 4 seconds, 1 minute before each cycle of the aFRR process commences. The Aggregator shall ensure that on the Portfolio control check day D of the Portfolio, the submitted aFRR Baseline Load is equal to at least 50% of the Maximum Contribution to aFRR of the Portfolio in accordance with its Registered Characteristics.

Upon completion of the control check day, the HETS Operator shall verify whether the deviation of the declared Baseline Load from metered activity meets the compliance criterion described below. Metered measurements from the Supervisory Control and Data Retrieval System (SCADA) are used to monitor the Baseline Load. For the day D control check, the following steps are followed:

- For each period t of 4sec, the deviation DEV_t, shall be calculated as follows:

$$DEV_t = EBL_t − SQ_t$$

- For the total of 24 hours, the average Baseline Load RBL_D is calculated as follows:

$$RBL_D = \frac{\sum_{t \in D} |EBL_t|}{T}$$

- For the total of 24 hours, the quality control QF_D, index is calculated from the following:

$$QF_D = 1 - \frac{\sqrt{\frac{\sum_{t \in D} DEV_t{}^2}{T}}}{max\ (RBL_D, 0, 1)}$$

Where

EBL_t: the Baseline Load as declared by the Aggregator

SQ_t: metering measurement of the Portfolio by the Supervisory Control and Data Retrieval System (SCADA)

T: the number of 4sec periods during the 24 hours for which the control check lasts

It should be clarified that, during the conduct of the audit, any time periods during which a Dispatch Order is issued for the response of part or all of the Portfolio shall be excluded.

Checks of the aFRR Baseline Load are considered satisfactory if the quality control index is equivalent to at least 95%, that is:

$$QF_D \geq 95\%$$

The HETS Operator shall inform the competent Aggregator of the outcome of the check. In the event that the test does not meet requirements, the HETS Operator shall set a new audit date in consultation with the Aggregator for when a period of at least one (1) month has elapsed since the initial test.

5.3   Monthly aFRR Portfolio Baseline check

The HETS Operator shall check the accuracy of the aFRR Baseline Load declarations sent by the Aggregator for each Portfolio. The calculations shall be carried out monthly in the month following the baseline month. For the conduct of the monthly checks per Portfolio, the measurements of the Supervisory Control and Data Recovery System (SCADA) are used and the following steps are applied:

- For each period t of 4sec, the deviation DEV$_t$, shall be calculated as follows:

$$DEV_t = EBL_t - SQ_t$$

- For each day D of month M the average Baseline Load RBL_D is calculated as follows:

$$RBL_D = \frac{\sum_{t \in D} |EBL_t|}{T}$$

- For each day D of the month M, the quality control QF_D, index is calculated, as follows:

$$QF_D = 1 - \frac{\sqrt{\frac{\sum_{t \in D} DEV_t^2}{T}}}{max\ (RBL_D, 0, 1)}$$

- For the total number of days of month M, the quality control index is calculated QF_M

$$QF_M = \frac{\sum_{D \in M} QF_D}{N}$$

Where
EBL_t: the Baseline Load as sent by the Aggregator

SQ_t: metering measurement of the Portfolio by the Supervisory Control and Data Retrieval System (SCADA)

T: the number of 4sec periods during day D of the month M

N: the number of days in the month M

It should be clarified that, during the conduct of the audit, any time periods during which any Dispatch Order is issued for the response of part or the entirety of the Portfolio shall be excluded. The audit of the aFRR Baseline Load shall be considered successful if the quality control indicator at a monthly level is at least equal to 95%, that is:

$$QF_M \geq 95\%$$

The HETS Operator shall inform the competent Aggregator of the outcome of the check.

In the event that a Portfolio fails to comply with the monthly check of the Baseline Load for three months out of a rolling period of six (6) months, it shall be deprived of the right to participate in the aFRR procedure. In the above case, the HETS Operator shall notify the competent Aggregator of the termination date of the Portfolio's participation in the aFRR procedure. In order for the Portfolio to rejoin the aFRR process, the Aggregator must repeat the initial aFRR Baseline Load verification, in accordance with the provisions of section 5.24.2, after the period of one (1) month has elapsed from the date of termination of the Aggregator's participation in the aFRR process. For initial control checks to be conducted again, the respective Aggregator must pay 50% of the registration fee as foreseen for the Portfolio it represents.

Appendix I: Typical Photovoltaic Generation Curves

The following table presents the 15-minute Photovoltaic Generation Curves, which correspond to conditions of full sunlight and normal operation. The derivation of these curves was based on the simulation of a photovoltaic station located in Thiva, equipped with bifacial panels. For each month, the day with the highest production was selected.

The main source of uncertainty in calculating the photovoltaic generation curves is that solar time varies with geographical longitude and latitude. The difference in solar noon between the extreme points of Greece can reach up to 30 minutes. Thiva was selected as the reference location because it lies at approximately the average geographical longitude and latitude of Greece, thereby reducing this error by about half.

It is clarified that the time series in the following table refer to Greek winter time (EET, UTC+2h), and each 15-minute interval shown corresponds to the start of the respective Imbalance Settlement Period — for example, the time 05:15 corresponds to the 15-minute interval between 05:15 and 05:30, and so on. For the 15-minute Imbalance Settlement Periods that are not shown in the following table, the coefficients are considered to be zero.

UTC+2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
5:30	0	0	0	0	0,0014	0,006673	0,001942	0	0	0	0	0
5:45	0	0	0	0	0,0098	0,02002	0,011788	0	0	0	0	0
6:00	0	0	0	0	0,021	0,030697	0,024269	0,003234	0	0	0	0
6:15	0	0	0	0,006067	0,0336	0,041375	0,03786	0,014099	0	0	0	0
6:30	0	0	0	0,037613	0,0602	0,057391	0,056859	0,028586	0,006273	0	0	0
6:45	0	0	0	0,070373	0,098	0,078745	0,084595	0,05148	0,024698	0	0	0
7:00	0	0	0	0,106773	0,1456	0,114781	0,121762	0,088214	0,058675	0,006338	0	0
7:15	0	0	0,010497	0,154093	0,2016	0,158825	0,169468	0,137883	0,108072	0,046565	0	0
7:30	0	0,002376	0,051461	0,21112	0,2562	0,209543	0,223969	0,195313	0,168577	0,109039	0,001387	0

UTC+2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
7:45	0	0,017818	0,11534	0,27664	0,3136	0,26293	0,280135	0,257011	0,233655	0,18393	0,015253	0
8:00	0,004484	0,053453	0,191891	0,340947	0,3654	0,32032	0,339213	0,320003	0,298211	0,260762	0,04576	0,007528
8:15	0,011211	0,11641	0,271387	0,406467	0,4242	0,375042	0,39829	0,381183	0,362898	0,335266	0,098453	0,026346
8:30	0,045966	0,207875	0,350243	0,470773	0,476	0,432432	0,452931	0,441847	0,424186	0,402784	0,17888	0,051438
8:45	0,095295	0,292212	0,423466	0,530227	0,5292	0,487154	0,503826	0,495914	0,482862	0,466811	0,2496	0,089891
9:00	0,161441	0,369423	0,491825	0,583613	0,5796	0,535202	0,552087	0,545712	0,538401	0,525017	0,34944	0,156823
9:15	0,234314	0,439506	0,553143	0,627293	0,6258	0,585919	0,601596	0,594734	0,589888	0,578825	0,429867	0,233353
9:30	0,315035	0,50365	0,609469	0,68068	0,6706	0,628629	0,645142	0,638194	0,635888	0,626812	0,4992	0,311138
9:45	0,394635	0,563043	0,661186	0,723147	0,7098	0,670003	0,685914	0,67661	0,678228	0,673635	0,556053	0,383904
10:00	0,468629	0,617684	0,708679	0,76076	0,7462	0,708709	0,725577	0,711922	0,713381	0,714509	0,605973	0,459179
10:15	0,526927	0,66995	0,753867	0,794733	0,777	0,746079	0,75678	0,744	0,748795	0,748268	0,65312	0,528182
10:30	0,572893	0,715088	0,790607	0,82628	0,8092	0,776777	0,787844	0,768964	0,781857	0,777112	0,693333	0,584638
10:45	0,612132	0,755475	0,821842	0,85904	0,8358	0,806139	0,814193	0,796902	0,806033	0,804534	0,726613	0,631058
11:00	0,649129	0,789923	0,851157	0,879667	0,8666	0,828829	0,834025	0,81708	0,826941	0,82898	0,75296	0,659913
11:15	0,683884	0,818432	0,873175	0,89544	0,882	0,851518	0,85344	0,836353	0,846282	0,841268	0,77376	0,687514
11:30	0,711912	0,844565	0,891993	0,914853	0,8932	0,867534	0,869943	0,847865	0,863793	0,855626	0,7904	0,711351
11:45	0,735455	0,86357	0,907099	0,9282	0,91	0,874208	0,878541	0,864421	0,872418	0,865973	0,80288	0,733934
12:00	0,751151	0,881388	0,918876	0,93912	0,917	0,88622	0,8913	0,867008	0,876077	0,873475	0,812587	0,74648
12:15	0,765726	0,887327	0,927581	0,940536	0,9254	0,895562	0,892687	0,876709	0,881958	0,872958	0,81952	0,750244
12:30	0,771331	0,886139	0,929373	0,941547	0,9268	0,898232	0,898511	0,879943	0,884571	0,865197	0,816747	0,751498
12:45	0,773574	0,887327	0,931165	0,937907	0,924	0,90357	0,896292	0,878649	0,878037	0,85071	0,812587	0,750244
13:00	0,774695	0,886139	0,927325	0,9282	0,9212	0,894228	0,889636	0,873993	0,867191	0,84476	0,80288	0,743971
13:15	0,771331	0,886139	0,921564	0,923347	0,9142	0,88622	0,883534	0,867267	0,860657	0,828851	0,787627	0,733934
13:30	0,766847	0,8802	0,910427	0,91364	0,9002	0,875542	0,876184	0,858471	0,847327	0,815528	0,768213	0,717624
13:45	0,761241	0,86951	0,894937	0,89908	0,8834	0,864865	0,852192	0,840233	0,827856	0,797937	0,746027	0,698805

UTC+2	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
14:00	0,742182	0,855255	0,875864	0,872387	0,8624	0,844845	0,820573	0,824065	0,804464	0,770386	0,721067	0,674968
14:15	0,720881	0,833874	0,854869	0,846907	0,8386	0,824825	0,803099	0,80919	0,776107	0,742836	0,6864	0,642349
14:30	0,695095	0,812492	0,827731	0,825067	0,8134	0,802135	0,779246	0,78358	0,744221	0,709206	0,650347	0,604711
14:45	0,661461	0,781608	0,799568	0,788667	0,7798	0,772773	0,744992	0,75771	0,717301	0,671954	0,60736	0,559546
15:00	0,627828	0,744785	0,765517	0,74984	0,7504	0,742075	0,712957	0,725374	0,682671	0,624613	0,5616	0,499326
15:15	0,58971	0,705586	0,724424	0,7098	0,7154	0,712713	0,678148	0,690192	0,6402	0,579083	0,504747	0,445379
15:30	0,54038	0,667574	0,682948	0,66976	0,6762	0,671338	0,642646	0,654104	0,5959	0,521912	0,45344	0,376376
15:45	0,487688	0,613705	0,635712	0,621227	0,6356	0,635302	0,607005	0,615171	0,546764	0,466423	0,388267	0,301101
16:00	0,418178	0,563043	0,585275	0,572693	0,5908	0,593927	0,563736	0,578954	0,497498	0,403043	0,27872	0,218298
16:15	0,341942	0,50365	0,528053	0,518093	0,5432	0,537871	0,518388	0,532389	0,442351	0,339922	0,20384	0,154314
16:30	0,264585	0,445445	0,467631	0,46228	0,4928	0,496496	0,472346	0,483108	0,389295	0,247485	0,135893	0,062729
16:45	0,178258	0,380113	0,40196	0,402827	0,4382	0,44044	0,422698	0,426972	0,325262	0,134649	0,069333	0,023837
17:00	0,075115	0,31003	0,332065	0,33852	0,405533	0,38038	0,367365	0,367473	0,260314	0,026645	0,023573	0,011291
17:15	0,012332	0,236383	0,259098	0,271787	0,3542	0,337671	0,313557	0,310819	0,203207	0,019273	0,002773	0,001255
17:30	0,006727	0,159173	0,146959	0,20748	0,3108	0,277611	0,260165	0,250285	0,146884	0,010606	0	0
17:45	0,001121	0,039199	0,026755	0,14924	0,252	0,230898	0,212181	0,191821	0,080499	0,001682	0	0
18:00	0	0,008315	0,017922	0,097067	0,1778	0,194862	0,171687	0,133356	0,030318	0	0	0
18:15	0	0,001188	0,009985	0,055813	0,1218	0,156156	0,133965	0,08304	0,016466	0	0	0
18:30	0	0	0,001152	0,033973	0,0742	0,121455	0,102901	0,044236	0,006926	0	0	0
18:45	0	0	0	0,015773	0,0336	0,092092	0,076968	0,025223	0,000523	0	0	0
19:00	0	0	0	0,00364	0,0252	0,058725	0,056304	0,016168	0	0	0	0
19:15	0	0	0	0	0,014	0,022689	0,038692	0,007243	0	0	0	0
19:30	0	0	0	0	0,0056	0,006673	0,023021	0,000517	0	0	0	0
19:45	0	0	0	0	0	0,002669	0,009292	0	0	0	0	0
20:00	0	0	0	0	0	0	0,000693	0	0	0	0	0