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## IMPLEMENTATION GUIDE

# EXCHANGE OF OPERATIONAL SCHEDULES

## – REV. 30 MAY 2023

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### Revision history

SECTION	CHANGE	DATE/REV
4, 7	Corrections to table 1, Planned resource schedule	October 2022
1-4	General explanations added to sections 1-4C11 – solar cells added; A97 added.	December 2022
3.4.3	Corrections to table 2, Time series: explanatory and GLN code for Energinet moved to receiver field. All example dates in tables have been "standardised". Mutual interdependence between registeredResource.mRID and mktPSRType.psrType ObjectAggregation changed to mandatory. Time series has been added to table 2: A97.	
3.4.4	In Table 7, sender and receiver have been corrected	
2. and 3.4	Time series for mFRR activated, A97, has sign (+/-)	19 December 2022
-	Clarifications and additional guidance.	2 March 2023
3.3	Updated figure 2, last step is a technical acknowledgement; this has now been omitted from the process.	
3.4.4	Deleted as a result of the removal of the ConfirmedResourceSchedule_marketDocument	
3.4.3	In message types, use hyphen	30 March 2023
3.4.3	In createdDateTime, indication of seconds was added	30 May 2023

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## 1. Scope

This document aims to clarify and describe the business processes for submitting operational schedules for balance-responsible parties (BRPs) operating in the Danish electricity market.

## 2. Terms and definitions

The following business types are used in this operational schedule document:

**A01 (Production):** Production for a generation facility, including activations.

**A04 (Consumption):** Consumption of a demand facility.

**A60 (Minimum):** Minimum capacity per unit.

Examples of minimum capacity:

Solar and wind power units – 0

Thermal units – minimum electricity load limit on generator

**A61 (Maximum):** Maximum capacity per unit.

Examples of maximum capacity:

Solar and wind power units – forecast for a unit with full utilisation of wind and solar resources.

Thermal units – the maximum production of a unit with the configuration of the specific day (incl. fuel).

**A97 (mFRR):** Indicates the amount of activated mFRR energy per facility/sum of fuel type with sign, with upward regulation indicated by a positive sign and downward regulation indicated by a negative sign. This time series must always be supplied. If ancillary services are not provided, the time series must be 0.

Example of use of signs for regulation:

Generation facilities that increase generation when activated supply a time series with a positive sign.

Demand facilities that reduce demand when activated supply a time series with a positive sign.

**C11 (ProductionStopped):** Weather-dependent RE facilities (wind turbines and solar cells connected to the DSO grid) participating in the day-ahead, intraday, or mFRR energy activation markets, must submit the volume of withheld installed capacity in a shutdown time series.

The following registeredResource.mRID is used in the operational schedule document:

**GSRN for generation/demand units  $\geq$  10 MW:** For all units with a capacity larger than or equal to 10MW, a separate time series must be submitted with the expected generation of the unit.

**A10:** Global Location Number (GLN 13) or Global Service Relation Number (GSRN 18), which is maintained by GS1 (gs1.dk).

The following mktPSRType.psrType is used in the operational schedule document:

When reporting sums for production/consumption units < 10MW, mktPSRType.psrType must be filled in with the main fuel type. For larger units, the main fuel type is registered in master data and must therefore not be submitted. For solar and wind power facilities, C11 (shutdown time series) must be submitted with main fuel type Solar or Onshore Wind.

**A03 (Mix production and consumption unit):** Unit that can both store and consume energy, e.g. a battery.

**A05 (Decentralised Consumption):** The sum of local consumption.

**B01 (Biomass):** Total production for units using straw, rapeseed oil, woodchips, or wood waste.

**B04 (Fossil Gas):** Total production for units using refinery gas, natural gas, or LPG.

**B05 (Fossil Hard coal):** Total production for units using hard coal, furnace coke, or coke.

**B06 (Fossil Oil):** Total production for units using diesel, fuel oil, or gas oil.

**B11 (Hydro Run-of-river and poundage):** Total production for units using hydropower.

**B15 (Other renewables):** Total production for other types of renewable energy such as biogas waste gasification, biogas landfill gas, biogas liquid manure, biogas water treatment plant, or wave power.

**B16 (Solar):** Total shutdown of solar energy.

**B17 (Waste):** Total production for waste.

**B19 (Onshore wind):** Total shutdown of wind energy.

### 3. Business process for operational schedule

#### 3.1 Overview

Requirements for the operational schedule process are stated in market regulation C3. A 'use case' is linked to the operational schedule process. The process for exchanging data, and the way in which this is done, is described below.

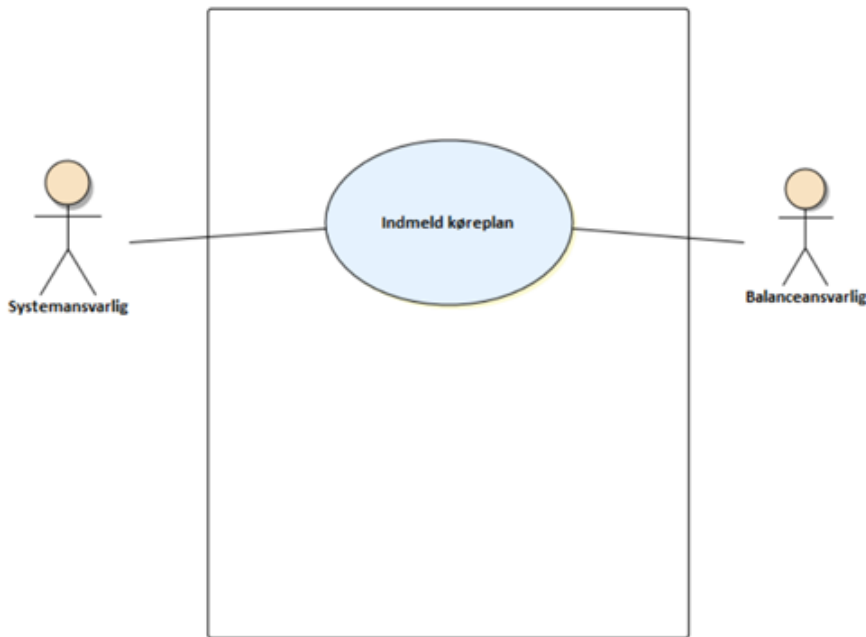


Figure 1 Use case Submit operational schedule.

### 3.2 General outline

An operational schedule contains a balance-responsible party's aggregated set of time series for production, consumption, and reduction of weather-dependent RE facilities for a 24-hour period. Operational schedules are submitted for western Denmark (DK1) and eastern Denmark (DK2), respectively.

Regulation C3, section 5, lists the production and consumption units that operational schedules must be submitted for.

For generation facilities, operational schedules must be broken down, depending on the size of the individual unit and the main fuel type used. If the generation facility is  $\geq 10$  MW, one operational schedule per generator type must be submitted for the generation facility (see C3 guideline, if relevant). If the generation facility is  $< 10$  MW, a total plan must be submitted, containing all units  $< 10$  MW with the same main fuel type.

The operational schedule for balance-responsible parties for production must include the following time series for each of the units' generator type and the sum of units with the same main fuel type, respectively, including wind and solar power connected at transmission level:

- Production schedule in MW
- Current minimum capacity in MW
- Current maximum capacity MW
- Current plan for activated mFRR energy in MW.

The operational schedule for balance-responsible parties for consumption must include the following time series for each of the units' consumption site/sum of consumption sites:

- A consumption plan in MW
- Current minimum capacity schedule in MW
- Current maximum capacity schedule in MW
- Current plan for activated mFRR energy in MW.

As an exception to other generation facilities, the balance-responsible party for production for weather-dependent RE facilities participating in the day-ahead, intraday, or mFRR energy activation markets, must submit the following time series for each of the units' generator type and the sum of units with the same main fuel type (solar power, B16, or wind power, B19):

- Shutdown time series for the volume of installed power which has been shut down (MW)
- Current plan for activated mFRR energy in MW.

When submitting a shutdown time series (C11), the volume of installed power regulated downwards must be specified. The A97 time series specifies the actual volume of power regulated downwards if this has been submitted and activated as mFRR bids.

As an example of a mFRR downward regulation where Energinet has ordered 5 MW downward regulation, a wind turbine with an installed capacity of 6 MW, which is expected to generate 5 MW based on the wind on that day, would have to submit 6 MW in C11 and 5 MW in A97.

Moreover, regulation may take place without the supply of mFRR/regulating power, for example in the event of outages, negative prices, or downward regulation of the unit 'in advance' to be able to supply upward regulation later. In this case, C11 must show the installed capacity regulated downwards, while A97 must be 0.

Below is an example of the time series to be submitted for solar and wind power.

Type	Grid level connection	Size in MW	Time series
Solar	Transmission	150	A01, A60, A61, and A97
Solar	Transmission	100	A01, A60, A61, and A97
Wind	Transmission	200	A01, A60, A61, and A97
Solar	Distribution	50	C11 and A97
Wind	Distribution	60	C11 and A97
Wind	Distribution	40	C11 and A97
Wind	Distribution	5	C11 and A97 (total)
Wind	Distribution	4	
Solar	Distribution	1	C11 and A97 (total)
Solar	Distribution	0.3	
Solar	Distribution	0.2	
Solar	Distribution	0.01	
Solar	Distribution	0.01	
Solar	Distribution	0.01	

### 3.3 Business process

Figure 2 and the following description explain the process of submitting operational schedules.

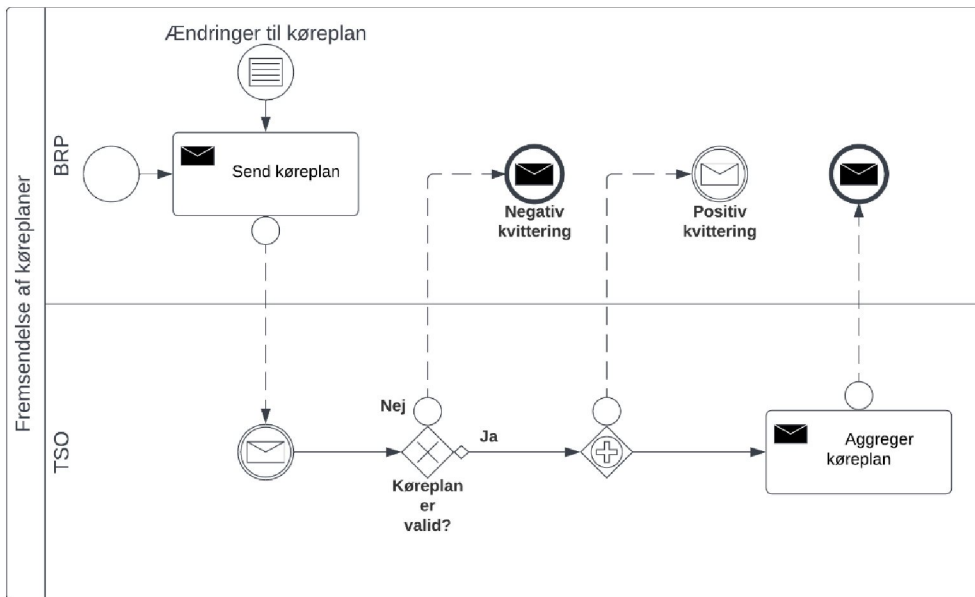


Figure 2 Schedule submission process for operational schedules (DK1 and DK2)

### 3.3.1 Initial status before submission of operational schedules

Prior to submitting an operational schedule, a balance-responsible party has planned production and/or consumption for the next day of operation.

### 3.3.2 Operational schedule submission process

#### Submit operational schedule

All balance-responsible parties for production and balance-responsible parties for consumption with adjustable consumption submit individual operational schedules for the next day of operation. An operational schedule must always describe how operation is expected to be conducted for all generators/units that the respective parties are responsible for. An operational schedule must always cover a full day of operation.

However, the first operational schedule submitted must reach Energinet before the deadline, but after "gate open". D-1 at 00:10.

#### Changes to operational schedules

If a balance-responsible party (BRP) makes operational changes or receives an order for mFRR activation (regulating power order), which is accepted, the balance-responsible party must submit a revised operational schedule to Energinet as described in "Submit operational schedule". Thus, the operational schedule must also include the part of the time series submitted previously.

Energinet "merges" the party's revised operational schedule with the most recently approved operational schedule. When a party revises and submits an operational schedule to Energinet, changes from the previous to the revised schedule will take place during a period known as "dead time" (delay period). The last value before the delay period will refer to the previous operational schedule, whereas the first value after the delay period will refer to the revised operational schedule. Energinet will merge the two operational schedules to create a new schedule, which will be the sum of the previous schedule adjusted to match the revised schedule.

Figure 3 below illustrates how two operational schedules are merged.

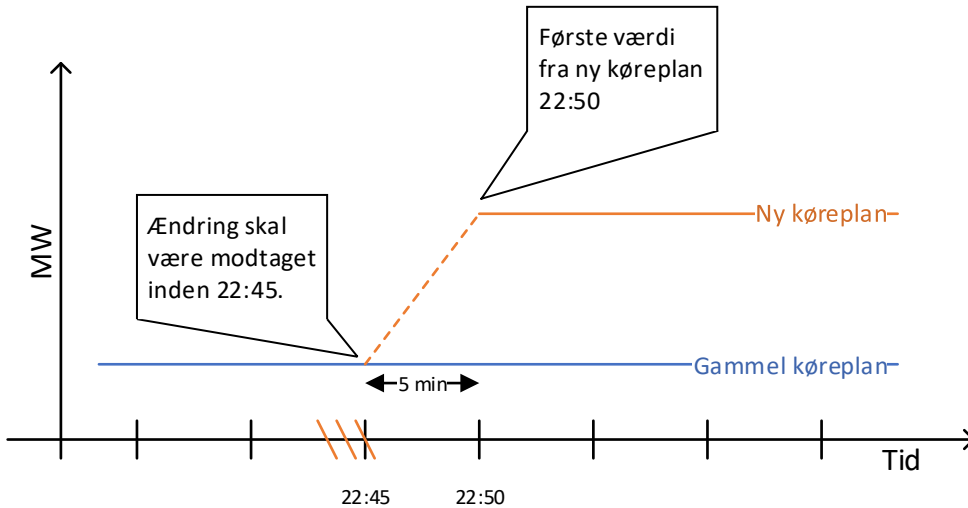


Figure 3 Merging to create new operational schedule.

The example shows that the party who wants to change the schedule at 22:50 must have submitted a revised operational schedule to Energinet by 22:45.

Changes can be submitted until five minutes before the end of the day.

### Validate operational schedule

On receipt of an operational schedule, Energinet will check the content for general errors in relation to ENTSO-E schema, whether the codes used are correct, and whether the necessary message elements are present. The identification of the individual parties is verified, and a check is done of whether the schedule covers a 24-hour period with time indicated in CET with regard to summer/wintertime.

If a unit producing more than 10 MW submits an operational schedule with values below 10 MW, this schedule will, however, be accepted. Depending on whether errors are found or not, a positive or negative receipt acknowledgement will be generated, which is then sent to the party.

### Send receipt acknowledgement

Depending on whether errors are found or not, a positive or negative receipt acknowledgement will be generated, which is then sent to the party. The receipt acknowledgement uses reason codes as specified in ENTSO-E StandardReasonCodeList in urn-entsoe-eu-wgedi-codelists.xsd.

### 2C. Send aggregated operational schedule

If a schedule is approved, Energinet will send the confirmed operational schedule in a separate message, and the balance-responsible party acknowledges receipt hereof.

## 3.4 Business rules

All values are marked with a positive sign, except downward regulation in the A97 time series, for activated mFRR.



### 3.4.1 Adjustment of schedules

If adjustments are made to an operational schedule, the entire schedule must be re-submitted, including any changes.

### 3.4.2 Description of parties

Each participant in the electricity market is responsible for its balance between production and consumption of electricity as well as trade in electricity. A participant is identified by a unique ID, regardless of the number of roles the participant may have. An approved balance-responsible party (BRP) is a participant approved to handle balance responsibility for a given production unit, consumption, or trade towards Energinet. In this document, a balance-responsible party is either a balance-responsible party for consumption or production and is responsible for the submission of operational schedules based on physical trades for one or more electricity-consuming or electricity-generating units.

### 3.4.3 Dependencies with PlannedResourceSchedule\_MarketDocument

The Planned Resource Schedule market document is used to submit operational schedules.

The table below describes the values in the fields.

PlannedResourceSchedule\_MarketDocument is message type ENDK-A14

The acknowledgement is message type ENDK-ACK-A14

ECP service endpoint: SERVICE-ENDK-RESOURCESCHEDULE

	XSD require-ments	
<b>PlannedResourceSchedule_MarketDocument</b>		
mRID	Mandatory	Senders Unique Identification, preferably UUID
RevisionNumber	Mandatory	The revision number of the document
type	Mandatory	A14 = Resource Provider Resource Schedule
process.processType	Mandatory	A17 = Schedule day
sender_MarketParticipant.mRID	Mandatory	The coding scheme is the Energy Identification Coding Scheme (EIC), maintained by ENTSO-E.  GLN/EIC for BRP A01=EIC A10 = EAN/GLN
sender_MarketParticipant.marketRole.type	Mandatory	A06 = Production responsible party
receiver_MarketParticipant.mRID	Mandatory	The coding scheme is the Energy Identification Coding Scheme (EIC), maintained by ENTSO-E.  EIC for Energinet = 10X1001A1001A248 GLN for Energinet = 5790000432752  A01=EIC A10 = EAN/GLN
receiver_MarketParticipant.marketRole.type	Mandatory	A04 = System operator
createdDateTime	Mandatory	Creation date/time of the document (in ISO 8601 UTC format) YYYY-MM-DDTHH:MM:SSZ
schedule_Period.timeInterval	Mandatory	Period covered (in ISO 8601 UTC format)  <period.timeInterval> <start>2013-07-31T22:00Z</start> <end>2013-08-01T22:00Z</end> </period.timeInterval>  This should cover the complete period In relation to a CET time zone: In winter, the time spread is from 23:00 UTC to 23:00 UTC The change from winter to summer time spread is from 23:00 UTC to 22:00 UTC The summer time spread is from 22:00 UTC to 22:00 UTC The change from summer to winter time spread is from 22:00 UTC to 23:00 UTC
domain.mRID	Conditional	Not used
subject_MarketParticipant.mRID	Conditional	Not used
subject_MarketParticipant.marketRole.type	Conditional	Not used

Table 1 PlannedResourceSchedule\_MarketDocument

PlannedResource_TimeSeries		
mRID	Mandatory	Unique identification of time series within the document
businessType	Mandatory	A01 = Production dispatchable
		A04 = Consumption dispatchable
		A60 = Minimum possible. The time series provides a schedule of minimum possible values for a Resource Object.
		A61 = Maximum available. The time series provides a schedule of maximum available values for a Resource Object.
		A97 = Manual frequency restoration reserve activated
		C11 = A time series providing the volume of production units reduced by an energy provider / producer / supplier.
flowDirection.direction	Conditional	Not used
Product	Mandatory	8716867000016 = Active power
connecting_Domain.mRID	Mandatory	DK1 = 10YDK-1-----W (EIC)
		DK2 = 10YDK-2-----M (EIC)
registeredResource.mRID	Conditional (Mandatory this or the next)	GSRN for production/consumption unit >= 10 MW
		A10 = GS1, the coding scheme for the preceding attribute. Mutually exclusive with mktPSRType.psrType
mktPSRType.psrType	Conditional (Mandatory this or the previous)	Main fuel type when submitting sum for production/consumption units < 10MW. Mutually exclusive with registeredResource.mRID
		A03 = Mixed production and consumption unit. Used for e.g. batteries.
		A05 = Load (Decentral Consumption: decentralised consumption)
		B01 = Biomass A production unit using biomass
		B04 = Fossil Gas: A production unit using refinery gas, natural gas, LPG
		B05 = Fossil Hard coal: A production unit using hard coal, furnace coal, coke
		B06 = Fossil Oil: A production unit using diesel, fuel oil, gas oil
		B11 = Hydro Run-of-river and poundage: A production unit using hydropower
		B15 = Other renewables: Other renewable energy types such as biogas waste gasification, biogas landfill gas, biogas liquid manure, biogas water treatment plant, wave power
		B16 = (Solar): A production unit based on solar energy,
		B17 = Waste: A production unit using waste
		B19 (Onshore wind): A production unit based on wind power.
resourceProvider_MarketParticipant.mRID	Mandatory	A01=EIC
		The coding scheme is the Energy Identification Coding Scheme (EIC), maintained by ENTSO-E. In this context we expect balance-responsible party, same as GLN/EIC for BRP in sender_MarketParticipant.mRID, table 1
		A10 = EAN/GLN
Acquiring_Domain.mRID	Conditional	Not used
marketAgreement.type	Conditional	Not used
marketAgreement.mRID	Conditional	Not used
measurement_Unit.name	Mandatory	MAW = Megawatt
objectAggregation	Mandatory	A06 = Resource Object. Production/consumption unit >= 10 MW A08 = Resource type. Production/consumption < 10MW
		Defines if either registeredResource.mRID – GSRN or mktPSRType.psrType – main fuel type is used in the time series

Table 2 PlannedResource\_TimeSeries

UnavailableReserve_TimeSeries (associated with Original_MarketDocument)	Conditional	Not used
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Table 3 UnavailableReserve\_TimeSeries (associated with Original\_MarketDocument)

Series_Period		
timeinterval	Mandatory	The start and end time of the period. <period.timeInterval> <start>2013-07-31T22:00Z</start> <end>2013-08-01T22:00Z</end> </period.timeInterval>
resolution	Mandatory	PT05M = 5 minutes

Table 4 Series\_Period

Point		
Position	Mandatory	Position within the time interval Between 1- 289 (+/- 12 on DTS days)
Quantity	Mandatory	The actual production/consumption (only zero/positive values are reported) Precision is 0.1

Table 5 Point

Reason	Conditional	Not used
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Table 6 Reason

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#### 4. Assembly Model's references

IEC 62325-451-7 – Planned Resource Schedule

iec62325-451-1 – Acknowledgement\_v8\_1.xsd