Manual on Energy Bidding

for the mFRR balancing service and for redispatching

Version 1 - March 2021

Content

Preface

This manual serves to facilitate market parties to determine how to provide energy bids which Elia uses to perform balancing or redispatching.

- It is the Scheduling Agent who submits **Redispatching Energy Bids** to Elia in compliance with article 248 of the Federal Grid Code and the Terms & Conditions for the Scheduling Agent.

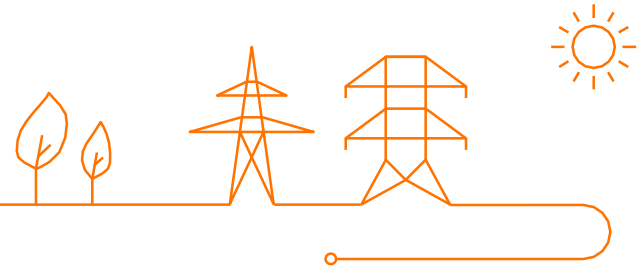
  More information on https://www.elia.be/en/electricity-market-and-system/system-services/alleviating-congestion-risk

- It is the Balancing Service Provider (BSP) who submits **Balancing Energy Bids** for either the **aFRR Service** or the **mFRR Service** to Elia in compliance with article 226 of the Federal Grid Code. The BSP may submit aFRR and mFRR Energy Bids freely ("non-contracted FRR") or in respect of balancing capacity for aFRR or mFRR ("contracted FRR") which Elia procured from the BSP before the concerned day of energy delivery.

  More information on https://www.elia.be/en/electricity-market-and-system/system-services/keeping-the-balance

This manual explains the **future designs for energy bidding**. In the course of **2022** the new designs will be used to bid energy for balancing and redispatching. The main change is that all energy bids will be submitted explicitly to Elia, meaning the BSP or Scheduling Agent will submit energy bids using the bid characteristics explained in this manual and, therefore, Elia will no longer need to deduct the availability of energy for balancing or redispatching based on other information.

The cases described in this manual are non-exhaustive and non-binding. They represent the most likely cases for which market parties will submit energy bids and the manual will be updated based on market feedback. For advise on particular case, the market party contact Elia bilaterally. Regardless of the case descriptions in this document, the submission of energy bids must always be in compliance with relevant contracts for the BSP or for the Scheduling Agent.



Bidding energy to be used for balancing or redispatching

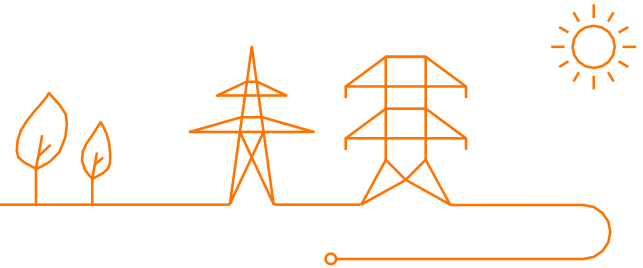
BSPs and Scheduling Agents submit energy bids to Elia to be used in the framework of **3 products**:

- aFRR (balancing - automatic Frequency Restoration Reserves)
- mFRR (balancing - manual Frequency Restoration Reserves)
- Redispatching

The framework for explicit energy bids is created in the European regulation, specifically in the European Guidelines on Electricity Balancing (EBGL) and in the Implementation Frameworks (IF) for aFRR and mFRR, which define the list of bid characteristics to be used in balancing energy bid.

The list of bid characteristics for aFRR is limited, focusing on fully divisible volumes and prices.

The list of bid characteristics for mFRR is more extended, for example, allowing also indivisible volumes to be offered and using more complex bid properties to submit mFRR energy under specific conditions. This list of mFRR bid characteristics serves as a basis for Redispatching Energy Bids, yet some more bid characteristics are available for the Scheduling Agent to better reflect the specificities of flexibility that is available for redispatching but not for balancing.



Characteristics of energy bids for aFRR, mFRR & Redispatching

BSPs and Scheduling Agents submit energy bids to Elia using specific bid characteristics that reflect the conditions in which an activation of the bid is acceptable.

Considering the major redesign of bidding for mFRR and redispatching, examples of bidding for these products are elaborated in this manual.

	Energy bid characteristics	aFRR	mFRR	RD
Local design	ID	y	y	y
	List of Delivery points	y	y	y
	Link with FRR capacity	y	y	
	Direction	y	y	y
	Bid price	y	y	y
	Bid volume	y	y	y
mFRR only	Activation type		y	
	Minimum bid volume (indivisible volume)		y	y
	Part of exclusive group		y	y
	Part of parent/child relation		y	y
	Quarter-hour linking		y	y
Redispatching only	Full activation time			y
	Maximum activation time			y

mFRR Energy Bidding

Characteristics of mFRR Energy Bids

The BSPs must submit mFRR Energy Bids in compliance with the definition of mFRR energy products as described in European regulation (European Guidelines on Electricity Balancing “EBGL” and in the mFRR Implementation Framework “mFRR IF”). This regulation also lists the bid characteristics and some specific rules for each characteristic are also set at the European level.

In addition, Elia adds 3 bid characteristics in the local design.

Specific descriptions and rules for the use of each bid characteristic are explained in the mFRR design note and in the BSP Contract for the mFRR Service (available online at https://www.elia.be/en/electricity-market-and-system/system-services/keeping-the-balance/mfrr).

	Characteristics of mFRR Energy Bids for qh(t)
Local design	ID
	List of Delivery points
	Link with FRR capacity : contracted or non-contracted mFRR
European design	Direction: upward or downward activation
	Bid price (€/MWh)
	Bid volume (MW)
	Activation type: available for “scheduled activation (SA) only” or for “both scheduled and direct activation (SA+DA)”
	Minimum bid volume (indivisible volume) (MW)
	Part of exclusive group: exclusive group ID
	Part of parent/child relation (“multipart bids”) : Parent/child group ID
	Quarter-hour linking: ID(s) of linked bids in qh(t-1) or qh(t-2)

Cases of mFRR Energy Bidding

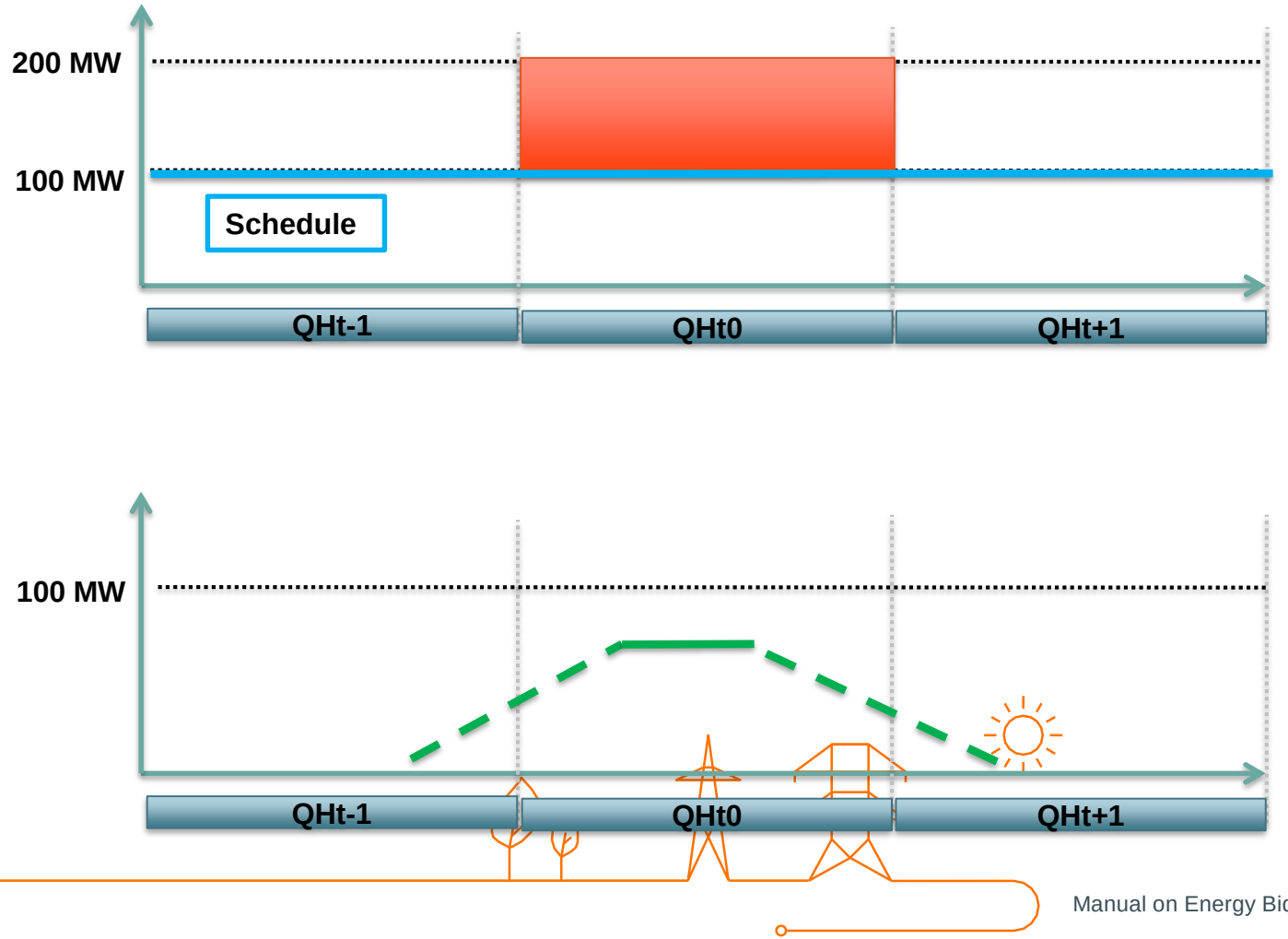
1. Divisible volume without complexity – 1 bid
2. Divisible volume without complexity – Multiple bids
3. Indivisible volume
4. Partially divisible volume
5. Volume available for direct activation
6. Volume partly available for direct activation, partly for scheduled activation only
7. Quarter-hour linking of simple bids
    - consecutive activation of energy in start-up modus
    - ramping constraints
    - increasingly expensive energy use
    - limited energy available
    - delivery points with a longer required time between two activations
    - preventing direct activation during a deactivation period
8. Complex bids:
    - Parent-child-relations
    - Exclusive Groups
9. Concrete cases
    - mFRR providing group of DP_{su} with different operating modes: CCGT
    - Limited Energy Resources

1. Divisible volume without complexity – 1 bid

The most simple bids include only a (fully divisible) bid volume and price. For mFRR Energy Bids this implies also:

- that the minimum bid volume (indivisible part) is 0MW.
- in the most simple case, we assume a bid only available for Scheduled Activation.

Bid for QH(t0)	
Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
(max) Bid volume	100 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	/
Activation type mFRR	SA only
FRR capacity link	Non-contracted



Bid 001 offers a divisible volume up to 100 MW.

Upward activation possible of any power between 0 and 100MW.

This example follows the activation profile of an mFRR Scheduled Activation for 1 qh.

2. Divisible volume without complexity – Multiple bids

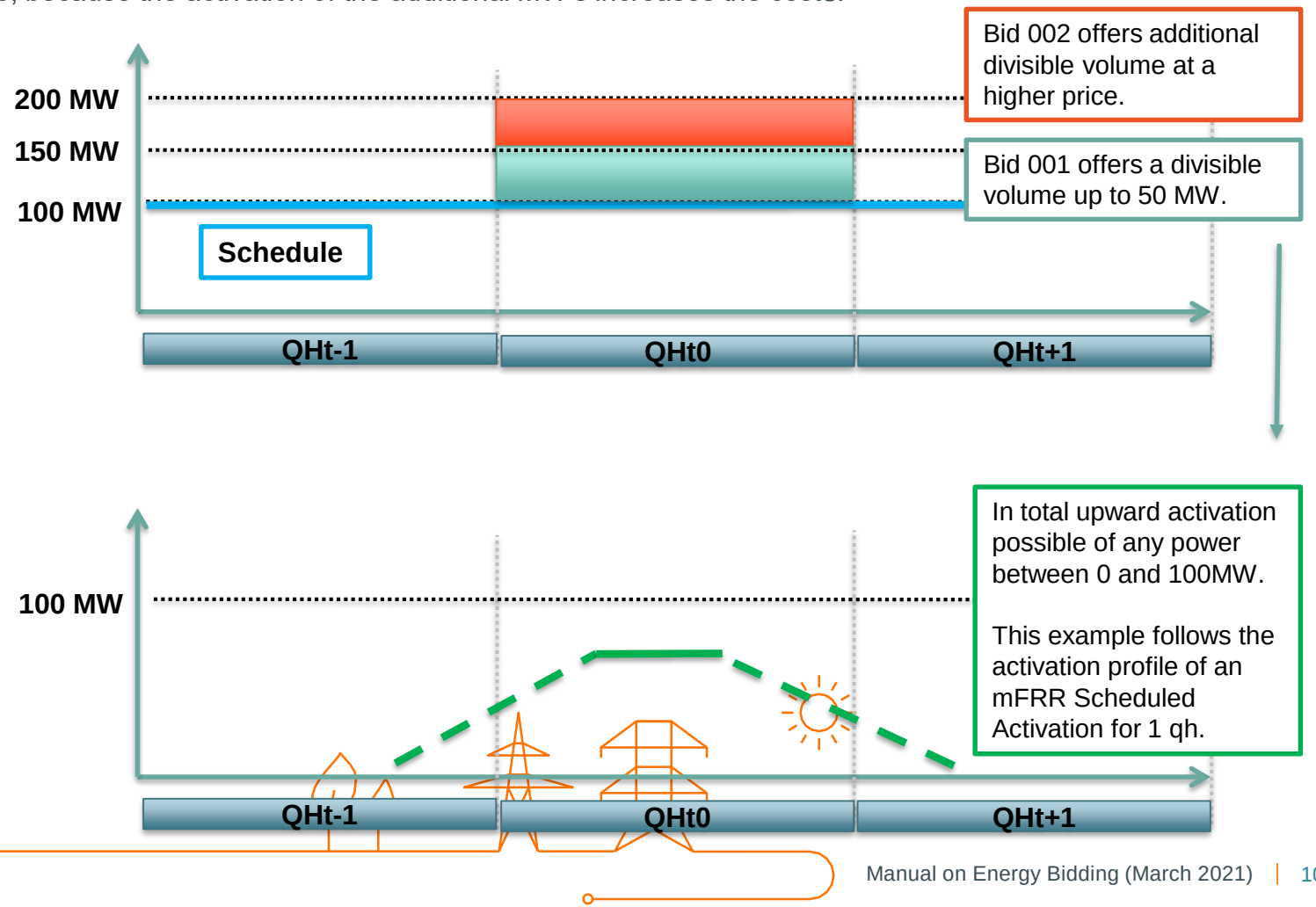
Multiple mFRR Energy Bids can be offered on the same mFRR Providing Group for the same quarter-hour QH(t).

A reasons could be:

- volume is split and offered at different price, for example, because the activation of the additional MW's increases the costs.

Bids for QH(t0)

Delivery point(s)	DP1	DP1
ID	001	002
Direction	Upwards	Upwards
Bid price	**50 € / MWh**	**70 € / MWh**
Bid volume	50 MW	50 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	**/**	**/**
Activation type mFRR	SA only	SA only
FRR capacity link	Non-contracted	Non-contracted



2. Divisible volume without complexity – Multiple bids

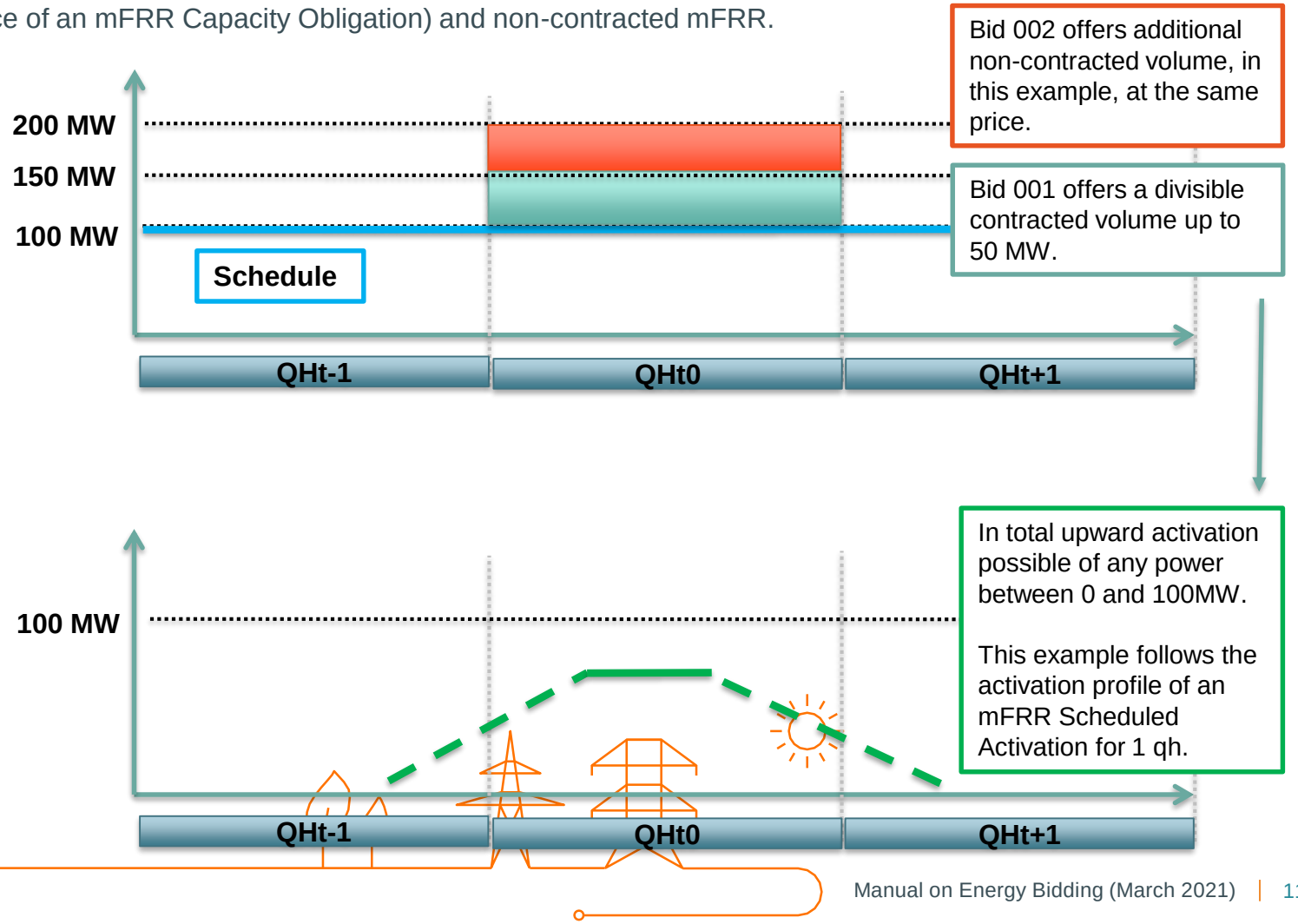
Multiple mFRR Energy Bids can be offered on the same mFRR Providing Group for the same quarter-hour QH(t).

A reasons could be:

- volume is split between contracted mFRR (in compliance of an mFRR Capacity Obligation) and non-contracted mFRR.

Bids for QH(t0)

Delivery point(s)	DP1	DP1
ID	001	002
Direction	Upwards	Upwards
Bid price	50 € / MWh	50 € / MWh
Bid volume	50 MW	50 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	/	/
Activation type mFRR	SA + DA	SA +DA
FRR capacity link	**Contracted**	**Non-contracted**



3. Indivisible volume

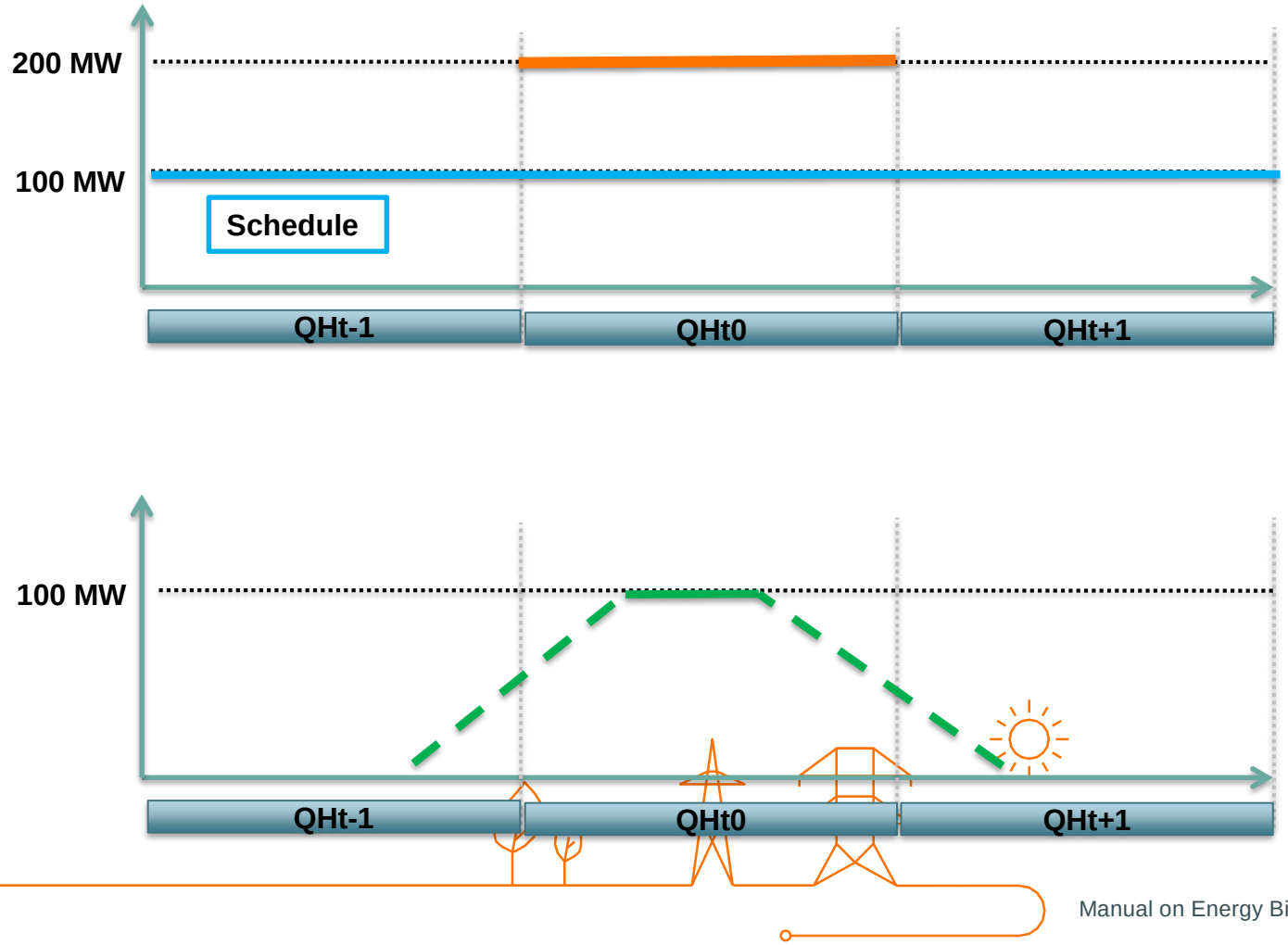
mFRR Energy Bids may also offer an indivisible volume. This implies:

- that the minimum bid volume equals the bid volume.

A BSP could use such a bid format to offer volume representing the start-up of an asset.

Bid for QH(t0)

Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	**100 MW**
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA only
FRR capacity link	Non-contracted



Bid 001 offers an indivisible volume of 100 MW.

Upward activation possible of 100MW. An activation of less than 100MW may not be requested.

This example follows the activation profile of an mFRR Scheduled Activation for 1 qh.

4. Partially divisible volume

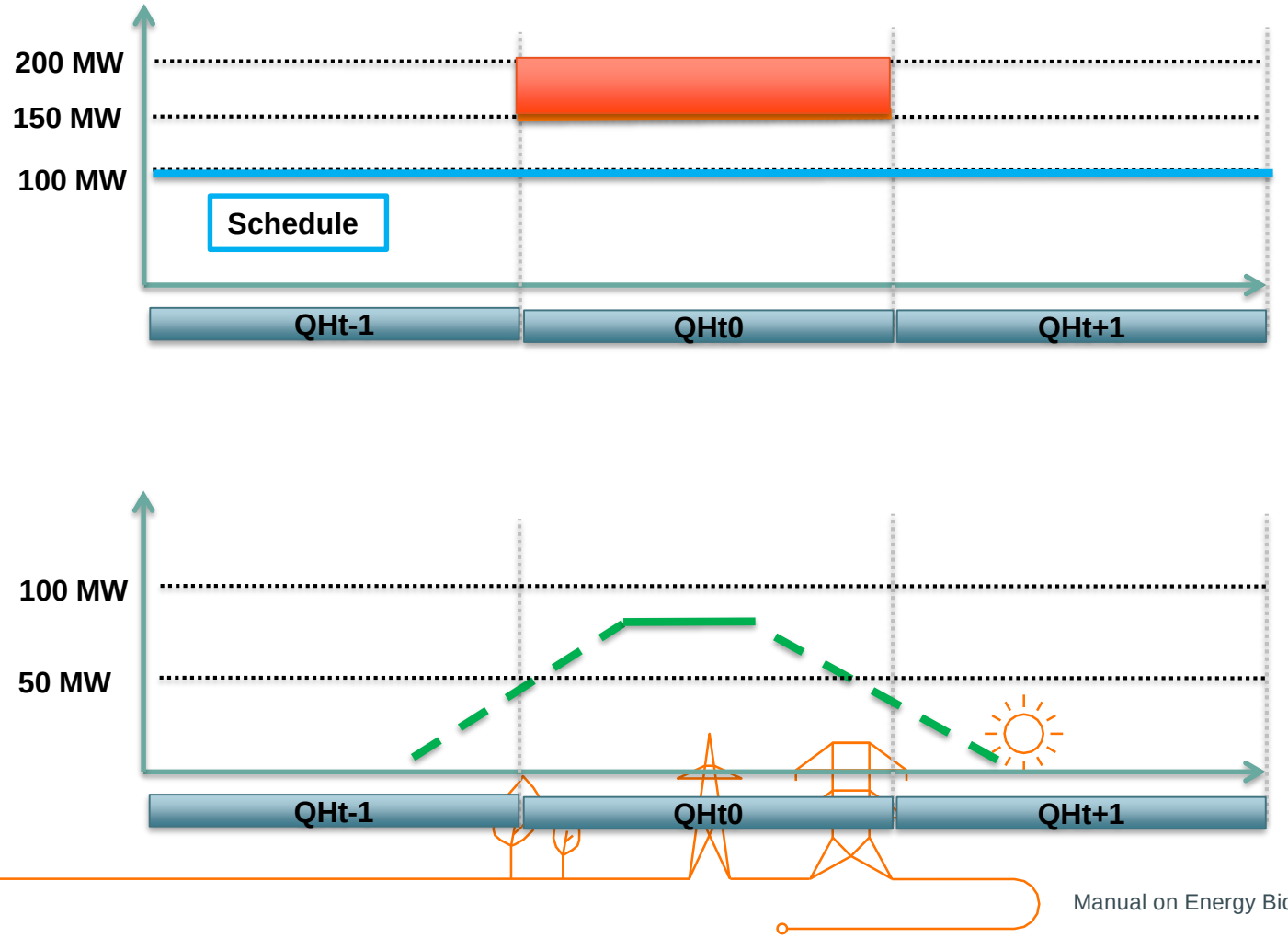
mFRR Energy Bids may also offer a partially divisible volume. This implies:

- that the minimum bid volume is larger than 0 MW but smaller than the bid volume.

A BSP could use such a bid format to offer volume representing the start-up of an asset.

Bid for QH(t0)

Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	**50 MW**
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA only
FRR capacity link	Non-contracted



Bid 001 offers a partially divisible volume: between 50MW and 100 MW can be selected for activation.

Upward activation possible of 100MW. An activation of less than 50MW may not be requested.

This example follows the activation profile of an mFRR Scheduled Activation for 1 qh.

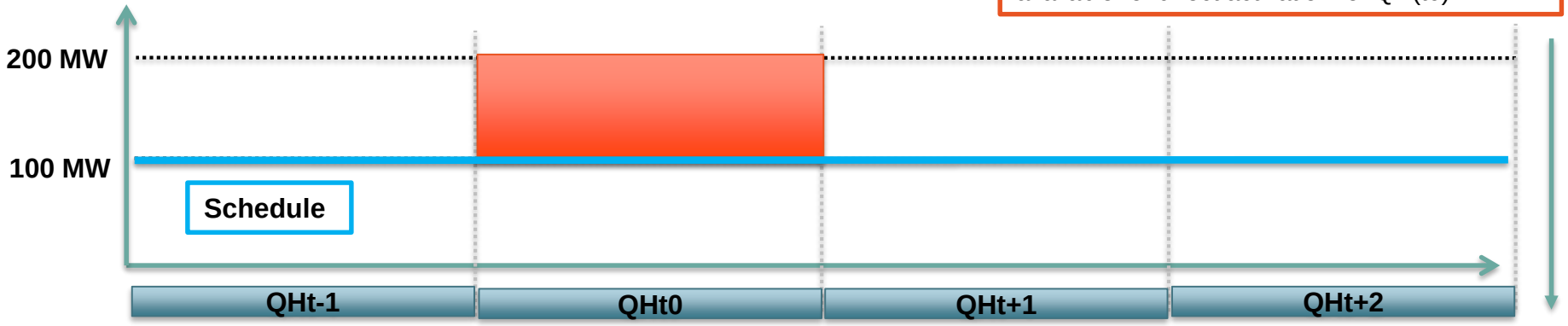
5. Volume available for direct activation

mFRR Energy Bids can be offered for Scheduled Activation only or for both Scheduled and Direct activation. The BSP sets this characteristics by defining the “Activation type” of the bid.

In case a bid for QH(t0) is selected for an mFRR Direct Activation, the period of delivery at full power includes the first 10 minutes of QH(t+1). This is a specific characteristic of mFRR.

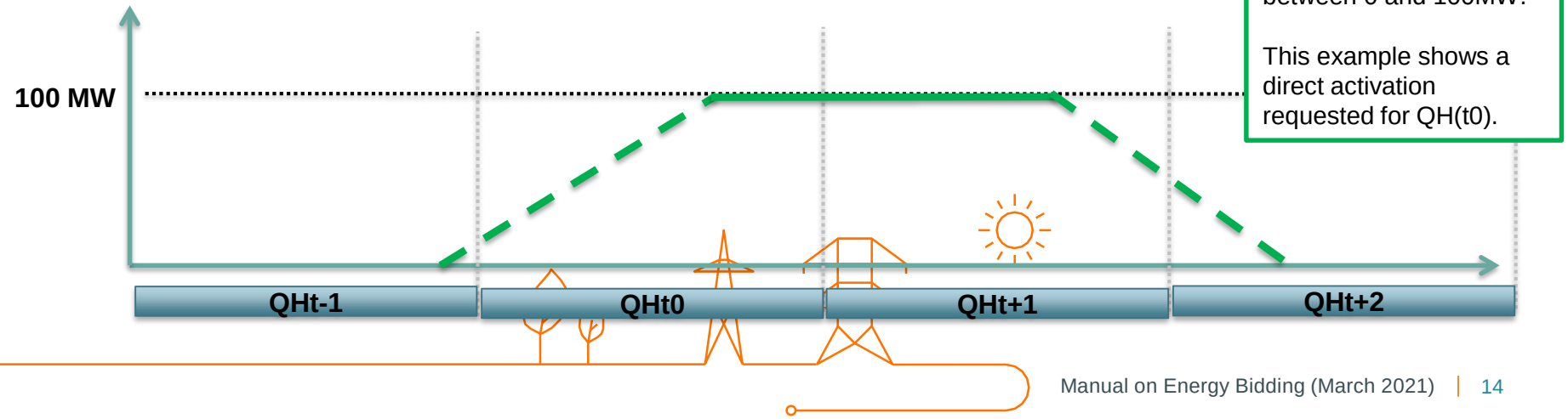
Bid for QH(t0)	
Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
(max) Bid volume	100 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	/
Activation type mFRR	**SA + DA**
FRR capacity link	Contracted

Bid 001 offers a divisible volume up to 100 MW available for direct activation for QH(t0).



Upward activation possible of any power between 0 and 100MW.

This example shows a direct activation requested for QH(t0).

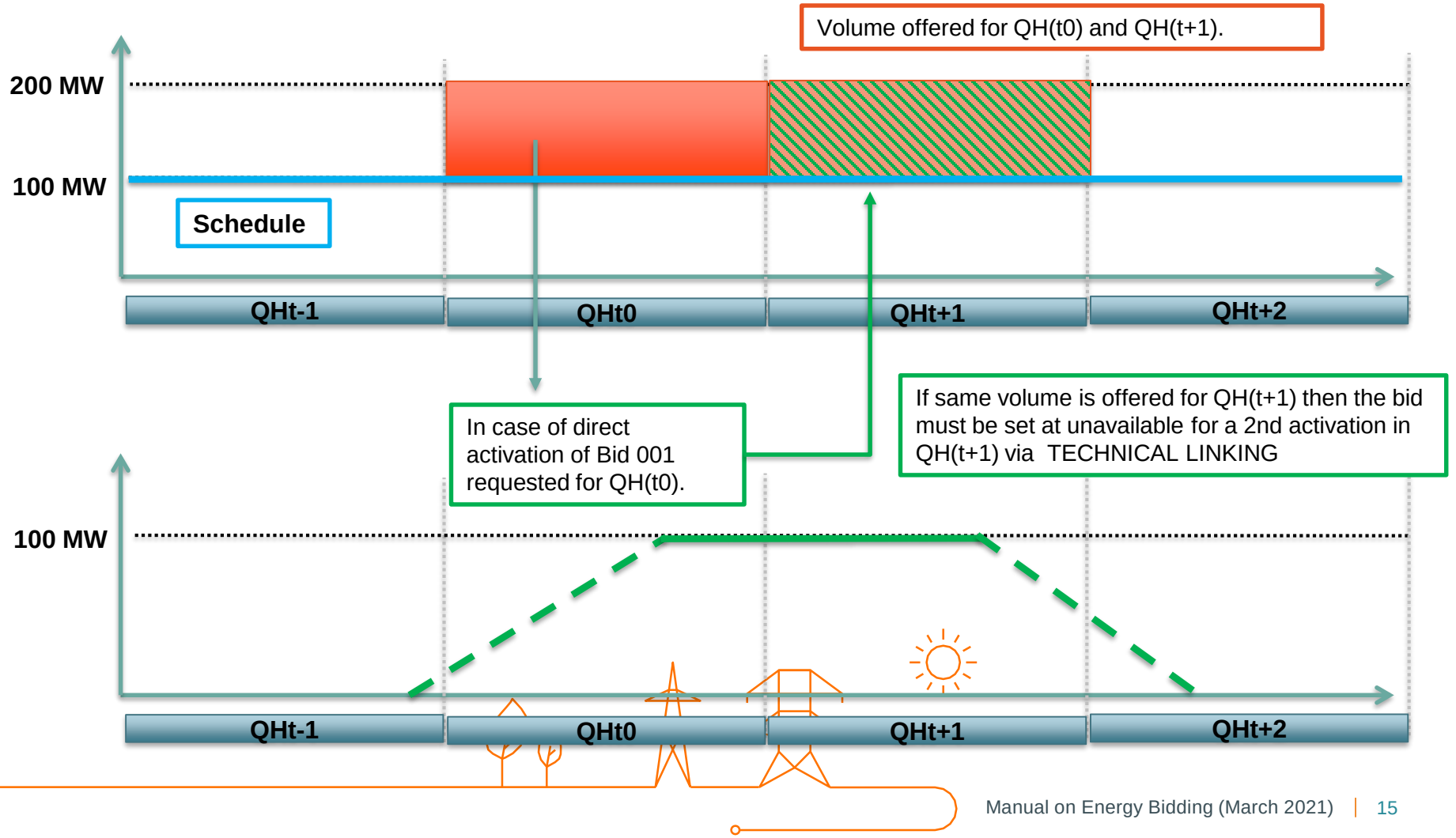


5. Volume available for direct activation: technical linking

Volume that is offered for Direct Activation for QH(t0) would default also be offers in an mFRR Energy Bid for QH(t+1). However, in case of Direct Activation in QH(t0), it must be avoided to again activated the bid in QH(t+1) as this would lead to a double activation of the volume. To prevent such double activation, the bids are 'technically linked. The selection algorithm recognizes the need to technically link mFRR Energy Bids based on the "ID'" bid characteristic.

Bids for QH(t0) & QH(t+1)

Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
(max) Bid volume	100 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	**SA + DA**
FRR capacity link	Contracted



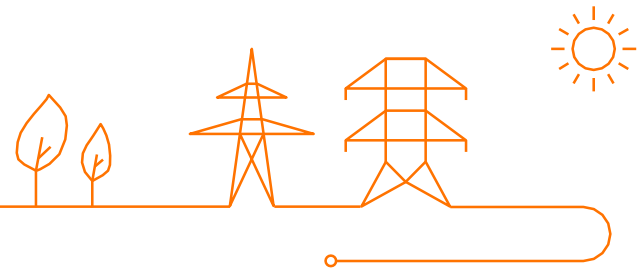
5. Volume available for direct activation: impact of technical linking in case of multiple bids (1)

Multiple mFRR Energy Bids can be offered as available for Direct Activation on the same mFRR Providing Group for the same quarter-hour QH(t) (e.g. the volume on the Providing Group is split and offered at different prices).

Bids for QH(t0) & QH(t+1)

Delivery point(s)	DP1	DP1
ID	001	002
Direction	Upwards	Upwards
Bid price	**50 € / MWh**	**70 € / MWh**
Bid volume	50 MW	50 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	**/**	**/**
Activation type mFRR	**SA + DA**	**SA + DA**
FRR capacity link	Contracted	Contracted

Technical links may exist between 1 bid QH(t0) and 1 bid in QH(t+1):
- Bid 001 in QH(t+1) is linked to Bid 001 in QH(t0)
- Bid 002 in QH(t+1) is linked to Bid 002 in QH(t0)



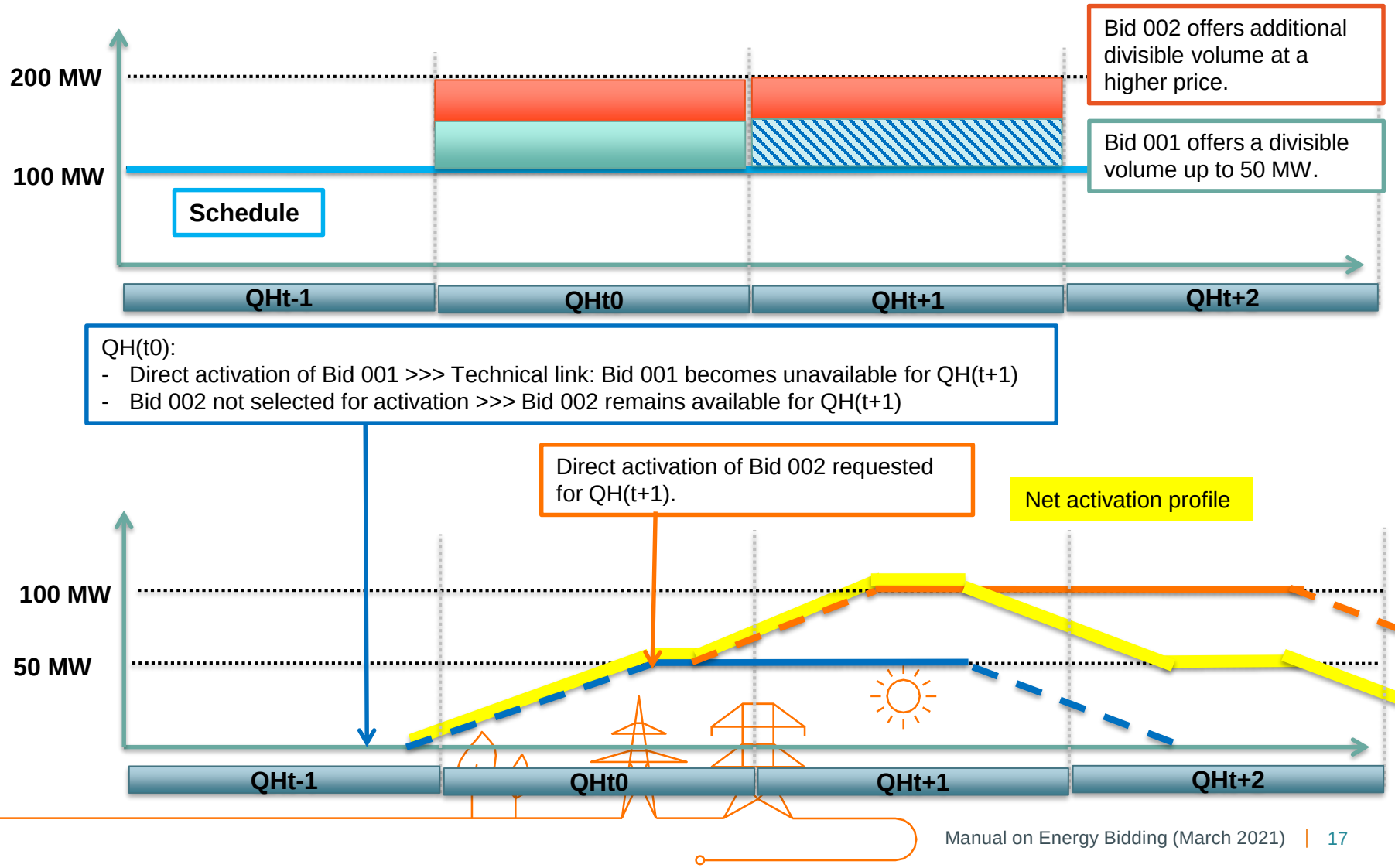
5. Volume available for direct activation: impact of technical linking in case of multiple bids (2)

The activation of multiple bids on the same Providing Group will result in a net expected activation profile.

The impact of the technical link in case of multiple mFRR Energy Bids is shown in the example:

- Bid 001 is selected for direct activation for QH(t0), which implies that full delivery lasts in QH(t+1). There is no consecutive activation requested for QH(t+2).

Bid 002 is selected for direct activation for QH(t+1), which implies that full delivery lasts in QH(t+2). However, the net activation profile changes because of the deactivation of Bid 001.



6. Multiple bids: Volume partly available for direct activation, partly for scheduled activation only

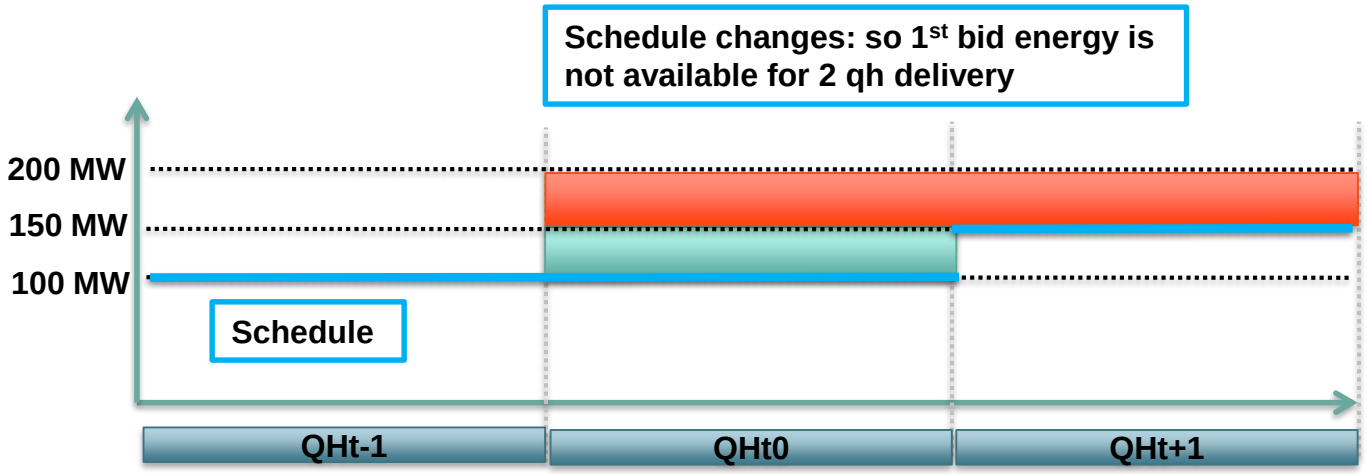
Multiple mFRR Energy Bids can be offered on the same mFRR Providing Group for the same quarter-hour QH(t) because the volume is partly available for both scheduled and direct activation and partly available for scheduled activation only.

A reasons could be:

- The MW schedule changes in the next quarter-hour and thereby a part of the volume is not available for delivery during 2 quarter-hours (which is required in case of direct activation.

Bids for QH(t0)

Delivery point(s)	DP1	DP1
ID	001	002
Direction	Upwards	Upwards
Bid price	50 € / MWh	50 € / MWh
Bid volume	50 MW	50 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	**/**	**/**
Activation type mFRR	SA only	SA +DA
FRR capacity link	**Non-contracted**	**Contracted**



6. Multiple bids: Volume partly available for direct activation, partly for scheduled activation only

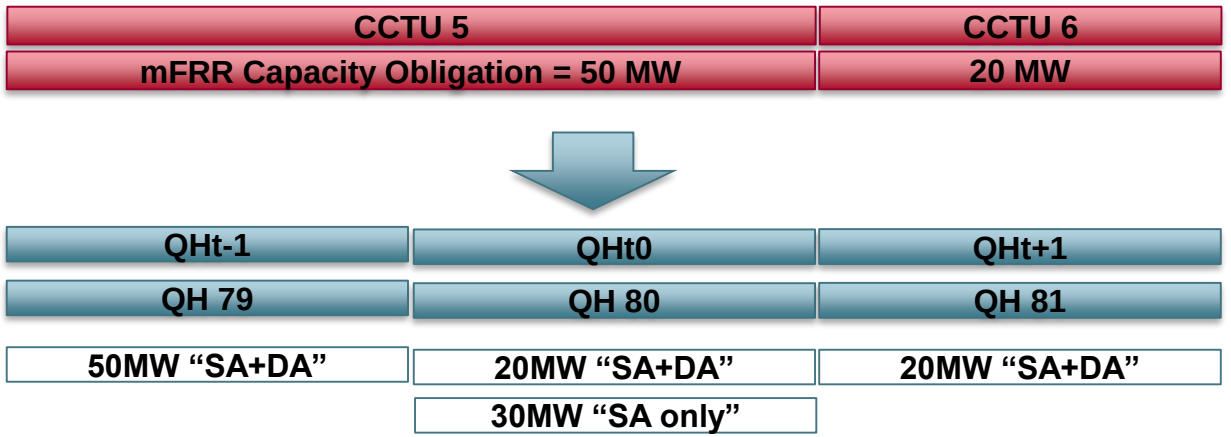
Multiple mFRR Energy Bids can be offered on the same mFRR Providing Group for the same quarter-hour QH(t) because the volume is partly available for both scheduled and direct activation and partly available for scheduled activation only.

A reasons could be:

- The volume is offered in compliance with mFRR Capacity Obligation. However, if it is the last quarter-hour of the contracted period (CCTU) and the energy is not available for balancing during the next quarter-hour then the BSP can offer the volume in the last-quarter-hour of the CCTU as available for scheduled activation only.

Bids for QH(t0)

Delivery point(s)	DP1	DP1
ID	001	002
Direction	Upwards	Upwards
Bid price	50 € / MWh	50 € / MWh
Bid volume	30 MW	20 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	***I***	***I***
Activation type mFRR	SA only	SA +DA
FRR capacity link	**Contracted**	**Contracted**



7. Quarter-hour linking of simple bids *

BSPs may use the bid characteristic **"quarter-hour linking"** to reflect that an mFRR Energy Bid submitted for QH(t0) is available only depending on the selection for activation (or not) of an mFRR Energy Bid on the same mFRR Providing Group in the two preceding quarter-hours.

BSPs need a bid characteristic to show this type of conditionality as at the gate closure time (GCT) for mFRR Energy Bids for QH(t0), the BSP is not yet aware of all activations in the preceding quarter-hours:

- Direct activations for QH(t0) may still be requested until 2,5 minutes after GCT for QH(t+2)
- Scheduled and direct activations for QH(t+1) may be still requested until 17,5 minutes after GCT for QH(t+2).

The use of quarter-hour linking allows to avoid that, in respect of a selection for activation, the underlying asset on which the bid's volume is offered, would need to perform unfeasible activations.

Quarter-hour linking may not be applied on mFRR Energy Bids that are part of an Exclusive Group or a Parent-Child-Relation.

Characteristics of mFRR Energy Bids for qh(t)	QH Linked simple mFRR Energy Bids for qh(t)
ID	Yes
List of Delivery points	Yes
Link with FRR capacity	Yes
Direction	Yes
Bid price	Yes
Bid volume	Yes
Activation type	Yes
Minimum bid volume (indivisible volume)	Yes
Part of exclusive group	**No**
Part of parent/child relation ("multipart bids")	**No**
Quarter-hour linking: ID(s) of linked bids in qh(t-1) or qh(t-2)	**Yes**

** In European documents quarter-hour linking is are called **"conditional linking"**.*

7. Quarter-hour linking of simple bids

An mFRR Energy Bid submitted for QH(t0) may be linked to maximum 3 different mFRR Energy Bids in QH(t-1) and maximum 3 in QH(t-2). The links represent the following situations:

- The QH(t0) bid is **initially** available or unavailable for selection for activation.
- The QH(t0) bid's availability status changes (i.e., the bid becomes (respectively) unavailable or available) if (at least) one of the links is valid.
- The link is applicable if the linked bid in QH(t-1) or QH(t-2) was activated or not.

BSPs create quarter-hour links by using two fields when submitting an mFRR Energy Bid for QH(t0):

- The ID of the mFRR Energy Bid in QH(t-2) or in QH(t-1) to which the bid is linked.
- The type of link:

Type 1. Initially **available** – becomes **un**available if the linked bid is activated (for either scheduled or direct activation)
Type 2. Initially **available** – becomes **un**available if the linked bid is not activated
Type 3. Initially **available** – becomes **un**available if the linked bid is activated for scheduled activation
Type 4. Initially **available** – becomes **un**available if the linked bid is activated for direct activation
Type 5. Initially **available** – becomes **un**available for direct activation if the linked bid is activated for direct activation
Type 6. Initially **available** – becomes **un**available for direct activation if the linked bid is activated for scheduled activation

Type A. Initially **un**available – becomes **available** if the linked bid is activated (for either scheduled or direct activation)
Type B. Initially **un**available – becomes **available** if the linked bid is not activated
Type C. Initially **un**available – becomes **available** if the linked bid is activated for scheduled activation
Type D. Initially **un**available – becomes **available** if the linked bid is activated for direct activation
Type E. Initially **un**available – becomes **available** for direct activation if the linked bid is activated for direct activation
Type F. Initially **un**available – becomes **available** for direct activation if the linked bid is activated for scheduled activation

7. Quarter-hour linking: used to reflect consecutive activation of energy in start-up modus

Example: starting from QH(t-2) a BSP offers energy in start-up modus.

From QH(t-1) onwards, the BSP may submit two mFRR Energy Bids to reflect that the activation price of energy in start-up modus drops in case of consecutive activation (as then only variable costs would be charged).

For the first activation of the start-up bid, the bid price would include both the fixed start-up costs and the variable costs.

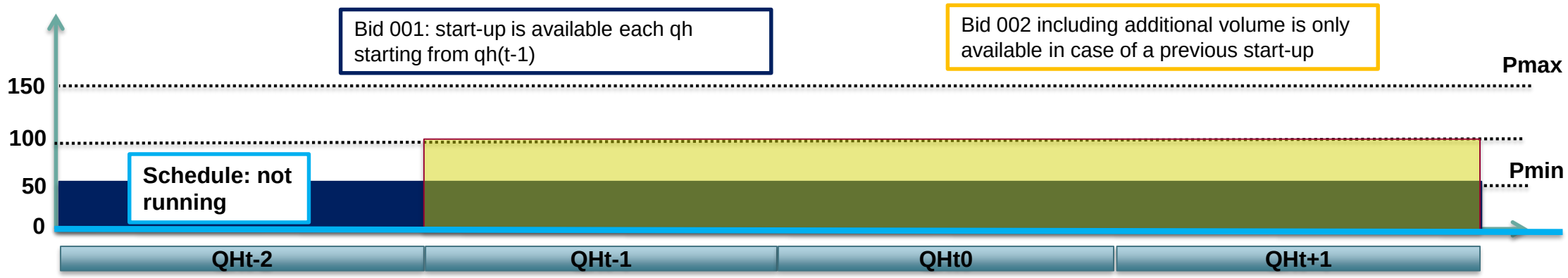
In this example, once started up, then during the next quarter-hour an additional 50MW becomes available for activation leading to a total offered volume of 100MW.

	Bid for QH(t-2)	Bids for QH(t-1)		Bids for QH(t0)	
Delivery point(s)	DP1	DP1	DP1	DP1	DP1
ID	QH-2/001	QH-1/001	QH-1/002	QH0/001	QH0/002
Direction	Upwards	Upwards	Upwards	Upwards	Upwards
Bid price	200 € / MWh	200 € / MWh	50 € / MWh	200 € / MWh	50 € / MWh
Bid volume	50 MW	50 MW	100 MW	50 MW	100 MW
Minimum bid volume	50 MW	50 MW	50 MW	50 MW	50 MW
Exclusive group ID	/	/	/	/	/
Parent/child group ID	/	/	/	/	/
Quarter-hour link 1 - Linked bid & link type	**/**	**QH-2/001 Type 1** (Initially available – becomes unavailable if linked bid is activated)	**QH-2/001 Type C** (Initially unavailable – becomes available if linked bid is activated for SA)	**QH-1/001 Type 1**	**QH-1/001 Type C**
Quarter-hour link 2 - Linked bid & link type	**/**	**QH-2/002 Type 1**	**QH-2/002 Type C**	**QH-1/002 Type 1**	**QH-1/002 Type C**
Quarter-hour link 3 - Linked bid & link type	**/**	**/**	**/**	**QH-2/001 Type 4** (Initially available – becomes unavailable if linked bid is activated for DA)	**QH-2/001 Type D** (Initially unavailable – becomes available if linked bid is activated for DA)
Activation type mFRR	SA + DA	SA + DA	SA only	SA + DA	SA only
FRR capacity link	**Non-contracted**	**Non-contracted**	**Non-contracted**	**Non-contracted**	**Non-contracted**

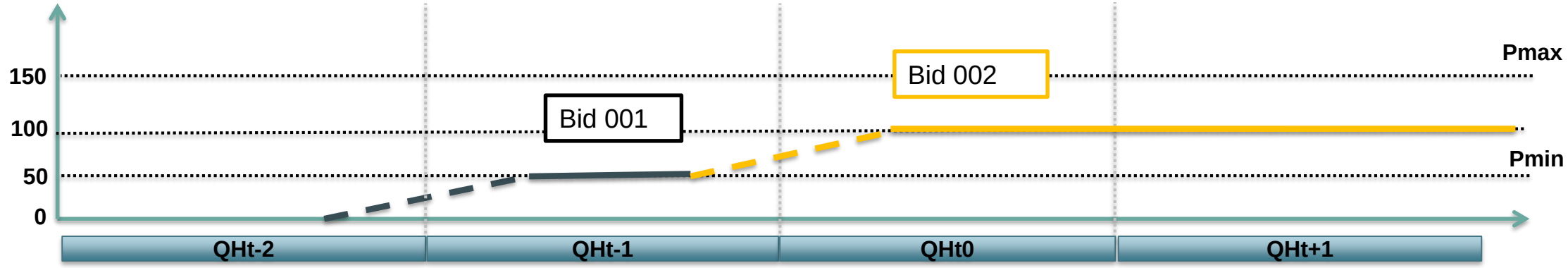
7. Quarter-hour linking: used to reflect consecutive activation of energy in start-up modus

Example:

Offered mFRR Energy Bids



Possible activation



Initial availability	Available	Available	Available	Available
Final availability	Available	Available	**Unavailable**	**Unavailable**
Initial availability	Unavailable	Unavailable	Unavailable	Unavailable
Final availability	Unavailable	Unavailable	**Available**	**Available**

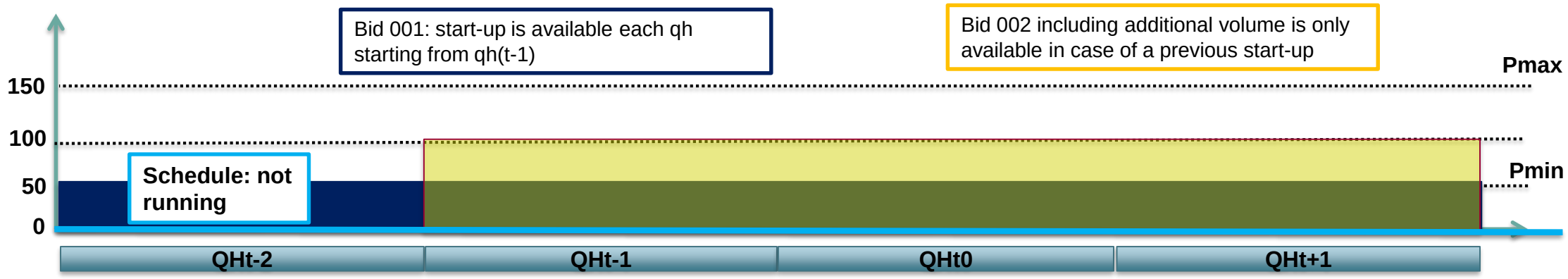
activated

activated

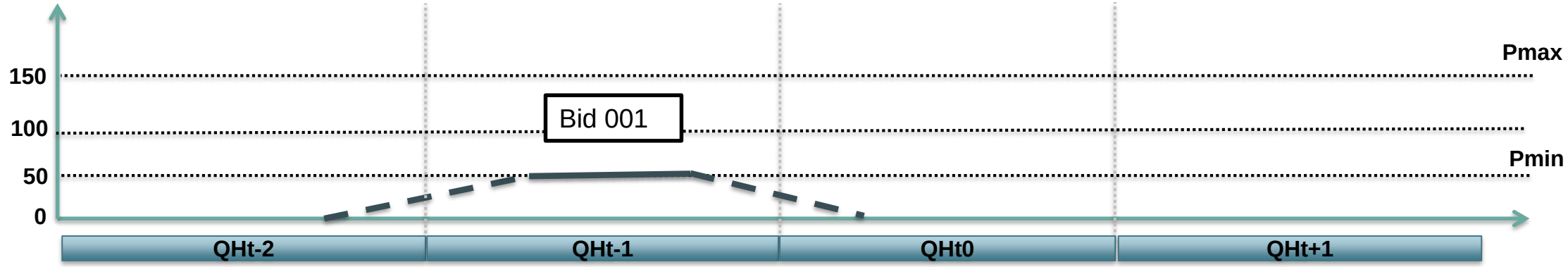
7. Quarter-hour linking: used to reflect consecutive activation of energy in start-up modus

Example:

Offered mFRR Energy Bids



Possible activation



Initial availability	Available	Available	Available	Available
Final availability	Available	Available	**Unavailable**	Available
Initial availability	Unavailable	Unavailable	Unavailable	Unavailable
Final availability	Unavailable	Unavailable	**Available**	Unavailable

activated

Not activated

7. Quarter-hour linking: used to reflect ramping constraints

Example: A BSP offers energy in both upward and downward direction on the same delivery point throughout the day.
Considering the ramping rates, an upward activation after a downward activation is technically not feasible, and therefore the BSP uses QH linking.

Upward volume: 40MW
Downward volume: 40MW
Upward ramping: 4MW/minute
Downward ramping: 10MW/minute

The upward bids are initially available each quarter-hour, but become unavailable if in the previous quarter-hour(s) the bid in the downward direction was activated because the ramping is too slow to switch direction and deliver the full volume from one quarter-hour to another.

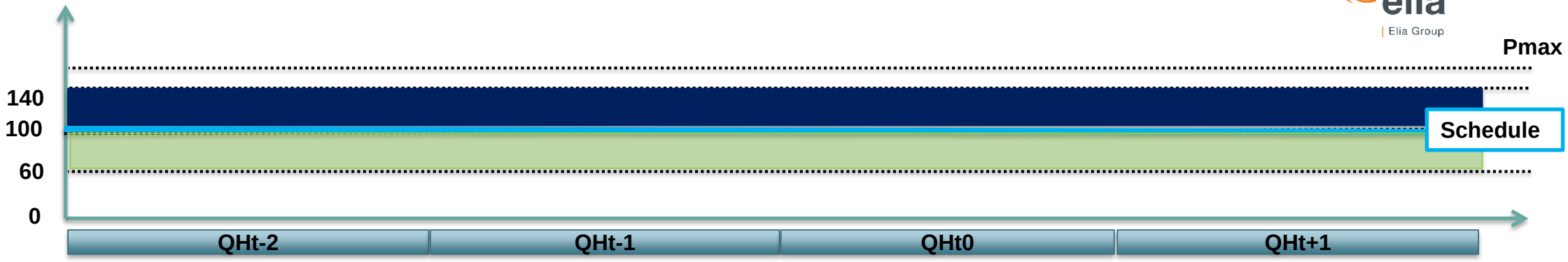
Bids for QH(t0)

Delivery point(s)	DP1	DP1
ID	QH0/001	QH0/003
Direction	**Upwards**	**Downwards**
Bid price	20 € / MWh	5 € / MWh
Bid volume	40 MW	40 MW
Minimum bid volume	10 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link 1 - Linked bid & link type	**QH-1/003** **Type 1** (Initially available – becomes unavailable if linked bid is activated)	**/**
Quarter-hour link 2 - Linked bid & link type	**QH-2/003** **Type 4** (Initially available – becomes unavailable if linked bid is activated for DA)	**/**
Activation type mFRR	SA + DA	SA + DA
FRR capacity link	**Non-contracted**	**Non-contracted**

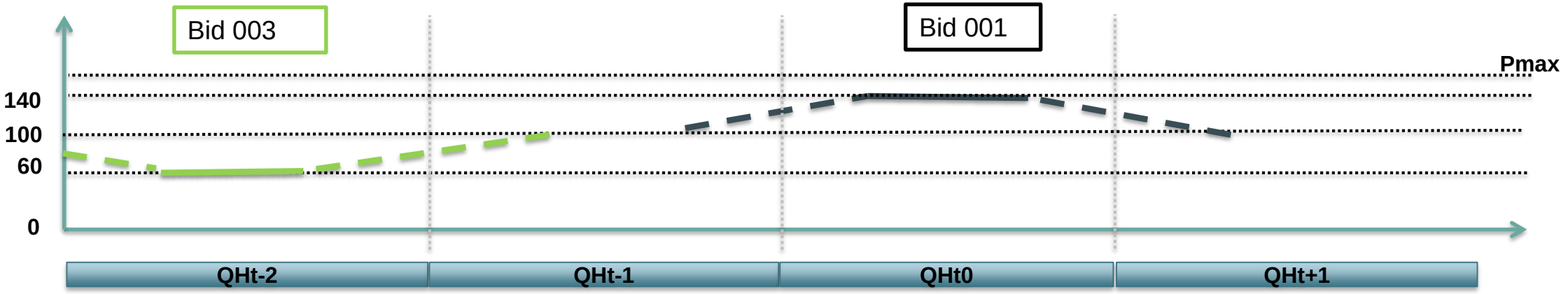
7. Quarter-hour linking: used to reflect ramping constraints

Example:

Offered mFRR Energy Bids: upward & downward



Possible activation



Initial availability	Available	Available	Available	Available
Final availability	Available	**Unavailable**	Available	Available
Initial availability	Available	Available	Available	Available
Final availability	Available	Available	Available	Available

activated

activated

7. Quarter-hour linking: increasingly expensive energy use

Example: A BSP offers upward energy on a delivery point with energy limitations. In case of consecutive activations (as more energy is used and the need to recharge increases), the BSP charges a higher activation price:

⇒ Initially, only the cheapest bid 1 is available:
Bid 001 = 100MW @ 10 €/MWh

⇒ If bid 001 is activated, then during the next quarter-hour bid 002 is available:
Bid 002 = 100MW @ 20 €/MWh

⇒ If then bid 002 is activated, then during the next quarter-hour bid 003 is available:
Bid 003 = 100MW @ 30 €/MWh

Bid 003 remains available for consecutive activations.

Bids for QH(t0)

Delivery point(s)	DP1	DP1	DP1
ID	QH0/001	QH0/002	QH0/003
Direction	Upwards	Upwards	Upwards
Bid price	10 € / MWh	20 € / MWh	30 € / MWh
Bid volume	100 MW	100 MW	100 MW
Minimum bid volume	0 MW	0 MW	0 MW
Exclusive group ID	/	/	/
Parent/child group ID	/	/	/
Quarter-hour link 1 - Linked bid & link type	**QH-1/001** **Type 1** (Initially available – becomes unavailable if linked bid is activated)	**QH-1/001** **Type C** (Initially unavailable – becomes available if linked bid is activated for SA)	**QH-1/002** **Type C**
Quarter-hour link 2 - Linked bid & link type	**QH-2/001** **Type 4** (Initially available – becomes unavailable if linked bid is activated for DA)	**QH-2/001** **Type D** (Initially unavailable – becomes available if linked bid is activated for DA)	**QH-2/002** **Type D**
Quarter-hour link 3 - Linked bid & link type	**QH-1/002** **Type 1**	/	**QH-1/003** **Type C**
Quarter-hour link 4 - Linked bid & link type	**QH-2/002** **Type 4**	/	**QH-2/003** **Type D**
Quarter-hour link 5 - Linked bid & link type	**QH-1/003** **Type 1**	**/**	**/**
Quarter-hour link 6 - Linked bid & link type	**QH-2/003** **Type 4**	**/**	**/**
Activation type mFRR	SA+DA	SA+DA	SA+DA
FRR capacity link	Non-contracted	Non-contracted	Non-contracted

7. Quarter-hour linking: limited energy available

Bid for QH(t0)

Delivery point(s)	DP1
ID	QH0/001
Direction	Upwards
Bid price	7 € / MWh
Bid volume	20 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link 1 **- Linked bid & link type**	**QH-1/001** **Type 6** (Initially available – becomes unavailable for DA if linked bid is activated for SA)
Quarter-hour link 2 **- Linked bid & link type**	**QH-2/001** **Type 5** (Initially available – becomes unavailable for DA if linked bid is activated for DA)
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted

A BSP may offer upward energy on a delivery point with energy limitations.

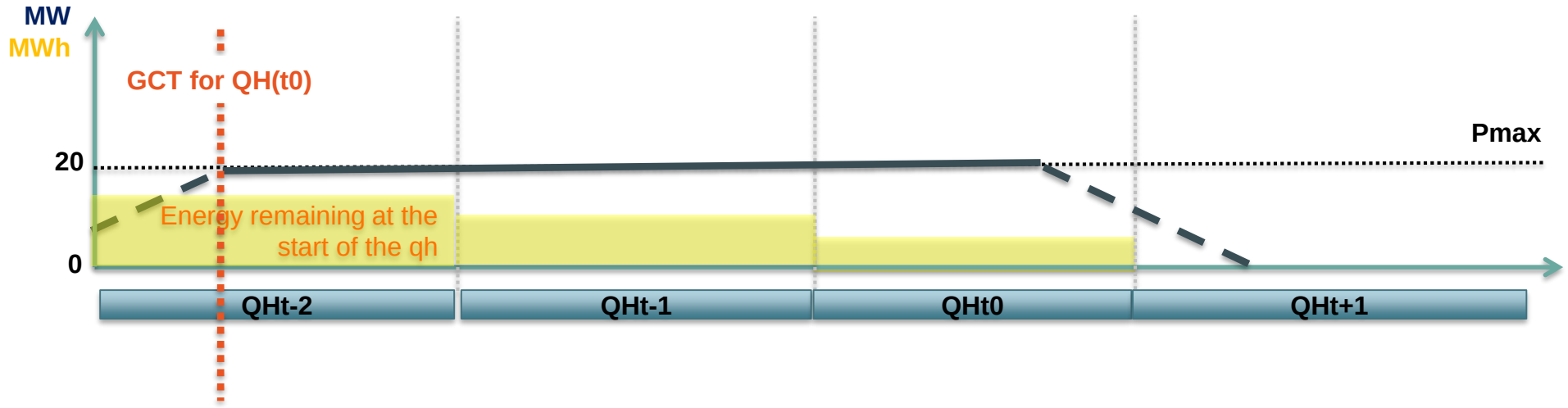
⇒ If there is energy remaining for a full delivery during 4 consecutive quarter-hours, then the BSP can submit a simple unlinked bid.

⇒ If there is not sufficient energy remaining then the BSP can use the quarter-hour linking to prevent activation of an mFRR Energy Bid when the energy is no longer available.

Example:

- Available power per qh: 20MW
- Remaining energy at gate closure time for QH(t0), taking into account activations for QH(t-2) : maximum 10MWh (= 2 qh activations at full power)

7. Quarter-hour linking: limited energy available



Bid 001: Info known at GCT for QH(t0)

Initial availability	Available	Available	Available
Initially remaining energy at start qh	15MWh (= 3 qh)	10MWh (=2qh)	Maximum 10MWh

activated

activated

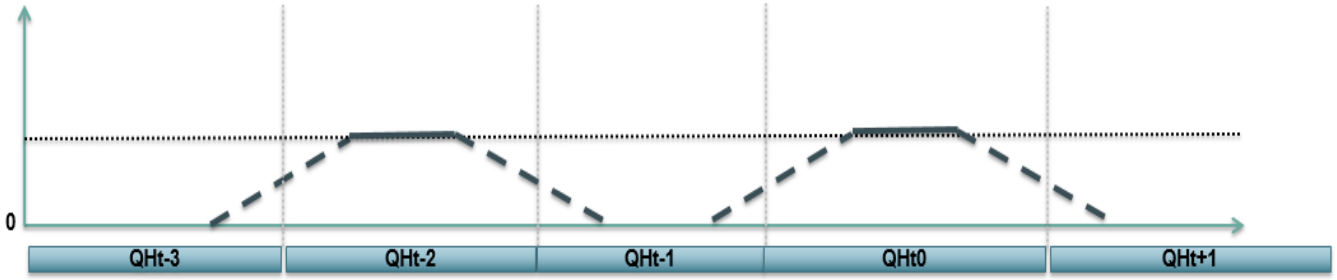
activated

Update in availability status and remaining energy if activated

Updated availability	Available	Available	**Available for SA Unavailable for DA**
Remaining energy after activation	10MWh (= 2 qh) ⇒ Still SA and DA feasible	**5MWh (= 1 qh) ⇒ Only SA feasible afterwards**	**0MWh**

7. Quarter-hour linking: delivery points with a longer required time between two activations

A BSP may offer energy on a delivery point which needs a longer neutralization time than 1 quarter-hour between two activation (or longer than 5 minutes between the end of a deactivation period and the start of a new ramping period) as shown on the figure:

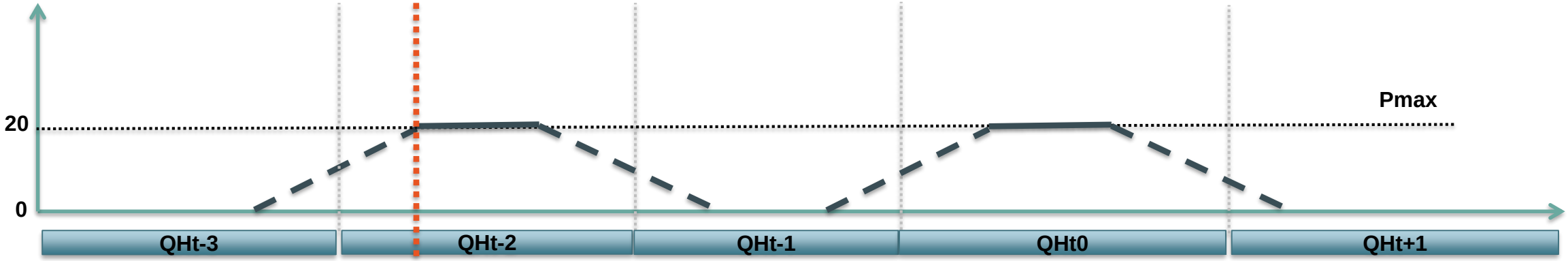


To prevent such an activation pattern, when at GCT for QH(t0) the BSP knows that the bid was already selected for Scheduled Activation for QH(t-2), the BSP can use a quarter-hour link for the mFRR Energy Bid submitted for QH(t0) to prevent activation if there would be not activation requested for QH(t-1) in between, and thereby ensure a longer neutralization time.

Bid for QH(t0)

Delivery point(s)	DP1
ID	QH0/001
Direction	Upwards
Bid price	7 € / MWh
Bid volume	20 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link 1 - Linked bid & link type	**QH-1/001** **Type 2** (Initially available – becomes unavailable if linked bid is not activated)
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted

7. Quarter-hour linking: delivery points with a longer required time between two activations



activated

At GCT for qh(t0), the BSP already knows that a Scheduled Activation for qh(t-2) was requested.

The BSP does not know yet whether there will be a deactivation or a consecutive activation in qh(t-1).

Add quarter-hour link for Bid 001 in bid submission starting from QH(t0):

Quarter-hour link 1		**QH-1/001** **Type 2** (Initially available – becomes unavailable if linked bid is not activated)	**QH0/001** **Type 2** (Initially available – becomes unavailable if linked bid is not activated)
Initial availability	Available	Available	Available
Updated availability		**Unavailable**	**Unavailable**

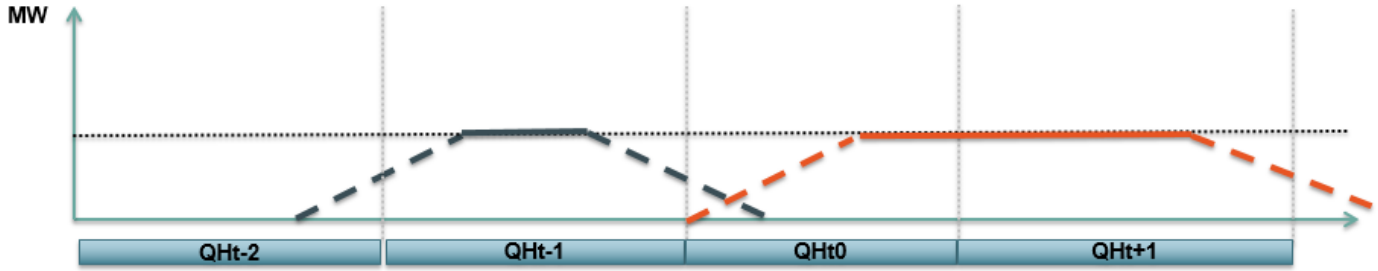
activated

Not activated

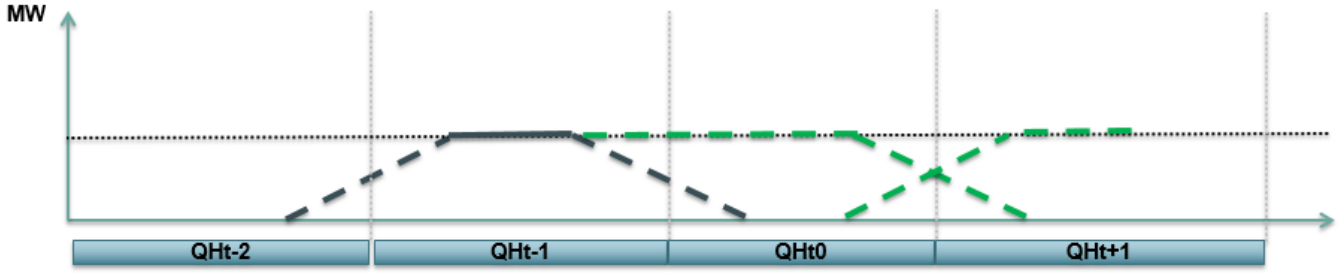
Bids will remain unavailable for activation as long as the quarter-hour link remains valid.
At the end of the neutralization time, the BSP must again delete the quarter-hour link to make bids available again.

7. Quarter-hour linking: preventing direct activation during a deactivation period

A BSP may offer mFRR energy for each quarter-hour but want to prevent that a bid is selected for direct activation for QH(t0) while the deactivation period from a preceding (scheduled or direct) activation is still ongoing on the same delivery point, as shown on the figure:



To prevent such an activation pattern, the BSP can use a quarter-hour link for the mFRR Energy Bid submitted for QH(t0) to prevent direct activation in case of a scheduled activation in QH(t-1) or direct activation n QH(t-2), yet allow either a consecutive scheduled activation for QH(t0) or a next (scheduled or direct) activation for QH(t+1) as shown on the figure:



Bid for QH(t0)

Delivery point(s)	DP1
ID	QH0/001
Direction	Upwards
Bid price	7 € / MWh
Bid volume	20 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link 1 - Linked bid & link type	**QH-1/001** **Type 6** (Initially available – becomes unavailable for DA if linked bid is activated for SA)
Quarter-hour link 2 - Linked bid & link type	**QH-2/001** **Type 5** (Initially available – becomes unavailable for DA if linked bid is activated for DA)
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted

8. Complex mFRR Energy Bids

BSPs may submit 'complex' mFRR Energy Bids: these are bids that are either associated in an **Exclusive Group** or in a **Parent-Child-Relation.**

- An mFRR Energy Bid may not be part of both an exclusive group and a parent-child-relation.
- A complex mFRR Energy Bid may not be subject to quarter-hour linking (see case 7).

Characteristics of mFRR Energy Bids for qh(t)	Simple mFRR Energy Bids for qh(t)	Exclusive Group mFRR Energy Bids for qh(t)	Parent-child-relation mFRR Energy Bids for qh(t)
ID	Yes	Yes	Yes
List of Delivery points	Yes	Yes	Yes
Link with FRR capacity	Yes	Yes	Yes
Direction	Yes	Yes	Yes
Bid price	Yes	Yes	Yes
Bid volume	Yes	Yes	Yes
Activation type	Yes	Yes	Yes
Minimum bid volume (indivisible volume)	Yes	Yes	Yes
Part of exclusive group		**Yes**	
Part of parent/child relation ("multipart bids")			**Yes**
Quarter-hour linking: ID(s) of linked bids in qh(t-1) or qh(t-2)			

8. Complex mFRR Energy Bids: Parent-child-relation *

Several mFRR Energy Bids can be associated via a Parent-Child-Relation during the same quarter-hour. This implies that **the bids that appear later in the merit order can only be selected for activation if the associated bids earlier in the merit order have been fully selected for activation**. An mFRR Energy Bid may only be part of one parent-child-relation for the concerned quarter-hour.

The activation type and direction of the mFRR Energy Bids must be the same. The prices of the mFRR Energy Bids must be different.

The technical link (based on the Parent/Child Group ID) will be applied on the entire group, thereby preventing the activation of any of the bids in parent-child-relation during the next quarter-hour

Bids for QH(t0)

Delivery point(s)	DP1	DP2	DP3
ID	001	002	003
Direction	Upward	Upward	Upward
Bid price	50 € / MWh	70 € / MWh	90 € / MWh
Bid volume	50 MW	100 MW	30 MW
Minimum bid volume	0 MW	0 MW	0 MW
Exclusive group ID	/	/	/
Parent/child group ID	**P/C Group 1**	**P/C Group 1**	**P/C Group 1**
Quarter-hour link	***/***	***/***	***/***
Activation type mFRR	SA+DA	SA+DA	SA+DA
FRR capacity link	Non-contracted	Non-contracted	Non-contracted

** In European documents parent-child-relations are called "multipart bids".*

8. Complex mFRR Energy Bids: Exclusive Groups

Several mFRR Energy Bids can be associated via Exclusive Group during the same quarter-hour. This implies that **only one bid in the exclusive group can be selected for activation in the same quarter-hour**. An mFRR Energy Bid may only be part of one exclusive group for the concerned quarter-hour.

The activation type of the mFRR Energy Bids must be the same but other bid characteristics (even direction) may be different.

In case one of the bids is selected for direction activation, the technical link (based on the Exclusive Group ID) will be applied on the entire group, thereby preventing the activation of any of the bids in the exclusive group during the next quarter-hour

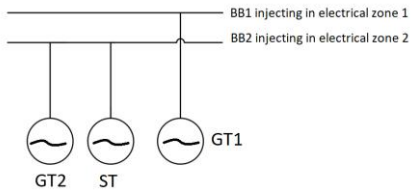
Bids for QH(t0)

Delivery point(s)	DP1	DP2	DP3
ID	001	002	003
Direction	Upward	Upward	Upward
Bid price	50 € / MWh	70 € / MWh	90 € / MWh
Bid volume	50 MW	100 MW	30 MW
Minimum bid volume	0 MW	0 MW	0 MW
Exclusive group ID	**ExclGr 1**	**ExclGr 1**	**ExclGr 1**
Parent/child group ID	/	/	/
Quarter-hour link	**/**	**/**	**/**
Activation type mFRR	SA+DA	SA+DA	SA+DA
FRR capacity link	Non-contracted	Non-contracted	Non-contracted

9. Concrete case:
CCGT - mFRR providing group of DP_{su} with different operating modes

If technically feasible to operate GT1(+ST) and GT2(+ST) separately, then volume must be offered in 2 mFRR Energy Bids if GT1 and GT2 are located in different zones.

Assume a Technical Facility = GT1 + GT2 + ST
The BSP can offer mFRR Energy when the facility is in running mode (production at Pmin or higher) either in full CCGT or full OCGT.



⇒ Example: Divisible positive mFRR energy available up to Pmax: could be on GT1(+ST), on GT2(+ST), or on both

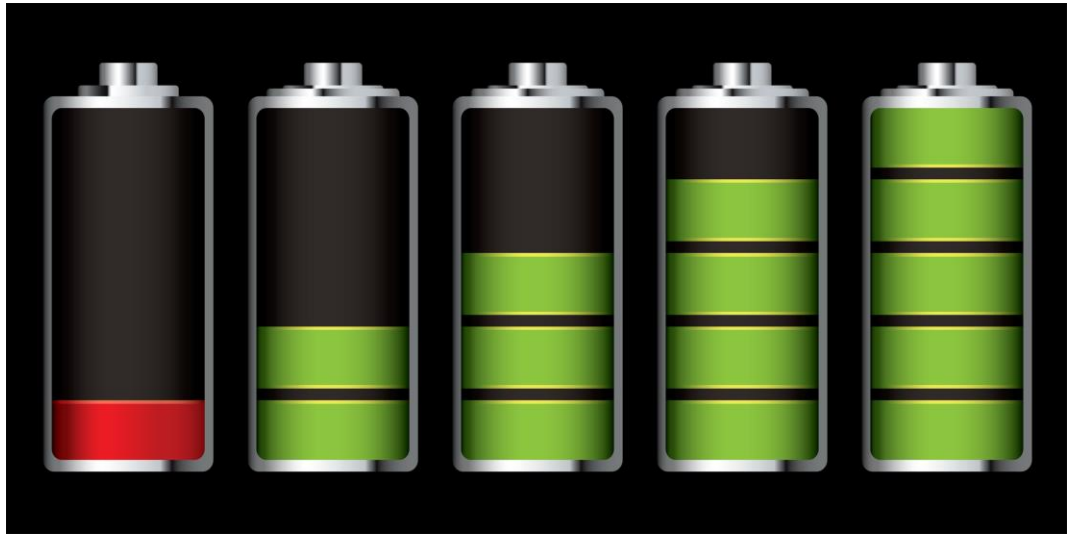
Similar mFRR Energy Bids can be offered for downward activation.

	2 bids for QH(t0)		OR	1 bid for QH(t0)
Delivery point(s)	**GT1, ST**	**GT2, ST**		**GT1, GT2, ST**
ID	001	002		001
Direction	Upward	Upward		Upward
Bid price	63 € / MWh	63 € / MWh		63 € / MWh
Bid volume	50 MW	50 MW		100 MW
Minimum bid volume	0 MW	0 MW		0 MW
Exclusive group ID	/	/		/
Parent/child group ID	/	/		/
Quarter-hour link	/	/		/
Activation type mFRR	SA+DA	SA+DA		SA+DA
FRR capacity link	Non-contracted	Non-contracted		Non-contracted

9. Concrete case:
Limited Energy Resources

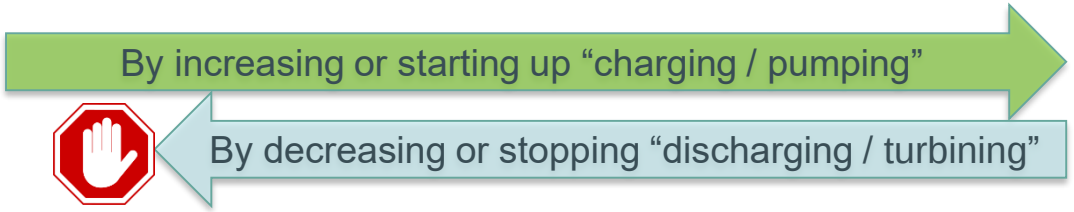
Limited Energy Resources (batteries, pump storage) require attention as, depending on the state of charge and the schedule, several bids may be submitted.

Delivery points may be defined for the entire storage facility or individually for each pump or turbine of a pump storage facility. The examples show the most detailed case with the turbine and pump as individual DP.



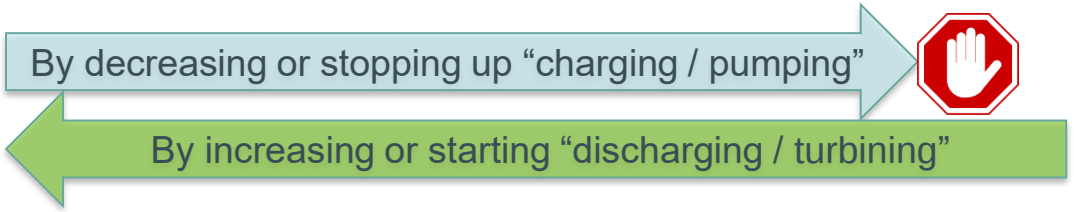
Downward mFRR Energy serves to decrease the net injection on the grid, which can be the result of:

- charging or pumping
- decreasing or shutting down ongoing discharging or turbining



Upward mFRR Energy serves to increase the net injection on the grid, which can be the result of:

- discharging or turbining
- decreasing or shutting down ongoing charging or pumping

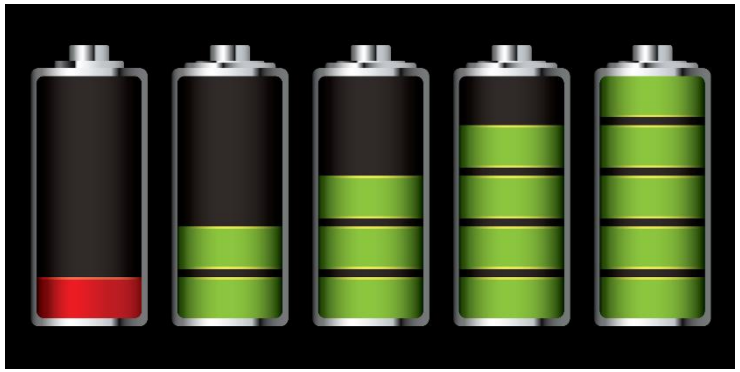


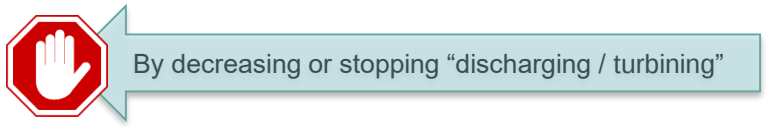
9. Concrete case: Limited Energy Resources
Fully charged & discharging at maximal capacity

Situation: The storage facility is fully charged and scheduled to turbine at maximal capacity. Downward mFRR can be offered by decreasing or even stopping the turbine.

Bid for QH(t0)

Delivery point(s)	Turbine
ID	001
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW – 100 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted





DOWN

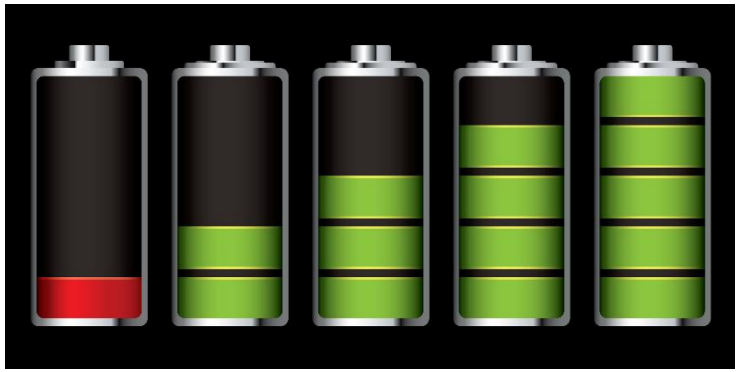
9. Concrete case: Limited Energy Resources Partly charged & discharging

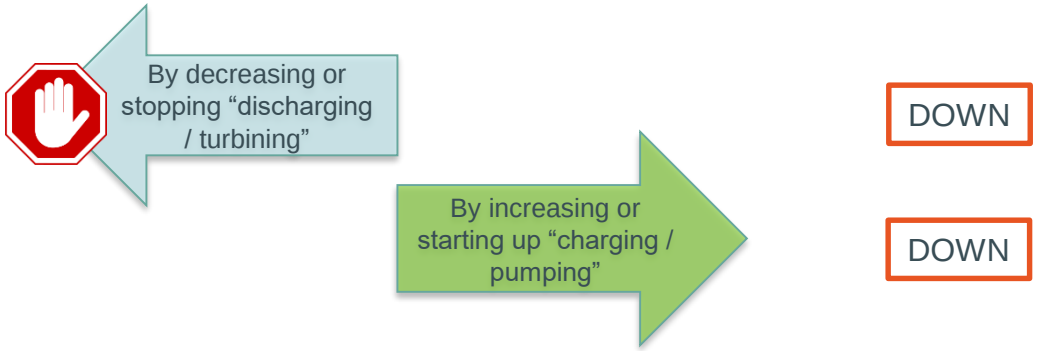
Situation: The storage facility is partly charged and scheduled to turbine at maximal capacity. Downward mFRR can be offered by decreasing or even stopping the turbine, and also by starting up the pumping.

If technically feasible to switch from turbining to pumping in the same quarter-hour, then both can be offered in separate mFRR Energy Bids or in the same mFRR Energy Bid.

Bid for QH(t0)

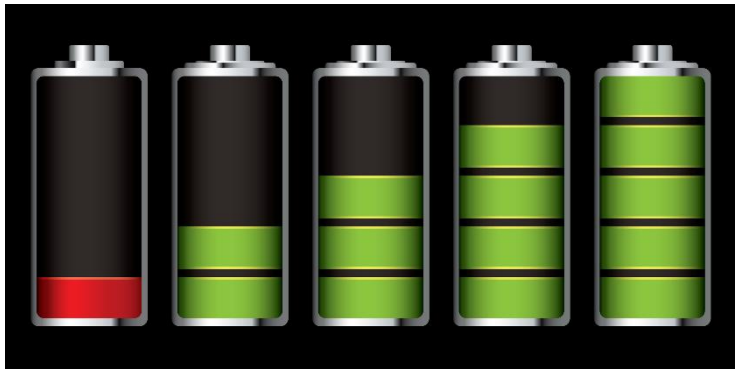
Delivery point(s)	Turbine + Pump
ID	001
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW – 100 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted





9. Concrete case: Limited Energy Resources Partly charged & discharging

Situation: The storage facility is partly charged and scheduled to turbine at maximal capacity. Downward mFRR can be offered by decreasing or even stopping the turbine, and also by starting up the pumping.



If **not** technically feasible to switch from turbining to pumping in the same quarter-hour, then both can be offered in separate mFRR Energy Bids:that are linked: the pumping bid would be initially unavailable and only become available once the turbine as been stopped.

Bid for QH(t0)

Delivery point(s)	Turbine		Pump
ID	QH0/001		QH0/002
Direction	**Downward**		**Downward**
Bid price	20 € / MWh		20 € / MWh
Bid volume	50 MW		50 MW
Minimum bid volume	0 MW		50 MW
Exclusive group ID	/		/
Parent/child group ID	/		/
Quarter-hour link 1 - Linked bid & link type	**/**		**QH-1/001 - Type A** (Initially unavailable – becomes available if linked bid is activated)
Quarter-hour link 2 - Linked bid & link type			**QH-2/001 - Type D** (Initially unavailable – becomes available if linked bid is activated for DA)
Activation type mFRR	SA+DA		SA+DA
FRR capacity link	Non-contracted		Non-contracted

By decreasing or stopping "discharging / turbining"

DOWN

By increasing or starting up "charging / pumping"

DOWN

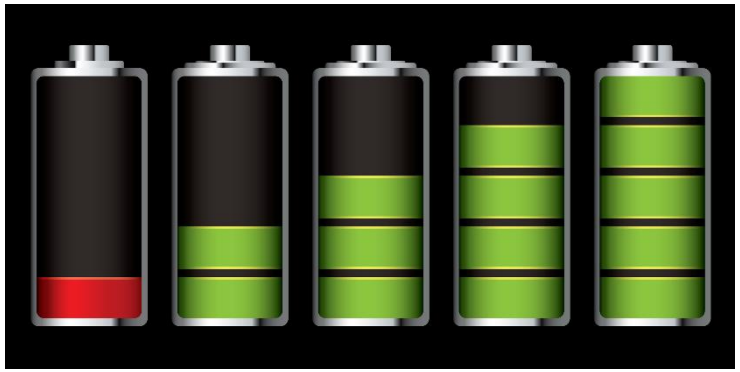
9. Concrete case: Limited Energy Resources
Fully charged & discharging below maximal capacity

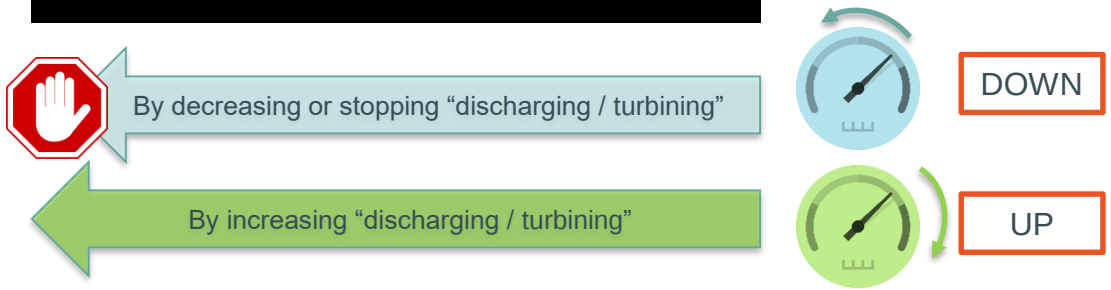
Situation: The storage facility is fully charged and scheduled to turbine, but the turbining is not at maximal capacity. As in the previous cases, downward mFRR can be offered by decreasing or even stopping the turbine.

However, in addition, upward mFRR can be offered by increasing the turbine to maximal capacity, if the state of charge allows an increase in turbing.

Bids for QH(t0)

Delivery point(s)	Turbine		Turbine
ID	001		002
Direction	**Downward**		**Upward**
Bid price	20 € / MWh		25 € / MWh
Bid volume	70 MW		30 MW
Minimum bid volume	0 MW – 70 MW		0 MW
Exclusive group ID	/		/
Parent/child group ID	/		/
Quarter-hour link	**/**		**/**
Activation type mFRR	SA+DA		SA+DA
FRR capacity link	Non-contracted		Non-contracted



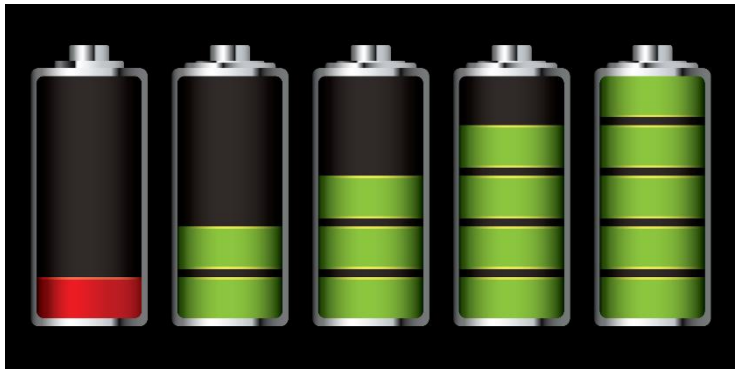


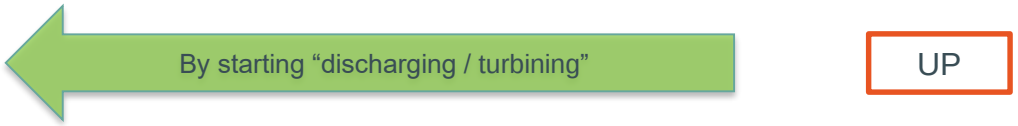
9. Concrete case: Limited Energy Resources Fully charged & not scheduled

Situation: The storage facility is fully charged and not scheduled to turbine. Upward mFRR can be offered by starting up the turbine.

Bid for QH(t0)

Delivery point(s)	Turbine
ID	001
Direction	**Upward**
Bid price	25 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW – 100 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted





Once turbining, starting from the next quarter-hour pumping becomes feasible.

A BSP can in advance submit a downward bid on the pump with a quarter-hour link to the turbine bid as in a previous example.

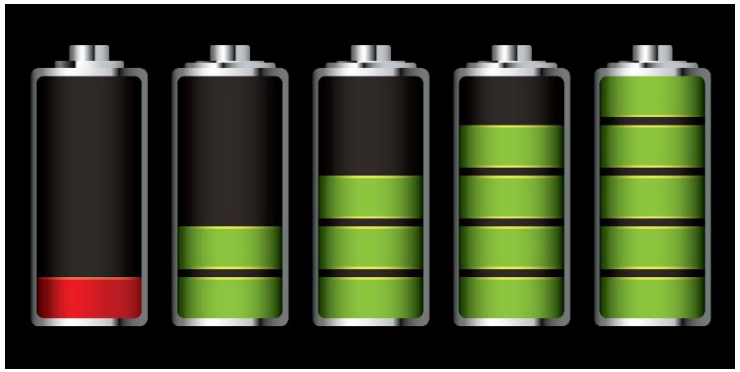
If it would be technically unfeasible to deliver a net result of an activation of both the upward and downward bid, the BSP can use exclusive groups but not quarter-hour linking. This means that the BSP can only submit the downward bid on the pump for quarter-hours with a GCT after QH(t0).

9. Concrete case: Limited Energy Resources Not charged & not scheduled

Situation: The storage facility is not charged and not scheduled to pump. Downward mFRR can be offered by starting up the pump.

Bid for QH(t0)

Delivery point(s)	Pump
ID	001
Direction	**Downward**
Bid price	25 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW – 100 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted



By starting up “charging / pumping” → DOWN

Once pumping, starting from the next quarter-hour turbining becomes feasible.

A BSP can in advance submit an upward bid on the turbine with a quarter-hour link to the pump bid as in a previous example.

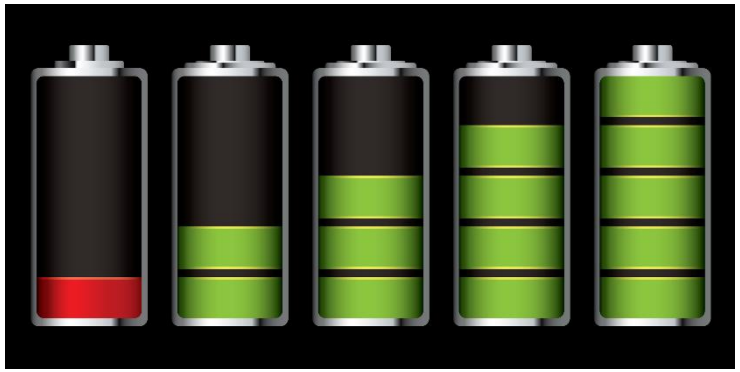
If it would be technically unfeasible to deliver a net result of an activation of both the upward and downward bid, the BSP can use exclusive groups but not quarter-hour linking. This means that the BSP can only submit the upward bid on the turbine for quarter-hours with a GCT after QH(t0).

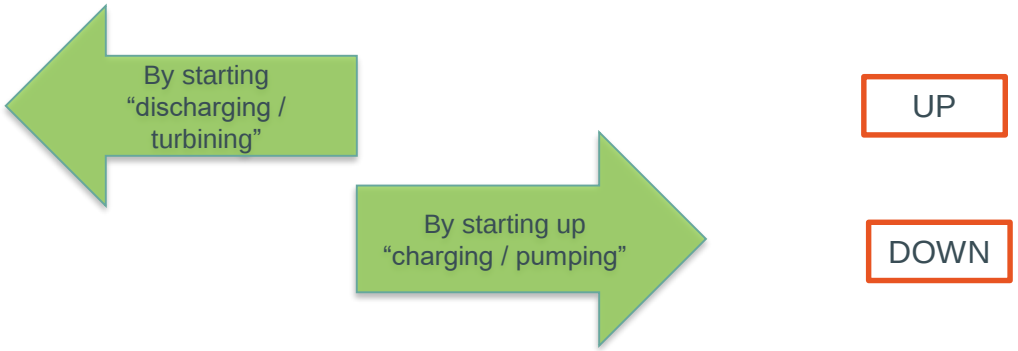
9. Concrete case: Limited Energy Resources Partially charged & not scheduled

Situation: The storage facility is partially charged and not scheduled to pump or turbine. The BSP can offer both upward and downward mFRR.

Bids for QH(t0)

Delivery point(s)	Pump		Turbine
ID	001		002
Direction	**Downward**		**Upward**
Bid price	15 € / MWh		20 € / MWh
Bid volume	50 MW		50 MW
Minimum bid volume	0 MW – 50 MW		0 MW – 50 MW
Exclusive group ID	/		/
Parent/child group ID	/		/
Quarter-hour link	**/**		**/**
Activation type mFRR	SA+DA		SA+DA
FRR capacity link	Non-contracted		Non-contracted





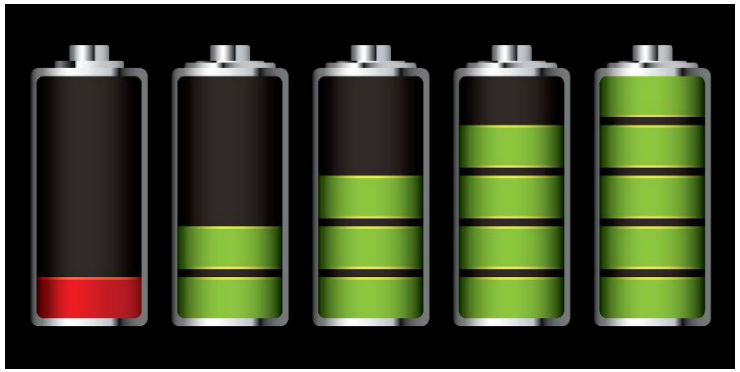
If not technically feasible to respond in a netted way to the activation request of both the upward and the downward bids (due to an indivisible volume), then the BSP can associate the bids in an exclusive group.

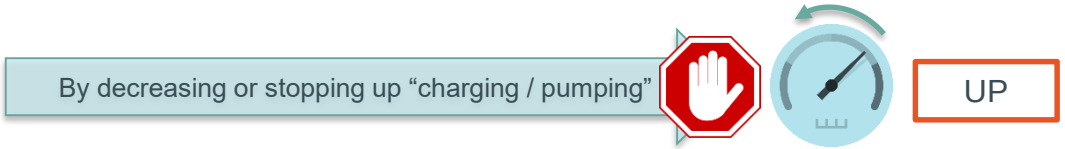
9. Concrete case: Limited Energy Resources Not charged & charging at maximal capacity

Situation: The storage facility is not charged and scheduled to pump at maximal capacity. Upward mFRR can be offered by reducing or shutting down the pump.

Bid for QH(t0)

Delivery point(s)	Pump
ID	001
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW – 100 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
Activation type mFRR	SA+DA
FRR capacity link	Non-contracted





Similar to previous examples, the BSP can offer upward mFRR Energy Bids on the turbine if the state of charge would allow it during QH(t0) or during a subsequent quarter-hour.

Redispatching (RD) Energy Bidding

RD Bidding Characteristics

Scheduling Agents (SA) submit energy bids to Elia using specific bid characteristics that reflect the conditions in which an activation of the bid is acceptable.

The **main redispatching energy bids characteristics are aligned with the mFRR bid characteristics** that serve as a basis for Redispatching Energy Bids.

Two additional bid characteristics are available for the Scheduling Agent to better reflect the specificities of flexibility that is available for redispatching but not for balancing.

- **Full Activation Time (FAT)** that allows bidding flexibility with an activation time longer than 12,5 min
- **Maximum Activation Time (MAT)** that allows bidding flexibility that can only be activated during a limited period of time. This characteristic is particularly useful for energy limited units.

	Energy bid characteristics
Characteristics aligned with mFRR design	Bid ID
	List of DP
	Direction: Upward or Downward activation
	Bid price (€/MWh)
	Bid volume (MW)
	Minimum bid volume (indivisible volume) (MW)
	Part of exclusive group: exclusive group ID
	Part of parent/child relation (“multipart bids”): Parent/child group ID
	Quarter-hour linking (Conditional linking): ID(s) of linked bids in qh(t-1) or qh(t-2)
Redispatching only	Full Activation Time (min)
	Maximum Activation Time (min)

RD Bidding Characteristics – Two specific RD bid properties
Full Activation Time and Maximum Activation Time

Delivery point(s)	DP1
ID	RD001
Direction	Upward
Bid price	50 € / MWh
Bid volume	50 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	/

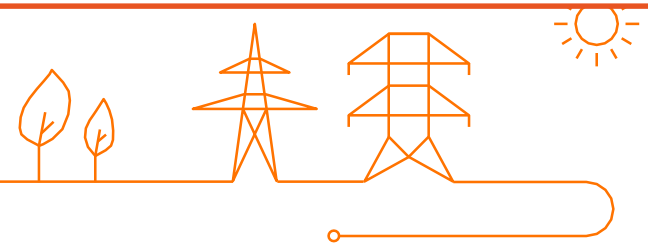
RD Full Activation Time	30 min
RD Max activation time	120 min

Full-activation time (FAT)

- time (in min) necessary for a TU/TUs in an Operating Mode (OM) to reach the requested maximum bid volume (assuming a linear activation profile)
- Default value: 12,5 min
- Granularity:12,5 min OR multiple of 15 min
- In case of activation of part of the volume of a divisible bid: the actual full activation time will be deduced from the FAT, the max bid volume and the RD requested volume

Maximum activation time (MAT)

- maximum time (in min) during which the maximum bid volume can be activated (representing e.g. an energy limit)
- Default value: no limitation
- Granularity: multiple of 15 min
- In case of a fully divisible/partially divisible bid: the MAT is independent on the requested volume



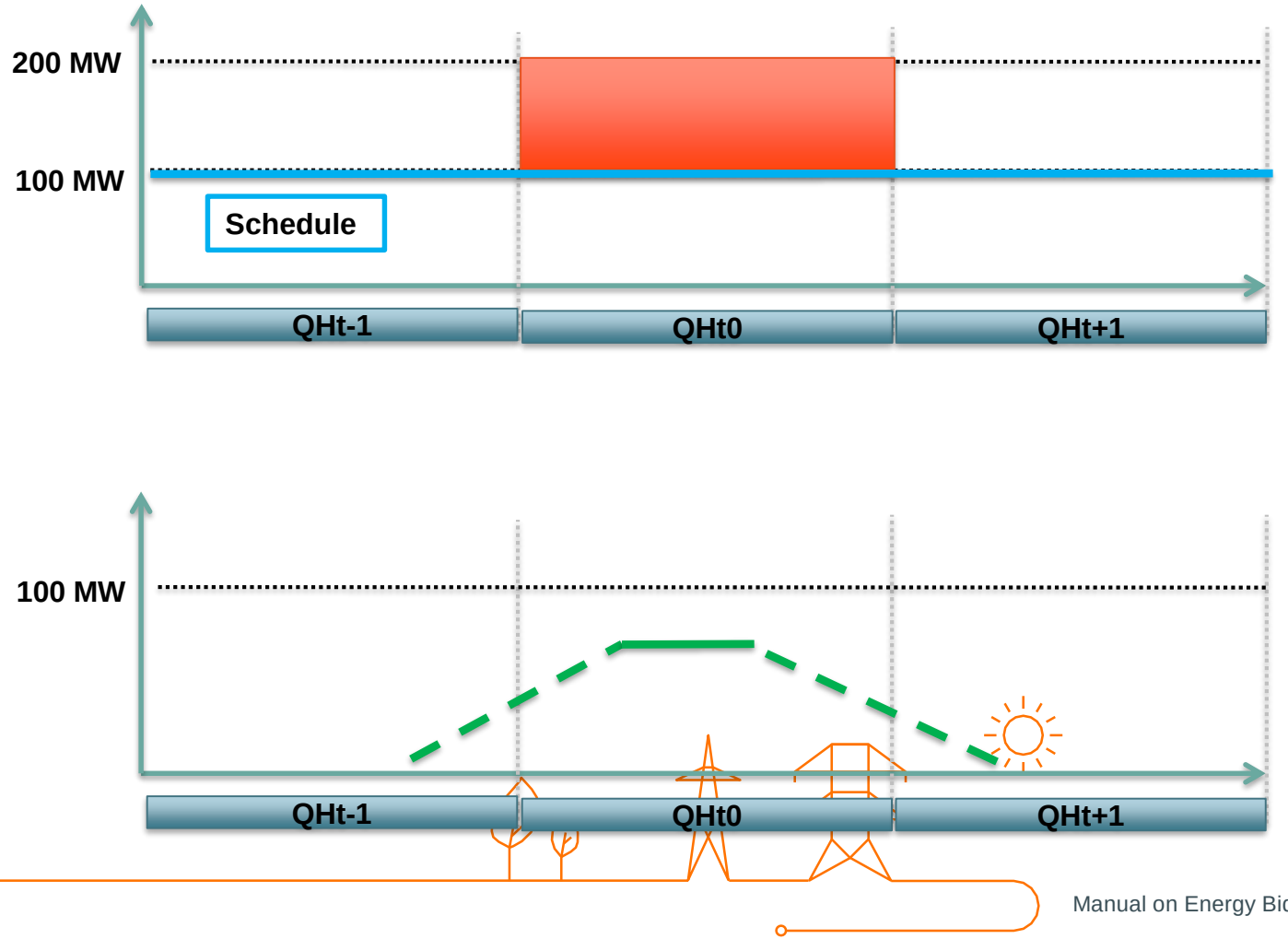
Cases of RD Energy Bidding

1. Divisible volume without complexity – 1 bid
2. Divisible volume without complexity – Multiple bids
3. Indivisible volume
4. Partially divisible volume
5. Bid with longer Full Activation Time
    - Indivisible volume
    - Divisible volume
6. Bid with Maximum Activation time
7. Quarter-hour linking of simple bids
    - Consecutive activation of energy in start-up modus
8. Complex bids:
    - Parent-child relation
    - Exclusive groups
        - Exclusive groups - Energy limited case
9. Concrete cases
    - Technical Facility with different operating modes: CCGT
    - Limited Energy Resources

1. Divisible volume without complexity – 1 bid

The most simple bids include only a (fully divisible) bid volume and price. For RD Energy Bids this implies also that the minimum bid volume (indivisible part) is 0MW.

Bid for QH(t0)	
Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	/
RD Full Activation Time	12,5 min
RD Max activation time	/



Bid 001 offers a divisible volume up to 100 MW.

Upward activation possible of any power between 0 and 100MW.

This example follows the activation profile of a RD Scheduled Activation for 1 qh.

2. Divisible volume without complexity – Multiple bids

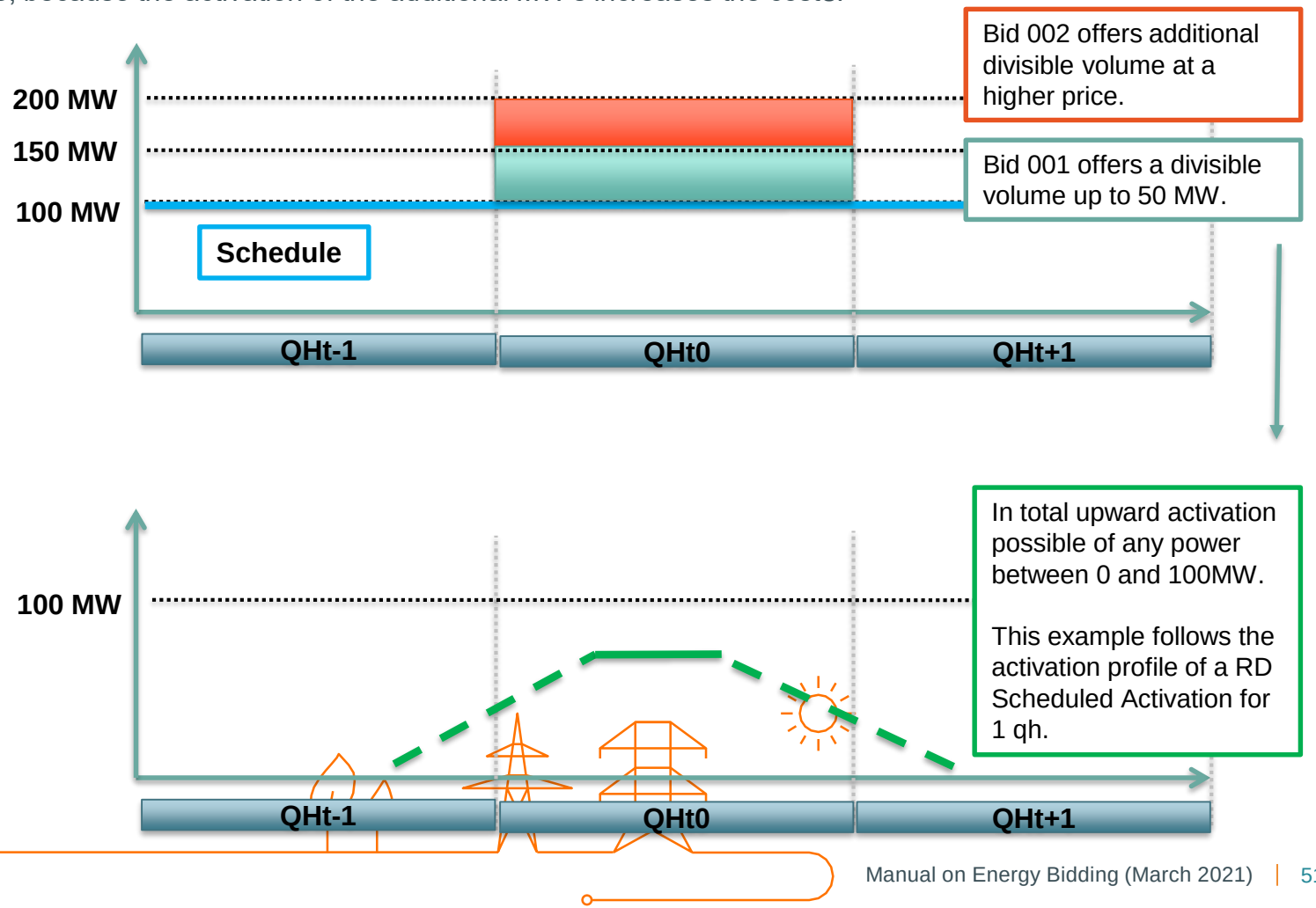
Multiple RD Energy Bids can be offered for the same quarter-hour QH(t).

A reason could be:

- volume is split and offered at different price, for example, because the activation of the additional MW's increases the costs.

Bids for QH(t0)

Delivery point(s)	DP1	DP1
ID	001	002
Direction	Upward	Upward
Bid price	**50 € / MWh**	**70 € / MWh**
Bid volume	50 MW	50 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	**/**	**/**
RD Full Activation Time	12,5 min	12,5 min
RD Maximum Activation Time	/	/



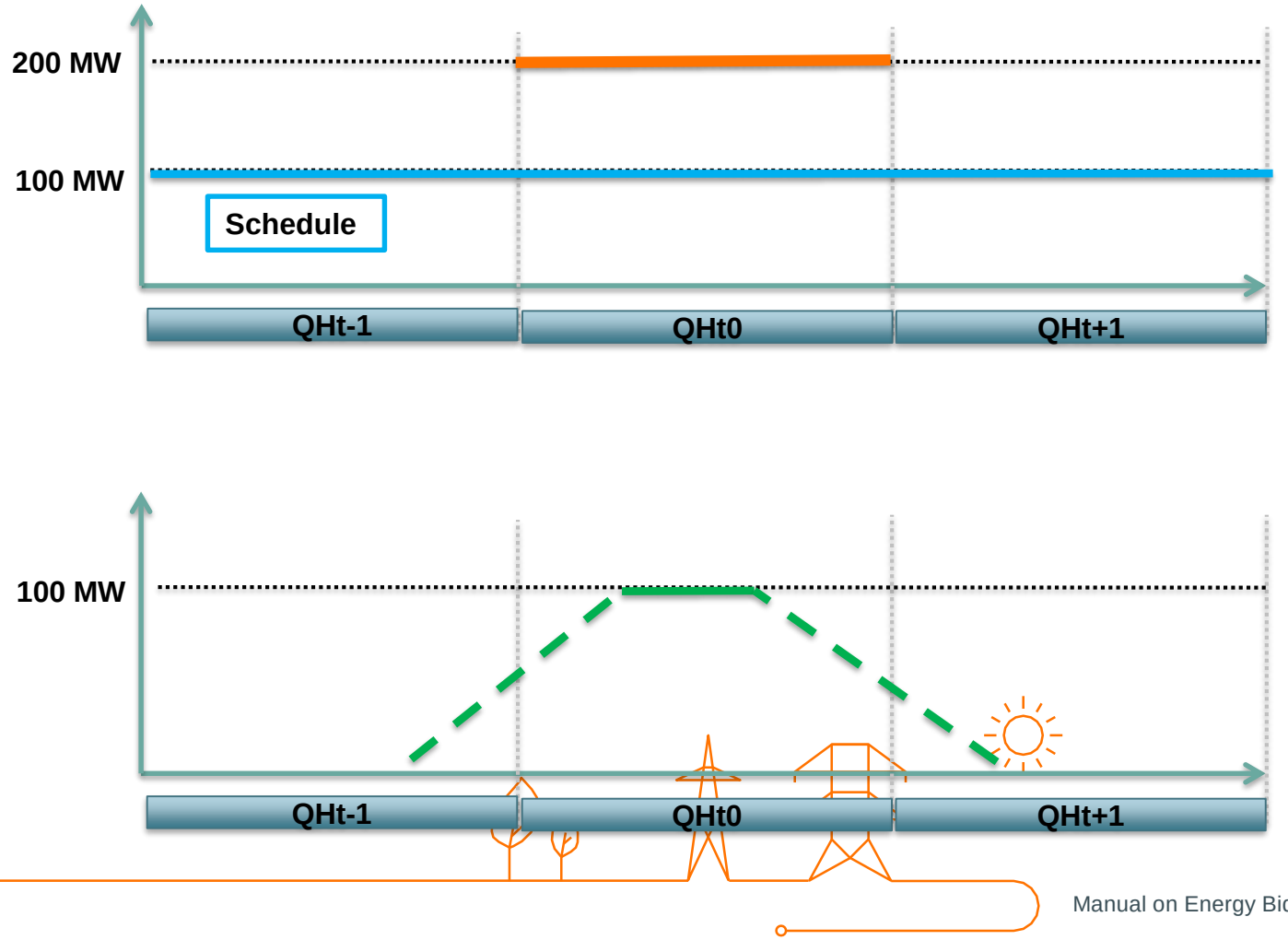
3. Indivisible volume

RD Energy Bids may also offer an indivisible volume. This implies:

- that the minimum bid volume equals the bid volume.

Bid for QH(t0)

Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	**100 MW**
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	/



Bid 001 offers an indivisible volume of 100 MW.

Upward activation possible of 100MW. An activation of less than 100MW may not be requested.

This example follows the activation profile of a RD Scheduled Activation for 1 qh.

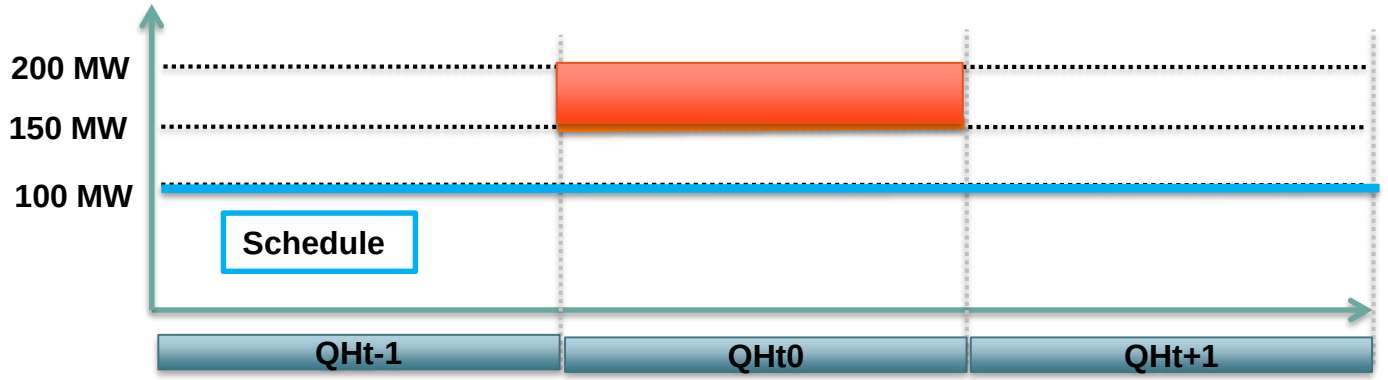
4. Partially divisible volume

RD Energy Bids may also offer a partially divisible volume. This implies:

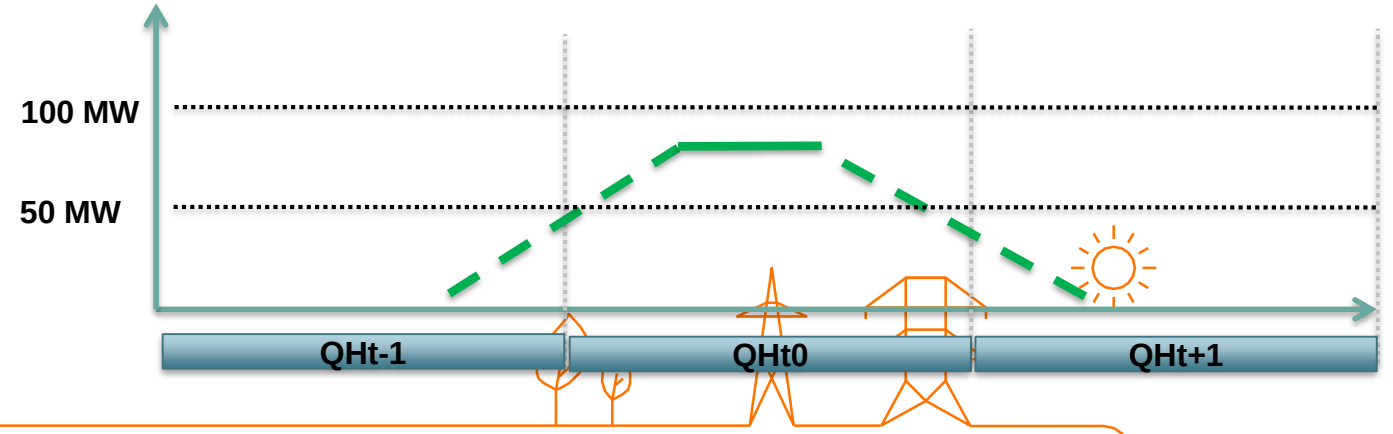
- that the minimum bid volume is larger than 0 MW but smaller than the bid volume.

Bid for QH(t0)

Delivery point(s)	DP1
ID	001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	**50 MW**
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	/



Bid 001 offers a partially divisible volume: between 50MW and 100 MW can be selected for activation.



Upward activation possible of 100MW. An activation of less than 50MW may not be requested.

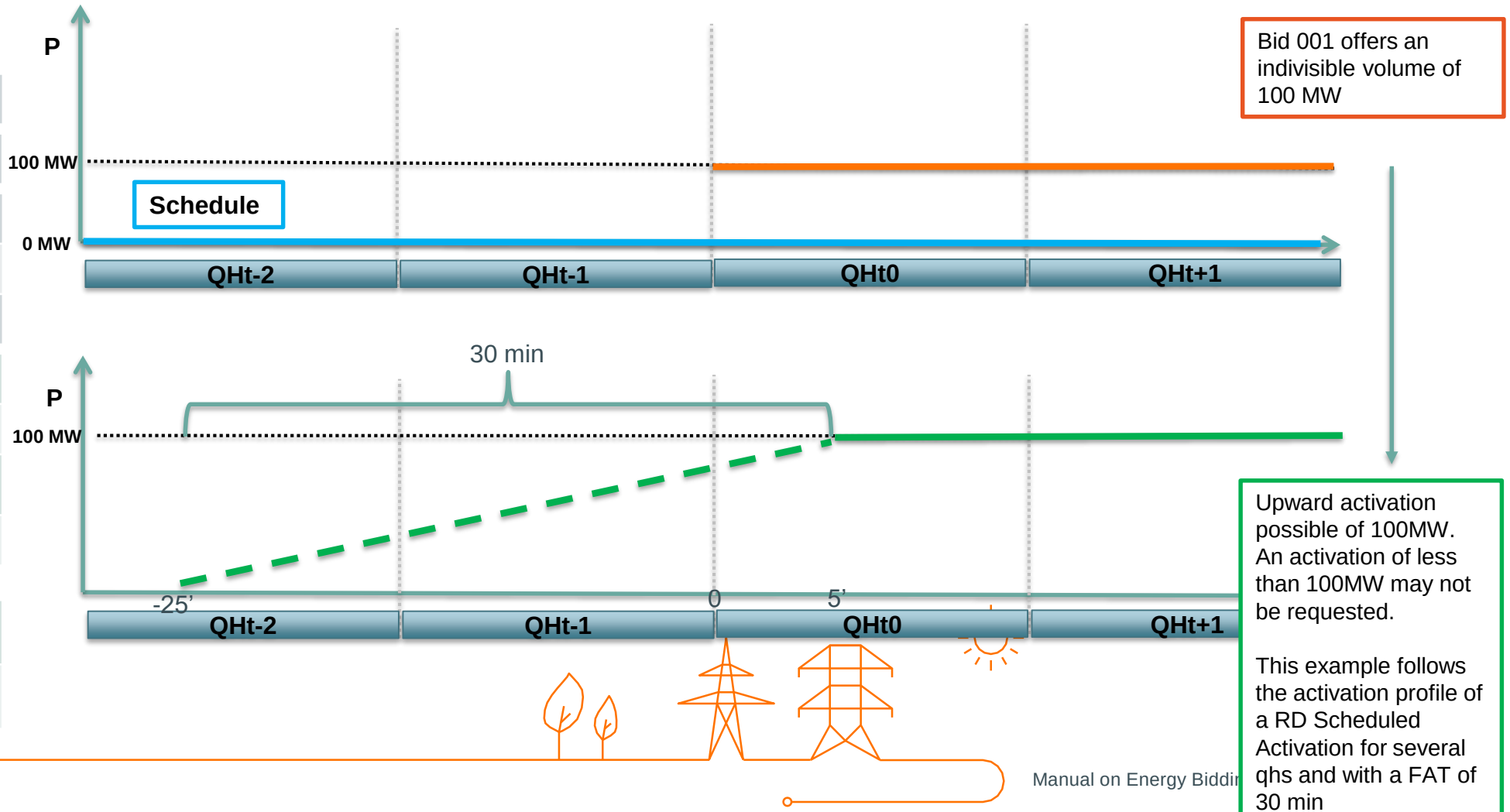
This example follows the activation profile of a RD Scheduled Activation for 1 qh.

5 Simple indivisible bid with longer Full Activation Time

A simple indivisible bid with a FAT longer than 12,5 min means that the deadline for Elia to request the activation of the offered flexibility (in scheduled or direct activation) starting at Qht0 must respect the FAT indicated in the bid.

Bids for qht0

Delivery point(s)	DP1
ID	RD001
Direction	Upward
Bid price	200 € / MWh
Bid volume	100 MW
Minimum bid volume	100 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	**30 min**
RD Max activation time	/



5 Simple divisible bid with longer Full Activation Time

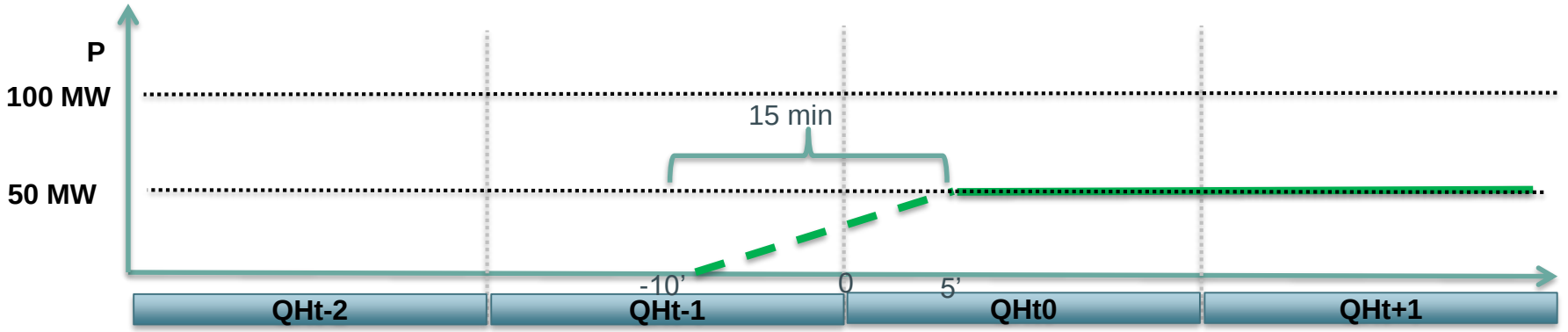
A simple divisible bid with a FAT longer than 12,5 min means that the deadline for Elia to request the activation of the offered flexibility (in scheduled or direct activation) starting at Qht0 must request the FAT indicated in the bid.

In case of activation of part of the volume of a divisible/partially divisible bid, the actual full activation time will be deduced from the following bid characteristics: FAT, max bid volume in combination with the RD requested volume assuming a linear activation profile i.e.

Actual activation time = FAT * RD requested/max Bid volume

Bids for qh1

Delivery point(s)	DP1
ID	RD001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	/
RD Full Activation Time	30 min
RD Max activation time	/



Bid 001 offers a divisible volume up to 100 MW with a FAT of 30 min

Upward activation possible of any power between 0 and 100MW.

If the RD requested volume is 50 MW, the expected activation time will be: 50/100 * 30 = 15 min

This example follows the activation profile of a RD Scheduled Activation for several qhs from qht0 with an activation time of 15 min.

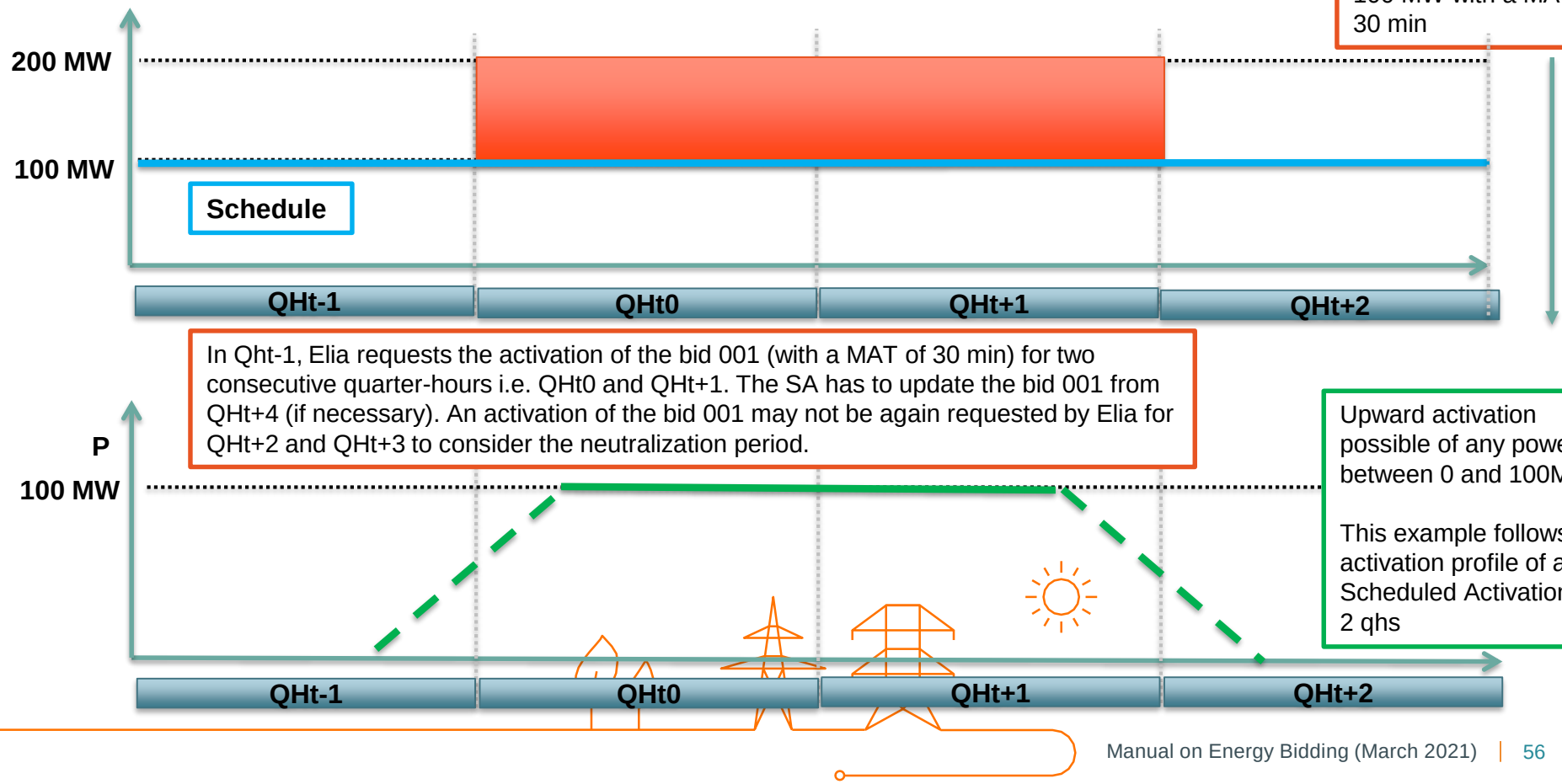
Note: If part but not all the flexibility is available within a FAT of 12,5 min, this flexibility could also be offered via several different bids with a FAT of 12,5min that are linked via Qh linking

6. Simple bid with Maximum Activation Time

A simple divisible bid with a MAT means that Elia can only request the activation of the offered flexibility (in scheduled or direct activation) starting at QHt0 for a limited number of quarter-hours defined by this parameter in the bid. If the activation of the bid is requested from QHt0 for a given period (respecting the MAT indicated in the bid), the SA has to update its RD bid for the quarter-hours following the end of the activation period (if necessary). To allow the SA to update its RD bid considering the neutralization period and avoid unfeasible activations, a new activation of the bid cannot be requested by Elia during 1 hour following the initial activation request in QHt0 (i.e. no new activation of the bid until QHt+3 included).

The MAT characteristic is independent on the divisibility of the bid i.e. is applied for any requested bid volume.

Delivery point(s)	DP1
ID	RD001
Direction	Upward
Bid price	50 € / MWh
Bid volume	100 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Max activation time	**30 min**



7. Quarter-hour linking of simple bids

SA's may use the bid characteristic **"quarter-hour linking"** to reflect that a RD Energy Bid submitted for QH(t0) is available only depending on the selection for activation (or not) of a RD Energy Bid in the two preceding quarter-hours.

A RD Energy Bid submitted for QH(t0) may be linked to maximum 3 different RD Energy Bids in QH(t-1) and maximum 3 in QH(t-2). The links represent the following situations:

- The QH(t0) bid is **initially** available or unavailable for selection for activation.
- The QH(t0) bid's availability status changes (i.e., the bid becomes (respectively) unavailable or available) if (at least) one of the links is valid.
- The link is applicable if the linked bid in QH(t-1) or QH(t-2) was activated or not.

SA's create quarter-hour links by using two fields when submitting a RD Energy Bid for QH(t0):

- The ID of the RD Energy Bid in QH(t-2) or in QH(t-1) to which the bid is linked.
- The type of link:

Type 1. Initially **available** – becomes **un**available if the linked bid is activated
Type 2. Initially **available** – becomes **un**available if the linked bid is not activated

Type A. Initially **un**available – becomes **available** if the linked bid is activated
Type B. Initially **un**available – becomes **available** if the linked bid is not activated

7 Quarter-hour linking: used to reflect consecutive activation of energy in start-up modus

The start-up of a Technical Unit (TU) (or an operating mode of a Technical Facility) can be represented via two bids linked via QH linking:

1. The **start-up bid** (Bid 001) with an indivisible volume (e.g. the minimum active power of a Technical Unit) and a price including the variable and start-up costs. The FAT of this bid could also be longer to represent the start-up of a TU which needs a time longer than 12,5 min to go to its Pmin

2. The **continued start-up bid** (Bid 002) which is available after the TU has started-up. This bid has a partially divisible volume between Pmin and the max volume of the bid. The price of this bid only includes variable cost. The bid 002 can only be selected for activation in case bid 001 (the start-up bid) has been activated during the previous qh.

	Bid for QH(t-2)	Bids for QH(t-1)		Bids for QH(t0)	
Delivery point(s)	DP1	DP1	DP1	DP1	DP1
ID	QH-2/001	QH-1/001	QH-1/002	QH0/001	QH0/002
Direction	Upward	Upward	Upward	Upward	Upward
Bid price	200 € / MWh	200 € / MWh	50 € / MWh	200 € / MWh	50 € / MWh
Bid volume	50 MW	50 MW	100 MW	50 MW	100 MW
Minimum bid volume	50 MW	50 MW	50 MW	50 MW	50 MW
Exclusive group ID	/	/	/	/	/
Parent/child group ID	/	/	/	/	/
Quarter-hour link 1 - Linked bid & link type	/	**QH-2/001 Type 1** (Initially available – becomes unavailable if linked bid is activated)	**QH-2/001 Type A** (Initially unavailable – becomes available if linked bid is activated)	**QH-1/001 Type 1** (Initially available – becomes unavailable if linked bid is activated)	**QH-1/001 Type A** (Initially unavailable – becomes available if linked bid is activated)
Quarter-hour link 2 - Linked bid & link type	/	**QH-2/002 Type 1**	**QH-2/002 Type A**	**QH-1/002 Type 1**	**QH-1/002 Type A**
RD Full Activation Time	30 min	30 min	12,5 min	30 min	12,5 min
RD Maximum Activation Time	/	/	/	/	/

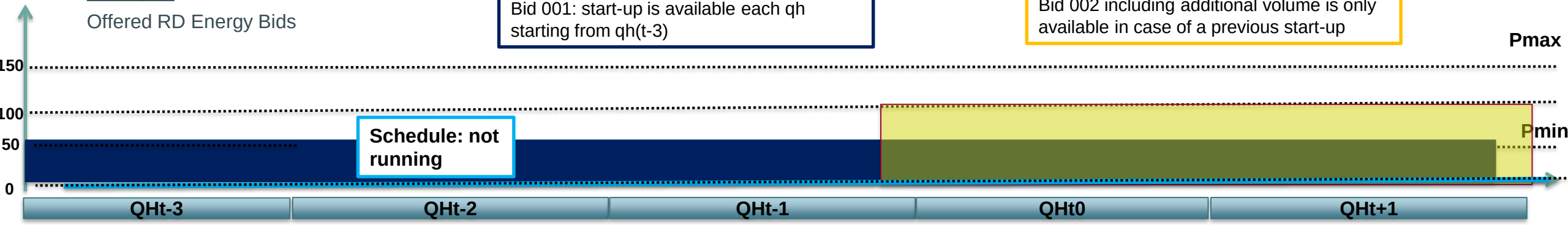
7 Quarter-hour linking: used to reflect consecutive activation of energy in start-up modus

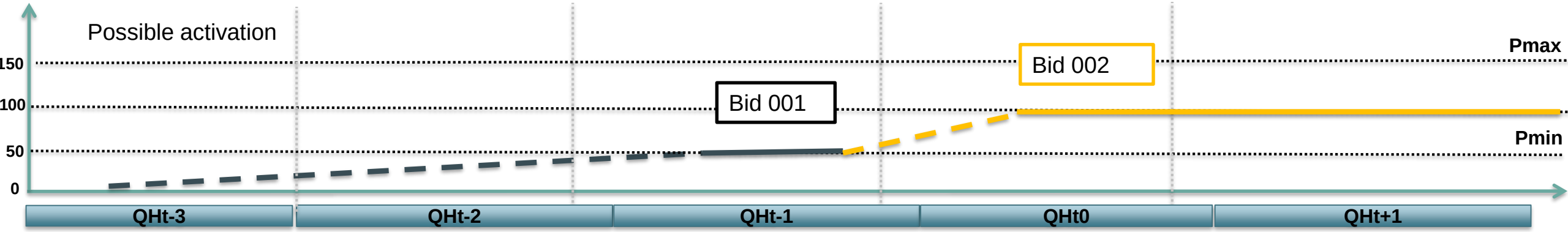
Example:

Offered RD Energy Bids

Bid 001: start-up is available each qh starting from qh(t-3)

Bid 002 including additional volume is only available in case of a previous start-up





Initial availability	Available	Available	Available	Available
Final availability	Available	Available	**Unavailable**	**Unavailable**
Initial availability	Unavailable	Unavailable	Unavailable	Unavailable
Final availability	Unavailable	Unavailable	**Available**	**Available**

activated

activated

8. Complex RD Energy Bids

SA's may submit 'complex' RD Energy Bids: these are bids that are either associated in an **Exclusive Group** or in a **Parent-Child-Relation.**

Characteristics of RD Energy Bids for qh(t)	Simple RD Energy Bids for qh(t)	Exclusive Group RD Energy Bids for qh(t)	Parent-child-relation RD Energy Bids for qh(t)
ID	Yes	Yes	Yes
List of Delivery points	Yes	Yes	Yes
Direction	Yes	Yes	Yes
Bid price	Yes	Yes	Yes
Bid volume	Yes	Yes	Yes
RD Full Activation Time	Yes	Yes	Yes
RD Maximum Activation Time	Yes	Yes	Yes
Minimum bid volume (indivisible volume)	Yes	Yes	Yes
Part of exclusive group		**Yes**	
Part of parent/child relation ("multipart bids")			**Yes**
Quarter-hour linking: ID(s) of linked bids in qh(t-1) or qh(t-2)			

8. Complex RD Energy Bids: Parent-child-relation *

Several RD Energy Bids can be associated via a Parent-Child-Relation during the same quarter-hour. This implies that **the bids that appear later in the merit order can only be selected for activation if the associated bids earlier in the merit order have been fully selected for activation**. A RD Energy Bid may only be part of one parent-child-relation for the concerned quarter-hour.

The direction of the RD Energy Bids must be the same. The prices of the RD Energy Bids must be different.

The technical link (based on the Parent/Child Group ID) will be applied on the entire group, thereby preventing the activation of any of the bids in parent-child-relation during the next quarter-hour

Bids for QH(t0)

Delivery point(s)	DP1	DP2	DP3
ID	001	002	003
Direction	Upward	Upward	Upward
Bid price	50 € / MWh	70 € / MWh	90 € / MWh
Bid volume	50 MW	100 MW	30 MW
Minimum bid volume	0 MW	0 MW	0 MW
Exclusive group ID	/	/	/
Parent/child group ID	**P/C Group 1**	**P/C Group 1**	**P/C Group 1**
Quarter-hour link	***I***	***I***	***I***
RD Full Activation Time	12,5 min	12,5 min	12,5 min
RD Max activation time	/	/	/

** In European documents parent-child-relations are called "multipart bids".*

8. Complex RD Energy Bids: Exclusive Groups

Several RD Energy Bids can be associated via Exclusive Group during the same quarter-hour. This implies that **only one bid in the exclusive group can be selected for activation in the same quarter-hour**.

All bid characteristics (even direction) may be different.

Contrary to mFRR bids:

- A RD energy bid can be part of more than one exclusive group for the concerned quarter-hour.
- The number of exclusive groups per SA is not limited
- A RD energy bid can be part of an exclusive group and have a quarter-hour linking

Bids for QH(t0)

Delivery point(s)	DP1	DP2
ID	001	002
Direction	Upward	Upward
Bid price	50 € / MWh	70 € / MWh
Bid volume	50 MW	100 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	**ExclGr 1**	**ExclGr 1**
Parent/child group ID	/	/
Quarter-hour link	**/**	**/**
RD Full Activation Time	12,5 min	12,5 min
RD Max activation time	/	/

8 Exclusive group - Energy limited case (1/2)

In case of an energy limited technical unit, the SA can submit RD energy bids linked with exclusive groups to represent the energy limitation of its technical unit. Depending on the energy limitation, the SA can submit several RD bids with different maximum and minimum volumes and maximum activation time that are associated with an exclusive group.

Example:

- Assume a Technical Unit with an energy limit of 100 MWh
- The SA submits three 3 different bids associated via one exclusive group
    1. The bid 001 offers a divisible volume up to 50 MW with a MAT of 120 min
    2. The Bid 002 offers a partially divisible volume between 50MW and 100 MW with a MAT of 60 min
    3. The Bid 003 offers a partially divisible volume between 100MW and 200 MW with a MAT of 30 min

Bid 001 offers a divisible volume up to 50 MW with a MAT of 120 min

Delivery point(s)	DP1
Bid ID	RD001
Direction	Upward
Bid price	50 € / MWh
(max) Bid volume	50 MW
Minimum bid volume	0 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	/
RD Full Activation Time	12,5 min
RD Max activation time	120 min (2 h)

Bid 002 offers a partially divisible volume between 50MW and 100 MW with a MAT of 60 min

Delivery point(s)	DP1
Bid ID	RD002
Direction	Upward
Bid price	50 € / MWh
(max) Bid volume	100 MW
Minimum bid volume	50 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	/
RD Full Activation Time	12,5 min
RD Max activation time	60 min

Bid 003 offers a partially divisible volume between 100MW and 200 MW with a MAT of 30 min

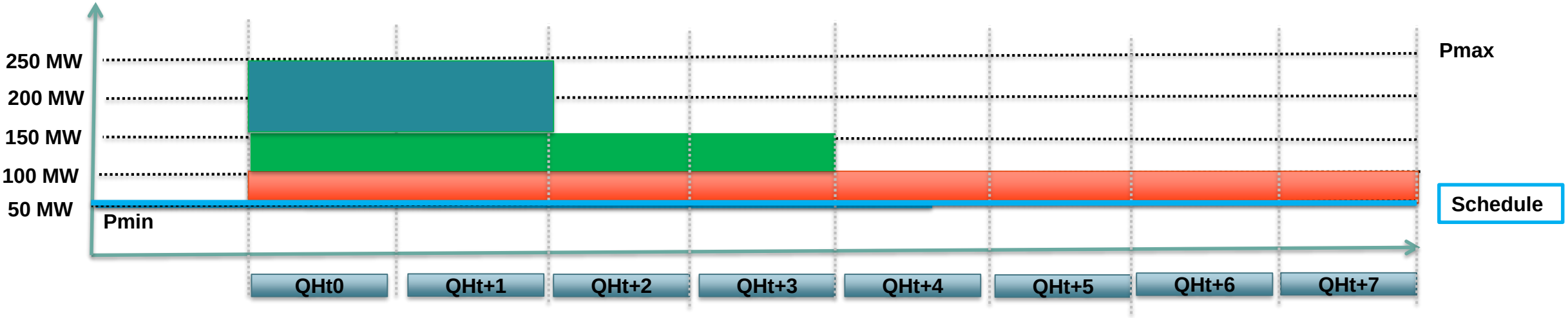
Delivery point(s)	DP1
Bid ID	RD003
Direction	Upward
Bid price	50 € / MWh
(max) Bid volume	200 MW
Minimum bid volume	100 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	/
RD Full Activation Time	12,5 min
RD Max activation time	30 min

8 Exclusive group - Energy limited case (2/2)

Bid 001 offers a divisible volume up to 50 MW with a MAT of 120 min

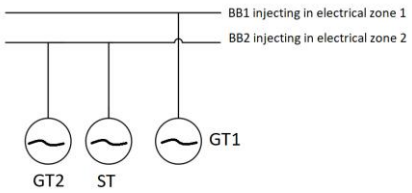
Bid 002 offers a partially divisible volume between 50MW and 100 MW with a MAT of 60 min

Bid 003 offers a partially divisible volume between 100MW and 200 MW with a MAT of 30 min



9 Concrete case:
CCGT – Technical Facility with different operating modes

- Assume a Technical Facility (TF) with three technical units (TUs) = GT1 + GT2 + ST
- This TF is characterized by the possibility to operate in several operating modes by combining differently its Technical Units
- The SA can offer RD Energy when the TF is running in a given operating mode (production at Pmin or higher) either in full/half CCGT or full/half OCGT.



⇒ Example: Divisible positive RD energy available up to Pmax: could be on GT1(+ST), on GT2(+ST), or on both

⇒ Similar RD Energy Bids can be offered for downward activation.

- In addition to offer the flexibility of its running operating mode for a given qh, **the RD energy available by switching to another operating mode** needs also to be offered for redispatching (with specific full activation time if relevant)
- Depending on the technical characteristics of the TF, and mainly on the possibility to operate separately the different technical units, the possible operating modes to be offered can be different (these operating modes need to be defined in the contract)

If technically feasible to operate GT1(+ST) and GT2(+ST) separately, then volume must be offered in 2 RD Energy Bids

	2 bids for QH(t0)		OR	1 bid for QH(t0)
Delivery point(s)	**GT1, ST**	**GT2, ST**		**GT1, GT2, ST**
ID	001	002		001
Direction	Upward	Upward		Upward
Bid price	63 € / MWh	63 € / MWh		63 € / MWh
Bid volume	50 MW	50 MW		100 MW
Minimum bid volume	0 MW	0 MW		0 MW
Exclusive group ID	/	/		/
Parent/child group ID	/	/		/
Quarter-hour link	**/**	**/**		**/**
RD Full Activation Time	12,5 min	12,5 min		12,5 min
RD Maximum Activation Time	/	/		/

9 Full CCGT in running mode – Positive energy – Separate operation of TUs is feasible

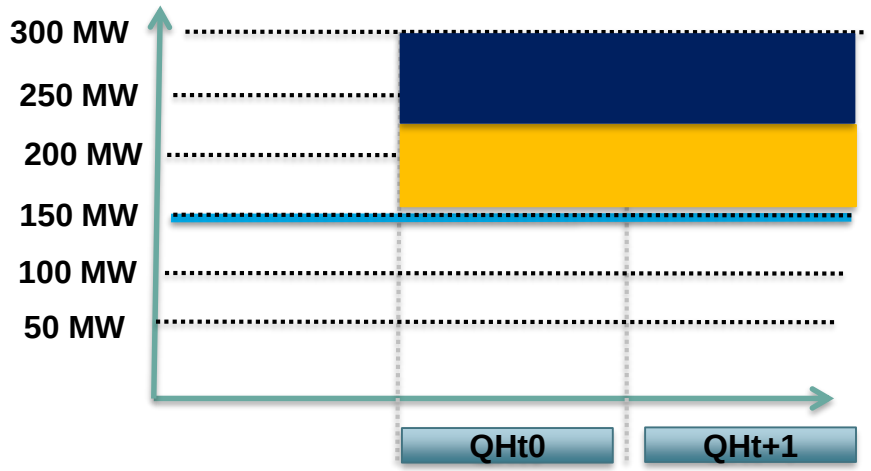
	Pmax	Pmin	Schedule
GT1	100 MW	30 MW	50 MW
GT2	100 MW	30 MW	50 MW
ST	100 MW	20 MW	50 MW

In this example, the running operating mode is CCGT i.e. GT1, GT2 and ST are producing power and have an associated production schedule. If a separate operation of the technical units is possible, 2 bids are requested from the SA

Default case:
2 Bids for qht0

Delivery point(s)	GT1 , ST	GT2 , ST
Bid ID	RD001	RD002
Direction	Upward	Upward
Bid price	63 € / MWh	63 € / MWh
(max) Bid volume	75 MW	75 MW
Minimum bid volume	0 MW	0 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link	/	/
RD Full Activation Time	12,5 min	12,5 min
RD Maximum Activation Time	/	/

Example: Request the TF to go to its maximum power for QHt0 and QH t+1



Combined Schedules of GT1, GT2 and ST

- Activated bids for QHt0: RD001 and RD002
- Activated bids for QHt+1: RD001 and RD002

9 Full CCGT in running mode – Positive energy – Separate operation of TUs is NOT feasible

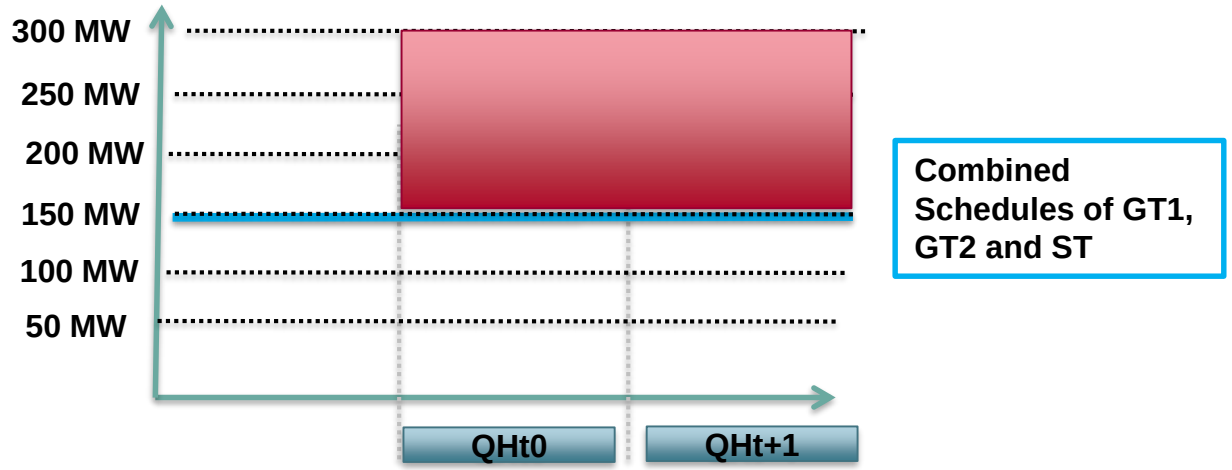
	Pmax	Pmin	Schedule
GT1	100 MW	30 MW	50 MW
GT2	100 MW	30 MW	50 MW
ST	100 MW	20 MW	50 MW

In this example, the running operating mode is CCGT i.e. GT1, GT2 and ST are producing power and have an associated production schedule. If a separate operation of the technical units is not possible,1 bid is requested from the SA

1 Bid for qht0

Delivery point(s)	GT1, GT2, ST
Bid ID	RD001
Direction	Upward
Bid price	63 € / MWh
(max) Bid volume	150 MW
Minimum bid volume	0 MW
Exclusive group ID	/
Parent/child group ID	/
Quarter-hour link	/
RD Full Activation Time	12,5 min
RD Maximum Activation Time	/

Example: Request the TF to go to its maximum power for QHt0 and QH t+1



- Activated bids for QHt0: RD001
- Activated bids for QHt+1: RD001

9 OCGT GT1 in running mode – Positive energy – Separate operation of TUs is feasible

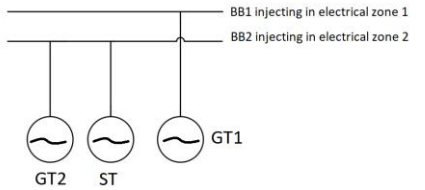
In this example, the running operating mode is OCGT GT1 i.e. only GT1 is producing power and has an associated production schedule. In addition to offering RD energy on the running operating mode, the **start-up of the other operating modes** is required. If a separate operation of the technical units is possible, 7 bids are requested from the SA (RD001 for the running operating mode, RD002&003 for the start-up of GT2, RD004&005 for the start-up of GT1+ST and RD006&007 for the start-up of GT2+ST)

	Pmax	Pmin	Schedule
GT1	100 MW	30 MW	50 MW
GT2	100 MW	30 MW	0 MW
ST	100 MW	20 MW	0 MW

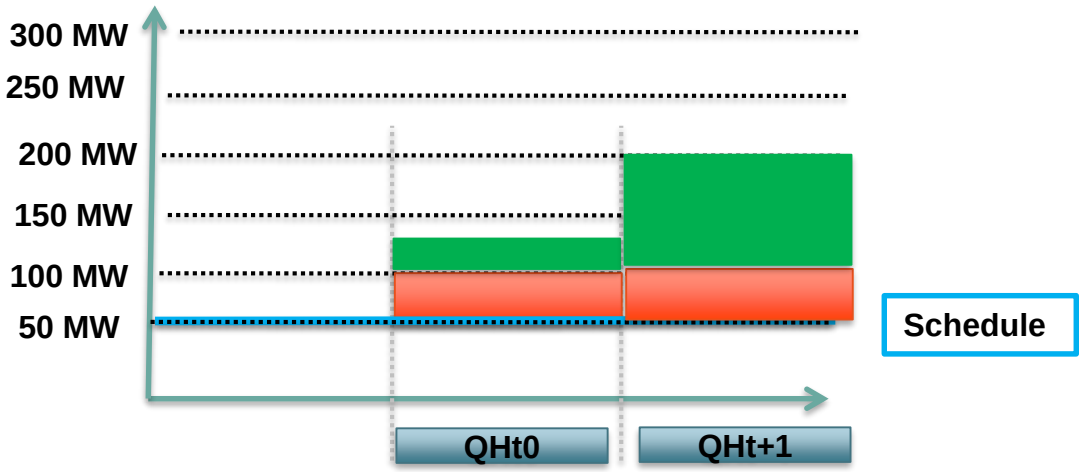
7 Bids for qht0

Delivery point(s)	GT1	GT2	GT2	GT1,ST	GT1,ST	GT2,ST	GT2,ST
Bid ID	RD001	RD002	RD003	RD004	RD005	RD006	RD007
Direction	Upward	Upward	Upward	Upward	Upward	Upward	Upward
Bid price	63 € / MWh	100 € / MWh	63 € / MWh	200 € / MWh	63 € / MWh	200 € / MWh	63 € / MWh
(max) Bid volume	50 MW	30 MW	100 MW	20 MW	100 MW	50 MW	150 MW
Minimum bid volume	0 MW	30 MW	30 MW	20 MW	20 MW	50 MW	50 MW
Exclusive group ID	ExclGr 1	ExclGr 2	ExclGr 2	ExclGr 1	ExclGr 1	ExclGr 2	ExclGr 2
Parent/child group ID	/	/	/	/	/	/	/
Quarter-hour link 1 - Linked bid & link type	/	QH-1 RD002 – Type 1	QH-1 RD002 – Type A	QH-1 RD004 – Type 1	QH-1 RD004 – Type A	QH-1 RD006 – Type 1	QH-1 RD006 – Type A
Quarter-hour link 2 - Linked bid & link type		QH-1 RD003 – Type 1	QH-1 RD003 – Type A	QH-1 RD005 – Type 1	QH-1 RD005 – Type A	QH-1 RD007 – Type 1	QH-1 RD007– Type A
RD Full Activation Time	12,5 min	12,5 min	12,5 min	60 min	12,5 min	60 min	12,5 min
RD Maximum Activation Time	/	/	/	/	/	/	/

9 OCGT GT1 in running mode – Positive energy – Separate operation of TUs is feasible

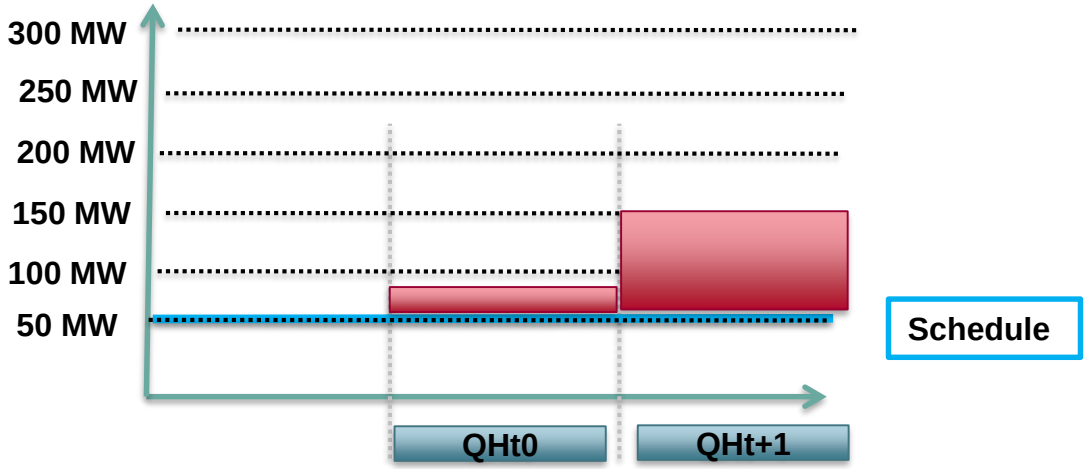


Example 1: Request to go to the Pmax of the OCGT in qht+1



- Activated bids for QHt0: RD001 and RD002
- Activated bids for QHt+1: RD001 and RD003

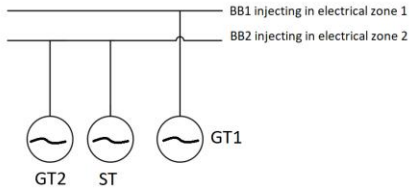
Example 2: Request to go to the Pmax of GT1+ST in qht+1



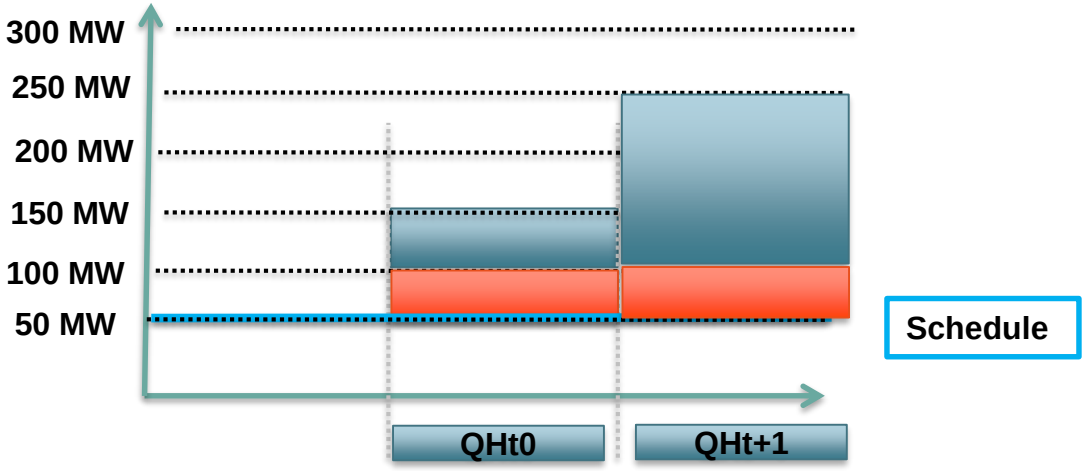
- Activated bids for QHt0: RD004
- Activated bids for QHt+1: RD005

Note: these graphs represent the energy activated by Elia and not the activation profiles of the bid

9 OCGT GT1 in running mode – Positive energy – Separate operation of TUs is feasible

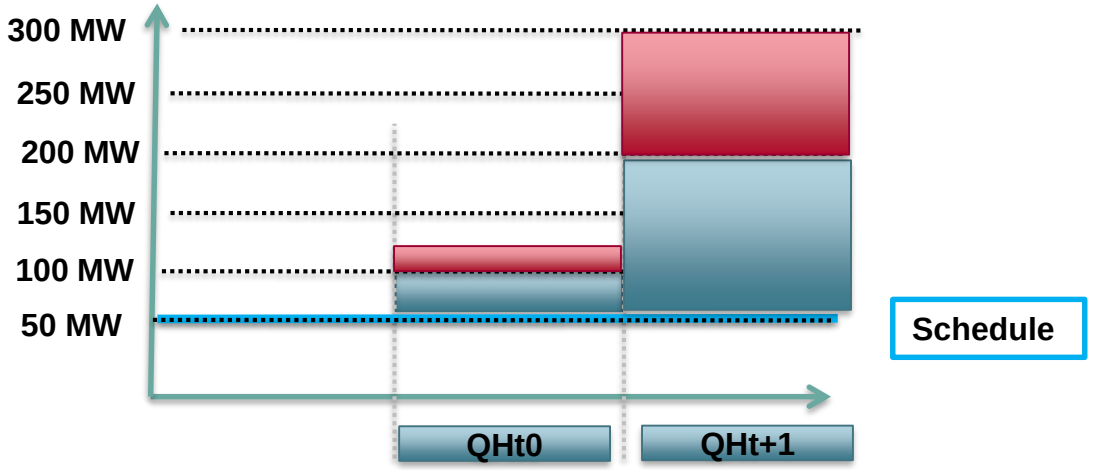


Example 3: Request to go to the Pmax of GT1 & Pmax of GT2 +ST in qht+1



- Activated bids for QHt0: RD001 and RD006
- Activated bids for QHt+1: RD001 and RD007

Example 4: Request to go to the Pmax of the CCGT in qht+1



- Activated bids for QHt0: RD004 and RD006
- Activated bids for QHt+1: RD005 and RD007

Note: these graphs represent the energy activated by Elia and not the activation profiles of the bid

9 OCGT GT1 in running mode – Positive energy – Separate operation of TUs is NOT feasible

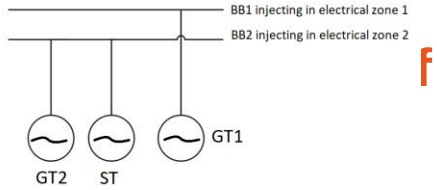
In this example, the running operating mode is OCGT GT1 i.e. only GT1 is producing power and has an associated production schedule. In addition to offering RD energy on the running operating mode, the **start-up of the other operating modes** is required. If a separate operation of the technical units is NOT possible, 5 bids are requested from the SA (RD001 for the running operating mode, RD002&003 for the start-up of GT2, RD004&005 for the start-up of GT1+GT2 + ST). The bids RD004 and RD005 belong to two different exclusive groups.

	Pmax	Pmin	Schedule
GT1	100 MW	30 MW	50 MW
GT2	100 MW	30 MW	0 MW
ST	100 MW	20 MW	0 MW

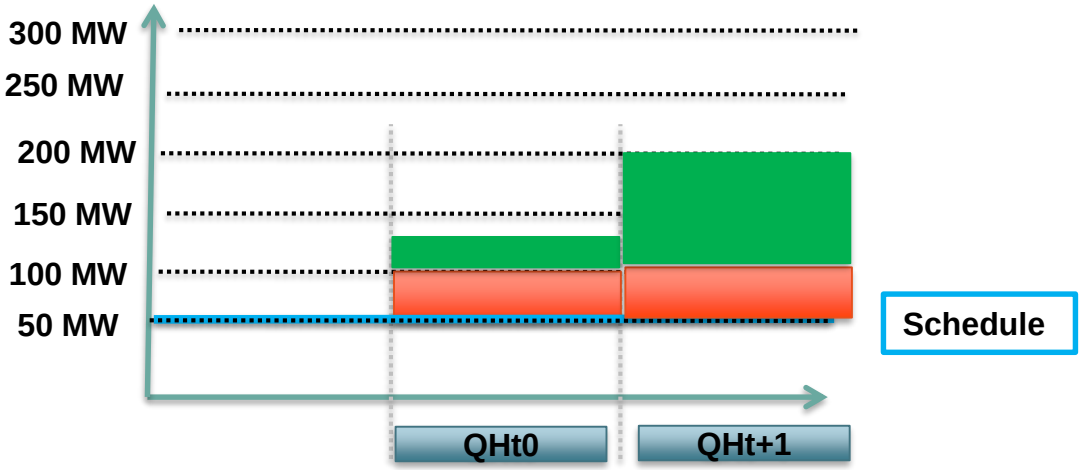
5 Bids for qht0

Delivery point(s)	GT1	GT2	GT2	GT1;GT2;ST	GT1;GT2;ST
Bid ID	RD001	RD002	RD003	RD004	RD005
Direction	Upward	Upward	Upward	Upward	Upward
Bid price	63 € / MWh	100 € / MWh	200 € / MWh	200 € / MWh	63 € / MWh
(max) Bid volume	50 MW	30 MW	100 MW	50 MW	300 MW
Minimum bid volume	0 MW	30 MW	30 MW	50 MW	50 MW
Exclusive group ID	ExclGr 1	ExclGr 2	ExclGr 2	ExclGr 1& ExclGr2	ExclGr 1& ExclGr2
Parent/child group ID	/	/	/	/	/
Quarter-hour link 1 - Linked bid & link type	/	**QH-1 RD002 – Type 1**	**QH-1 RD002 – Type A**	**QH-1 RD004 – Type 1**	**QH-1 RD004 – Type A**
Quarter-hour link 2 - Linked bid & link type		**QH-1 RD003 – Type 1**	**QH-1 RD003 – Type A**	**QH-1 RD005 – Type 1**	**QH-1 RD005 – Type A**
RD Full Activation Time	12,5 min	12,5 min	12,5 min	60 min	12,5 min
RD Maximum Activation Time	/	/	/	/	/

9 OCGT GT1 in running mode – Positive energy – Sepa f TUs is NOT feasible

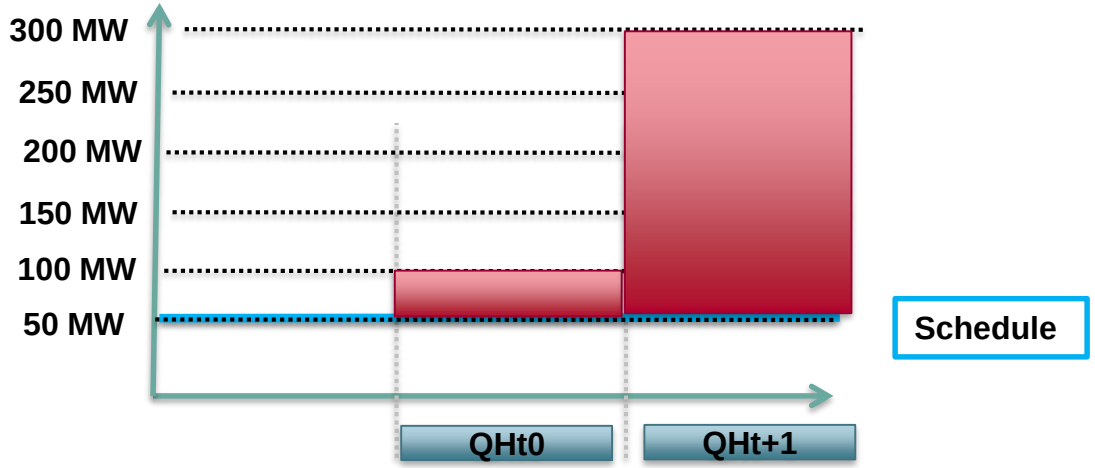


Example 1: Request to go to the Pmax of the OCGT in qht+1



- Activated bids for QHt0: RD001 and RD002
- Activated bids for QHt+1: RD001 and RD003

Example 2: Request to go to the Pmax of the CCGT in qht+1



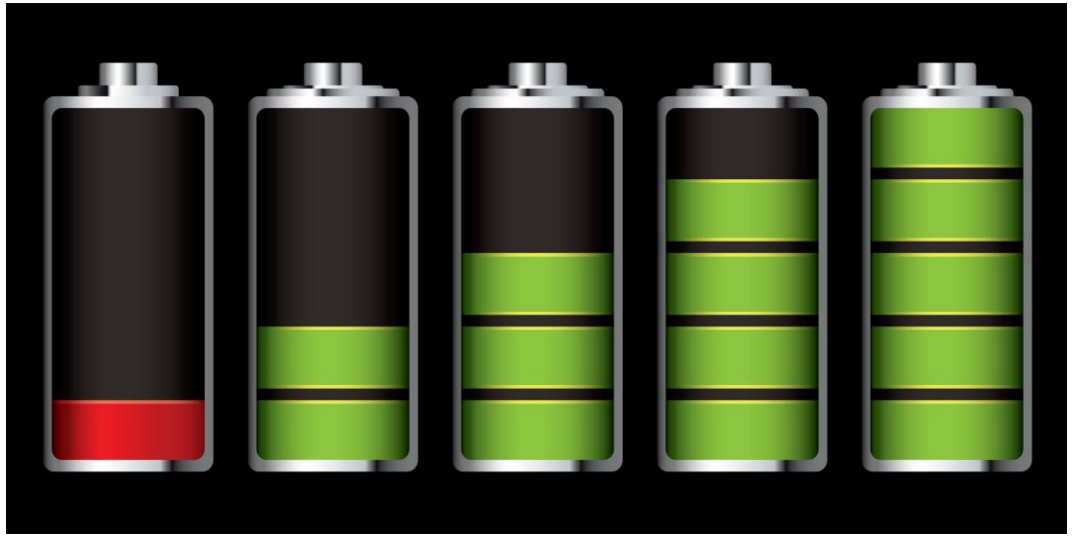
- Activated bids for QHt0: RD004
- Activated bids for QHt+1: RD005

Note: these graphs represent the energy activated by Elia and not the activation profiles of the bid

9 Concrete case:
Limited Energy Resources

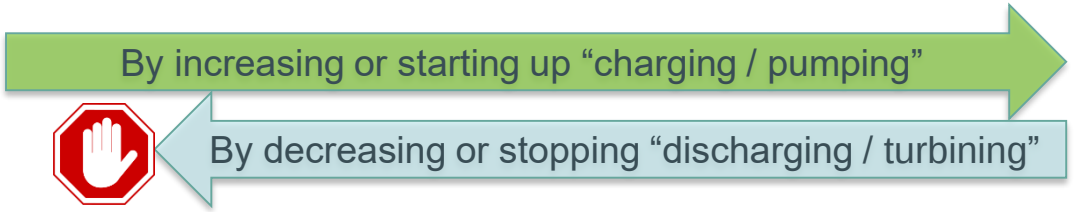
Limited Energy Resources (batteries, pump storage) require attention as, depending on the state of charge and the schedule, several bids may be submitted.

Delivery points may be defined for the entire storage facility or individually for each pump or turbine of a pump storage facility. The examples show the most detailed case with the turbine and pump as individual DP.



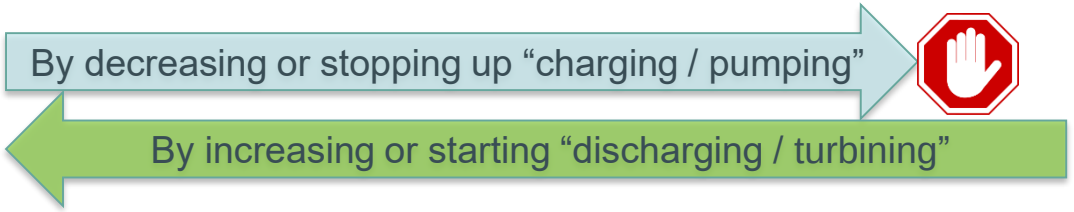
Downward RD Energy serves to decrease the net injection on the grid, which can be the result of:

- charging or pumping
- decreasing or shutting down ongoing discharging or turbining



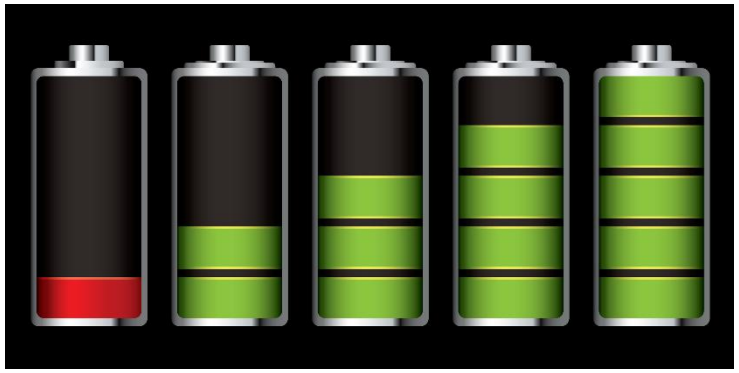
Upward RD Energy serves to increase the net injection on the grid, which can be the result of:

- discharging or turbining
- decreasing or shutting down ongoing charging or pumping



9. Concrete case: Limited Energy Resources
Fully charged & discharging at maximal capacity

Situation: The storage facility is fully charged and scheduled to turbine at maximal capacity. Downward RD can be offered by decreasing or even stopping the turbine. As the duration of activation of a RD bid can vary, the SA can submit several RD bids associated with an exclusive group with different volumes and MAT (and possibly prices) to represent the energy limitation of the storage facility.



Example:
Assume a Storage facility with a limitation in time to stop discharging/turbining. The SA can provide two bids on the turbine with different volumes and MAT (and possibly prices)

1. The bid 001 offers a (un)-divisible volume up to 50 MW with a MAT of 120 min
2. The Bid 002 offers a partially divisible volume between 50MW and 100 MW (or indivisible volume of 100 MW) with a MAT of 60 min

Bids for QH(t0)

Delivery point(s)	Turbine
ID	001
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	50 MW
Minimum bid volume	0 MW – 50 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	120 min

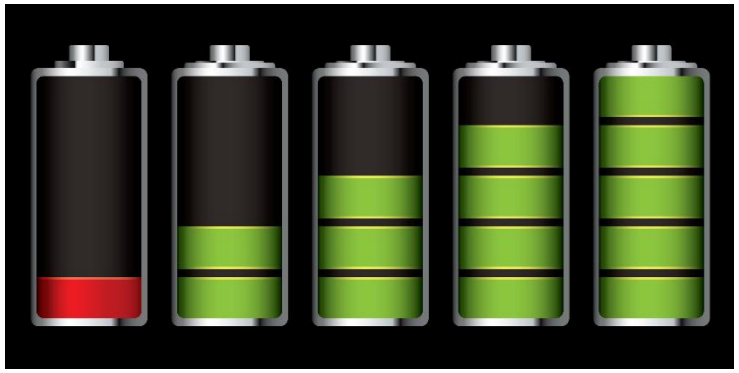
Delivery point(s)	Turbine
ID	002
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	100 MW
Minimum bid volume	50 MW – 100 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	60 min

By decreasing or stopping “discharging / turbining”

DOWN

9. Concrete case: Limited Energy Resources
Partly charged & discharging at maximal capacity

Situation: The storage facility is partly charged and scheduled to turbine at maximal capacity. Downward RD can be offered by decreasing or even stopping the turbine, and also by starting up the pumping. As the duration of activation of a RD bid can vary, the SA can submit several RD bids associated with an exclusive group with different volumes and MAT (and possibly prices) to represent the energy limitation of the storage facility.



If technically feasible to switch from turbining to pumping in the same quarter-hour, then both can be offered in separate RD Energy Bids or in the same RD Energy Bid.

The SA can provide two RD energy bids on the turbine + pump with different volumes and MAT (and possibly prices)

Bid for QH(t0)

Delivery point(s)	Turbine + Pump
ID	001
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	50 MW
Minimum bid volume	0 MW – 50 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	120 min

Delivery point(s)	Turbine + Pump
ID	001
Direction	**Downward**
Bid price	20 € / MWh
Bid volume	100 MW
Minimum bid volume	50 MW – 100 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	60 min

By decreasing or stopping “discharging / turbining”

DOWN

By increasing or starting up “charging / pumping”

DOWN

9. Concrete case: Limited Energy Resources
Partly charged & discharging at maximal capacity

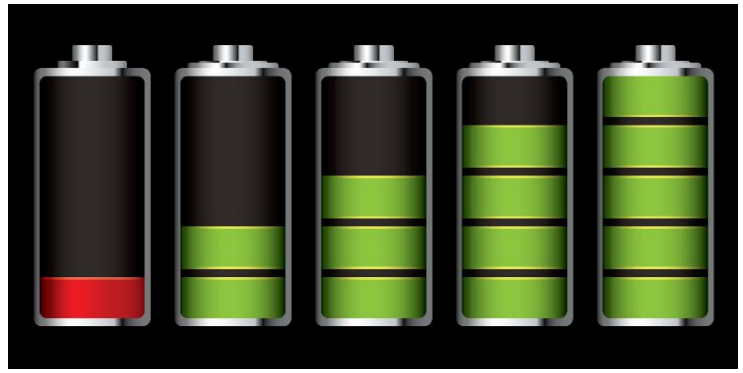
Situation: The storage facility is partly charged and scheduled to turbine at maximal capacity. Downward RD can be offered by decreasing or even stopping the turbine, and also by starting up the pumping. As the duration of activation of a RD bid can vary, the SA can submit several RD bids associated with an exclusive group with different volumes and MAT (and possibly prices) to represent the energy limitation of the storage facility.

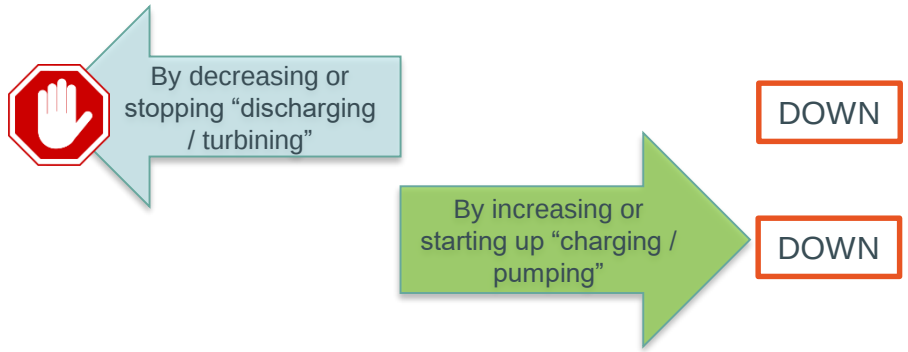
If **not** technically feasible to switch from turbining to pumping in the same quarter-hour, then both can be offered in separate RD Energy Bids that are linked: the pumping bid would be initially unavailable and only become available once the turbine as been stopped.

To take the energy limitation into account, the SA can provide a third bid on the turbine only with a different MAT and volume. This bid is associated with an exclusive group with bid 001.

Bid for QH(t0)

Delivery point(s)	Turbine	Pump
ID	QH0/001	QH0/002
Direction	**Downward**	**Downward**
Bid price	20 € / MWh	20 € / MWh
Bid volume	50 MW	50 MW
Minimum bid volume	0 MW	50 MW
Exclusive group ID	/	/
Parent/child group ID	/	/
Quarter-hour link 1 - Linked bid & link type	**/**	**QH-1/001 - Type A** (Initially unavailable – becomes available if linked bid is activated)
RD Full Activation Time	12,5 min	12,5 min
RD Maximum Activation Time	60 min	60 min



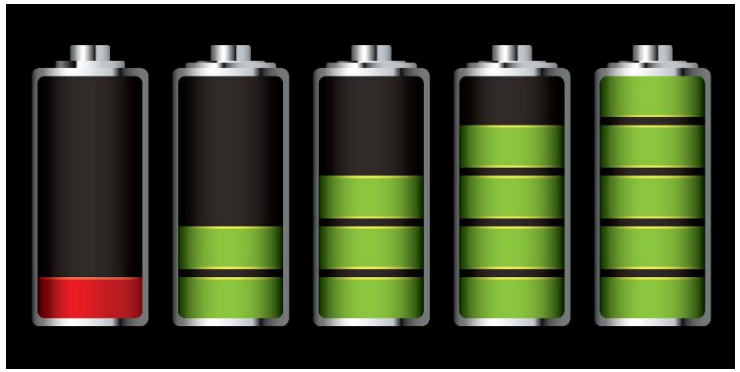


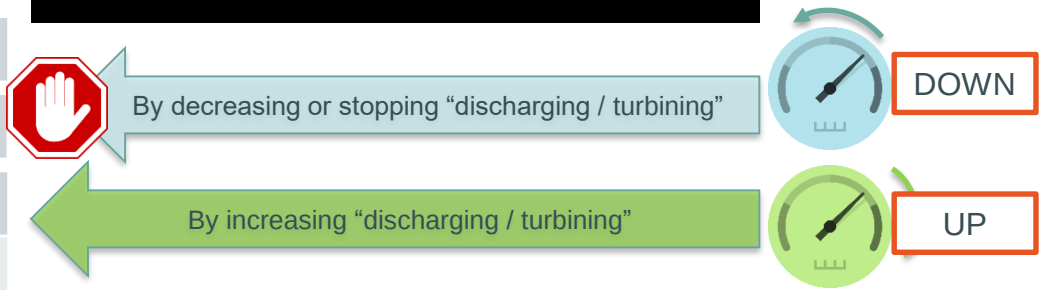
9. Concrete case: Limited Energy Resources
Fully charged & discharging below maximal capacity

Situation: The storage facility is fully charged and scheduled to turbine, but the turbining is not at maximal capacity. As in the previous cases, downward RD can be offered by decreasing or even stopping the turbine. However, in addition, upward RD can be offered by increasing the turbine to maximal capacity, if the state of charge allows an increase in turbining. To take the energy limitation into account, the SA can provide additional bids on the turbine with different MAT and volume for both upward and downward directions. These upwards and downwards bids are associated with an exclusive group as explained in the previous cases.

Bids for QH(t0)

Delivery point(s)	Turbine	Turbine	Turbine	Turbine
ID	001	002	003	004
Direction	**Downward**	**Downward**	**Upward**	**Upward**
Bid price	20 € / MWh	20 € / MWh	25 € / MWh	25 € / MWh
Bid volume	35 MW	70 MW	15 MW	30 MW
Minimum bid volume	0 MW – 35 MW	35 MW – 70 MW	0 MW – 15 MW	15 MW – 30 MW
Exclusive group ID	ExclGr 1	ExclGr 1	ExclGr 1	ExclGr 1
Parent/child group ID	/	/	/	/
Quarter-hour link	/	/	/	/
RD Full Activation Time	12,5 min	12,5 min	12,5 min	12,5 min
RD Maximum Activation Time	120 min	60 min	60 min	30 min





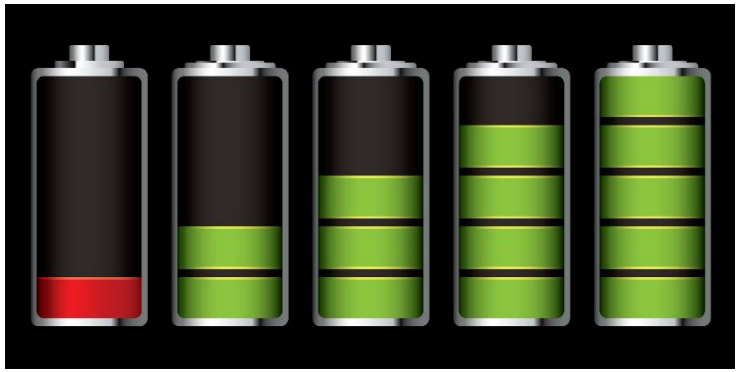
9. Concrete case: Limited Energy Resources Fully charged & not scheduled

Situation: The storage facility is fully charged and not scheduled to turbine. Upward RD can be offered by starting up the turbine. As the duration of activation of a RD bid can vary, the SA can submit several RD bids associated with an exclusive group with different volumes and MAT (and possibly prices) to represent the energy limitation of the storage facility.

Bids for QH(t0)

Delivery point(s)	Turbine
ID	001
Direction	**Upward**
Bid price	25 € / MWh
Bid volume	50 MW
Minimum bid volume	0 MW – 50 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	120 min

Delivery point(s)	Turbine
ID	002
Direction	**Upward**
Bid price	25 € / MWh
Bid volume	100 MW
Minimum bid volume	50 MW – 100 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	60 min



By starting “discharging / turbining”

UP

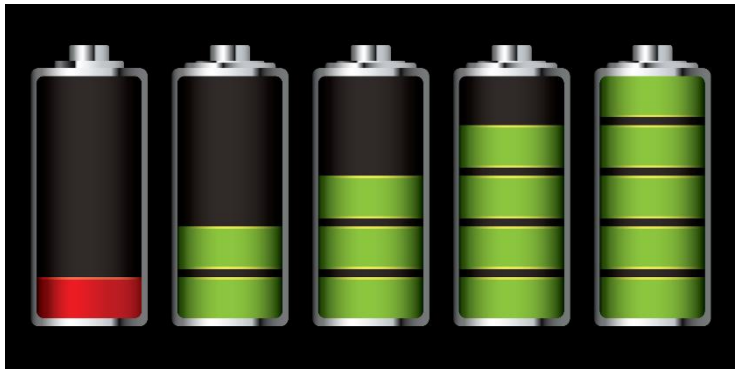
9. Concrete case: Limited Energy Resources Not charged & not scheduled

Situation: The storage facility is not charged and not scheduled to pump. Downward RD can be offered by starting up the pump. As the duration of activation of a RD bid can vary, the SA can submit several RD bids associated with an exclusive group with different volumes and MAT (and possibly prices) to represent the energy limitation of the storage facility.

Bid for QH(t0)

Delivery point(s)	Pump
ID	001
Direction	**Downward**
Bid price	25 € / MWh
Bid volume	50 MW
Minimum bid volume	0 MW – 50 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	120 min

Delivery point(s)	Pump
ID	002
Direction	**Downward**
Bid price	25 € / MWh
Bid volume	100 MW
Minimum bid volume	50 MW – 100 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	60 min



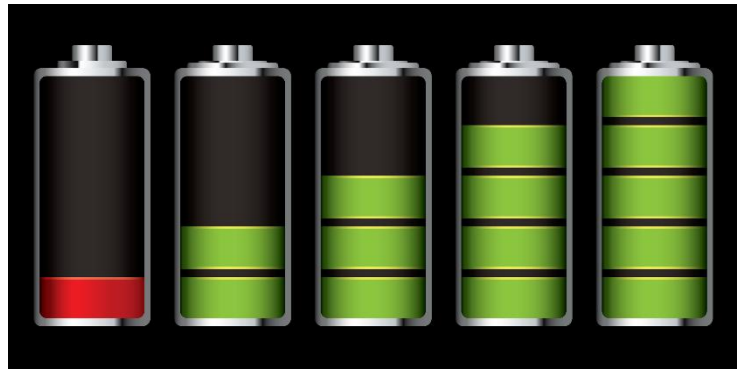
By starting up “charging / pumping” → DOWN

9. Concrete case: Limited Energy Resources Partially charged & not scheduled

Situation: The storage facility is partially charged and not scheduled to pump or turbine. The RD can offer both upward and downward RD. To take the energy limitation into account, the SA can provide additional bids on the turbine and/or the pump with different MAT and volume. These bids on the turbine and on the pump are associated with an exclusive group as explained in the previous cases.

Bids for QH(t0)

Delivery point(s)	Pump	Pump	Turbine	Turbine
ID	001	002	003	004
Direction	**Downward**	**Downward**	**Upward**	**Upward**
Bid price	15 € / MWh	15 € / MWh	20 € / MWh	20 € / MWh
Bid volume	25 MW	50 MW	25 MW	50 MW
Minimum bid volume	0 MW – 25 MW	25 MW – 50 MW	0 MW – 25 MW	25 MW – 50 MW
Exclusive group ID	ExclGr 1	ExclGr 1	ExclGr 1	ExclGr 1
Parent/child group ID	/	/	/	/
Quarter-hour link	/	/	/	/
RD Full Activation Time	12,5 min	12,5 min	12,5 min	12,5 min
RD Maximum Activation Time	120 min	60 min	120 min	60 min



By starting "discharging / turbining"

UP

By starting up "charging / pumping"

DOWN

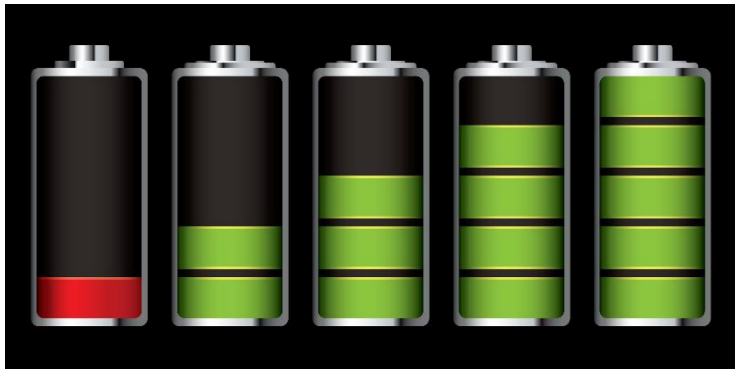
9. Concrete case: Limited Energy Resources Not charged & charging at maximal capacity

Situation: The storage facility is not charged and scheduled to pump at maximal capacity. Upward RD can be offered by reducing or shutting down the pump. As the duration of activation of a RD bid can vary, the SA can submit several RD bids associated with an exclusive group with different volumes and MAT (and possibly prices) to represent the energy limitation of the storage facility

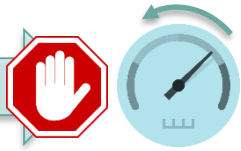
Bid for QH(t0)

Delivery point(s)	Pump
ID	001
Direction	**Upward**
Bid price	20 € / MWh
Bid volume	50 MW
Minimum bid volume	0 MW – 50 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	120 min

Delivery point(s)	Pump
ID	002
Direction	**Upward**
Bid price	20 € / MWh
Bid volume	100 MW
Minimum bid volume	50 MW – 100 MW
Exclusive group ID	ExclGr 1
Parent/child group ID	/
Quarter-hour link	**/**
RD Full Activation Time	12,5 min
RD Maximum Activation Time	60 min



By decreasing or stopping up “charging / pumping”



UP