brugel

LE REGULATEUR BRUXELLOIS POUR L'ENERGIE
DE BRUSSELSE REGULATOR VOOR ENERGIE

REGULERINGSCOMMISSIE VOOR ENERGIE IN HET BRUSSELS HOOFDSTEDELIJK GEWEST

BESLISSING (BRUGEL-BESLISSING-20200902-142)

Betreffende de voorstellen van technische voorschriften C8/06 en C8/07 van Synergrid.

Opgesteld op basis van artikels 79 en 190*bis* van het technisch reglement voor het beheer van het elektriciteitsdistributienet in het Brussels Hoofdstedelijk Gewest en de toegang ertoe.

02/09/2020

Kunstlaan 46 avenue des Arts – B-1000 Bruxelles / Brussel
T: 02/563.02.00 – F: 02/563.02.13
info@brugel.brussels – www.brugel.brussels

Inhoudsopgave

1 Wettelijke grondslag

Artikel 190*bis* van het technisch reglement voor het beheer van het elektriciteitsdistributienet in het Brussels Hoofdstedelijk Gewest en de toegang ertoe voorziet dat:

> *"Iedere persoon wiens gebruikelijke activiteiten bestaan in het aansturen van het verbruik en/of de elektriciteitsproductie van een of meer distributienetgebruikers om de aldus aangeboden flexibiliteit te valoriseren, sluit met de distributienetbeheerder een flexibel toegangscontract af. Het flexibel toegangscontract wordt opgesteld op basis van het model dat is goedgekeurd door Brugel, bepaald door Synergrid of, bij ontstentenis, door de distributienetbeheerder. De operator van flexibiliteitsdiensten leeft de technische voorwaarden na die door de distributienetbeheerder zijn opgelegd en, in elk geval, de Synergrid-normen."*

Verder voorziet artikel 79 §3 van hetzelfde technisch reglement dat:

> *"§3. De voorschriften bedoeld in paragraaf 2 en de normen van Synergrid, of elke afwijking daarvan, worden door Brugel goedgekeurd.*
> *De in alinea 1 beoogde voorschriften en normen treden in werking twee maanden na de goedkeuring van Brugel of, indien ze binnen deze termijn niet zijn goedgekeurd, twee maanden na de mededeling ervan door de distributienetbeheerder aan Brugel."*

Deze beslissing voldoet aan deze wettelijke bepalingen

2 Inleiding

Op 1 april 2020 heeft Synergrid een voorstel voor een overeenkomst tussen de distributienetbeheerder en de dienstverlener van flexibiliteit in het kader van de levering van flexibiliteitsdiensten door het gebruik van flexibiliteit bij distributinetgebruikers ter goedkeuring voorgelegd. Aangezien dit een contract was dat in alle drie de regio's moest worden toegepast, kwamen de gewestelijke regulatoren overeen om via het Forbeg-platform voor analyse en besluitvorming samen te werken om in de drie gewesten een identieke overeenkomst te hebben.

Op 19 mei 2020 hebben de gewestelijke regulatoren hun opmerkingen over het voorgestelde DNB-FSP-overeenkomst meegedeeld. De gewestelijke regulatoren instanties bepaalden met name

"De regulatoren merken op dat het ontwerp van overeenkomst bepaalt dat voor de levering van aFRR een meetinstallatie nodig is dat voldoet aan de eisen van de voorschriften C8/06 en C8/07. Deze voorschriften zijn nog niet onderworpen aan een proces dat leidt tot hun goedkeuring. Daarom kan er niet naar hen worden verwezen.

De regulatoren kunnen geen contractbepalingen goedkeuren die gebaseerd zijn op niet-gevalideerde documenten en die kunnen worden aangevochten, zoals met name blijkt uit de opmerkingen over het gebruik van een lokale gateway die tijdens de openbare raadpleging zijn gemaakt.

De regulatoren nodigen Synergrid uit om een discussie over de inhoud van deze vereisten in gang te zetten."

Op 18 juni heeft Synergrid een openbare raadpleging gelanceerd omtrent het voorschrift C6/08, General technical requirements measurement system and Gateway for an aFRR service delivery point connected to the Distribution Grid en het document C8/07, Explanatory note – aFRR business processes.

Op 13 Juli heeft Synergrid een voorstel van de technische voorschriften C8/06 et C8/07 ter goedkeuring aan BRUGEL voorgelegd. Deze beslissing heeft betrekking op dit voorstel.

3 Analyse en ontwikkeling

3.1 Voorwerp van het voorschrift

Het voorschrift C8/06 heet "General technical requirements – measurement system and gateway for an aFRR service delivery point connected to the distribution grid" en specificeert de technische eisen voor het meetsysteem en de gateway die worden gebruikt om gegevens met betrekking tot de levering van de aFRR-dienst naar het communicatieplatform van de netbeheerders te communiceren.

Het ontwerp van het nieuwe aFRR-product voorziet uitwisseling van meetgegevens in bijna real-time (4s) op het servicepunt voor leveringspunten waarvoor Elia geen dagschema ontvangt. Deze gegevens worden gebruikt voor de verificatie van de levering van het gecontracteerde flexibiliteitsvolume en voor het settlement process.

Het voorschrift C8/07, "aFRR – business processes" is een toelichting en kan worden beschouwd als een ondersteunend document dat verschillende processen beschrijft die verband houden met de realisatie van het digitale kanaal van de meetgegevens.

3.2 Algemene opmerkingen

De drie gewestelijke regulatoren kwamen overeen om voor dit voorschrift samen te werken voor de analyse en hebben een gezamenlijk document opgesteld met commentaar. Dit document is als bijlage van deze beslissing opgenomen en bevat opmerkingen over de vereisten voor de lokale gateway en de nauwkeurigheid van de meetsystemen.

De gewestelijke regulatoren concluderen dat de voorgestelde technische vereisten, ondanks enkele opmerkingen, in de huidige vorm kunnen worden goedgekeurd.

BRUGEL acht het echter noodzakelijk te verduidelijken dat, wanneer in de toekomst de flexibiliteitsdiensten worden opengesteld voor de laagspanning, bij de discussies over dit onderwerp ook rekening moet worden gehouden met deze technische eis. Dit punt wordt behandeld in het document " *Commentaires des régulateurs régionaux sur le contrat entre le GRD et le FSP dans le cadre de la fourniture de services de flexibilité par l'utilisation de la flexibilité d'utilisateurs du réseau de distribution*", dat als bijlage is gevoegd bij de beslissing 142 omtrent het voorstel van Synergrid voor een overeenkomst tussen de distributienetbeheerder en de dienstverlener van flexibiliteit in het kader van de levering van flexibiliteitsdiensten door het gebruik van flexibiliteit bij distributienetgebruikers.

4 Beslissing

Gelet op artikels 79 §3 en 190*bis* van het technisch reglement voor het beheer van het elektriciteitsdistributienet in het Brussels Hoofdstedelijk Gewest en de toegang ertoe;

Rekening houdend met het voorstel van het technische voorschrift C8/06 "General technical requirements – measurement system and gateway for an aFRR service delivery point connected to the distribution grid" en de toelichtingsnota C8/07 "aFRR – business processes" van Synergrid;

Rekening houdend met bovenstaande en in de bijlage opgenomen observaties;

BRUGEL beslist het technische voorschrift C8/06 "General technical requirements – measurement system and gateway for an aFRR service delivery point connected to the distribution grid" en de toelichtingsnota C8/07 "aFRR – business processes" van Synergrid goed te keuren.

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5 Bijlage I: Commentaires des régulateurs régionaux sur la prescription C8/06 « General technical requirements: measurement system and gateway for an aFRR service delivery point connected to the distribution grid »

Annexe

CWaPE
Commission
Wallonne
pour l'Energie

brugel
LE REGULATEUR BRUXELLOIS POUR L'ENERGIE
DE BRUSSELSE REGULATOR VOOR ENERGIE

VREG
ENERGIE WIJZER

Date du document : 18/08/2020

COMMENTAIRES DES REGULATEURS REGIONAUX SUR LA PRESCRIPTION C8/06 « GENERAL TECHNICAL REQUIREMENTS : MEASUREMENT SYSTEM AND GATEWAY FOR AN AFRR SERVICE DELEVERY POINT CONNECTED TO THE DISTRIBUTION GRID »

1. OBJET

Par courriel daté du 13 juillet 2020, Synergrid soumet, pour approbation, aux régulateurs régionaux la prescription C8/06 *(General technical requirements Measurement system and Gateway for an aFRR service delivery point connected to the Distribution Grid)* et le document C8/07 *(Explanatory note – aFRR business processes).*

Ces documents C8/06 et C8/07 complètent le projet de contrat entre le GRD et le FSP (i.e. fournisseur de services de flexibilité) dans le cadre de la livraison de services de flexibilité par l'utilisation de la flexibilité d'utilisateurs du réseau de distribution.

Il apparaît toutefois que le document C8/07 se présente plutôt comme un document explicatif de la prescription C8/06, et à ce titre ne doit pas faire l'objet d'une approbation en bonne et due forme de la part des régulateurs régionaux. Les commentaires repris dans le présent document se limiteront donc à la prescription C8/06.

2. RETROACTES

Par courriel daté du 21 février 2020, Synergrid informait les régulateurs régionaux du lancement d'une consultation publique concernant un nouveau modèle de contrat FSP-GRD. Il s'agit plus spécifiquement d'un modèle de contrat générique, qui couvre la livraison de plusieurs services de flexibilité via l'utilisation de la flexibilité des utilisateurs du réseau de distribution. L'objectif poursuivi par Synergrid est de rompre avec une démarche historique qui consistait à établir des contrats spécifiques à un ou plusieurs produits d'équilibrage et/ou SDR, et ce afin d'éviter à l'avenir une multiplication des contrats. Les annexes de ce contrat dit générique permettront de tenir compte de l'évolution des services de flexibilité.

Le 1er avril, Synergrid communiquait pour approbation le projet de contrat FSP-GRD tel que revu à la suite de la consultation publique.

Le 19 mai 2020, les régulateurs régionaux communiquaient leurs commentaires sur le projet de contrat FSP-GRD générique. Les régulateurs régionaux précisaient notamment :

« Les régulateurs constatent que le projet de contrat prévoit que la fourniture de aFRR requiert un dispositif de mesure conforme aux exigences de prescriptions C8/06 et C8/07. Ces prescriptions n'ont pas encore fait l'objet d'un processus conduisant à leur approbation. Il ne peut donc y être fait référence.
Les régulateurs ne peuvent approuver les dispositions du contrat qui s'appuient sur des documents non validés et susceptibles de contestation, comme le montre en particulier les remarques concernant l'usage d'un gateway local soulevées lors de la consultation publique.

Les régulateurs invitent Synergrid à lancer une discussion sur le contenu de ces prescriptions. »

Le 18 juin 2020, Synergrid a lancé une consultation publique concernant la prescription C8/06 *(General technical requirements Measurement system and Gateway for an aFRR service delivery point connected to the Distribution Grid)* et le document C8/07 *(Explanatory note – aFRR business processes).*

Le 13 juillet 2020, soumet, pour approbation, aux régulateurs régionaux la prescription C8/06 *(General technical requirements Measurement system and Gateway for an aFRR service delivery point connected to the Distribution Grid)* et le document C8/07 *(Explanatory note – aFRR business processes).* Ces documents sont complétés de documents reprenant les réactions exprimées par les stakeholders lors de la consultation publique.

3. EXAMEN DE LA PRESCRIPTION C8/06

Après examen des documents fournis par Synergrid le 13 juillet 2020, les régulateurs régionaux sont en mesure d'approuver la prescription C8/06 *(General technical requirements Measurement system and Gateway for an aFRR service delivery point connected to the Distribution Grid)*.

Cette approbation est toutefois assortie des observations suivantes :

3.1. Local gateway

Les régulateurs régionaux ont compris des discussions avec Synergrid que les exigences reprises dans la prescription C8/06, et notamment celles relatives au *local gateway*, sont pour l'essentiel issues des exigences d'Elia, en tant que FRP, vis-à-vis des installations raccordées sur son réseau.

Les régulateurs régionaux estiment à cet égard qu'il revient effectivement à Elia, en tant que FRP, de définir en concertation avec le stakeholders ses exigences techniques en matière de fourniture de services de réglage de la fréquence en général, et de services de type aFRR en particulier.

La consultation publique menée par Synergrid a néanmoins permis de mettre en évidence un certain nombre d'inquiétudes de la part de certains FSP. Il apparait en effet que les exigences relatives au *local gateway* constituerait un défi à la fois technique et économique pour ces acteurs, en particulier en ce qui concerne les installations de plus petite puissance. Les régulateurs régionaux comprennent également qu'Elia a d'ailleurs accepté de reporter d'une année le recours à ce *local gateway* afin permettre aux acteurs concernés de mettre en place la chaîne IT nécessaire.

Dès lors que les exigences d'Elia en matière de *local gateway* ont été formulées afin d'encadrer notamment la fourniture de services de type aFRR pour les installations raccordées à son réseau, les régulateurs régionaux s'interrogent sur l'opportunité d'appliquer *mutadis mutandis* de telles exigences pour les installations de plus petites puissances raccordées sur le réseau de distribution, et plus spécifiquement encore celles raccordées sur le réseau basse tension.

Les régulateurs régionaux précisent dès lors que le débat à venir (voir le document « *Commentaires des régulateurs régionaux sur le contrat entre le GRD et le FSP dans le cadre de la fourniture de services de flexibilité par l'utilisation de la lfexibilité d'utilisateurs du réseau de distribution* ») au sujet de l'ouverture des services de flexibilité à la basse tension pourrait le cas échéant les inciter à étendre le débat avec la CREG et Elia afin de mieux appréhender l'opportunité de telles exigences dans le cadre de la fourniture de services de réglage de la fréquence au départ d'installations de plus petites puissances.

3.2. Exigences en matière de systèmes de mesure

Les exigences de Synergrid en matière de systèmes de mesure renvoient pour l'esentiel à celles reprises dans les règlements techniques régionaux en matière de gestion des réseaux de distribution.

Il apparaît néanmoins que les exigences reprises dans ces règlements techniques pourraient ne pas être totalement adaptées à la fourniture de services de réglage de la fréquence au départ d'installations de plus petties puissance raccordées sur le réseau de distribution.

A cet égard, les régulateurs régionaux rappellent que, dans certaines Régions, le règlement technique relatif à la gestion du réseau de distribution est actuellement en cours en de révision. Ces processus de révision devraient permettre d'adapter les règles en matière de comptage aux nécessités du développement de la fourniture de services de flexibilité au départ de ressources flexibles situées sur les réseaux de distribution. Les régulateurs régionaux invitent les gestionnaires de réseau de transport (en tant que FRP) et de distribution, ainsi que les autres acteurs de marché au premier rang desquels figurent les fournisseurs de services de flexibilité, à alimenter le débat dans le cadre des consultations publiques organisées à cet effet. En particulier, le gestionnaire de réseau de transport, en tant que FRP, pourrait utilement préciser ses exigences minimales.

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Synergrid

Federatie van de elektriciteits- en gasnetbeheerders in België
Fédération des gestionnaires de réseaux électricité et gaz en Belgique

C8/06

General technical requirements

Measurement system and Gateway for an aFRR service delivery point connected to the Distribution Grid

version 2.2

1 Version change log

Version 1.0 – Initial version - January 2020

Version 1.1 – Minor changes – 13/03/2020

Version 2.0 – Changes – 6/04/2020

Version 2.1 – Update on Gateway technical requirements – 12/05/2020

Version 2.11 – Adding contacts – 25/05/2020

Version 2.2 – Additional changes gateway – 12/06/2020

2 Introduction

2.1 Subject of prescription C8/06

In the new aFRR design, a real-time data exchange of measured data and collection of parameters, used for the aFRR-settlement process is required for service delivery points (i.e. delivery points for which ELIA does not receive MW daily schedules) participating in the aFRR service.

Private measurement devices must send the data, via gateways, directly to Communication Platform (CP). The gateways (GW) have to be installed locally within the premise of the grid user and must have direct connection with the Communication Platform.

More information regarding the gateways and related processes can be found in the explanatory note C8/07.

To secure this data and the platform, we will deploy multiple mechanisms with respect to the data exchange (E2E encryption of the measured data between the gateway and the FlexHub, certificate-based authentication) and require the upload on the real-time Communication Platform Web Portal of specific security-related technical documentation for each gateway model.

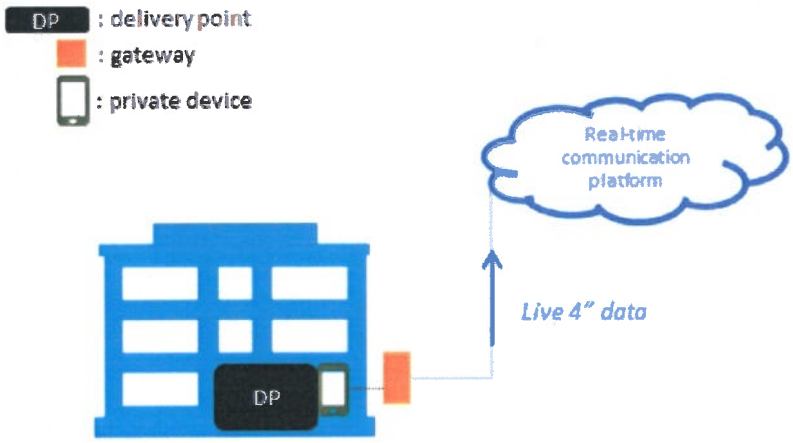


figure 1: general view

The present prescription C8/06:

- is limited to aFRR service delivery points connected to the distribution grid.
- defines on the one hand minimal technical and regulatory requirements for a measurement system (= measurement device including its accessories) when the transfer of energy is not applicable. When transfer of energy is well applicable to the flexibility product, a new analysis of the specific requirements will be performed and could lead to changes of to the present prescription.

- describes on the other hand the technical framework related to the management of the gateways and delivery points (SDPs) and their interaction with the real-time Communication Platform.

Remark:

- URL's for integration test environment and production environment will be communicated later on, before the integration testing phase.

2.2 Asset configurations

The following configurations are authorised (see figure 2):

1. A single gateway transmits real-time data from one SDP measured by a measurement device.
2. A single gateway transmits real-time data from multiple SDPs measured by measurement devices.

In both configurations,

a. The private measurement device is located at the SDP. The SDP can also be defined at the level of the headpoint/access point.

b. The connection of a single gateway to SDPs located on two or more access points is not allowed.

c. A gateway must collect every 4s, the instantaneous power measurement values of a measurement device and other necessary parameters required for the aFRR services, and communicate this in real-time to the real-time Communication Platform using the communication protocol determined by Elia.

d. The communication from gateway to Communication Platform is to be done without an intermediate third-party communication system.

e. The gateways always have to be installed locally within the premise of the grid user which is delimited by the headpoint/access point.

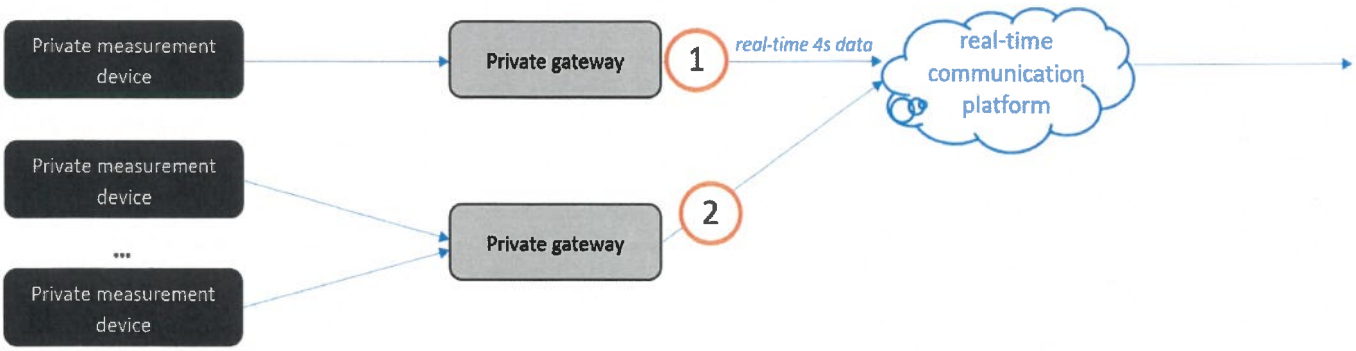


figure 2: schematic view

A local gateway being directly connected to the Real-Time Communication Platform (as described in point d & e above), is the final requirement. A transition period related to the final technical requirement is introduced for maximum one year starting on the go-live of the aFRR design foreseen on the 1st of September 2020. The transition period is foreseen until the 31st of August 2021 at the latest.

This transition period implies that a temporary deviation of the final technical requirement above (i.e. point d & e above) is permitted (acceptance of a degraded mode). This temporary deviation permits the use of a connection via **centralized virtual gateways** to the real-time Communication Platform.

The data will still be sent per delivery point, each delivery point being linked to a separate virtual gateway, to the Communication Platform. All specifications written in this document and corresponding business processes remain valid and must be complied with. At the end of the transition period, all participants need to comply with the final requirements, whereby gateways must be installed locally and connected directly to Communication Platform.

3 Requirements measurement systems

Unless specified in the Technical Regulations for the Distribution Grid according to the Region, the private measurement system shall meet the following minimum requirements:

- The accuracy class of the measurement core of the current transformers (CT) should at least be in line with the requirements of the current transformers for the energy metering as specified in the current Technical Regulations for the Distribution Grid.

- The accuracy class of the measurement core of the voltage transformers (VT) should at least be in line with the requirements of the voltage transformers for the energy metering as specified in the current Technical Regulations for the Distribution Grid.

- The distribution system operator will check the accuracy of the CTs and VTs.

- The accuracy class of the measurement system for the 4s power measurements should be in line with the requirements of the energy metering as specified in the Technical Regulations for the Distribution Grid in force.

- The measurement system must have a sampling rate which allows to give a new value exactly each 4s. Sampling rate must be $1/2^n$ times the 4s interval (with n as an integer > 0).

- As required by Synergrid technical requirement C2/112, any cable connecting the current and voltage transformer to a measurement device is of type LIYY and must comply with following requirements regarding section and length:

Electrical length of cable	Voltage circuit	Current circuit
< 8m (minimum 3m)	4 x 2,5 mm^2 Cu	6 x 2,5 mm^2 Cu

≥ 8m (maximum 18m)	4 x 2,5 mm² Cu	6 x 4 mm² Cu

The connection of the cables between the transformers and the measurement device must be continuous (without any junction, nor intermediate connection strips) and executed according to article 4.4.2.2. of the AREI/RGIE.
The connection wires to current and voltage transformers shall not be part of the same cable.

- A system of 2 or 3 current/voltage transformers is allowed (two- or three-wattmeter method) but the three-wattmeter method is preferred.

- The installation must be properly grounded.

- Precision control of the measurement system is mandatory every 5 years following technical specifications of the distribution system operators. A copy of the report shall be transmitted to the distribution system operator.

- The relevant system operator has the right to perform an ad-hoc on-site audit at any time.

4 Requirements gateways

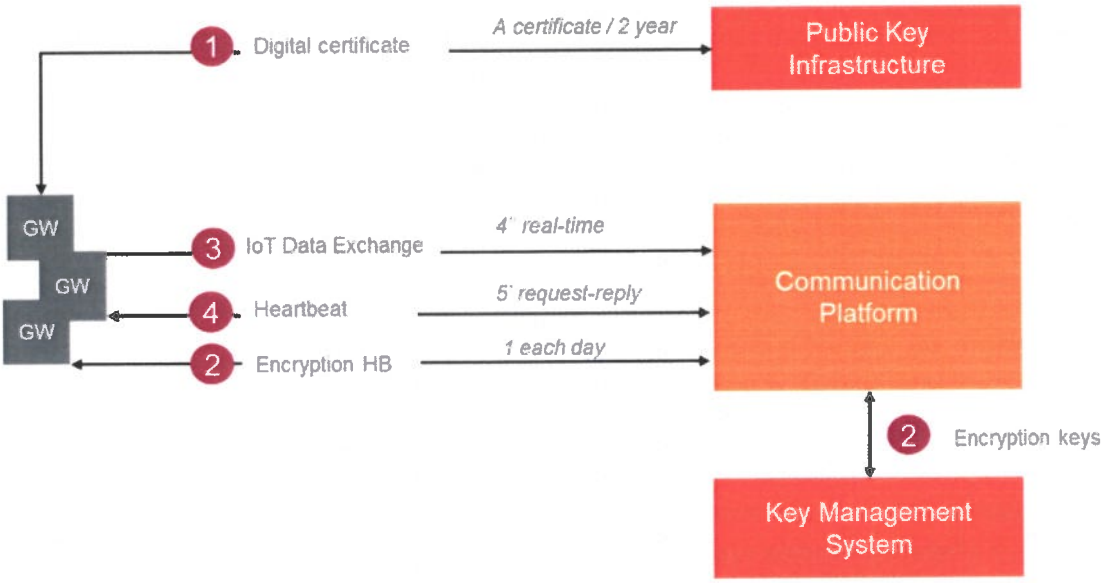
4.1 Data exchange specifications

This section describes the detailed data exchange interface specifications to exchange data between the gateways, the Communication Platform and the security components. In the first version of the platform, the exchange of aFRR data is unidirectional (except for the heartbeat) from the gateways via the aFRR Communication Platform to the Flexhub. The message flow will consist of real-time 4s aFRR messages, used for the settlement of aFRR activations. One message will be sent for each delivery point connected to a gateway.

The security mechanisms allow a reliable and secure data exchange: the Public Key Infrastructure (PKI) allows certificate-based authentication of the gateways and the Key Management System distributes encryption keys that can be used to encrypt the aFRR message body.

4.1.1 Data flows

Below a visualisation of the E2E process flow of all data exchanges the gateways must be able to support.



1. Each gateway and application that will connect to the Communication Platform will need to acquire a digital certificate from the Public Key Infrastructure (valid for 2 years). This certificate is used to authenticate the gateway for all connections to the platform and Key Management System.

2. The data (body) has to be end-to-end encrypted (from the gateway to the FlexHub). Every day, an independent Key Management System (KMS) will generate encryption keys to be used for message body encryption and will send these via the Communication Platform to the gateways.

3. Every 4 seconds, an aFRR message with encrypted body is send by the gateway to the Communication Platform. To be able to connect and publish the message on the queue, the gateways must have a digital certificate retrieved from the Public Key Infrastructure (PKI).

4. At regular interval (initially every 5 minutes), the Communication Platform will put a heartbeat message on the topic to which the gateway must reply. The message includes key values for specific use cases and for gateway connection status updates.

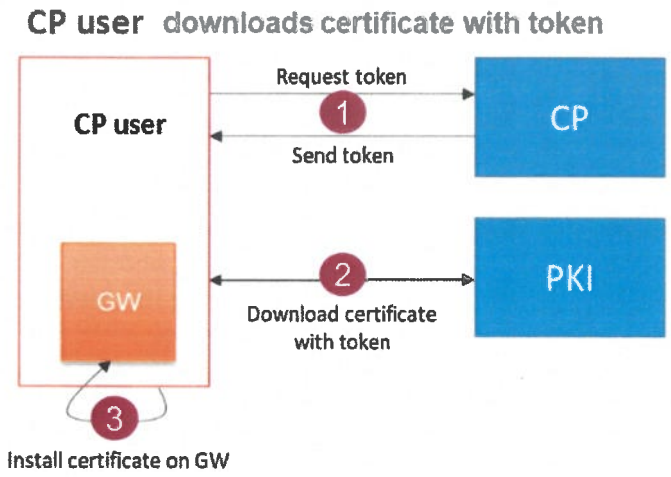
Message queues enable asynchronous communication, which means that the endpoints that are producing and consuming messages interact with the queue, not each other. In contrast to queues, in which each message is processed by a single consumer, **topics** and subscriptions provide a one-to-many form of communication, in a publish/ subscribe pattern.
The data exchange between the gateway and the Communication Platform will be done using two different topics (1 topic for each direction).

4.1.2 Interfaces

4.1.2.1 Certificate-based authentication

The following scenarios will be provided for acquisition of tokens and certificates:

Scenario 1: Acquisition of the Certificate through the portal



1. The CP user requests a token via an action in the user interface of the portal for a gateway. A validation code will be generated and shown in the portal in the concerned gateway information screen, and a mail will be sent to the CP user with a token.
2. The CP user navigates to a secure webpage via the web portal and uses the token as well as the validation code to download the certificate.

   When the request is valid, the CP user can download a ZIP file with a PFX file and the password to extract the certificate (CERT file – X.509 Certificate).

Scenario 2: Acquisition of the Certificate by the Gateway using a token

This second scenario will be available in a subsequent release and the detailed specification will be made available in one of the following updates of this document.

4.1.2.2 aFRR Messages

The messages in the data exchange will be composed of a functional header and a message body.

All required (and optional) fields are described in the following sections. In the element column, abbreviations are used to make the message tags smaller to reduce the message size.

With respect to datetimes, we use the ticks datetime format, which are the milliseconds, counted from the reference date: **01-01-2019 00:00:00 UTC**.

4.1.2.2.1 Body (to be encrypted – see next sections)

Element	Data Type	Origin	Description
SDP – SDP EAN	String	SCADA / FSP BE	The aFRR service delivery point EAN number.
DPM – DPmeasured	Decimal (JSON)	Measurement device	The instantaneous net (gross if the net value cannot be measured) power

			measurement (in MW) per delivery point.
DPB – DPbaseline	Decimal (JSON)	SCADA / FSP BE	The power (in MW) that the delivery point would have injected/consumed without the activation of aFRR service. The baseline is sent 60 seconds in advance.
AS – DPaFRR	Integer (JSON)	SCADA / FSP BE	This is a logical (0 or 1) signal that indicates whether the delivery point is delivering the service for the concerned timeframe.
PS – DPaFRR,supplied	Decimal (JSON)	SCADA / FSP BE	The number of MW of ΔPsec_tot4 that is attributed by the BSP to the delivery point in question.
MTS – Measure timestamp	Ticks (UTC)	Measurement device / gateway	The datetime on which the snapshot of the Pmeasured is taken. The Pbaseline in this message represents its value for this timestamp + 1 minute in the future.

4.1.2.2.2 Header

Element	Data Type	Origin	Description
MT - Message Type	String	Data source originated	Represents the message type & frequency. This makes sure that every message type is unique no matter what frequency is requested.
SID – Sender Id	String	Data source originated	The Endpoint Id as registered in the Communication Platform
GID – Gateway Id	String	Date source originated	The Gateway ID of the gateway as generated by the Communication Platform.
EKV – Encrypted key version	Integer (optional)	Data source originated	The version of the encryption key used (changes at certain periods). If not sent, then the message body is to be considered: not encrypted.
HV – Header version	Integer	Data source originated	The header version allows communication on the same message type but with different versions in case the message header structure is updated. This way, senders have time to adapt and a receiver knows how to interpret the message.
BV – Body version	Integer	Data source originated	The body version allows communication on the same message type but with different versions in case the message body structure is updated. This way, senders have time to adapt and a receiver knows how to interpret the message.

CTS - Creation timestamp	Ticks (UTC)	Date source originated	The timestamp when the message has been sent by the sender.

4.1.2.2.3 Protocol

MQTTS protocol has to be used between the gateway and the Communication Platform.

4.1.2.2.4 Encryption Algorithm

In order to encrypt the message bodies, the Advanced Encryption Standard (AES) / Rijndael algorithm (128 bits) using symmetric keys is used. A lot of implementation libraries are available in Python, JAVA, C#, ...

The algorithm is described in the ISO/IEC 18033-3 standard. A simple description of this algorithm can be found here:

https://en.wikipedia.org/wiki/Advanced_Encryption_Standard

This algorithm is used with, as default, the following parameters:

- Block size: 128 bits
- Key size: 128 bits
- Cypher: CBC
- Padding: PKCS7

4.1.2.3 Encryption keys

As described in the process flows, a Key Management System will generate encryption keys and put them available to each separate gateway through the Communication Platform.

Therefore, a specific message type will be exchanged.

4.1.2.3.1 Header

Parameter	Value	Description
MT - Message Type	String (ENCRYPTION KEY)	Represents the message type & frequency. This makes sure that every message type is unique no matter what frequency is requested.

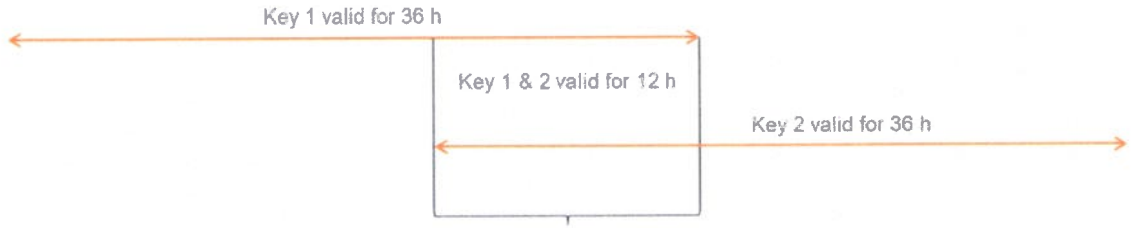
4.1.2.3.2 Body

Parameter	Value	Description
MT – Message Type		The message type for which the key is requested
KEY	string	The encryption key itself. This key is encrypted from the secure KMS using the GW certificate.
KV - Key version	integer	The key version of the requested key
KT – Key Type	string	The algorithm supported for encryption

VF - Valid From (Start Validity)	Ticks	Validity start datetime of the encryption key
VT - Valid To (Stop Validity)	Ticks	Validity end datetime of the encryption key

Gateways

An encryption key is valid for **36 hours** and a new key will be retrieved daily. This means we will have an encryption key overlap of 12 hours within which period the new key must be received and used:



4.1.2.3.3 Technical information

The Communication Platform will exchange this message type with the same principles as the aFRR messages but in the other direction. A specific topic for this message exchange will be foreseen.

Please note that currently, only the AES / Rijndael algorithm is supported by the platform. Others can be added later on.

To guarantee the confidentiality on the key, the key present in the message will be encrypted with the gateway certificate public key. The gateway will need to use its own certificate private key to decrypt the key and after use it to send messages.

Message example:


```
{
  "MT": "ENCRYPTIONKEY",
      "Body":
      "hj7EFc+S5giTCk41loj21ILGOT4aZkafhXzSbmt/gy4ANB4as1MZsnyAwixU76vm4AEmniUw29+8g
      NLEg9Yq0LeR8Hc3zEqGXFaplqNv+6TrSQy+VvZG2NR4xaK1EvAUF8GeP6U9FMVz4eB8MWB94R
      W44n3QOYfCQz7CTEJXvbwbwclGHJN4wsfGPMMxdZUeUiLAuhHvGG7KeLPefTl2DoHS4N8B2m
      ol7lXFZcSD1vnCy4kcF3Jyd6KPEzKfhkFJc2FZaidIjSWuo/Z5HQb74hAmg2m/REQnw7yXfaHjJ3E8Z
      zoFZhw+sR7TsBnZvDInni74zuv0R7UFTg2eHmKHnA==" }
```


4.1.2.4 Encryption key Request

As described in the process flows, a Key Management System will generate encryption keys and put them available through to each separate gateway through the Communication Platform. When the

gateway has to be replaced or restarted with an empty configuration, the latest encryption key(s) has(ve) to be requested to be able to send new messages again.

Therefore, a specific message type will be exchanged.

Note that one message will be received (as described in section 4.1.2.3) for each message type and version managed by the gateway with an active aFRR service (normally only one because there is currently only one message type with only one version).

4.1.2.4.1 Header

Parameter	Value	Description
MT - Message Type	String (ENCRYPTION KEYREQUEST)	Represents the message type & frequency. This makes sure that every message type is unique no matter what frequency is requested.

4.1.2.4.2 Body

Body is empty

4.1.2.4.3 Technical information

The Communication Platform will exchange this message type with the same principles as the aFRR messages but in the other direction. A specific topic for this message exchange will be foreseen.

Message example:

```
{
"MT": "ENCRYPTIONKEYREQUEST"
}
```

4.1.2.5 Heartbeat

The heartbeat mechanism allows to exchange key values between the gateways and the Communication Platform that are not related to the exchange of market data from endpoints.

The Communication Platform indicates the pace of the heartbeat messages and will be initially set to every five minutes.

The heartbeat message has two functioning methods:

- Ad hoc: an action button in the management portal will be provided in order to initiate a one-time heartbeat message sent to the gateway. If this message is successfully replied to by the gateway, its communication status will be set to 'Connected'. This allows the user to test the connection and authentication of a gateway.

- Recurrent: once a service is activated on this endpoint, the CP will initiate a heartbeat at the interval it choses (5 minutes initially). Also here, the communication status of the gateway will be updated in the portal in case a heartbeat is not replied to. The time to live of the heartbeat message will equal the heartbeat frequency (5 minutes initially).

4.1.2.5.1 CP to GW

Header

Parameter	Value	Description
MID - MessageId	Integer	A counter that can be reinitialized
MT - Message Type	String (HEARTBEAT)	Represents the message type & frequency. This makes sure that every message type is unique no matter the frequency with which the message heartbeat is posted.

Body

Parameter	Value	Description
TS - Time Sync	1	Only present when a gateway must synchronize its internal clock with an NTP server
GWV - GW Version	1	Only present when a gateway must send its firmware and software version. This will be requested daily.

TimeSync et GW version parameters are 2 keys that can be added as list of parameters in the message. Other parameter(s) can be added later on in body.

Message example without time synchronization and GW version needed:

```
{
   "MID": 36,
   "MT": "HEARTBEAT",
 },
```

Message example with time synchronization and without GW version needed:

```
{
   "MID": 36,
   "MT": "HEARTBEAT",
   "Body": "{"TS":1}"
 },
```

Message example without time synchronization and with GW version needed:

```
{
   "MID": 36,
   "MT": "HEARTBEAT",
   "Body": "{"GWV":1}"
 },
```

Message example with time synchronization and GW version needed:

```
{
   "MID": 36,
   "MT": "HEARTBEAT",
   "Body": "{"TS":1, "GWV":1}"
 },
```

4.1.2.5.2 GW to CP

Header

Parameter	Value	Description
MID - MessageId	Integer	The message ID of the Heartbeat request message.
MT - Message Type	String (HEARTBEAT)	Represents the message type & frequency. This makes sure that every message type is unique no matter what frequency is requested.
GID – Gateway Id	String	The Gateway ID of the gateway as registered in the Communication Platform.
CTS - Creation timestamp	Ticks (UTC)	The timestamp when the message has been sent by the sender

Body

Parameter	Value	Description
SV - Software version	String	The model software version on which the gateway is running. Only to be sent when the GW Version field in the request is sent.
FWV - Firmware version	String	The model firmware version on which the gateway is running. Only to be sent when the GW Version field in the request is sent.

Message example without software and firmware version needed:

```
{
   "MID": 36,
   "MT": "HEARTBEAT ",
   "GID": "123-ABCD",
   "CTS": 29666589696
 },
```

Message example with software and firmware version needed:

```
{
   "MID": 36,
   "MT": "HEARTBEAT ",
   "GID": "123-ABCD",
   "CTS": 29666589696,
   "Body": "{"SV":"1.2", "FWV":"1.74"}"
 },
```

4.1.2.5.3 Technical information

The Heartbeat will be pushed regularly on the GW receiver topic. The response is sent to the same topic as the aFRR messages.

4.1.3 Exception handling

4.1.3.1 Buffering

A local buffering of at least 5 days has to be done locally. This will be used when the communication between the GW and the aFRR Communication Platform is interrupted. The data has to be timestamped at the moment they are produced.

Once the communication is back up, the messages not sent during the interruption have to be sent.

4.1.3.2 Throttling

To avoid congestion, a maximum of **1** message can be sent per second per gateway.

4.1.3.3 Message grouping

- Message grouping can be done for a period of **1** minute (15 data of 4s). Pay attention that it is only valid during exception handling (communication failure, ...).
- When grouping, the header is sent only once and the bodies of the specific time series will be grouped in one body.
- The body will be encrypted only once.

4.1.3.4 Fallback files

In the event that Elia does not receive the data through real time communication for bigger gaps, the following is put in place:

- The FSP must, on the request of Elia, be able to provide a fallback file with time series containing the same parameters requested in the aFRR message.

- Elia can only request fallback files in a period covering maximum 90 days before the day of request.
- The delivery of the fallback file must be fulfilled within five working days.

4.1.4 *Service level agreements*

To assure correct, complete and real-time data exchange, a monitoring is foreseen on predefined KPIs.

4.2 Technical features

4.2.1 *URL's and config*

The platform will be available at the following URL's:

ACC: https://rtcp-acc.synergrid.be/

DEMO: https://rtcp-pre.synergrid.be/

PROD: https://rtcp.synergrid.be/

Please note that the first tests starting from May 18th have to be done with the Pre-Prod environment. The acceptance environment will be used when updates of the platform will be release. The production environment (to use for the pre-qualifications tests) will be released in the coming weeks.

The Device Provisioning System URL is the following without using the Microsoft SDK:

https://global.azure-devices-provisioning.net/{connectionScope}/registrations/{GatewayBusinessId}/register?api-version=2019-03-31

The GatewayBusinessId is generated by the platform when a new Gateway is created.

Connection scope :
ACC: 0ne000F2E25
DEMO: 0ne000F7DB8
PROD: 0ne000FEA0A

With the Microsoft SDK, the connection string is the following:

global.azure-devices-provisioning.net

Note that these URL's & configurations will not change in case of DRP.

The name of the 2 topics:
Cloud to Device: $"devices/{GatewayBusinessId}/messages/devicebound/#"
Device to Cloud: $"devices/{GatewayBusinessId}/messages/events/"

4.2.2 *Message format testing*

Testing of the validity of JSON (RFC 8259 format) messages in the communication portal interface will be foreseen.

4.2.3 *Examples*

Below, some examples of messages are given. It will also be possible to test the message format (JSON Validation) in the test platform.
To receive more detail on how to connect to the platform and a detailed example (in C#) of the code to connect to our platform, please use the technical reference as defined in point 2 of this document.
Other examples (in different programming languages) can be found here: https://docs.microsoft.com/en-us/azure/iot-hub/iot-hub-devguide-sdks.

The section to use is **'IoT Hub Device SDKs'**

4.2.3.1 Data exchange

Messages have to be sent with encrypted body. In this section, on overview is given of unencrypted and encrypted data to allow to generate the correct JSON before encryption. As previously described, the body can contain multiple 4 seconds data to cover some exception flows. Both cases are detailed below.

- aFRR data – Unencrypted JSON with one 4s data:


```
{
  "MT": "AFRR",
  "HV": 1,
  "BV": 1,
  "GID": "SN4589674",
  "CTS": 33496996088,
  "EKV": 1,
  "SID": "84V-UOU-40P",
  "Body":
"[{"DPM":0.123,"DPB":0.987,"AS":1,"PS":0.0,"MTS":0,"SDP":"541122334455667788"}]",
}
```


- aFRR data – Encrypted JSON with one 4s data :

The encryption key to use for this message has the following properties:

Encryption type: RijndaelManaged -> KeySize: 128, Padding: PKCS7, Mode: CBC
Encryption key: 9xu0DqrgaFYgrPhudq9s6A==
Encryption IV: 9xu0DqrgaFYgrPhudq9s6A==


```
{
  "MT": "AFRR",
```

```
    "HV": 1,
    "BV": 1,
    "GID": "SN4589674",
    "CTS": 33496996088,
    "EKV": 1,
"SID": "84V-UOU-40P",
    "Body":
"9pMzn4mX5b/+y5SSPVzi6vgebzyLDQJ5bog4c3mg+8cIXS1eVw5ELNlbBUqllhYznMt872Nu7dwUyBTb
Ykl7IPcC9NK8XFy9wnFtVLLmFjM="
  }
```


5 Time synchronization and time stamp

As each measurement needs to be provided with a time stamp, there are two options:

(1) The time reference and stamp are given in the gateway;

(2) The time reference and stamp are given in the measurement device.

The data must be timestamped each 4 seconds.

Regarding time synchronization, the device that is responsible for the time stamping must be synchronized with an NTP-server or an equivalent system at all times. The precision of the timestamp should be at least 20ms. In case of consistent time difference, the CPO will request, via a heartbeat message, to synchronise to an NTP-server.

6 Contacts for gateway

For any question, please contact the persons as mentioned in the 'Technical Guide for Gateway Management V2.3' available on the Elia-website via this link.

Synergrid

Federatie van de elektriciteits- en gasnetbeheerders in België
Fédération des gestionnaires de réseaux électricité et gaz en Belgique

C8/07

Explanatory note

aFRR – business processes

1 Introduction

This explanatory note C8/07 explains the aFRR project context and has to be considered as a supporting document to the Synergrid C8/06 (General technical requirements measurement system and gateway for an aFRR service delivery point connected to the distribution grid) for better understanding.

2 Glossary

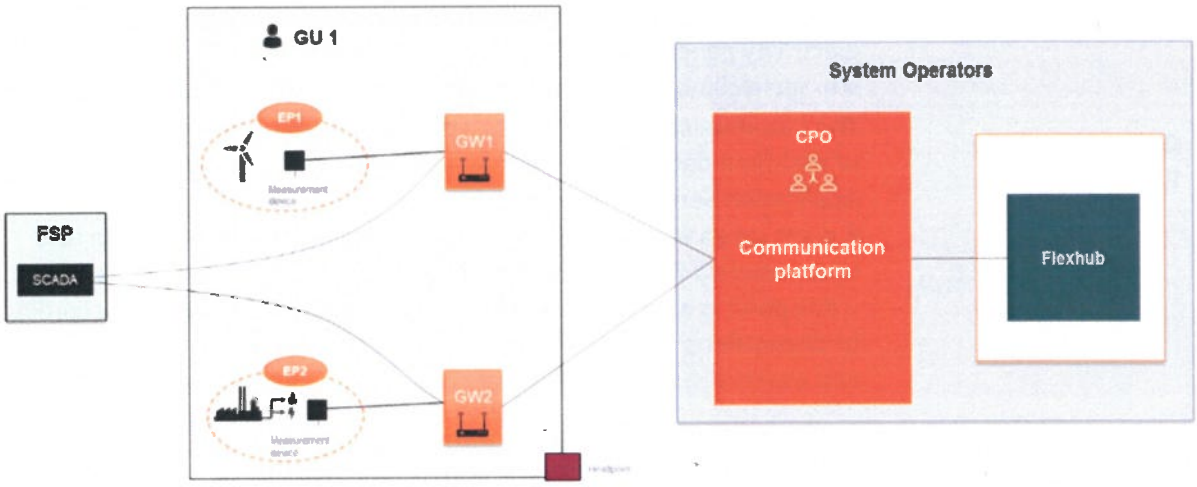
The definitions below are non-binding but are given to correctly interpret the context of this document's content and C8/06. In case of inconsistent definitions or contradictions between this document and the T&C (terms and conditions) BSP aFRR, the latter prevails.

Concept	Definition
Access Point	As defined in Art. 2 §1 (29) of the Federal Grid Code for an access to the transmission grid of ELIA. For an access to the ELIA Grid other than transmission grid, or to a Public Distribution Grid, or to a CDS: a point, defined by physical location and voltage level, at which access to the ELIA Grid other than transmission grid, or to a Public Distribution Grid, or to a CDS is granted, with a goal to inject or take off power, from an electricity generation unit, a consumption facility, a non-synchronous storage facility, connected to this grid.
Communication Platform (CP)	The Communication Platform is a platform enabling a secure exchange of real-time data between the assets of Grid Users and applications of Application Service Providers.
(Service) Delivery Point (SDP)	A point on an electricity grid or within the electrical facilities of a Grid User, where a Balancing Service or strategic reserve service is delivered – this point is associated with one metering and/or measures, according to dispositions of the BSP Contract aFRR, that enable(s) ELIA to control and assess the delivery of the aFRR Service.
Endpoint (EP)	A digital data access point registered on the CP that allows the exchange of data between the SDP and an Application over the CP via a Gateway.
Flexhub (FH)	The Flexhub is an application that stores and structures flexibility related data. It is connected to the Communication Platform for the exchange of data and the activation of services.
Flexibility Service Provider (FSP)	The Flexibility Service Provider (FSP) offers flexibility services and valorises the aFRR service on the GUs Service Delivery Points. In the context of aFRR, the flexibility offered is for system balancing so the FSP is considered a Balance Service Provider (BSP).
Gateway (GW)	A private communication gateway connecting the physical asset and its metering device to the CP in a digital way. This gateway must be installed locally for the exchange of aFRR data.
Headpoint (HP)	Means an Access Point (always identified by a single EAN number representing offtake). Each Headpoint is registered by the System Operator in the Access Register.

Measurement device (MD)	The measurement device is the device that measures the electrical asset(s). Either it pushes the data or the data is pulled by a gateway.
Grid User (GU)	As defined in Art. 2 §1 (57) of the Federal Grid Code for a Grid User connected to the ELIA Grid or to Public Distribution Grid; or as defined in Art. 2 §1 (58) of the Federal Grid Code for a Grid User connected to a CDS. In the context of this technical guide, Grid Users are companies that are connected to the transmission or medium-voltage distribution grids and are contracted by FSPs to participate in the delivery of aFRR via DP_DG units.
Communication Platform Operator (CPO)	The Communication Platform Operator operates, maintains and manages the Communication Platform. The CPO is representing and mandated by the System Operators.

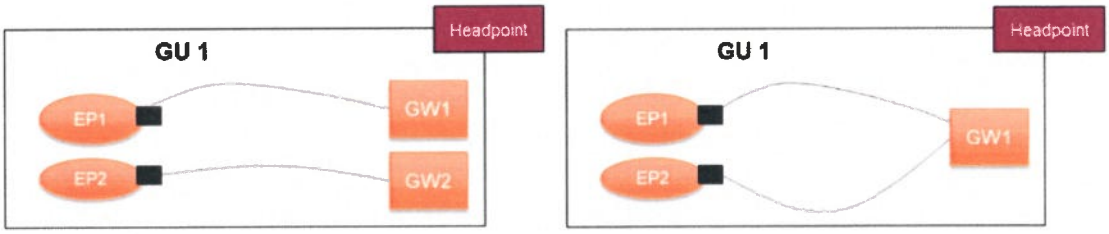
3 Overview of actors and concepts

The figure below gives an overview of the actors that are involved and concepts that are used in the real-time data exchange of the aFRR settlement messages. Note that the contracting and the onboarding process precede this situation. The onboarding processes are described in the next section. The contracting process is described in the T&C BSP aFRR.



4 Data sources

The data sources consist of three elements:



- **Measurement device**: Pmeas is measured and sent in real time by the measurement device via the private local gateway towards the Communication Platform. The data can either be pushed

by the measurement device via the local gateway or pulled by the gateway from the measurement device. The FSP system enriches the message with the required aFRR parameters. The measurement device general technical requirements are described in document C8/06 (which can be found on Synergrid website). The measurement devices must not be registered on the Communication Platform.

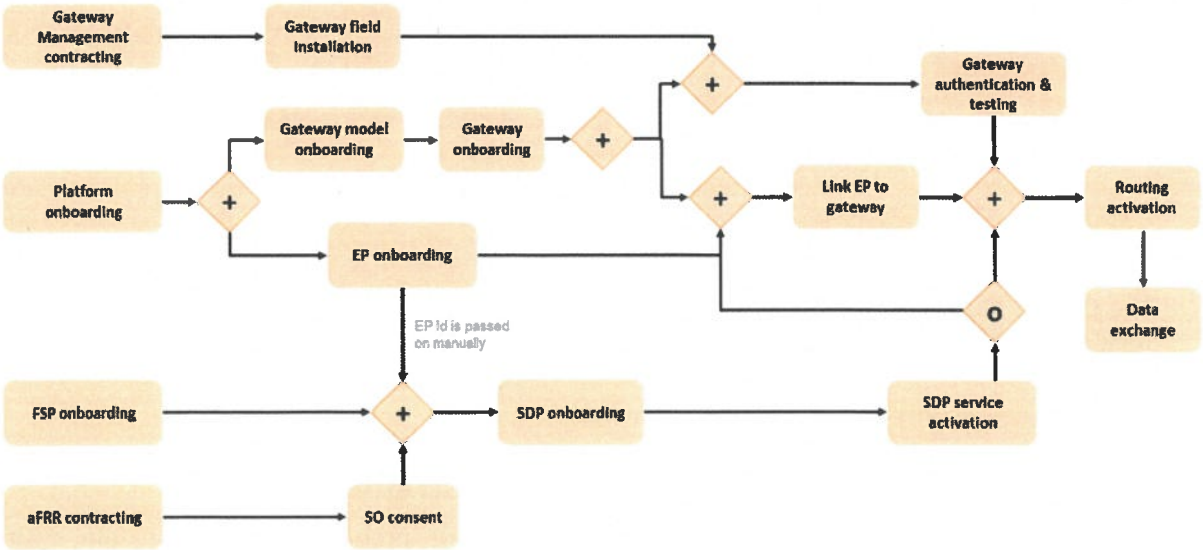
- **Gateways**: Private gateways are operated and maintained by the GU or an FSP mandated by the GU. The gateways have to be installed **locally** within the premise of the grid user and must have direct connection with the Communication Platform. A gateway can be connected to multiple endpoints behind the same headpoint (access point) but **cannot** be connected to endpoints of different headpoints. The gateways must be connected to the Communication Platform and comply with the general technical requirements set out in document C8/06 (which can be found on Synergrid website). They are administratively registered on the Communication Platform via the management portal.

- **Endpoints**: The endpoint is considered the digital data access point and by transfering data towards the Communication Platform it enables services on this point. Endpoints must be registered under a headpoint on the Communication Platform, and can only be done in case a correct mandate is obtained. In the context of aFRR, an endpoint can be seen as a digital version of the Delivery Point, which is not providing energy but used for data exchange.

5 High level business processes

In the figure below you can find the high-level business processes representing the necessary preliminary activities that must be fulfilled in order to establish the digital metering data chain required for the real-time data exchange of aFRR settlement data.

DISCLAIMER: Note that these processes are work in progress and can still be subject to change.



5.1 Data source related processes

5.1.1 *Contracting and registration*

- ***Gateway management contracting:***

In case the grid user does not manage his own gateways and endpoints, these activities can be delegated to an FSP. This delegation contract will be the subject to the subsequently use of a Gateway Management (GWM) designation document. In the text below the term **CP user** will be used, which will either be the GU or the FSP if mandated by the GU.

- ***Account onboarding***

The CP user onboards his account and users in order to manage its data sources on the Communication Platform.

5.1.2 *Physical processes*

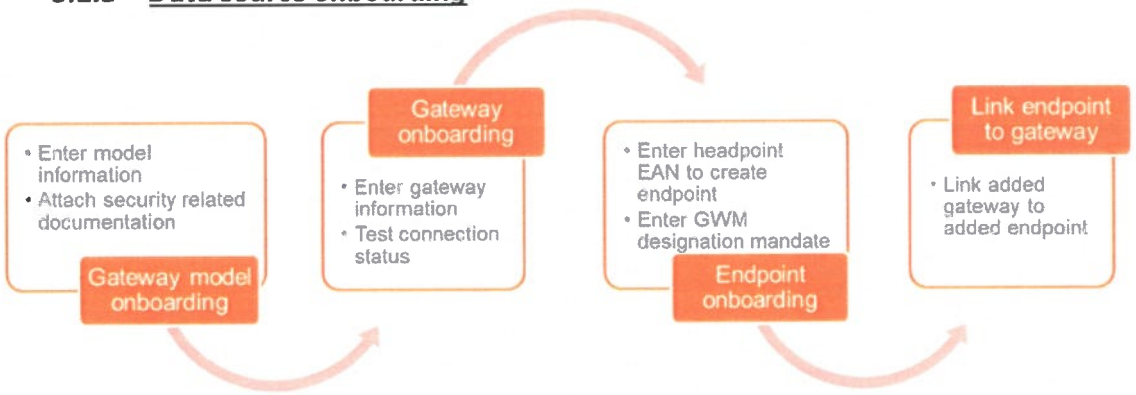
- ***Gateway field installation***

The CP user physically installs the gateway on the premise of the grid user, connects it to the measurement device, and assures the gateway is configured correctly.

- ***Gateway authentication and testing***

The CP user installs the digital certificate on the gateway and connects to the platform to test the installed gateway via the heartbeat (see document C8/06).

5.1.3 *Data source onboarding*



- ***Gateway model onboarding***

The CP user must first register a gateway model and upload the required security documentation related to the model.

The following security documentation is required:

Documentation	Description
Secure product development lifecycle	Documentation of the secure product development life cycle including the standards, practices (including continuous improvement), and development environment (including the use of secure coding practices) used to create or modify provided energy delivery system hardware, software, and firmware. If applicable, it

	must be documented how the most critical application security weaknesses (including OWASP Top 10 or SANS Top 25 Most Dangerous Software Errors) are addressed in the Supplier's SDLC.
Secure network configuration management	Provide documentation that the network configuration management interface is secured.
Security standards	Listing of security standards to which the implementation adheres.
Patches and updates	Documentation that the installed GW (including third-party hardware, software, firmware, and services) has appropriate updates and patches installed prior to activation of the communication to the Communication Platform or within (a pre-negotiated period) after installation. Patches and updates need to be done continuously during the GW lifecycle.
Publicly disclosed vulnerabilities	Upon request of the Communication Platform operator, and prior to activation of the communication to the Communication Platform, a summary documentation must be provided of publicly disclosed vulnerabilities in the procured product and the status of the party's disposition of those publicly disclosed vulnerabilities.
Hardware - software testing	A Quality Assurance program and validation that the software and firmware of the procured product have undergone Quality Control testing to identify and correct potential cybersecurity weaknesses and vulnerabilities. This testing shall include fuzz testing, static testing, dynamic testing, and penetration testing. Positive and appropriate negative tests must be used to verify that the procured product operates in accordance with requirements and without extra functionality, as well as monitor for unexpected or undesirable behaviour during these tests. This testing may be done by an independent entity or the CP user's company. Summary documentation of the results of the testing must be provided including unresolved vulnerabilities and recommended mitigation measures.
Cybersecurity program	The Communication Platform Operator shall reserve the right to request documentation of CP user's implemented cybersecurity program, including recent assessment results or conduct periodic (at a negotiated frequency and scope) on-site security assessments at the GW installed facilities. These on-site security assessments may be conducted by an independent third party, at the discretion of the CPO.

- ***Gateway onboarding***

The CP user can subsequently register gateways of successfully uploaded models on the platform.

- ***Endpoint onboarding***

In parallel, the CP user can onboard endpoints. Therefore, he enters a headpoint EAN number and uploads the GWM designation document, in case the CP user is an FSP mandated by the GU, for the gateway management activities. He subsequently creates an endpoint, which will automatically be linked to this headpoint on the platform.

- ***Link endpoint to gateway***

When an active endpoint and gateway are correctly registered on the platform, CP user links the gateway to the endpoint on which it is (or will be) installed.

5.2 Other processes

To give additional project context the following processes are introduced. The final processes will be included in the aFRR terms and conditions.

- ***aFRR contracting***

The grid user contracts the Flexibility Service Provider to valorise its flexibility to the Flexibility Requesting Party (FRP). This contract will be the subject of the subsequently used Grid User declaration.

- ***FSP onboarding***

The FSP will contract either the Flexibility Requesting Party and System Operator with a preliminary agreement or final contract. The FRP or SO will request the Flexhub Operator to register or update the FSP account in the Flexhub.

- ***SO consent***

The DSOs assess with a Network Flexibility Study whether the delivery point can participate in aFRR and the SO reviews the GU declaration. After reviewing the SDP request, the SDP is registered in the Flexhub.

- ***SDP onboarding***

The SDP is subsequently onboarded in the Flexhub and linked to the corresponding Flexibility Service Provider. The FSP is able to already register the corresponding Endpoint ID, but this is not mandatory.

- ***SDP activation***

Once the SDP is onboarded and the Endpoint Id is completed (by the SO in the Flexhub), the SO will send a service activation message via the Flexhub to the Communication Platform to open up the routing.

- ***Routing activation***

When an endpoint, on which the aFRR service is activated from the Flexhub **and** which is linked to an active registered gateway installed on the premise of the grid user, the routing will be enabled.

- ***Data exchange***

Once messages enter with this endpoint and gateway combination, the Communication Platform will route the data to the Flexhub from where it will be collected by aFRR settlement systems.