RealtimeInterface

Positioning of the Realtime Interface System Operator - Connected Party

Dutch implementation of RfG interface requirements

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Inhoud

1. Introduction

The goal of this document is to define the context, positioning and scope of the Realtime Interface (RTI), with the aim of providing a general background for the purpose of implementation. This document should be read in conjunction with the Technical Specifications and relevant appendices.

The first chapter gives a brief background of the domain of Realtime Interface and the respective specifications. It also explains the justification and scope for development of the RTI.

2. Background

The energy transition is in full swing. Increasing amounts of distributed energy resources (DER[1]), such as solar photovoltaic systems (PV) and wind turbines are connected to the power system. The existing transmission and distribution grids are not designed to handle these large amounts of DER. For this reason, System Operators in the Netherlands are increasingly confronted with scarce transport capacity and cannot reinforce their grid infrastructure at the same pace as DER are being installed.

In the Netherlands, System Operators therefore have started to investigate ways to connect larger amounts of DER in the existing power system and grid infrastructure. Congestion management methods have been implemented to reduce the impact of scarce transmission capacity whilst reinforcing transmission and distribution grids and connecting DER without N-1 grid redundancy. Regulatory changes have been approved and implemented, enabling System Operators to apply congestion management methods on a large scale to free up capacity in the power system.

Figure 1 - Parties in involved in the development of RTI

One of the tools to enable such use cases is an interface between Connected Parties with a grid connection and their System Operator, which enables Connected Parties and System

[1]DER is a generic term, consisting of among others: Power Generating Modules conform regulation (RfG, 2016/631) and Storage Facilities.

Operators to exchange operating constraints and measurement data (near) real-time, reflecting the expected and actual behaviour at the Point of Common Coupling (PoCC), also known as the Electrical Connection Point (conform IEC 61850-7-420). This interface is used by System Operators to interact with Connected Parties, allowing them to monitor and control the behaviour of Connected Parties on the PoCC.

In 2020, the Dutch System Operators, united in their national association Netbeheer Nederland (NBNL), initiated their first project in close collaboration with market parties to describe a Realtime Interface (RTI), see Figure 1. In February 2024, the first version of the specifications has been released. As a result, RTI version 1 has entered its operational phase. This document describes the positioning of the RTI concept.

2.1. Justification

The reason and justification for development and use of a Realtime Interface is as follows:

- The EU grid code Requirements for Generators (RfG 2016/631) requires Power Generating Facility Owners to have an interface (input port) to be able to reduce active power output, following remote instructions of the System Operator. The System Operator has the right to specify requirements for this interface. This enables remote monitoring, control and provides operational instructions regarding power output. As a result, Connected Parties in the electricity grid need to meet the requirements specified by the System Operators. The System Operators shall specify the requirements of a RTI to facilitate the exchange of information about operating constraints and metering data near real-time.
- To manage scarce transport capacity whilst awaiting grid reinforcements (or to prevent such reinforcements), System Operators may apply congestion management and/or other forms of capacity management. For the sake of operational security and optimal use of available capacity, System Operators need to be able to rely on metering values for monitoring and must be able to communicate operating constraints to Connected Parties real-time.
- The national regulatory framework in the Netherlands, particularly related to capacity management (e.g., congestion management, connecting DER without N-1 grid redundancy) has been updated. In November 2022, the new Dutch grid code (‘Netcode Elektriciteit’) has taken effect, implying capacity management can be actively applied by System Operators. In April 2024, this regulatory framework is further tightened, forcing System Operators to connect Connected Parties with Power Generating Facilities up to 150% of the rated network capacity.
- To ensure operational security in the power system and provide an alternative for disconnecting grid segments or individual Connected Parties, System Operators see a need for a RTI between System Operator and Connected Parties to exchange measurement values and operational constraints. System Operators may require Connected Parties to have a RTI in place to provide, monitor and control (advanced) services related to capacity management. Proposed changes in the regulatory framework further guarantee the possibility to utilise the RTI.

- The association of Dutch System Operators, united in Netbeheer Nederland (NBNL) has developed and implemented a first harmonised RTI concept for the Dutch electricity sector. This was designed in cooperation with market participants and Connected Parties to include both System Operator and Connected Party perspectives. The RTI concept standardised both the technical specifications of the RTI and the use cases (including application framework) for which the RTI is applied. As a result, the interface between System Operator and Connected Party is, with regards to an RTI, standardised.

3. Position in the ecosystem

This chapter discusses the position of the RTI in the electricity market ecosystem. It describes the relevant roles used for the RTI as well as the interactions between them.

3.1. Role description for the Realtime Interface

This chapter discusses the roles relevant to the RTI, as well as their interactions. In the context of the RTI, the following roles are relevant:

- **The System Operator:** The Distribution System Operators and Transmission System Operator are responsible for the secure and continuous operation of the distribution and transmission system, respectively.
- **The Connected Party:** A legal entity representing a power-generating module or demand facility connected to the transmission or distribution system at the connection point and having a connection agreement (i.e. Aansluit- en Transportovereenkomst (ATO)) with the relevant System Operator.
- **The Power Generating Facility Owner:** A natural or legal entity owning a power-generating facility, consisting of one or more power-generating modules connected to the power system at one or more connection points.
- Other roles such as the **Congestion Service Provider, Balancing Service Provider and Balancing Responsible Party** are relevant for market arrangements but out of scope in the context of RTI.

The interactions between a System Operator, Connected Party, Power Generating Facilities and Congestion Service Provider, can be modelled into a simplified triangular flow diagram as visualized in **Fout! Verwijzingsbron niet gevonden.**. This figure visualizes the position of the RTI in the overall ecosystem, including its scope. As visualized in the figure, the scope of the RTI is limited to interactions between System operator and Connected party. Interactions with market parties (e.g. BRP, BSP, CSP) and interactions behind the PoCC are out of scope. The RTI explicitly does not touch upon market processes and arrangements with e.g. congestion service providers.

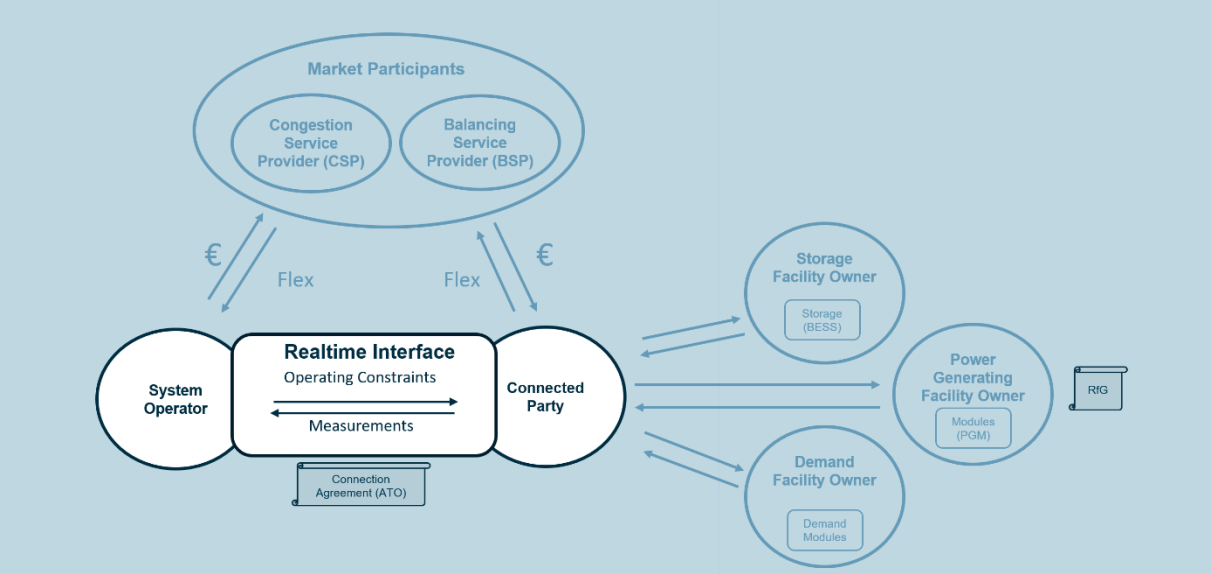


Figure 2: Interface between Market Participants, Connected Party and System Operator, including domain/scope of operation of the RTI

The RTI communicates operating constraints and measurements which apply at the demarcation of the connection point between the System Operator and Connected Party, referred to as the Point of Common Coupling (PoCC). This enables the System Operator to be able to monitor, control and provide instructions to Connected Parties for the purpose of capacity management and other services. Only the System Operator with which the Connected Party has an ATO can communicate with the Connected Party via the RTI.

The Connected Party is responsible to distribute operating constraints to the entities or facilities behind its PoCC and to aggregate the measurements to represent the PoCC. Connected Parties are responsible to follow up these operating constraints in accordance with the applicable use case and corresponding application framework.

The time domain in which the RTI is applied is foreseen to be in the real-time domain. The exact moment of communication depends on the applicable use case and corresponding application framework. This is visualized in Figure 3.

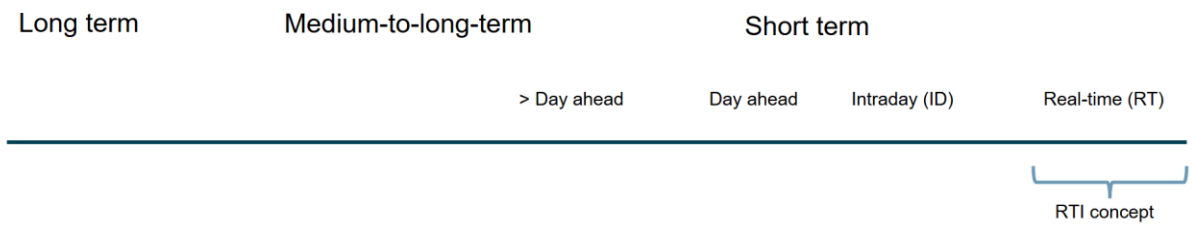


Figure 3: Illustration of the applicable time domains for the RTI concept

4. Scope

This section describes the scope of the RTI solution and its specification. The RTI is an operational interface between the relevant System Operator and the Connected Party, typically with Power Generating Facilities. To this end, the technical specifications for an RTI in the Dutch power system are defined. However, the RTI specifications are developed such that it may also be applied for Grid Connections with both generation and consumption.

The RTI is used for System Operators to communicate operating constraints to Connected Parties, and receive measurement data from Connected Parties to be able to monitor and verify if these constraints instructions are followed. A setpoint refers to a real-time limiting value (constraint) at the Point of Common Coupling representing generation, consumption or

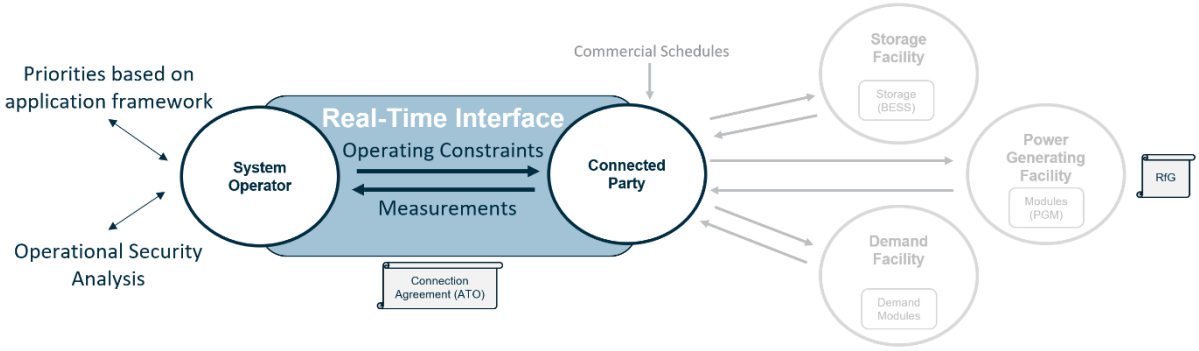


Figure 4 Scope of the Realtime Interface

exchange of electricity for specified time periods. Setpoints communicated by the System Operator to the Connected Party should be considered as constraints from the System Operator.

The technical specification of the RTI solution restricts itself to the interface between the System Operator (“Endpoint System Operator”) and Connected Party (“Endpoint Connected Party”), which is shown in Figure 4.

4.1. Out of scope

The RTI is not used for communication between System Operator and market parties (e.g. market roles such as Congestion Service Providers) and not used for communication of transactional data such as prices or volumes. This also applies to the technical, financial and settlement processes and interfaces between Balancing Responsible Parties, Balancing Service Providers or Congestion Service Providers and Power Generating Facility Owner(s). These roles are not included in the scope of the RTI and the technical specifications.

5. Application of the Realtime Interface

The specifications of the RTI describe the technical instrument. These RTI-specifications can facilitate various use cases, related to capacity management. For each use case the RTI is applied, a so-called application framework will be published, providing the framework within which the RTI is applied for said use case. Part of the operational communication of the RTI is a reference to the use case for which the RTI is applied. See Figure 5.

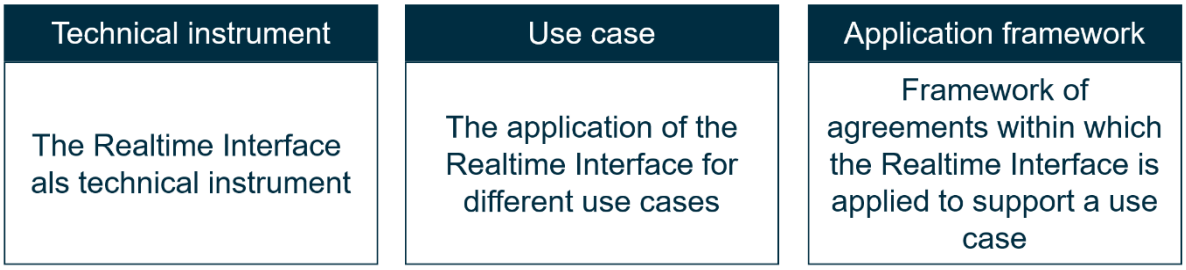


Figure 5 Differentiating Technical instrument, Use case and Application framework

6. Demarcation of ownership and responsibilities

Previous chapters describe the positioning in the ecosystem, roles in relation to the RTI. This chapter describes the demarcation between and responsibilities of the relevant roles on an abstract level. The demarcation point is where the SO responsibility ends and the Connected Party responsibility begins. The RTI impacts demarcation points on three levels: business level, communication level and power system level. An abstract representation of the different demarcation points can be found in Figure 6.

Demarcation point *'I'* illustrates the contractual demarcation on the business layer. On a business level, contractual agreements and application frameworks ensure the interactions between System Operator and Connected parties and their respective responsibilities during the day-to-day operation of the RTI.

On communication level, the demarcation point can vary, depending on for example implementation, RTI version, and contractual agreements. However, for each Connected Party, the demarcation point should be fixed at either 'D1', or 'D2' to ensure clear responsibilities are allocated to both SO and Connected Party.

On a Power System level, the demarcation point is captured by the PoCC, as defined in the Grid Codes. Detailed, version specific requirements as a result of demarcation of ownership and responsibilities can be found in the respective specification documents.

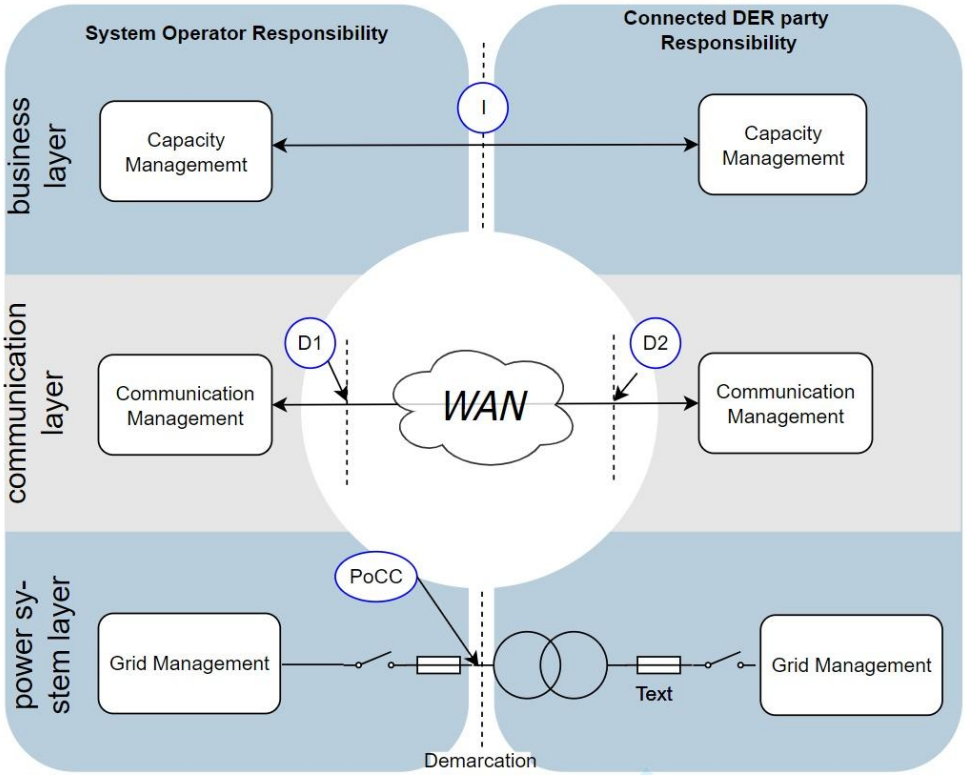


Figure 6 Abstract representation of the different demarcation points

7. Abbreviations

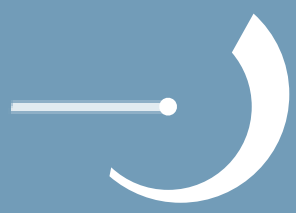
ACM	Autoriteit Consument en Markt
ATO	Aansluit- en Transportovereenkomst / Connection and Transportation Agreement
BRP	Balance Responsible Party
BSP	Balancing Service Provider
CDC	Common Data Class
CSP	Congestion Service Provider
DA	Distribution Automation
DCC	Demand Connection Code, Commission Regulation (EU) 2016/1388
DER	Distributed energy resource
DMS	Distribution management system
DO	Data Object
DSO	Distribution System Operator
GCP	Grid Connection Point
EMS	Energy Management System
ENCS	European Network for Cyber Security
EV	Electric Vehicle
GOPACS	Grid Operators Platform for Congestion Solutions
HVDC	High Voltage Direct Current
ID	Intraday
IEC	International Electrotechnical Commission
IED	Intelligent Electronic Device
kVA	Kilo Volt-Ampère
kVAr	Kilo Volt-Ampère reactief
kW	Kilowatt
kWh	Kilowatthour
LV	Low Voltage
MMS	Manufacturing Message Specification
MV	Medium Voltage
MVA	Mega Volt-Ampère
MVAr	Mega Volt-Ampère reactive
MW	MegaWatt
NBNL	Netbeheer Nederland
OT	Operational Technology
PoCC	Point of Common Coupling
PGMD	Power Generating Module Document
PID	Project Initiation Document
PV	Photovoltaics
RfG	Requirements for Generators, Commission Regulation (EU) 2016/631
RTI	Realtime Interface
RTI version 1	The first version of the realtime-interface

RTI version 2	The second version of the realtime-interface
RTU	Remote Terminal Unit
SA	Substation Automation
SGAM	Smart Grid Architectural Model
SO	System Operator
TSO	Transmission System Operator
UTC	Coordinated Universal Time
WAN	Wide Area Network
XML	Extended Markup Language

Changelog

This section contains the main changes from the previous version of the positioning document.

nr.	Document	Chapter/ Paragraph	Page num-ber	Original text/Remark	Modification
1	Positioning	3 Position in ecosystem	7	RTI concept both ahead and real-time.	RTI concept focuses on real-time, update text and figure
2	Positioning	3 Position in ecosystem	8	Schedule (ahead-of-time)	Setpoint (real-time)



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